M54 to M6 Link Road

TR010054

Preliminary Environmental Information Report

APFP Regulation 5(2)(q)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

May 2019

Contents

Figures

Appendices

1. INTRODUCTION

1.1. Overview and Need for the Proposed Scheme

1.1.1. The M54 to M6 Link Road (herein referred to as 'the proposed Scheme') would provide a link road between Junction 1 of the M54 and Junction 11 of the M6. The proposed Scheme aims to reduce congestion on local and regional routes, particularly the A460 and A449 and deliver improved transport links to encourage the development of the surrounding area, providing social and economic benefits for the West Midlands region. The proposed Scheme would comprise the following works:

- a new link road of approximately 2.5 km (1.6 miles) in length between the M54 Junction 1 and the M6 Junction 11 to provide a two lane carriageway in both directions;
- new grade-separated junction at M54 Junction 1 to provide free flow links to and from the M54 and the new link road;
- a three roundabout dumbbell arrangement connected by short dual carriageway link roads would be provided at M54 Junction 1 to maintain connectivity of the local road network;
- realignment of Hilton Lane over the new link road and construction of a new accommodation bridge and access track along the length of the proposed Scheme; and
- the new link road would connect at-grade to M6 Junction 11. Junction capacity improvements are proposed at M6 Junction 11.

1.1.2. In 2001 the West Midlands Area Multi Modal Study (Ref 1.1) recommended the construction of a link road between the M54 and M6/ Birmingham Northern Relief Road (also referred to as M6 Toll) to provide the 'missing' link between the M54 and the M6 northbound. The government formerly identified the need for the proposed Scheme in 2014 in the Road Investment Strategy: 2015 to 2020 (Ref 1.2), which sets out the long term approach to improve England's motorways and major roads.

1.1.3. The M54 currently merges into the M6 southbound at Junction 10a. There is no direct motorway link from the M54 to the M6 northbound or M6 Toll. Traffic wishing to make this movement has to leave the motorway network and use the regional and local road network including the A449, A5 and A460. The routes used are heavily congested, particularly during peak periods, and exhibit relatively high accident rates.

1.1.4. The current signed trunk road route between the M54 eastbound and the M6 northbound is the A449, featuring a national speed limit, and the A5 with a 50 mph speed limit travelling between M54 Junction 2 and M6 Junction 12. Traffic heading for the M6 northbound and the M6 Toll currently diverts at M54 Junction 1 on to the A460, past the villages of Featherstone and Shareshill, then through M6 Junction 11.

1.1.5. The existing A460 west of the M6 is a single carriageway road approximately 10 m wide with no physical separation between the flows of traffic in each direction. The A460 predominantly features a 40 mph speed limit, interspersed with 30 mph and 50 mph sections. The A460 has numerous minor roads and private accesses joining it between the M54 and the M6, requiring six priority junctions and one signal controlled junction. These provide access to Featherstone, Shareshill, Hilton, Hilton Hall and other isolated properties. These junctions are all at-grade and result in right

turning traffic having to cross on-coming traffic to exit and enter the junctions. At Featherstone and Shareshill there are ghost island right turn lanes. The junction with New Road and Dark Lane in Featherstone is a signalised cross road.

1.1.6. The regional and local road network is not adequate to cope with the high volumes of traffic, often consisting of heavy goods vehicles (HGVs), having to divert off the motorway network to travel between the M54 and M6 northbound and the M6 Toll. There is a need to provide a link road to address the current levels of congestion and its impacts on local residents, motorists and business users. Investment in additional capacity would support local economic growth for Telford, Shrewsbury, Wolverhampton, Cannock and Tamworth by improving traffic flow and enhanced east-west and north-south routes.

1.1.7. The purpose of the proposed Scheme is to provide a link between the M54 Junction 1 and the M6 Junction 11. The proposed Scheme aims to relieve congestion in the A460 corridor and to provide better regional transportation links.

1.2. The Purpose of the Report

1.2.1. This document is a Preliminary Environmental Information Report (PEI Report) which presents a description of the proposed Scheme, the likely significant environmental effects based on the preliminary environmental information, measures to avoid or reduce such effects and the alternative designs considered. The PEI Report is a point in time assessment based on the knowledge available at the time of writing the assessment and is intended to support consultees in developing an informed view of the likely significant environmental effects of the proposed Scheme.

1.2.2. The assessment outlined in this PEI Report is subject to change as we are continuing to gather environmental information and identify the potential impacts of the proposed Scheme. This knowledge will then be fed back into the design process, developing measures to avoid or reduce adverse impacts - a process known as environmental impact assessment (EIA). The results of the full EIA will be presented in an Environmental Statement (ES) submitted with the required Development Consent Order (DCO) application.

1.2.3. This PEI Report has been prepared to assist consultees in understanding the potential impacts of the proposed Scheme and the mitigation measures currently proposed. It forms part of the consultation material provided for the statutory consultation process under the Planning Act 2008 (PA 2008) (as amended, including by The Highway and Railway (Nationally Significant Infrastructure Project) Order 2013) (Ref 1.3) (PA 2008). Further details are provided under Section 1.7 of this report.

1.3. Legislative and Policy Framework

Planning Act 2008

1.3.1. The proposed Scheme is defined as a Nationally Significant Infrastructure Project (NSIP) under Section 14(1)(h) and Section 22 of the PA 2008 (Ref 1.4) (as amended) by virtue of the fact that:

- it comprises the construction of a highway
- the highway to be constructed is wholly in England
- the Secretary of State is the highway authority for the highway

- the speed limit for any class of vehicle on the highway is to be 50 miles per hour or greater and the area for the construction of the highway is greater than 12.5 hectares (ha)

1.3.2. In accordance with the legislation, a DCO is therefore required to allow the construction and operation of the proposed Scheme.

The EIA Regulations

1.3.3. The proposed Scheme is considered to be an 'EIA development' and listed within Schedule 2 Regulation 3(1) Part 10 (f) (construction of roads) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (herein referred to as 'the EIA Regulations') (Ref 1.5), and it has the potential to generate significant environmental effects by virtue of its nature, scale and location.

1.3.4. In accordance with Regulation 8(1) (b) of the EIA Regulations, Highways England has notified the Secretary of State for Transport (Secretary of State) in a letter to the Planning Inspectorate (the Inspectorate) dated [11 January 2019] that an Environmental Statement presenting the findings of the EIA will be submitted with the DCO application.

1.3.5. An EIA Scoping Report was submitted to The Planning Inspectorate on 11 January 2019 and can be viewed at the following link:

https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010054/TR010054-000025-54M6-Scoping%20Report.pdf

1.3.6. The Inspectorate reviewed and consulted on the EIA Scoping Report and published a Scoping Opinion on 21st February 2019 which can be viewed at the following link:

https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010054/TR010054-000029-53J6%20-%20Scoping%20Opinion.pdf

1.3.7. Highways England acknowledges the comments of the Inspectorate given within the Scoping Opinion and also notes the comments provided by the statutory consultees to the Inspectorate in Appendix 2 to the Scoping Opinion along with the late consultation response published on 21 February 2019. Both the Scoping Opinion and the comments from the consultees have been considered in undertaking the ongoing EIA and in preparing this PEI Report.

1.3.8. Highways England is maintaining ongoing dialogue with the Inspectorate and other relevant statutory stakeholders in relation to the scope of EIA in order to ensure that the scope of the EIA is proportionate and meets the requirements of the EIA Regulations. The scope of the EIA for each topic is being agreed with the relevant statutory stakeholders and this will be reported in the ES.

The Decision Marker and Planning Policy

1.3.9. The Localism Act 2011 (Ref 1.6), appointed the Inspectorate as the agency responsible for operating the DCO process for NSIPs. In its role, the Inspectorate will examine the application for the proposed Scheme and then will make a recommendation to the Secretary of State who will make the decision on whether to grant or to refuse the DCO.

1.3.10. In accordance with section 104(2) of the PA 2008, the Secretary of State is required to have regard to relevant National Policy Statement (NPS), amongst other matters, when deciding whether or not to grant a DCO. The relevant NPS for the proposed

Scheme is the National Policy Statement for National Networks (NPSNN) (Ref 1.7) which was published in January 2015.

1.3.11. Other matters that the Secretary of State considers important and relevant include national and local planning policy. The National Planning Policy Framework (NPPF) published in February 2019 is the relevant national planning policy (Ref 1.8).

1.3.12. The key local planning policies of relevance to the proposed Scheme consist of the following:

- South Staffordshire Council Core Strategy Development Plan Document adopted December 2012 (Ref 1.9);
- South Staffordshire Site Allocations document adopted September 2018 (Ref 1.10);
- Minerals Local Plan for Staffordshire (2015-2030) adopted February 2017 (Ref 1.11); and
- Staffordshire and Stoke-on-Trent Waste Local Plan (2010 to 2026) adopted March 2013 (Ref 1.12).

1.3.13. The EIA Scoping Report submitted to the Inspectorate described the national and local planning policy relevant to the assessment with a summary provided for each environmental topic. These policies will be restated in the ES. The purpose of considering relevant planning policy during the EIA is twofold:

- To identify policy that could influence the sensitivity of receptors (and therefore the significance of effects) and any requirements for mitigation.
- To identify planning policy that could influence the methodology of the EIA. For example, a planning policy may require the assessment of a particular impact or the use of a particular methodology.

1.4. The Applicant

1.4.1. Highways England is the Applicant, and the Strategic Highways Company as defined in the Infrastructure Act 2015, and is charged with modernising and maintaining England's strategic road network, as well as running the network and keeping traffic moving.

1.5. Stakeholder Engagement

1.5.1. Consultation is a critical element of the DCO application process, and to date a range of consultation, both statutory and non-statutory has been undertaken. Consultation for the project commenced in PCF Stage 2 (options selection) where a range of options were still being explored and considered (refer to Chapter 3: Assessment of Alternatives), and will continue into PCF Stage 3 through to the submission of the DCO application.

1.5.2. Stakeholder engagement for the proposed Scheme is based on the following principles:

- Early and ongoing engagement to inform and influence the proposed Scheme design development process.
- Seeking an appropriate level of feedback at each stage in the iterative design process and ensuring that comments received are taken into consideration.
- Building of long term relationships with key stakeholders throughout the different stages of the proposed Scheme to help better understand their views.

- Where possible and practicable ensuring concerns are addressed.
- Ensuring appropriate statutory consultation is undertaken in accordance with requirements of the PA 2008 and associated guidance.

1.6. Structure of this PEI Report

1.6.1. The main text of this PEI Report divides into three parts:

- Chapters 1 to 4 describe the proposed Scheme, the alternatives considered and the approach taken to the EIA (including consideration of Major Events and Health Impacts).
- Chapters 5 to 14 present a preliminary assessment of the likely significant effects of the proposed Scheme in relation to ten specialist topics covering particular aspects of the environment.
- Chapter 15 considers the potential inter-relationships between the topics covered in Chapters 5 to 14, and between the proposed Scheme and other developments in the surrounding area, which together have the potential to generate cumulative effects.

1.6.2. The specialist topics covered in Chapters 5 to 14 of this PEI Report are:

- Chapter 5: Air Quality
- Chapter 6: Cultural Heritage
- Chapter 7: Landscape and Visual
- Chapter 8: Biodiversity
- Chapter 9: Noise and Vibration
- Chapter 10: Geology and Soils
- Chapter 11: Road Drainage and the Water Environment
- Chapter 12: Material Assets and Waste
- Chapter 12: Population and Health
- Chapter 14: Climate

1.6.3. References, a glossary and a list of abbreviations are included at the end of this PEI Report.

Non-Technical Summary

1.6.4. A separate report in the form of a PEI Report: Non-Technical Summary (NTS) has been produced for wider readership by consultees. The NTS provides a summary of this PEI Report in non-technical language.

1.7. Next Steps

1.7.1. As noted in Section 1.2, this PEI Report has been prepared to support consultees in developing an informed view of the likely significant environmental effects of the proposed Scheme.

1.7.2. A six week consultation on the proposed Scheme runs from 24 May to 5 July 2019 to enable people to review the proposals and provide feedback. Highways England invites comments on the proposed Scheme and the environmental issues addressed in the PEI Report.

1.7.3. To find out more about our scheme proposals you can:

- **Join us at one of our public information events:** Members of our team will be on hand to answer your questions. These events are being held at:
  - 31 May 2019: Featherstone and Hilton Community Centre, Baneberry Drive, Featherstone, WV10 7TR (13:00 – 20:00).
  - 1 June 2019: Featherstone and Hilton Community Centre, Baneberry Drive, Featherstone, WV10 7TR (11:00 – 18:00).
  - 5 June 2019: Shareshill Village Hall, Elms Lane, Shareshill, WV10 7JS (13:00 – 20:00).
  - 8 June 2019: Shareshill Village Hall, Elms Lane, Shareshill, WV10 7JS (11:00 – 18:00).
  - 11 June 2019: Wedges Mills Village Hall, Wolverhampton Road, Wedges Mill, WS11 1ST (15:00 – 20:00).
  - 13 June 2019: Cheslyn Hay Village Hall, Pinfold Lane, Cheslyn Hay, WS6 7HP (15:00 – 20:00).
  - 15 June 2019: Essington Community Centre, Hobnock Road, Essington (13:00 – 20:00).
- **Visit our website at:** www.highwaysengland.co.uk/M54-M6linkroad here you will find background information on the proposed Scheme plus information on the current consultation, including:
  - details on when and where our public information events are being held;
  - details of Information and Deposit Point locations at local libraries where information about the proposed Scheme can be viewed;
  - our Statement of Community Consultation;
  - the Consultation Booklet and the Response Form;
  - plans of the proposed Scheme, including the 'red line' Order Limits plans showing the extent of temporary and permanent land required for the construction of the proposed Scheme that will form part of our DCO application; and
  - this Preliminary Environmental Information Report which is accompanied by a Non-Technical Summary.
- **Phone us:** get in touch by calling 0300 123 5000
- **Email us:** at M54toM6linkroad@highwaysengland.co.uk

Responding to Consultation

1.7.4. There are various ways that you can respond to the consultation.

- **Completing the feedback form online:** www.highwaysengland.co.uk/M54-M6linkroad
- **Attending a consultation event:** where you can meet the project team and complete a paper feedback form;
- **Emailing us at:** M54toM6linkroad@highwaysengland.co.uk; and

- **Posting your response:** completed feedback forms can be sent by Freepost (you do not need a stamp) to the following address:
  Freepost M54 TO M6 LINK ROAD

1.7.5. If you need a paper copy of the feedback form, let us know and we can post one to you.

1.7.6. Please submit your responses by 23:59 on Friday 5 July 2019.

1.7.7. Your feedback will inform our continuing development of the proposed Scheme. Once we have taken your feedback into consideration, we plan to submit our application for a Development Consent Order in early 2020. We will also prepare a report on the consultation, recording the feedback and our response, which will be published with our application.

1.7.8. Your comments will be analysed by Highways England and any of its appointed agents. Copies may be made available in due course to the Secretary of State, the Planning Inspectorate and other relevant statutory authorities so that your comments can be considered as part of the DCO application process. We will request that your personal details are not placed on public record and will be held securely by Highways England in accordance with the General Data Protection Regulations 2018 and will be used solely in connection with the consultation process and subsequent DCO application and, except as noted above, will not be passed to third parties.

1.7.9. Following this consultation, Highways England will prepare a Consultation Report on the responses received and how they have been taken into account, including whether or not they led to changes to the design of the proposed Scheme or the environmental impact assessment currently being undertaken. This report will be submitted as part of the DCO application.

1.7.10. If our application for a Development Consent Order is accepted by the Planning Inspectorate, there will be an examination of the application in which you will have further opportunity to comment as part of the DCO application examination process. This examination will take a maximum of six months. The Planning Inspectorate then has three months to make a recommendation to the Secretary of State, who then has a further three months to make a final decision. If our application is approved, construction of the proposed Scheme is planned to start in 2021.

1.7.11. If you would like any further information on the Development Consent Order application process, please visit the Planning Inspectorate's website:

http://infrastructure.planningportal.gov.uk

2. THE PROPOSED SCHEME

2.1. Project Objectives

2.1.1. The Overall Objectives for the proposed Scheme are:

- **Make the network safer:** reducing accidents on the A460 and the A449 by transferring strategic traffic from the existing roads onto the new link. Designing the link to modern highway standards, reducing driver stress, and providing adequate capacity for predicted traffic levels.
- **Improve user satisfaction:** making journey times more reliable and easing congestion on the A460 and A449 by segregating local and non-motorised road users from high-speed traffic moving between the motorways by transferring strategic traffic from the local road network onto the new link.
- **Support the smooth flow of traffic:** by putting the right traffic on the right roads, providing long distance, strategic traffic with a route appropriate for its needs. Providing increased lane capacity and improved junction performance to meet predicted traffic growth. Making movements at M54 Junction 1 and M6 Junction 11 more free-flowing through improved geometry.
- **Encourage economic growth:** by increasing the capacity and resilience of a critical part of the trans-European network providing better access to and from the Midlands for businesses and commuters, enabling major residential and commercial developments to proceed, leading to increased economic growth, regionally and nationally.
- **Deliver better environmental outcomes:** by identifying environmental issues early and engaging with interested parties in order to try and minimise the impact of the proposals and deliver enhancement where possible.
- **More accessible and integrated network:** by placing the right traffic on the right roads and freeing up local capacity for all types of road user, including pedestrians, cyclists, equestrians and other vulnerable users and improve connectivity for the communities along the roads, improve amenities for non-motorised users and reduce severance on the routes.
- **Achieving real efficiency:** by promoting a “one team” type of environment which will help drive efficiencies in terms of cost and programme savings throughout the delivery of the project.
- **Keeping the network in good condition:** Providing a high capacity link to modern design standards will make the network easier and safer to maintain.
- **Create a Positive Legacy:** Recognising the wider benefits of the road improvement Scheme for local communities and businesses.

2.2. Project Location

2.2.1. The proposed Scheme would be located within the county of Staffordshire between the national and regional routes, the M54, M6 and A460 (see Figure 2.1). The M54 runs approximately east to west between Junction 10a of the M6 and the urban area of Telford. Located within the administrative boundary of local authorities Staffordshire County Council, South Staffordshire District Council and the City of Wolverhampton Council the proposed Scheme would be located in a predominantly rural area consisting mainly of mixed agricultural land and scattered woodland. South of Hilton Lane is an area of historic park land associated with Hilton Hall.

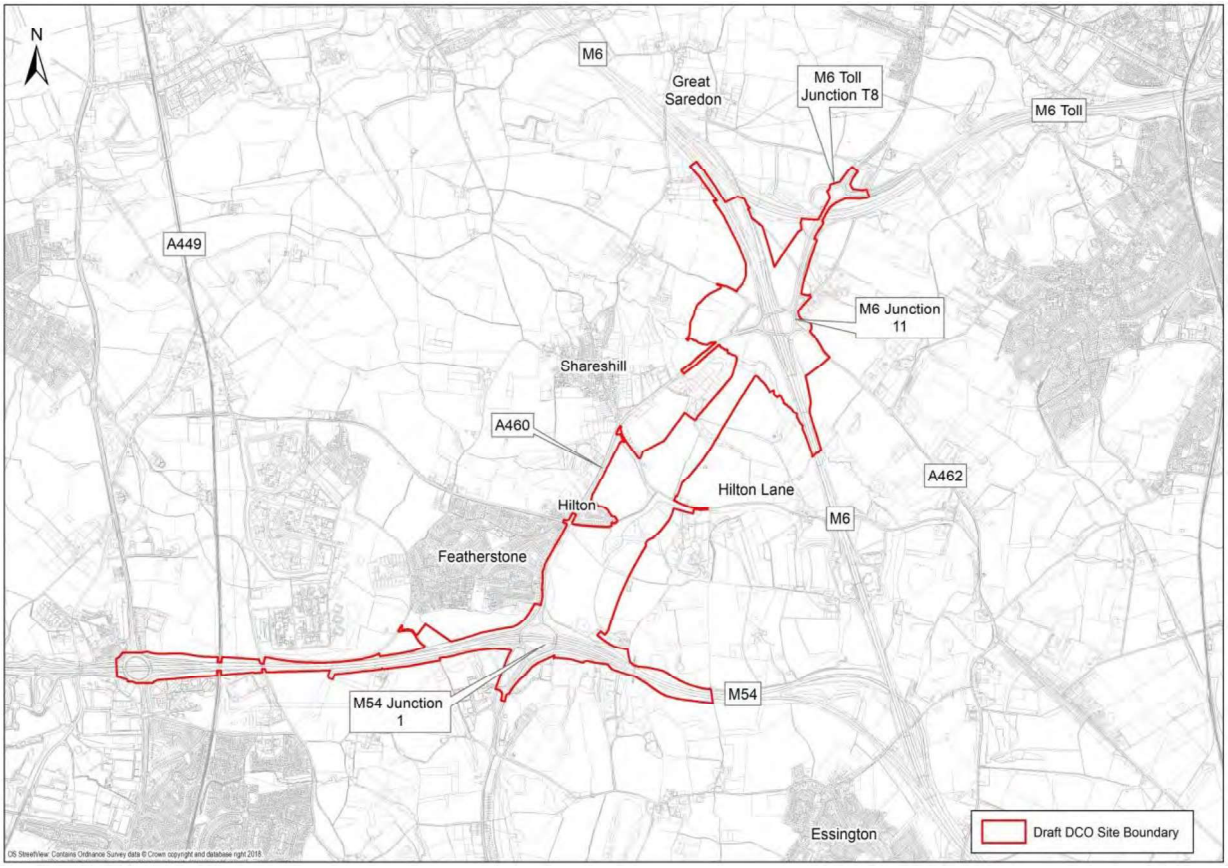


Figure 2.1: Location Plan

2.2.2. The nearest residential areas include the villages of Shareshill to the north-west, Featherstone and Hilton to the west and Essington to the south-east and the hamlet of Little Saredon to the north-west. The residential area of Bushbury, a suburb of Wolverhampton is located to the south of M54 Junction 2. There are also a number of more isolated residential properties and farm holdings in the vicinity of the proposed Scheme.

2.2.3. The land required temporarily and permanently for the construction, operation and maintenance of the proposed Scheme (hereafter referred to as the Order Limits which includes land required for permanent and temporary purposes. The Order Limits include the boundary of the main works (herein referred to as the draft DCO site boundary, refer to Figure 2.1) and a number of isolated pockets of land required to update the faces of existing signs only. Key environmental constraints and receptors for ecology, heritage, landscape, geology and soils, noise and vibration, population and health and water are illustrated in Figures 6.1 to 13.2. Study areas for each technical discipline are given from the draft DCO site boundary rather than the Order Limits as it is considered that the replacement of existing sign faces would not result in a significant effect on environmental receptors alone or in-combination with the works included in the draft DCO site boundary.

2.2.4. It is important to note that as the design process is ongoing the current Order Limits capture what is thought to be a reasonable worst-case requirement for land including both temporary and permanent land take.

2.2.5. The current Order Limits and draft DCO site boundary differ to that presented with the Scoping Report in January 2019. The main change to the draft DCO site boundary is its extension along the M54 corridor to Junction 2. The draft DCO site

boundary has also been extended in other areas to allow for additional working space and additional areas that may be required for mitigation measures.

2.2.6. The extension to the draft DCO site boundary between Junction 1 and Junction 2 of the M54 has been included to take into account the need for new road signs and changes to existing sign faces and foundations to communicate the changes to the road layout for road users.

2.2.7. The proposed Scheme is located in the Green Belt and crosses a Historic Landscape Area designated under Core Strategy policies EQ3 and EQ4. The draft DCO site boundary includes a sliver of land designated as the Hilton Cross Strategic Employment Site under Core Strategy Policy CP1 and EV1, located to the south-west of M54 Junction 1. At the time of writing this assessment, we are not aware of any extant or pending planning applications or other areas allocated for development in the South Staffordshire Local Plan located within the draft DCO site boundary.

2.3. Description of the Proposed Scheme

2.3.1. The preferred route for the proposed Scheme was announced in September 2018. This section provides a description of the proposed Scheme from south to north.

2.3.2. M54 Junction 1 would be rebuilt with the existing junction removed. The new arrangement would provide free flow movements between the M54 and the new link road in both directions. The free flow links would pass through the junction underneath the existing M54 at approximately existing ground level. Three new smaller roundabouts in a dumbbell arrangement connected by short link roads would replace the existing junction and maintain connectivity of the local road network at this location. An access road would be provided off the eastern roundabout to maintain access to land east of the proposed Scheme. The new dumbbell arrangement would result in the loss of a pond at Tower House Farm.

2.3.3. The proposed Scheme would cross to the west of Hilton Hall passing through part of Lower Pool (a large ornamental pool). The proposed Scheme would be roughly at-grade, close to Dark Lane (approximate distance of 47 m between the proposed edge of carriageway and the closest property). Dark Lane would be stopped up between the final property along Dark Lane to the west and the junction with Hilton Lane to the east.

2.3.4. The proposed Scheme would cross under the existing alignment of Hilton Lane approximately 5 m below existing ground level. A new bridge would connect Hilton Lane either side of the new link road. It is proposed that approximately 500 m of Hilton Lane would be reconstructed on a similar alignment and raised by approximately 3 m in height.

2.3.5. An accommodation bridge and access track would be provided along the mainline to serve severed land including land and three fishing ponds to the west of Hilton Hall and land to the east of Brookfield Farm. The route of the proposed Scheme would then continue to the east of Brookfield Farm resulting in the loss of a fishing pond, before continuing north to link into M6 Junction 11. Junction capacity improvements are proposed at M6 Junction 11. These improvements currently consist of an enlargement of the M6 Junction 11 roundabout to accommodate both A460 connection and the new link road. Two new structures would be required over the M6 which would be four lanes wide and designed to be built offline to the north and south of the existing structures.

Earthworks Design

2.3.6. At M54 Junction 1 the new free flow links would pass through the junction underneath the existing M54 at the level of the existing roundabout. The two roundabouts proposed at M54 Junction 1 to the north of the M54 would be on embankment in order to provide a dumbbell link over the mainline. These dumbbell roundabouts would be up to approximately 9 m above existing ground level. The roundabout to the south of the M54 would be roughly at the same height as the existing roundabout.

2.3.7. The proposed Scheme would be at approximately ground level in the vicinity of Dark Lane, dropping into cutting south of Hilton Lane to allow the new dual carriageway to pass underneath Hilton Lane and minimise visual intrusion. The cutting would be up to approximately 5.5 m below the existing ground level to the west and up to 9 m below existing ground level to the east due to the topography of the area. Hilton Lane would pass over the proposed Scheme on a bridge, raising the height of Hilton Lane by up to 2.5 m. The proposed Scheme would continue in cutting to the south of the fishing ponds, where it would be raised on a slight embankment before dropping back into a cutting east of Brookfield Farm. The cutting would be up to 7.4 m on the eastern side and up to 3.7 m on the western side due to the undulating nature of the existing topography. A false cutting, up to approximately 4 m in height is proposed directly east of Brookfield Farm to screen nearby properties from the proposed Scheme.

2.3.8. The proposed Scheme would then rise on an embankment to link into the new M6 Junction 11 roundabout. The improvements to M6 Junction 11 would result in the junction being raised by up to approximately 0.5 m above the existing junction.

2.3.9. Initial assessment indicates that the proposed Scheme would have a deficit of 90,000m^3 of material. This does not currently take into account materials that may be required or released through environmental mitigation, for example false cuttings, bunds, flood compensation areas and pond creation. Further design development will be undertaken to try and reduce this deficit to minimise the amount of material that would need to be imported for construction. A draft Environmental Masterplan illustrating initial proposed environmental mitigation measures is provided as Figure 2.2.

Drainage and Flood Risk Design

2.3.10. The design of the proposed Scheme will include the provision of a suitable drainage design. Outfalls would be provided to local watercourses, with flow rates limited in accordance with Environment Agency requirements.

2.3.11. The proposed Scheme would cross an area of land designated as Flood Zone 2 and Flood Zone 3 to the north of the proposed Scheme at Latherford Brook. Development in this area has the potential to result in an increased risk of flooding. In order to manage such risks, flood modelling will be undertaken in order to design appropriate compensatory flood storage areas. Flood storage provisions will be confirmed in the Environmental Statement.

2.3.12. The indicative locations of drainage ponds and potential areas required for flood alleviation are illustrated on Figure 2.2. The location and size of these areas will be further refined through the use of flood modelling.

Provision for Pedestrians, Cyclists and Equestrians

2.3.13. The proposed Scheme design aims to at least maintain the level of provision and connectivity for pedestrians, cyclists and equestrians (also referred to as non-

motorised users (NMUs)) that exists at present with enhanced provision where deemed appropriate and reasonable. In undertaking the design of proposed NMU facilities, the requirements of the Equality Act 2010 will be considered where required in order to take appropriate account of the needs of disabled users.

2.3.14. Improvements to NMU facilities and connectivity across M54 Junction 1 and M6 Junction 11 have been identified as opportunities to improve connectivity between local communities. This will be explored through preliminary design.

2.3.15. The proposed Scheme will be designed to minimise the impact on public rights of way. The design of alternative routes will aim to keep routes as close to the existing route as possible, and avoid diverting routes alongside the realigned road network where possible.

2.3.16. The proposed Scheme will adopt construction and traffic management methods which, as far as possible, maintain access to NMU routes for road users, cyclists, pedestrians, equestrians and other key accesses during construction periods.

Lighting and Signing Strategy

2.3.17. Currently it is anticipated that both M54 Junction 1 and M6 Junction 11 would be lit, however the mainline of the proposed Scheme is not anticipated to be lit outside of the junction areas. A project appraisal report will be undertaken as part of preliminary design that will confirm the requirement for lighting along the proposed Scheme.

2.3.18. The current proposed sign and gantry design includes six gantries; five full span gantries located at M6 Junction 11 and one cantilever gantry east of the M54 Junction 1.

2.3.19. It is proposed that existing signage arrangement would be retained along the M6. A review of the wider signing strategy for the strategic road network in the vicinity of the proposed Scheme will be undertaken as part of preliminary design. It is anticipated that new signs will be required on the eastbound approach to M54 Junction 1 to alert road users to the change in road layout. The extension of the draft DCO site boundary along the M54 to Junction 2 has been included to allow for these works within the highways boundary.

2.4. Construction, Operation and Long Term Management

Construction Activities

2.4.1. The approach to construction described below is indicative and subject to change but it is representative of the likely approach to be adopted.

2.4.2. It is currently anticipated that the majority of the proposed Scheme will be constructed offline including the mainline and majority of M54 Junction 1 with access from the existing road network. Once construction of the offline section of the proposed Scheme is complete the connections to the existing network at M54 Junction 1 and M6 Junction 11 will be constructed. This phasing seeks to complete sections of road works and open to traffic as soon as is practical, in order to secure tangible benefits to customers as early as possible.

2.4.3. The indicative likely site boundaries shown in Figure 2.3 allow for temporary traffic management areas, temporary working and storage areas, material stockpiles, haul roads, and provision for site compounds to be used during the construction of the proposed Scheme. However, these may be subject to change as a more detailed understanding of the construction methodology develops.

Construction Programme

2.4.4. Construction is planned to start in 2021 and the proposed Scheme is due to open to traffic in 2024. Further detail on the main phases of the construction programme will be provided in the Environmental Statement.

Construction compounds and site accesses

2.4.5. Two possible site compounds have been identified, the first is located near M6 Junction 11 between the A460 and Mill Lane, the second is located near M54 Junction 1 between Featherstone and the proposed Scheme (See Figure 2.2). Primary access to these compounds is likely to be off the A460 from M6 Junction 11 and M54 Junction 1 respectively. It is anticipated that the compound near M6 Junction 11 will be the main site compound as it has better access to both the North and the South via the M6 (without using the A460) whereas the second compound near M54 Junction 1 will be a satellite compound to aid the construction of M54 Junction 1.

2.4.6. The size of the main site office compound would be approximately 9.1 ha and would include temporary site offices, parking, and welfare facilities. The size of the satellite compound at M54 Junction 1 would be approximately 4.3 ha and would include temporary site offices, parking, and welfare facilities.

2.4.7. The exact locations and extents of the compound areas will be refined during ongoing definition of the construction approach and when finalised will be fully assessed in the ES.

Material storage and stockpiles

2.4.8. Various stockpile areas would be required for topsoil and other materials needed to be retained on site for re-use within the works. These would be located along the proposed Scheme within the draft DCO site boundary. The topsoil stockpiles would generally be located at the perimeter of working areas so that they would also screen the works from the public. They would be sown with grass seed to reduce their visual impact. The footprint of the stockpiles would generally be returned to their former use.

Haul routes (on-site)

2.4.9. Generally, construction plant would travel along the proposed Scheme using the footprint of the proposed embankments and cutting. A haul road for earthmoving equipment such as dump trucks would be required for the entire length of the proposed Scheme from M54 Junction 1 to M6 Junction 11. Its route would run adjacent to, but outside of the main earthworks. Haul road maintenance and dust control measures would be adopted.

2.4.10. All haul routes would be removed upon completion of the earthworks and the land reinstated to its former use.

Construction traffic (off-site)

2.4.11. Earthworks material would generally be retained and re-used within the project, but there may be some small quantities of contaminated material that would need to be transported to licensed waste management facilities.

2.4.12. Other construction traffic would consist of vehicles delivering the products required for the construction of the proposed Scheme, including concrete, bitumen, aggregates, pipes and steel. Some deliveries would arrive as abnormal loads, such as large construction plant.

Plant and Equipment

2.4.13. Construction of the proposed Scheme would require a large quantity of plant and equipment. The high volume of earth to be moved would require large excavators, dump trucks, dozers, compactors plus graders, bowsers and stabilising plant. Seasonal constraints associated with working in chalk, mean that a high number of on and off movements with low loaders to deliver earth moving plant would be required. Plant numbers will be determined by the construction methodology.

Utilities

2.4.14. Construction of the proposed Scheme is likely to require the diversion, relocation or protection of a number of existing utility assets.

2.4.15. Notable utilities assets that would require diversion as part of the proposed Scheme include a large diameter high pressure gas main in the vicinity of M54 Junction 1 and a large diameter potable water main along Dark Lane.

2.4.16. Further consultation with utility asset suppliers, owners and managers will be undertaken in order to finalise the utility solutions at each location.

Demolitions

2.4.17. As part of the proposed Scheme it is anticipated that both the existing bridges at M6 Junction 11 would be demolished.

2.4.18. It is currently anticipated that the existing structures at M54 Junction 1 that would be redundant upon completion of the proposed Scheme would be left in place and backfilled to avoid future maintenance activities.

Construction Environmental Management Plan

2.4.19. The construction of the proposed Scheme would be subject to measures and procedures defined within a Construction Environmental Management Plan (CEMP). This would include the implementation of industry standard practice and control measures for environmental impacts arising during construction, such as the control of dust and the approach to waste management on site.

2.4.20. An Outline Environmental Management Plan (OEMP) will be prepared as part of the development of the construction methodology, whilst measures to be included within the OEMP will be defined in part by the requirements for mitigation which arise from the technical assessments within the EIA. This PEI Report discusses proposed mitigation to be included in the OEMP as appropriate in relation to the preliminary assessments, and the technical assessments presented in the ES will take account of the agreed measures within the OEMP as 'embedded mitigation'.

Operation and Long Term Maintenance

2.4.21. Once completed and operational, the long term management (including maintenance requirements) of the new link road would be absorbed as part of 'the network' as defined within the Highways England Licence. It is Highways England's responsibility to ensure the maintenance, resilience, renewal, and replacement of the network.

Decommissioning

2.4.22. It is considered highly unlikely that the proposed Scheme would be demolished after its design life as the road is likely to have become an integral part of nationally important infrastructure. In the unlikely event of removal or demolition, this would be part of the relevant statutory process at that time, including EIA as appropriate.

Demolition of the proposed Scheme is not considered further in this PEI Report on this basis.

3. ASSESSMENT OF ALTERNATIVES

3.1. Introduction

3.1.1. The preferred route for the proposed Scheme was announced on 26th September 2018. This chapter presents a brief history of the proposed Scheme and the alternative designs considered to reach the preferred route as described in Chapter 2.

3.1.2. The process of option identification and selection is proscribed by the stages of the Highways England Project Control Framework (PCF) as shown in Figure 3.1.

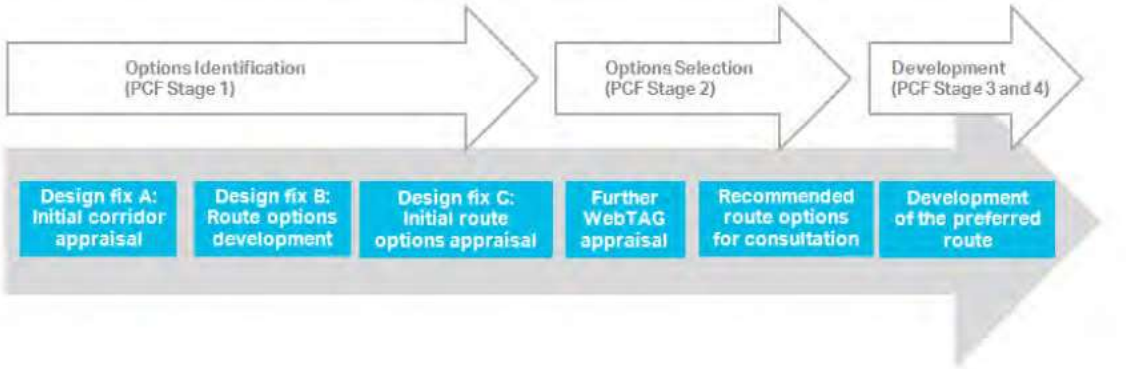


Figure 3.1: The option identification and selection process

3.1.3. A three-stage process of options identification and sifting was undertaken to identify shortlisted route options for detailed appraisal:

- Design Fix A - Corridor identification and initial sifting of corridors;
- Design Fix B - Design development of route options within preferred corridors; and
- Design Fix C - Initial appraisal and sifting of route options to identify options to take forward for appraisal.

3.2. Scheme History

3.2.1. In 2001 the West Midlands Area Multi Modal Study (Ref 3.1) recommended the following:

3.2.2. "*As a result of the appraisal process, the following key highway components, […] have been identified for the 2031 Plan:-*

- The M5/M6 corridor should retain a role as the north-south strategic route for long distance through traffic;
- A link should be provided between the M54 and the M6/Birmingham Northern Relief[1]"

3.2.3. PCF Stage 1 option identification took place between 2004 and 2009. In June 2006 early versions of these options were shared with the public for comment. Preliminary alignment options were developed in 2004. Three distinct route types were identified:

- Option A - A dual two lane all-purpose road linking the M54 Junction 1 to M6 Junction 11.

[1] The M6 Toll was previously referred to as the Birmingham Northern Relief.

- Option B - A dual two lane all-purpose road linking the M54 Junction 1 to M6 (Toll) Junction T8, bypassing M6 Junction 11.
- Option C - Provision of direct north facing links between the M54 and M6, at Junction 10 of the M6.

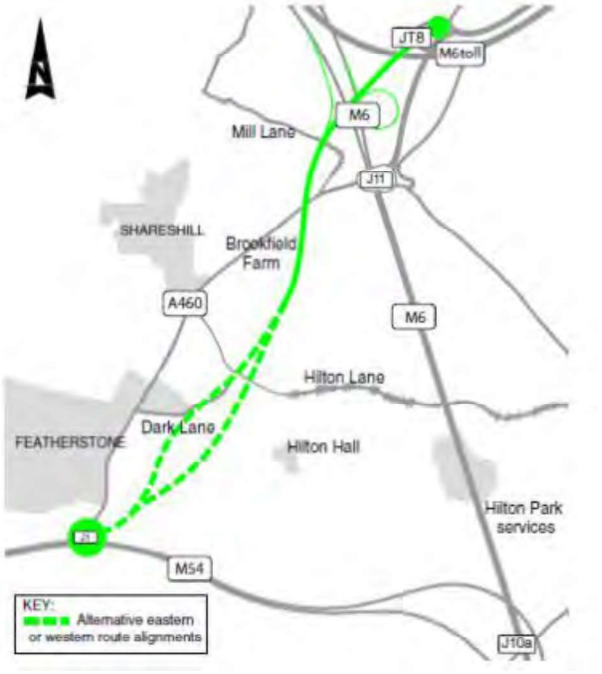
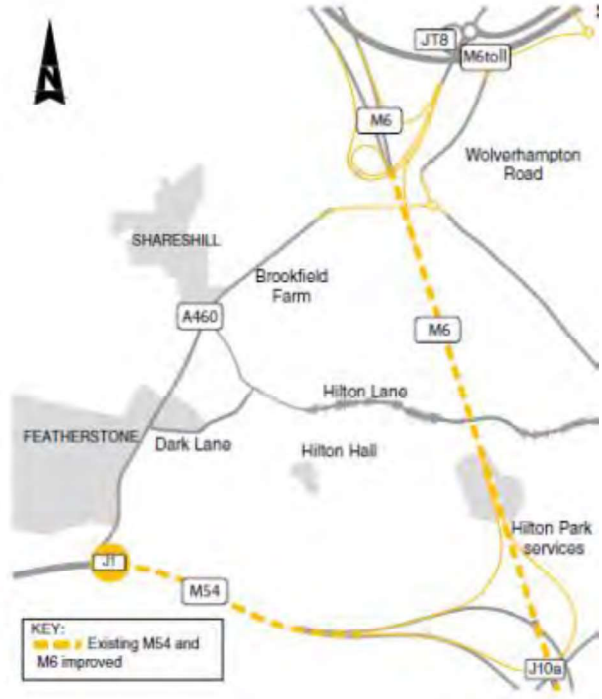
3.2.4. In June 2006 these three potential route concepts were shared with the public at public information exhibitions for comment. Following the public information exhibitions further development of the concepts was undertaken to take account of comments or views received at the exhibitions.

Option Selection - Environmental Assessment Report (2015)

3.2.5. Following the proposed Scheme's inclusion in the Road Investment Strategy (Ref 3.2) option selection commenced in 2014, initially assessing seven route options (A(e), A(w), B(e), B(w), C, B(e)M and B(w)M). These options were taken forward from the PCF Stage 1 2009 Traffic Assessment Report (TAR) (Ref 3.3) and 2014 TAR Addendum (Referred to during option identification as options A, B9, B10, C, D5 and D8) (Ref 3.4). From 2014 to 2016 these options were further developed and assessed, the results of which were reported in the 2015 Environment Assessment Report (EAR) (Ref 3.5). The EAR provided an initial assessment of air quality, noise and vibration, cultural heritage, landscape, nature conservation, geology and soils, materials, effects on all travellers, community and private assets and road drainage and the water environment for each of the proposed Scheme options. The conclusions of the environmental assessments within the EAR were used to inform the public consultation and used as part of the sifting process to inform the selection of the preferred route.

Table 3.1: Options assessed in the EAR (2015)

Option	Description	Scheme Design
Option A: East alignment and West alignment	A new dual 2-lane all-purpose link road between M54 Junction 1 and the M6 Junction 11, bypassing the villages of Featherstone and Shareshill and sited to the west of Hilton Hall.	

Option	Description	Scheme Design
Option B: East alignment and West alignment	A new dual 2-lane link road between the M54 Junction 1 and the M6 (Toll Junction T8. This option considered two variations in road specification; one is a dual 2-lane all-purpose road and the other a dual lane motorway.	
Option C	A direct motorway standard links at the M6 Junction 10a between the M54 and the M6 to and from the north. The M6 between Junction 10a and Junction 11 would become All Lane Running by continuing the hard shoulder running though Junction 10a up to Junction 11.	

3.2.6. Option B(w) assessed as providing the best overall solution when considered against the objectives of the proposed Scheme. However, this recommendation did not fully align with the outcome of the Public Consultation exercise where Option C gained the highest level of support from members of the public who responded to the questionnaire. During public consultation in 2015 with local stakeholders and members of the public it was determined that stakeholders preferred Option B, followed by Option C. In contrast, the public favoured Option C, followed by Option B.

3.2.7. In light of feedback received during the public consultation from local stakeholders and members of the public on the three proposed route options, further assessment work was required to help identify the route that provides the best overall solution at this location. Between January and March of 2016, a further 21 alternatives for the route concept 'C' were developed - these were presented in the Supplement to Scheme Assessment Report (Ref 3.6). The report concluded that in terms of safety, environmental and economic factors, the alternatives to Option C do not perform significantly better than the originally assessed Option C layout in terms of the extent that they achieve the objectives of the proposed Scheme.

3.2.8. The Supplement to Scheme Assessment Report recommended that Option B(W) should be put forward as the Preferred Route for the proposed Scheme following amendment to the design. This amendment included the A460 bridging the new link road to the west of the M6 Junction 11, with the link road lowered to a level similar to that of the existing A460.

Option Selection – Environmental Assessment Report Addendum (2018)

3.2.9. Following concerns about the use of designated green belt areas for development further assessment was recommended. In December 2016 during options selection, Highways England re-examined an alternative option based on Option C in terms of alignment and economics with the aim of keeping the route close to the existing motorway corridor. In January 2017 the review concluded that the Modified Option C(E) is a viable option and recommended that further detailed assessments be undertaken to produce comparative assessments between the Modified Option C(E) and Modified Option B(W) (an iteration of Option B(W), developed for the 2015 EAR).

3.2.10. A desk based study and environmental assessment of Modified Option C(E) found that this design option would have a direct impact on areas of ancient woodland identified by the Ancient Woodland Inventory (AWI), resulting in the loss and fragmentation of large areas of a valuable and irreplaceable ecological resource. As a result a further variant of Option C, Modified Option C(W) was identified that would avoid direct impacts on ancient woodland as identified by the Ancient Woodland Inventory.

3.2.11. Public consultation was carried out in September 2017 with approximately 71% of respondents supporting Modified Option B(W) as their preferred route. Modified Option C(W) attracted approximately 17% of the responses and Modified Option C(E) approximately 8%. Modified Option B(W) was favoured by local residents and businesses and well as key stakeholders such as Natural England. The exception to this was Historic England who preferred Modified Option C(W) due to the greater impact of the other options on the historic park land surrounding Hilton Hall.

3.2.12. Overall a large number of responses gave reasons against both Modified Option C(W) and C(E) referring to the impact on the local horse / farming community and the negative impact on wildlife and the landscape. The option C variants (C(W) and C(E)) were found to have a negative effect on several businesses in the area, such as a number of successful farms / equine businesses and a gun club. Reasons for support for Modified Option B(W) focused on convenience and directness, being the least disruptive option and reducing congestion on A460.

3.2.13. The free-flow connection to the M6 Toll was subject to contributions by other parties. However, the level of contributions available was not enough to meet the cost of the link to the M6 Toll, therefore a review of alternative cost saving options for the preferred route, Modified Option B(W) was undertaken. The new option design,

Modified Option B(W) (excluding M6 Toll Link) was identified as providing improved value for money. This option is a variant of Modified Option B(W), connecting to the M6 at Junction 11 rather than directly into the M6 Toll Junction T8.

3.2.14. An assessment of the potential environmental effects of all of the proposed Scheme options, Modified Option B(W), Modified Option B(W) (excluding M6 Toll Link), Modified Option C(E) and Modified Option C(W) are presented in the EAR Addendum (Ref 3.7). The EAR Addendum provided an initial high level assessment of air quality, noise and vibration, cultural heritage, landscape and visual, nature conservation, geology and soils, materials, people and communities (previously split into effects on all travellers and community and private assets) and road drainage and the water environment of the four proposed Scheme options. The conclusions of the environmental assessments within the EAR Addendum were used to inform the public consultation and used as part of the sifting process to inform the selection of the preferred route. Figure 3.2 illustrates the routes of the proposed Scheme options assessed within the EAR Addendum.

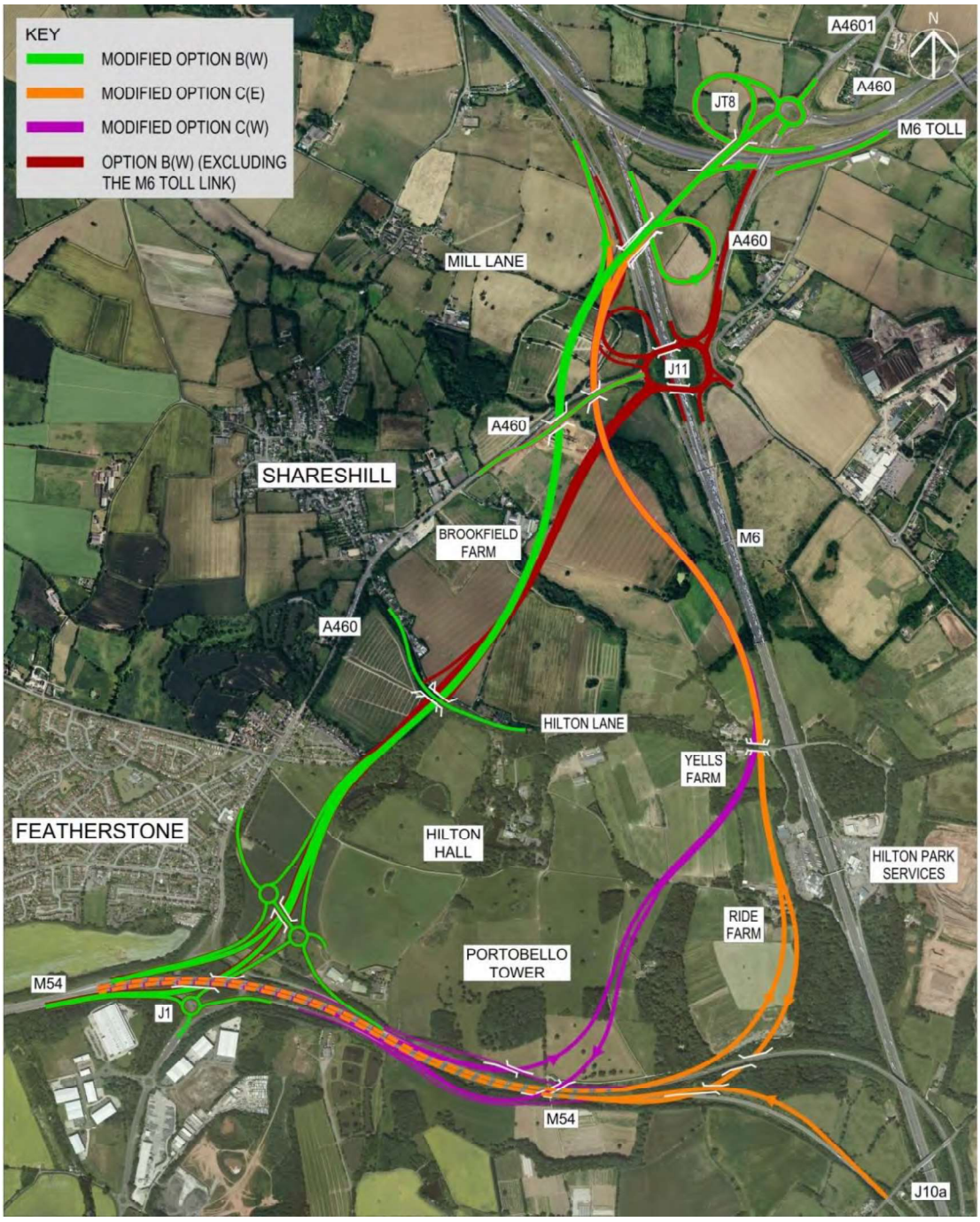


Figure 3.2: Alignment options assessed within the EAR Addendum

3.3. Selection of the Preferred Route

3.3.1. Modified Option B(w) (Excluding M6 Toll) was taken forwards as the preferred route due to the following:

- the route provides the highest benefit to the local economy;
- the route will provide the best journey time of the options;
- the route is preferred by the majority of the respondents to the public consultation;

- the route protects ancient woodland listed on the ancient woodland inventory; and
- the route provides the best value for money.

3.3.2. Further details of the options assessment and selection process can be found in the Scheme Assessment Report which is available online at:

www.highwaysengland.co.uk/M54-M6linkroad

3.4. Iterative Design

3.4.1. Highways England announced the Preferred Route on 26th September 2018 and it is this route which forms the basis for the proposed Scheme considered within this PEI Report.

3.4.2. Design development is ongoing, and is being informed by the iterative EIA process, consultation and evolving knowledge of the environment that would be affected by the proposed Scheme. Since the preferred route announcement the design of the proposed Scheme has been further developed taking into consideration local concerns and environmental data. The following changes have been made to the design.

- The northbound slip road loop at M6 Junction 11 has been removed to reduce land-take to the west of the junction.
- The alignment of the proposed Scheme to the east of Brookfield Farm has been moved to the west to minimise the number of ponds directly affected.
- The slip roads to Hilton Lane have been removed and the A460 would retain its connection to M6 Junction 11.
- The alignment of the proposed Scheme at Dark Lane has been shifted 25 m east away from the residential properties on Dark Lane (resulting in a distance of approximately 47 m between the nearest residential property and the edge of the carriageway) to reduce impacts on local residents.
- Retaining walls are proposed along the M54 east of Junction 1 to minimise the loss of existing noise bunds and tree planting which provide screening for Moseley Old Hall to the south and Featherstone to the north.

3.4.3. The ongoing design development will pay due regard to the outcomes from public consultation, the principles of good design, and the requirements of the NPSNN. Elements of the design which will be developed further through 2019 include, but are not limited to:

- junction layout at junction 11 of the M6;
- the alignment at Dark Lane;
- junction layout at junction 1 of the M54;
- site compounds and laydown areas;
- enhancement and compensation areas;
- non-motorised user (NMU) facilities;
- noise mitigation;
- drainage strategy;
- lighting;

- technology and signage; and
- landscape and earthworks design.

3.4.4. The alternatives which are being considered within the proposed Scheme design will be reported in the ES. The main reasons for rejection of the reasonable alternatives and the selection of the chosen option will be reported in accordance with the requirements of the EIA regulations.

4. ENVIRONMENTAL ASSESSMENT METHODOLOGY

4.1. General Approach

The National Policy Statement - National Networks

4.1.1. The National Policy Statement - National Networks (NPSNN) sets out the need for and the Government's policies to deliver Nationally Significant Infrastructure Projects (NSIPs) on the national road and rail networks in England. The NPSNN is used by the Secretary of State as the primary basis for making decisions on DCO applications for NSIPs.

4.1.2. Given the proposed Scheme is a road network NSIP, the EIA approach adopted is in accordance with the NPSNN. In particular, the EIA would adhere to all of the methodology requirements cited within NPSNN Section 5: Generic Impacts. Mitigation measures will be developed in accordance with the mitigation requirements also set out in Section 5 of the NPSNN.

The Design Manual for Roads and Bridges

4.1.3. Guidance published by the Government for the preparation of environmental assessments of proposed road schemes is contained in the Design Manual for Roads and Bridges (DMRB) Volume 11 (Ref 4.1). This sets out both the general process and the methods for assessing individual environmental topics. This PEI Report adheres to Interim Advice Note (IAN) 125/15 Environmental Assessment Update (Ref 4.2), which provides a new structure of DMRB Volume 11.

4.1.4. DMRB Volume 11 advises on the environmental topics to be included in an EIA, and the methods to be used in the assessment for each of those topics. The topics identified in Section 5 to 14 of this PEI Report are those required by DMRB and by the EIA Regulations.

4.1.5. The EIA being undertaken adheres to the most up-to-date, relevant guidance contained in DMRB and Highways England IANs. The methodologies used for the preliminary assessments for individual topics in this PEI Report are based on those provided in the EIA Scoping Report, having regard to the current stage of the assessment. Should any revisions to IANs or DMRB be issued between the PEI Report and reporting of the EIA in the ES, they will be adopted where appropriate, provided that it is reasonable to do so within the programme and governance for the project. Any changes in environmental legislation, such as the technical requirements under the EIA Regulations, will be accommodated within the ES as relevant.

Other Studies

Habitats Regulations Assessment

4.1.6. A Habitat Regulations Assessment (HRA) Screening will be undertaken for each Special Area of Conservation (SAC), possible SAC (pSAC) Special Protection Area (SPA) and potential SPA (pSPA) which could be affected. Where there is a likely significant effect this will determine any requirement for an Appropriate Assessment. The HRA Screening and any subsequent assessments will define any requirement for mitigation that is necessary to ensure there is no adverse effect on the integrity of these sites, alone or in combination with other plans and projects. Any required mitigation would then be incorporated into the proposed Scheme. Details of these assessments will be included within the ES and the full report will accompany the application for development consent.

Flood Risk Assessment

4.1.7. A Flood Risk Assessment (FRA) will be undertaken and a FRA report produced. This assessment will be undertaken in accordance with the requirements of the NPSNN utilising detailed flood maps and modelled flood extents provided by the Environment Agency to assess the impact of the proposed Scheme on flood risk. It is envisaged that the FRA will also summarise the proposed surface water drainage strategy. Details of the FRA will be included within the ES and the full report will accompany the application for development consent.

Water Framework Directive Assessment

4.1.8. A Water Framework Directive (WFD) Assessment will be undertaken and a WFD compliance assessment report produced alongside the ES. This report will consider the extent to which the proposed Scheme could impact on the current and future target WFD status of the water bodies (Latherford Brook). Where potential adverse effects are identified, an assessment of these will inform what mitigation measures need to be incorporated into the design and construction methods of the proposed Scheme to remove or minimise the effect. The results will be presented in the ES.

4.2. Existing Baseline and Future Conditions

4.2.1. In order to identify the effects of the proposed Scheme on the environment, it is important to understand the environment that would be affected by the proposed Scheme (the 'baseline conditions'). Understanding the baseline allows the measurement of changes that would be caused by the proposed Scheme.

4.2.2. The baseline conditions are not necessarily the same as those that exist at the current time; they are the conditions that would exist in the absence of the proposed Scheme either:

a) at the time that construction is expected to start, for impacts arising from construction; or

b) at the time that the proposed scheme is expected to open to traffic, for impacts arising from the operation of the proposed Scheme.

4.2.3. The identification of the baseline conditions therefore involves predicting changes that are likely to happen in the intervening period, for reasons unrelated to the proposed Scheme. This will entail taking current conditions and committed development into consideration and using experience and professional judgment to predict what the baseline conditions might look like prior to start of construction and operation.

4.2.4. This PEI Report presents baseline information representing the understanding at the time of writing. This baseline will become further developed as additional surveys are undertaken and data obtained, and will be presented in the ES.

4.3. Potential Significant Effects and Mitigation

Defining Assessment Years and Scenarios

4.3.1. The assessment of effects involves comparing a scenario with the proposed Scheme against one without the proposed Scheme over time. The absence and presence of a proposed Scheme are referred to as the 'Do Minimum' and 'Do Something' scenarios respectively. The 'Do Minimum' scenario represents the future baseline with minimal interventions and without new infrastructure. The 'Do Something' scenario represents the future with the proposed Scheme.

4.3.2. Depending on the topic, the effects in this PEI Report (and in the ES) are assessed for the 'Do Minimum' and 'Do Something' scenarios in the baseline year (assumed to be the year of opening, 2024 for the purposes of the ES) and a future assessment year, referred to as the 'design year' assumed to be 15 years after opening (2039).

4.3.3. Demolition of the proposed Scheme has been scoped out of the EIA on the basis that the road would become an integral part of national infrastructure and would not be decommissioned.

Identifying Potential Effects

4.3.4. The EIA Regulations require: "*The description of the likely significant effects" of the proposed scheme on the environment, covering "the direct effects and any indirect, secondary, cumulative, transboundary, short-term, medium-term and long-term, permanent and temporary, positive and negative effects of the development*". The PEI Report provides a preliminary view on likely significant effects, which will be refined during the ongoing EIA and design process.

4.3.5. For an effect to occur there has to be a source (from which the impact originates), a pathway (through which the impact can influence a receptor) and a receptor. Specialist topics identify and evaluate receptors that have the potential to be affected by during construction or operation of the proposed Scheme.

Significance Criteria

4.3.6. DMRB Volume 11, Section 2, Part 5, HA205/08 states that "*the significance of the effect is formulated as a function of the receptor or resource environmental values (or sensitivity) and the magnitude of project impact (change)*". This process includes the following stages:

- assigning environmental value (or sensitivity), refer to Table 4.1;
- assigning a magnitude of impact/change, refer to Table 4.2; and
- assigning an effect significance level, refer to Table 4.3.

Table 4.1: Environmental Value or Sensitivity and Typical Descriptors

Value	Typical Descriptors
Very high	Very high importance and rarity, international scale and very limited potential for substitution.
High	High importance and rarity, national scale, and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Low (or lower)	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity local scale.

Table 4.2: Magnitude of Impact/ Change and Typical Descriptors

Magnitude of Change	Typical Descriptors
Major	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements (Adverse).
	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality

Magnitude of Change	Typical Descriptors
	(Beneficial).
Moderate	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements (Adverse).
	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Minor	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse).
	Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Low or medium importance and rarity, local scale.
	Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial).
No Change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

Table 4.3: Matrix for Determination of Significance of Effect

Magnitude of Impact	Value/ Sensitivity of Receptor				
	Very High	**High**	**Medium**	**Low**	**Negligible**
Major	Very Large	Large/ Very Large	Moderate/ Large	Slight/ Moderate	Slight
Moderate	Large/ Very Large	Moderate/ Large	Moderate	Slight	Neutral/ Slight
Minor	Moderate/ Large	Slight/ Moderate	Slight	Neutral/ Slight	Neutral/ Slight
Negligible	Slight	Slight	Neutral/ Slight	Neutral/ Slight	Neutral
No change	Neutral	Neutral	Neutral	Neutral	Neutral

4.3.7. Those effects categorised as moderate, large or very large are considered to be significant. Slight adverse and neutral effects are not considered to be significant. Slight and moderate effects can be borderline cases and whether these effects are considered to be significant should be based on professional judgement. This determination should take into account whether effects are considered to be positive or negative, permanent or temporary, direct or indirect, the duration/frequency of the effect and whether any secondary effects are caused.

4.3.8. Significance criteria as described in the DMRB Volume 11, Section 2, Part 5 have been employed where specified within the environmental topic chapters. Where appropriate, topic-specific criteria have been adopted from institute guidelines or best practice. For some disciplines, predicted effects may be compared with quantitative thresholds and scales in determining effect significance. Where

quantitative measures may not be applied, qualitative criteria derived from DMRB have been utilised.

4.3.9. Not all of the environmental topics will use the above criteria or approach. For example, some topics do not use a matrix based approach but instead use numerical values to identify impacts (e.g. Noise and vibration) and some topics do not have agreed methods of assessment or scales of measurement for either value or sensitivity (e.g. Geology and soils). Therefore, each environmental topic specialist will use the information provided above, their topic specific guidance as well as their professional judgement to assess the significance of effects.

4.3.10. Further topic-specific details of the methodology for determining significance are presented in Chapters 6 to 15 of the EIA Scoping report. (see https://infrastructure.planninginspectorate.gov.uk/).

Mitigation measures, enhancements and residual effects

4.3.11. The EIA will take into account any design measures that have been incorporated into the proposed Scheme design, as well as any standard management activities that the proposed Scheme will implement.

4.3.12. Mitigation of potentially significant adverse environmental effects will be an iterative part of the proposed Scheme development following the hierarchy below:

- **Avoidance –** incorporate measures into the design to avoid the effect, for example, alternative design options or modifying the proposed Scheme programme to avoid environmentally sensitive periods (also referred to as design or embedded mitigation).
- **Reduction –** incorporate measures to lessen the effect, for example, fencing off sensitive areas during construction and implementing a Construction Environmental Management Plan (CEMP) to reduce the potential impacts from construction activities (also referred to as standard practice measures).
- **Compensation/ Remediation –** where it is not possible to avoid or reduce a significant effect then offsetting measures should be considered, for example the provision of replacement of habitat to replace that lost to the proposed Scheme or remediation such as the clean-up of contaminated soils (also referred to as additional mitigation).
- **Enhancement –** where possible enhancement measures will be incorporated into the proposed Scheme in line with the aims and objectives of the Highways England Licence. Enhancement measures are considered to be over and above any avoidance, mitigation and compensation measures required to neutralise the impacts of the proposed Scheme.

4.3.13. Impacts and effects that remain after mitigation are referred to as residual. Residual effects of moderate, large or very large significance are deemed to constitute a significant environmental effect in the context of EIA. Accordingly, these effects represent key factors in the decision-making process.

4.3.14. Likely effects will be assessed and categorised to identify those that are significant. The potential significance of effects will be assessed taking into account the impact avoidance measures embedded within the proposed Scheme design as well as the standard management practices that will be implemented.

4.3.15. After the effects of the proposed Scheme as designed have been assessed, any further measures required to mitigate such effects (especially where effects are

deemed to be significant) will be considered. Thereafter, the remaining residual effects will be reported.

Assessment of Cumulative Effects

4.3.16. Cumulative effects are the result of multiple impacts on environmental receptors or resources. There are principally two types of cumulative impacts:

- The combined action of a number of different projects, cumulatively with the project being assessed, on a single resource/receptor (cumulative).
- The combined action of a number of different environmental topic specific impacts upon a single resource/receptor (in combination).

4.3.17. Further details of the cumulative effects assessment is provided in Section 15.

4.4. Major Accidents and Disasters

Background

4.4.1. The 2017 EIA Regulations introduced a requirement to consider major accidents and disasters. The general scope of the requisite assessment covers:

- vulnerability of the project to risks of major accidents and/or disasters that are relevant to the project (subsequently referred to as major events); and
- any consequential significant environmental effects from those major events.

Methodology

4.4.2. The assessment will:

- apply professional judgement in consultation with Highways England to develop project specific definitions of major events;
- identify any major events that are relevant to and can affect the proposed scheme;
- describe the expected significant effects arising from the vulnerability of the proposed development to major accidents or disasters that are relevant to the project (where major events are identified);
- report the conclusions of this assessment within the individual environmental topics; and
- clearly describe any assumed mitigation measures and details of the preparedness for and proposed response to such emergencies, to provide an evidence base to support the conclusions and demonstrate that likely effects have been mitigated / managed to an acceptable level.

4.4.3. The potential receptors of impacts resulting from major accidents and disasters and any consequences for receptors will be reported in the relevant ES topic chapter as required.

4.4.4. The methodology adopted for the assessment is described is outlined in Chapter 5 of the EIA Scoping Report.

Preliminary assessment

4.4.5. The preliminary assessment undertaken for the PEI Report is that there are unlikely to be any significant effects associated with major events.

5. AIR QUALITY

5.1. Introduction

5.1.1. This chapter presents the findings of a preliminary assessment of temporary and permanent air quality impacts during construction and operation of the proposed Scheme. The chapter considers the known air quality baseline alongside a consideration of changes ('impacts') on air quality receptors as a result of the proposed Scheme.

5.1.2. The legislative framework and assessment methodology for the full Environmental Impact Assessment (EIA) is provided in Chapter 6: Air Quality, Sections 6.3 and 6.8 of the PCF Stage 3 EIA Scoping Report (Ref 5.1).

5.2. Stakeholder Engagement

5.2.1. Statutory and non-statutory bodies have been engaged as part of the assessment process to obtain background data, information and records concerning air quality within the defined study area, and to develop the assessment scope.

5.2.2. Following receipt of the EIA Scoping Opinion in February 2019, the scope of the air quality assessment has been be reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- The air quality assessment will quantify changes in particulate concentrations (PM_{10}). These changes in concentration will be used in conjunction with background $PM_{2.5}$ concentrations to determine the significance of any effect on the achievement of annual mean $PM_{2.5}$ air quality objectives.
- The study area for the local assessment will be determined following the methodologies given in DMRB guidance (HA207/07). The study area will be illustrated in accompanying figures where appropriate. Where scale permits the 200 m study area around the affected road network (ARN) will be provided.
- Regional emissions will be provided in a tabulated format only, as the information from the regional assessment is a reporting requirement only and does not affect the overall evaluation of air quality.
- The need for mitigation will be identified through the tests listed in IAN 174/13, which in addition to considering whether there are areas of poor air quality also considered if a scheme makes the situation significantly worse. If the proposed Scheme is determined to result in significant adverse effects for air quality mitigation will then be developed.
- The assessment will be informed by existing baseline data gathered by Highways England and the current datasets made available by the Local Planning Authorities within which the air quality study area is located. It is considered unlikely that specific PM_{10} air quality monitoring will be required as significant adverse air quality effects in relation to particulates are not expected.

5.2.3. Consultation with the relevant Local Authorities and Natural England will continue through the EIA process.

5.3. Assessment Assumptions and Limitations

5.3.1. The information presented in this chapter is based on the information available at the time of writing the report and based on an emerging design. The findings reported in this Preliminary Environmental Information (PEI) Report may be subject to change

as the design of the proposed Scheme is developed and refined through the EIA and consultation processes.

5.3.2. The detailed air quality assessment presented in the Environmental Statement (ES) will be based on detailed traffic modelling data which is currently being prepared. In the meantime, this PEI Report, which describes potential impacts due to changes in traffic flow (movements, composition and speed) and alignment, is based on the traffic data estimated for PCF Stage 2, options selection (Ref 5.2).

5.3.3. The traffic data estimated for the options selection stage used a base year of 2015. Base year air quality modelling predictions have therefore been compared to air quality monitoring data from 2015 to assess the accuracy of the air quality model, and therefore this year is discussed in detail in this PEI Report. In the ES, traffic data factored from a base year of 2015 to 2017 will be used, along with monitoring data that is representative of that year.

5.3.4. The traffic data estimated for the options selection stage was based on an opening year of 2021. The traffic modelling data which is currently being prepared and which will be used to inform the EIA will be based on an opening year of 2024; this PEI Report will use of the previous traffic data based on 2021. The influence of improving vehicle exhaust emission standards is likely to be greater than any additional growth in traffic over this period, resulting in reduced pollutant concentrations in 2024 compared to 2021. On this basis the results described in this PEI Report can be considered conservative.

5.3.5. Monitoring data have been obtained from local authorities and previous scheme-specific studies. The local operational air quality assessment uses the latest Defra local air quality management tools and guidance and Highways England tools and guidance that was available at the time the assessment was undertaken, with the predictions having been checked against appropriate local air quality monitoring data (matching the options selection stage base year of 2015).

5.3.6. Within this PEI Report the operational air quality assessment is concerned with the study area defined during the option selection stage. The study area reported in the ES may be different and will be defined when detailed traffic modelling data is available.

5.3.7. A local air quality assessment, a regional air quality assessment, and a WebTAG assessment based on updated traffic modelling data will be undertaken as part of the EIA and reported in the ES that will be submitted with the Development Consent Order (DCO) application.

5.3.8. At this stage, details in relation to construction vehicles, the construction schedule, associated activities and detailed plant equipment are not yet available, therefore only a qualitative discussion of potential construction air quality impacts associated with these sources is provided in this chapter.

5.3.9. An assessment of the construction impacts will be undertaken as part of the EIA and reported in the ES that will be submitted with the DCO application.

5.4. Study Area

5.4.1. For the local air quality assessment, the study area was defined on the basis of anticipated changes in traffic conditions (flow, speed and composition) as a result of the proposed Scheme i.e. Do-Something, compared to road conditions without the proposed Scheme i.e. Do-Minimum in the year of opening (see paragraph 5.3.4).

5.4.2. The traffic change criteria set out in Design Manual for Roads and Bridges (DMRB) Air Quality guidance (HA207/07) (Ref 5.3) will be used to define the 'affected road network' (ARN) for the local air quality assessment. The DMRB local air quality traffic change criteria are as follows:

- road alignment will change by 5 m or more; or
- annual average daily traffic (AADT) flows will change by 1,000 or more; or
- heavy duty vehicles (HDV) (vehicles greater than 3.5 tonnes, including buses and coaches) flows will change by 200 AADT or more; or
- daily average speeds will change by 10 km/hr or more; or
- peak hour speed will change by 20 km/hr or more.

5.4.3. These criteria are used to identify whether significant changes in air quality might occur. If a criterion is not met or exceeded, then a significant change in air quality is not anticipated. However, if a criterion is met, this does not automatically mean a significant effect is anticipated, but that further evaluation is required to understand the potential for significant effects.

5.4.4. The local air quality study area will be defined, based on the above criteria, for those links within the ARN which have sensitive receptors within 200 m of either side of road carriageways (specified in DMRB HA207/07). All road links within 200 m of these relevant receptors will then be included in the air quality assessment and this area forms the overall study area. A distance of 200 m from roads is used because at these distances pollutant contributions from roads are difficult to distinguish from background pollutant concentrations.

5.4.5. The area considered in this PEI Report is defined by predicted traffic data estimated for PCF Stage 2, options selection. It should be noted that the study area presented here may be different to that considered in the subsequent EIA and presented in the ES, following the provision of updated detailed traffic data, which will be based on an opening year of 2024 (see paragraphs 5.3.2 -5.3.4).

5.4.6. The air quality study area for the construction phase HGV and traffic management assessments considers an area of 200 m around the draft DCO site boundary. Construction phase HGV movements and construction phase traffic management are discussed qualitatively only at this stage given that applicable construction phase details are not detailed enough to support a quantitative assessment.

5.5. Baseline Conditions

5.5.1. The proposed Scheme is located within the boundary of South Staffordshire District Council and Staffordshire County Council. The study area used to inform the PEI Report contains road links located within a further 12 local authorities. They are: Birmingham City Council, Cannock Chase District Council, Dudley Metropolitan Borough Council, Lichfield District Council, North Warwickshire Borough Council, Sandwell Metropolitan Borough Council, Shropshire Council, Solihull Metropolitan Borough Council, Tamworth Borough Council, Telford and Wrekin Metropolitan Borough Council, Walsall Council, and City of Wolverhampton Council.

5.5.2. Baseline air quality data for the study areas has been gathered from the following sources:

- Department for Environment, Food and Rural Affairs (Defra) Air Quality Management Area (AQMA) information (Ref. 5.4);

- Local Authority monitoring data taken from local air quality management reports (Ref. 5.5 - Ref. 5.17);
- Highways England monitoring data;
- Defra Pollution Climate Mapping (PCM) Model Geographical Information System (GIS) data for the latest available year (Ref. 5.18);
- Defra air pollution background concentration maps (Ref. 5.19);
- Locations of human health receptors (residential properties, schools, hospitals and elderly care homes) from Ordnance Survey base mapping (Ref. 5.20);
- Designated ecological site boundary information (Ref 5.21); and
- Ecological site nitrogen sensitivity information (Ref 5.22).

Air Quality Management Areas

5.5.3. There are no AQMAs within 200 m of the proposed Scheme. The ARN used to inform this PEI Report has the potential to directly affect 12 AQMAs, as outlined in Table 5.1.

Table 5.1: AQMAs containing affected roads

Local Authority	AQMA	Description	Pollutant and Averaging Period
Birmingham City Council	Birmingham AQMA	Borough wide.	Annual mean NO_2 and 24-hr PM_{10}
Cannock Chase District Council	Cannock Chase AQMA	Area encompassing A5 (Watling Street) between junction with A34 (Walsall Road) and the district boundary with South Staffordshire. Includes the stretch of the A460 (Wolverhampton Road) between junction with A5 (Watling Street) and the district boundary.	Annual mean NO_2
Cannock Chase District Council	CCDC AQMA 2	A5 Watling Street between Churchbridge traffic islands and the district boundary with Walsall. Effectively continuing the existing AQMA to include all of the A5 within the district.	Annual mean NO_2
Cannock Chase District Council	AQMA3 (Five Ways Island)	A5190 Cannock Rd, Heath Hayes between the junction with Heath Way and the district boundary with Lichfield District Council. B4154 Hednesford Rd between the junction with Brownhills Rd, Norton Canes, Hayes Way, Heath Hayes, Wimblebury Rd	Annual mean NO_2
Dudley Metropolitan Borough Council	Dudley AQMA	Borough wide. Nine areas where the annual mean objective for nitrogen dioxide have been identified.	Annual mean NO_2
Lichfield City Council	A5 Muckley Corner AQMA (no.1)	Area encompassing the Muckley Corner Roundabout on the A5 along with a number of surrounding buildings.	Annual mean NO_2
Sandwell Metropolitan	Sandwell AQMA	Borough wide.	Annual mean NO_2

Local Authority	AQMA	Description	Pollutant and Averaging Period
Borough Council			
South Staffordshire District Council	AQMA No.1 (Woodbank)	Area encompassing Woodbank House, Teddesley Road, Penkridge and the adjacent M6 Motorway. It is understood that this AQMA is likely to soon be revoked.	Annual mean NO_2
South Staffordshire District Council	AQMA No.4 (Wedges Mills)	Area encompassing properties on the western side of Wolverhampton Road (A4601), Wedges Mills from its junction with Wood Lane for a distance of 200m northwards.	Annual mean NO_2
South Staffordshire District Council	AQMA No. 5 (Oak Farm)	Oak Farm, Watling Street (A5), Four Crosses.	Annual mean NO_2
Walsall Metropolitan Borough Council	Walsall AQMA	Borough wide (relating to both annual and hourly NO_2 objectives).	Annual mean NO_2 and hourly NO_2
Wolverhampton City Council	Wolverhampton AQMA 2005	The City of Wolverhampton.	Annual mean NO_2 and 24-hr PM_{10}

Monitoring Data

5.5.4. Monitoring data has been collected within the study area by local authorities and by Highways England, as detailed below.

Local Authority Monitoring Data

5.5.5. To comply with local air quality management regime reporting requirements, local authorities often collect air quality monitoring data within their administrative area. The data are often collected through a combination of automatic monitoring stations and passive NO_2 diffusion tubes.

5.5.6. In 2015 (options selection stage base year) there were six local authority automatic monitors and 72 local authority commissioned diffusion tube monitoring sites within the study area, collected by 11 local authorities. Details of the site locations and monitored concentrations are available in Appendix 5.1, Table 5.1A.

5.5.7. The data shows 17 exceedances to the annual mean objective value of NO_2 out of the 78 sites. These exceedances are highlighted in bold in Appendix 5.1, Table 5.1A.

5.5.8. A review of publically available local authority air quality monitoring data indicates that 2017/2018 is not yet available. The ES will include updated baseline air quality monitoring data as this data is made available.

Highways England Monitoring Data

5.5.9. In addition to the Local Authority data, Highways England has carried out passive diffusion tube monitoring at a series of locations in close proximity to the M54, M6 and M6 Toll motorways, to inform the local air quality assessment for the proposed Scheme. These sites were chosen to supplement the data available from local authorities and were located to represent sensitive receptor exposure close to the motorways.

5.5.10. There are 68 Highways England commissioned diffusion tube monitoring sites within the study area at which data was collected for periods between May 2012 and August 2014. Details of the site locations and monitored concentrations are available In Appendix 5.1 Table 5.1B.

5.5.11. When annualised to 2015 to account for changes in background concentrations between the monitoring periods and the options selection stage base year, the data shows two exceedances to the annual mean objective value of NO_2. These exceedances are highlighted in bold in Appendix 5.1 Table 5.1B.

EU Limit Value Compliance

5.5.12. Information on areas exceeding EU limit value thresholds (40 µg/m^3 for annual mean NO_2) is available from Defra's PCM Model. This model provides 'road contributed' concentrations of pollutants, including annual mean NO_2.

5.5.13. There are 200 Defra links present within the PEI Report study area. Of these, 53 links are predicted to exceed the EU limit value threshold based on 2015 roadside concentrations. These are summarised in Table 5.2.

Table 5.2: Roads within the study area with Defra PCM links predicted to exceed 40 µg/m^3 annual mean NO_2 in 2015

Road	Local Authority	Compliance Area	Maximum Predicted Annual Mean NO_2 in 2015
A38(M)	Birmingham City Council	West Midlands Urban Area	41.1
A4150	Wolverhampton City Council	West Midlands Urban Area	50.6
A449	Wolverhampton City Council	West Midlands Urban Area	42.6
M6	South Staffordshire District Council	West Midlands	44.5
M6	Sandwell Metropolitan Borough Council	West Midlands Urban Area	41.0
M6	Walsall Metropolitan Borough Council	West Midlands	42.0
M6	Birmingham City Council	West Midlands Urban Area	46.3
M6	Solihull Metropolitan Borough Council	West Midlands Urban Area	48.8

5.5.14. In years subsequent to 2015, increasingly fewer links within the study area are predicted to remain in exceedance of the EU limit value threshold. The PCM links exceeding in the base year of traffic data for the ES will be discussed in full in the ES where necessary.

5.5.15. By the opening year of 2024 no links within the study area are predicted to remain in exceedance of the EU limit value threshold.

Background Pollutant Concentrations

5.5.16. Annual average background pollutant concentration estimates have been sourced from Defra's 2015 based background maps for the study area for both NO_2 and PM_{10}. These maps present estimated background pollutant concentrations for the whole country at a resolution of 1 km x 1 km squares.

5.5.17. Contributions from motorways, trunk A-roads and primary A-roads within the grid squares of the background maps have been removed from the mapped concentrations using the Sector Removal Tool provided by Defra, as these sources are explicitly modelled in the assessment.

5.5.18. The range of background concentrations for the centre of each 1 km x 1 km square covering the study area for 2015 (options selection stage base year) and 2024 (opening year) is presented in Table 5.3.

5.5.19. In years subsequent to 2015 background concentrations are predicted to decrease year-on-year. This is largely due to the influence of improving vehicle exhaust emission standards over time. The background concentrations in the year matching the base year of traffic data for the EIA will be discussed in full in the ES where necessary.

Table 5.3: Summary of Defra estimated background map pollutant concentrations (sector removed) across the study area

	Annual Mean NO_2 ($\mu g/m^3$)		Annual Mean PM_{10} ($\mu g/m^3$)	
	2015	**2024**	**2015**	**2024**
Minimum	7.4	5.3	11.9	11.3
Average	14.6	10.7	14.8	14.2
Maximum	28.2	21.7	19.2	18.6

Receptors

Construction Phase

5.5.20. Sensitive receptors identified for the construction phase dust assessment are those receptors closest to the proposed Scheme, and existing areas which would be affected by construction works (and potential construction compounds), up to a maximum distance of 200 m from the proposed Scheme. There are no nationally designated ecosystems (e.g. Sites of Special Scientific Interest (SSSIs), Special Areas of Conservation (SACs) and Special Protection Areas (SPAs)) within 200 m of the anticipated construction works.

5.5.21. Sensitive receptors that may be affected by construction HGV movements and/or construction traffic management are those located within 200 m of the proposed Scheme and existing areas which would be affected by construction activities (including potential construction compounds). Whilst receptors in proximity to the proposed Scheme are understood, potential receptors located away from the proposed Scheme cannot be confirmed until the HGV movement routes and the effect of traffic management are known. Whilst this route and traffic management information is not available to inform the PEI Report, it will be available to inform the ES.

Operational Phase

5.5.22. The local air quality assessment that informed the options selection stage considered a total of 595 sensitive receptors. The selected sensitive receptors represent worst case exposure and provided a sufficient number of representative receptor locations within the study area to undertake an evaluation of the significance of air quality effects for the operational phase of the proposed Scheme. The receptors modelled are predominantly residential properties, but also include schools and hospitals.

5.5.23. The same assessment considered three nationally designated sites of ecological value (SACs, SPAs, SSSIs and Ramsar sites) which contain features which are sensitive to air pollutant impacts.

5.5.24. Site relevant critical loads, maximum background nitrogen deposition rates and maximum background NO_X concentrations within these designated sites are presented in Table 5.4. The values shown indicate that baseline critical loads for nitrogen deposition are already exceeded at the designated sites where such a critical load is available. They also show that the critical level for NO_X for the protection of vegetation (30 µg/m^3) is not currently exceeded, but is close to an exceedance at Stowe Pool and Walk Mill Clay Pit SSSI and Chasewater and the Southern Staffordshire Coalfield Heaths SSSI.

Table 5.4: Designated ecological sites within the air quality study area containing features which are sensitive to air pollutants

Designated Site	Relevant Nitrogen Critical Load Class	Critical Load (kg N/ha/yr)	Maximum nitrogen deposition (kg N/ha/yr)	Maximum NO_X concentration (µg/m^3)
Belvide Reservoir SSSI	Standing open water and canals	Site specific*	12.60	16.80
	Lowland open waters and their margins	Site specific*	12.60	16.80
Stowe Pool and Walk Mill Clay Pit SSSI	Rivers and streams	Site specific*	19.74	27.73
Chasewater and the Southern Staffordshire Coalfield Heaths SSSI	Raised and blanket bogs	Site specific†	24.22	29.27
	Valley mires, poor fens and transition mires	10	24.22	29.27
	Dry heaths	10	24.22	29.27
	Northern wet heath: Erica tetralix dominated wet heath	10	24.22	29.27
	Moist to wet dune slacks	Site specific‡	24.22	29.27
	Moist and wet oligotrophic grasslands: *Molinia caerulea* meadows	15	24.22	29.27
	Rich fens	15	24.22	29.27
	Permanent oligotrophic waters: Softwater lakes	Site specific§	20.44	29.27

* These water-containing habitats are probably phosphate-limited. Further work on their nitrogen sensitivity will be carried out, if necessary, for the ES.

†Critical load for this habitat is dependent on precipitation and water table levels. Further work will be carried out, if necessary, for the ES.

‡Critical load for this habitat is dependent on base availability. Further work will be carried

Designated Site	Relevant Nitrogen Critical Load Class	Critical Load (kg N/ha/yr)	Maximum nitrogen deposition (kg N/ha/yr)	Maximum NO_X concentration ($\mu g/m^3$)
out, if necessary, for the ES. §Critical load for this habitat should only be applied to oligotrophic waters with low alkalinity with no significant agricultural or other human inputs. Further work will be carried out, if necessary, for the ES.				

5.5.25. These receptors, which were selected based on the detailed traffic data that was available for the options selection stage will be subject to change, following the provision of detailed traffic data to inform the ES.

5.6. Potential Impacts

5.6.1. This section describes the potential impacts (both beneficial and adverse) associated with the construction and operation of the proposed Scheme. The potential impacts take account of measures that are being incorporated in the design and construction of the proposed Scheme that will mitigate air quality impacts; these are set out in Section 5.7.

Construction

5.6.2. During construction the proposed Scheme could affect local air quality in the following ways:

- Increased emissions of dust during construction of the proposed Scheme from the dust-raising activities on site that could affect sensitive receptors within 200 m of the proposed construction works.
- Emissions associated with non-road mobile machinery (NRMM) undertaking construction works.
- Emissions associated with changes in traffic flows during construction, as a result of temporary traffic management measures and/or additional vehicles travelling to and from the construction site transporting materials, plant and labour.

5.6.3. There is some potential for adverse effects during the construction of the proposed Scheme in relation to construction dust and NRMM and vehicle emissions. However, any impacts on human health related to air quality would be temporary (i.e. during the period of the construction works only) and could be suitably minimised by the application of industry standard mitigation measures. The need for any additional mitigation measures will be identified in addition to standard dust mitigation measures as part of the assessment.

5.6.4. The criterion for a potentially affected route in relation to construction HGV traffic is a change of more than 200 HGVs per day. Where HGV movements are below this threshold, significant changes in air quality are not likely. Further work would be required to characterise potential air quality impacts from this source during the preparation of the Environmental Statement, if construction phase estimated HGV numbers (based on advice from a construction contractor) are above the DMRB criteria for an extended period (i.e. more than six months).

5.6.5. The air quality assessment at the options selection stage identified that due to the proposed Scheme requiring some works to the existing road network, traffic management would be in place, to minimise traffic re-routing throughout the

construction phase. However, the extent of traffic re-routing it is not currently known and will be addressed during assessment work to inform the EIA and ES, when this information will be available.

Operation

5.6.6. Once the proposed Scheme is operational, local air quality could be affected (positively or negatively) by the following:

- Changes in vehicle activity (flows, speeds and composition) as a result of the proposed Scheme.
- Changes in the distances between sources of emissions and air quality sensitive receptors.

5.6.7. On the basis of the available information, including existing monitored levels in the wider study area, exceedances of the annual mean objective value for NO_2 have the potential to occur at locations near busy roads in the study area.

5.6.8. Operational impacts on air quality may be difficult to avoid, but in some circumstances it is possible to reduce impacts on air quality with appropriate mitigation measures, particularly if impacts are focused in a small geographic area rather than spread across the extent of the air quality study area. However, the proposed Scheme design to date does not include specific air quality mitigation measures for the operational phase.

5.7. Design, Mitigation and Enhancement Measures

5.7.1. Environmental considerations will be taken into account during further development of the proposed Scheme design, including consideration of measures to mitigate emissions to air from construction activities and associated sources, as well as traffic management during the construction phase, and measures to reduce operational emissions, such as the design of road alignment, and congestion alleviation.

5.7.2. With regard to the construction phase dust emissions, best practice mitigation measures will be implemented throughout the works, as in best practice on all well managed construction sites in the UK. The agreed measures will be set out as commitments within the proposed Scheme Construction Environmental Management Plan (CEMP) and are likely to include the following:

- Develop and implement a series of dust management measures and monitoring measures (e.g. visual inspections).
- Fully enclose site or specific operations where there is a high risk of dust production and the site is active for an extensive period.
- All construction plant would use fuel equivalent to ultra-low sulphur diesel (ULSD) where possible.
- Ensure vehicles entering and leaving sites are covered to prevent escape of materials during transport.
- Implement a wheel washing system (with rumble grids to dislodge accumulated dust and mud prior to leaving the site) where reasonably practicable.

5.7.3. The final selection of the most appropriate mitigation measures, including those specific to construction phase HGV movements and construction phase traffic management, will be reconsidered during the EIA and reported in the ES, when further information will be available.

5.7.4. Specific air quality mitigation measures for the operational phase are not proposed at this stage and no additional monitoring of air quality is currently recommended. This is because overall significant air quality effects are not anticipated.

5.7.5. The proposed Scheme offers the following opportunities for enhancement:

- Directing motorway traffic away from the A460 and the receptors there and taking the related vehicle emissions east, where there are fewer receptors.
- Reducing congestion and its consequential air quality effects.

5.8. Assessment of Effects

5.8.1. This section summarises the potential temporary and permanent effects associated with the proposed Scheme.

Construction

Construction Phase Dust Assessment

5.8.2. There is a risk of temporary adverse impacts from dust emissions to occur at sensitive receptors located within 200 m of the draft DCO site boundary, this includes the following receptors, approximately:

- 300 – 400 residential properties on the east side of Featherstone, including on Park Road, Dark Lane, Cannock Road, Hilton Road, West Winds, The Leas, Old Lane, The Avenue, Olde Hall Road, North Crescent, South Crescent, South View Close, to the west of the proposed Scheme;
- 10 – 20 residential properties on Church Lane and Hilton Lane on the south-east fringe of Shareshill, to the west of the proposed Scheme;
- Brookfield Farm, located off the A460 Cannock Road east of Shareshill, to the west of the proposed Scheme;
- 10-20 residential properties located in the vicinity of the Hilton Hall Business Centre, off Hilton Lane between the A460 and the M6, to the east of the proposed Scheme;
- Hill Farm and Tower House Farm, on either side of the M54 east of junction 1, to the east of the proposed Scheme; and
- Moseley Old Hall, south of the M54 west of junction 1, to the west of the proposed Scheme.

5.8.3. The standard measures listed in Section 5.7 should be sufficient to control emissions of dust from construction activities to the extent that any temporary effect is not significant. The need to apply site specific mitigation measures, in addition to standard mitigation measures, will be further considered in the ES, when more detailed construction information is available. All mitigation measures will be set out in the CEMP for the proposed Scheme. Adoption of such measures would minimise the risk of significant adverse dust effects and statutory nuisance issues during the construction.

Construction Phase HGV Assessment

5.8.4. As noted previously, the criterion for an affected route in relation to construction HGV traffic is a change of more than 200 HGVs per day. Where HGV movements are below this threshold, significant changes in air quality are not considered likely. Detailed information on likely HGV movements is not currently available. However, due to the nature of the proposed Scheme, it is likely large amounts of materials will

be transported to and from the construction site and associated compounds. There is a risk that the transportation of construction materials or waste materials could cause deterioration in air quality along the designated construction transport routes (which are to be confirmed). This will be quantified and reported in the ES, where the increases in construction phase HGVs exceed the criteria given above.

Construction Phase Traffic Management Assessment

5.8.5. The proposed Scheme would require works to the existing road network e.g. M54 Junction 1 and M6 Junction 11. Traffic management would likely be in place to minimise traffic re-routing throughout the construction phase. However, it is not currently known to what extent temporary traffic management and the re-routing of traffic may be required. It is currently anticipated that there would be a temporary adverse impact at sensitive receptor locations adjacent to roads predicted to see an increase in vehicle movements, and a temporary beneficial impact at sensitive receptor locations adjacent to roads predicted to see a decrease in vehicle movements, as a result of traffic management and traffic re-routing. Further air quality work may be required and reported in the ES to support the DCO application depending upon traffic re-routing estimates.

Operation

Local Operational Air Quality Assessment

5.8.6. As discussed in Section 6.3, the potential effects discussed here are based on traffic data assuming an opening year of 2021. This information is being used in this PEI Report to represent impacts in 2024. As pollutant concentrations are expected to reduce between 2021 and 2024 due to improving vehicle emissions standards, the results described in this PEI Report can be considered conservative, that is, to reflect a greater risk of exceedances of the annual mean objective values than if 2024-based data had been used.

5.8.7. The options selection stage assessment identified that all the sensitive receptor locations that have been considered within the PEI Report air quality study area are anticipated to meet the annual mean objective value for PM_{10}, both with the proposed Scheme (Do-Something) and without the proposed Scheme (Do-Minimum). Additionally, all locations within the study area are predicted to be below the objective for the number of days exceedance of the 24-hour PM_{10} objective.

5.8.8. The assessment identified an exceedance of the annual mean objective value for NO_2 in the Do-Minimum scenario at locations close to junction 7 of the M6, on Raleigh Croft and Amie Court. At these locations small adverse changes were predicted as a result of the Do-Something scenario, causing a worsening in local air quality.

5.8.9. It also identified exceedances of the annual mean objective value for NO_2 in the Do-Minimum scenario at some locations predicted to experience a beneficial effect as a result of the proposed Scheme (Do-Something), with medium to large changes in Sedgley and small changes in Bloxwich. However these beneficial reductions are not large enough for the concentrations of NO_2 to fall to below the annual mean objective.

5.8.10. The detailed traffic data made available for the options selection stage suggests that the proposed Scheme is predicted to reduce traffic on the A460 through Featherstone, by offering an alternative to vehicles which use this route to travel between the M54 and the M6 junction 11. This is expected to result in an improvement in air quality for those sensitive receptors along the A460.

5.8.11. Based on the estimated traffic flows available for the options selection stage assessment (sub, the nature of traffic flows, composition, speed and road alignment are expected to change to the extent that an adverse effect could occur at sensitive receptors in the following areas:

- closest to the proposed Scheme in Featherstone and Shareshill and the surrounding areas;
- close to the M54 between the M6 and junction 4;
- close to the M6 between junctions 10a and 13;
- on or close to the A449 between the M54 and Wolverhampton;
- on or close to the A449 between Wolverhampton and the A463;
- on or close to the A460 and the B4156 between the A449 and the M54;
- close to the M6 Toll between junctions 5 and 8;
- on or close to the A4601 between the M6 Toll and the A5190;
- on or close to the A5190 between the A460 and the B4154; and
- on or close to the A51 between the A4097 and the B5404.

5.8.12. Based on the estimated traffic flows available for the options selection stage assessment, the nature of traffic flows, composition, speed and road alignment are expected to change to the extent that a beneficial effect could occur for sensitive receptors on or close to:

- the A460 Cannock Road in Featherstone and Shareshill;
- the A449 between the M6 and the M54;
- the A5 between Telford and the M6 Toll;
- Straight Mile and Four Crosses Lane connecting Four Ashes and Four Crosses;
- the A34, Station Road, and Wolverhampton Road through Cheslyn Hay;
- the A462 between Wolverhampton Road and Hobnock Road;
- Hobnock Road and Bognop Road between the A462 and the A460;
- the B4156 between Essington and the A460;
- the M6 between junctions 4a and 10a;
- the Wolverhampton Ring Road A4150;
- the A462 between the A459 and the A4123;
- the A4123 between the A462 and the A4126;
- Bell Lane in Bloxwich;
- the A452 between the A5 and the A4124;
- the A5 between the A461 and the M42;
- the M42 between junctions 8 and 9; and
- the A4097 between the A51 and Marston.

5.8.13. The options selection stage assessment identified a range of impacts, both adverse and beneficial, at locations predicted to be in exceedance of the air quality objective for NO_2, but not to the extent that the overall effect of the proposed Scheme is considered significant, in line with the method set out in the IAN174/13.

Ecosystems Assessment

5.8.14. Based on the estimated traffic flows available for the options selection stage assessment, the nature of traffic flows, composition, speed and road alignment are expected to change to the extent that an adverse effect could occur in Belvide Reservoir SSSI.

5.8.15. Based on the estimated traffic flows available for the options selection stage assessment, the nature of traffic flows, composition, speed and road alignment are expected to change to the extent that a beneficial effect could occur in the following areas:

- Chasewater and the Southern Staffordshire Coalfield Heaths SSSI; and
- Stowe Pool and Walk Mill Clay Pit SSSI.

5.8.16. Further air quality and biodiversity assessment will be undertaken and reported in the ES. Significant air quality effects at these sites are not considered to be likely based on the calculations undertaken using the estimated traffic flows for the proposed Scheme.

Local Air Quality Compliance Risk Assessment

5.8.17. The results of the local air quality operational assessment have been used to determine compliance risks with the EU Air Quality Directive, following guidance set out within IAN 175/13.

5.8.18. A comparison between the outcome of the local air quality operational assessment and those links reported by Defra to the European Commission has found that there are no links anticipated to be non-compliant with the EU limit value threshold within the air quality study area for the proposed Scheme in the opening year of 2024.

5.8.19. At this stage an overall significant air quality effect is not considered to be likely.

6. CULTURAL HERITAGE

6.1. Introduction

6.1.1. This chapter presents the findings of a preliminary assessment of temporary and permanent impacts on cultural heritage during construction and operation of the proposed Scheme. This chapter considers potential impacts on the following:

- archaeological remains;
- historic buildings; and
- historic landscapes.

6.1.2. This chapter is supported by Figures 6.1 to 6.3. The legislative framework and assessment methodology for the full Environmental Impact Assessment (EIA) is provided in Chapter 7: Cultural Heritage, Sections 7.3 and 7.8 of the PCF Stage 3 EIA Scoping Report (Ref 6.1).

6.2. Stakeholder Engagement

6.2.1. Statutory and non-statutory bodies have been engaged as part of the assessment process to obtain background data, information and records concerning cultural heritage assets within defined study areas, and to develop the assessment scope.

6.2.2. Following receipt of the EIA Scoping Opinion in February 2019, the scope of the cultural heritage assessment has been be reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- Further explanation on the rationale behind the location and extent of the proposed study area.
- Consideration of potential effects on geoarchaeological and palaeoenvironmental deposits, as well as historic landscape features such as historic hedgerows and field boundaries, will be considered in the Environmental Statement (ES).

6.2.3. Consultation will continue with Historic England, Staffordshire Council County Archaeologist, South Staffordshire District Council conservation officers, The National Trust and The Gardens Trust throughout the EIA process.

6.3. Assessment Assumptions and Limitations

6.3.1. It is assumed that data provided by third parties is accurate at the time of reporting.

6.3.2. The information presented in this chapter is based on the information available at the time of writing the report and based on an emerging design for the proposed Scheme and the maximum likely extents of land take required for its construction and operation.

6.3.3. The findings of the preliminary assessment may be subject to change as the design of the proposed Scheme is developed and refined through the EIA and consultation processes, and as further research and investigative surveys are undertaken to fully understand its potential effects.

6.4. Study Area

6.4.1. The process of scoping identified that a 1 km study area around the draft DCO site boundary would be appropriate to identify any potential effects on designated heritage assets and their settings (see Figure 6.1 to 6.3).

6.4.2. This study area was defined following guidance provided in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 2: Cultural Heritage (HA 208/07) (Ref 6.2). The Zone of Theoretical Visibility outlined in Chapter 7 Landscape and Visual and the conclusions of the noise impact assessment will be considered when determining the study area for the ES. The 1 km study area is considered appropriate in order to place heritage assets within their wider context and to understand the landscape within which they are located. Assets of the highest significance (Grade I and II* listed buildings and scheduled monuments) beyond the defined 1 km study area will also be identified. However, these assets will only be discussed where the wider landscape forms a key contributing factor in their significance and where this has the potential to be affected by the scheme. This has ensured that the assessment is proportionate, in accordance with the requirements of the NPSNN and NPPF.

6.5. Baseline Conditions

6.5.1. Baseline cultural heritage data for the study area(s) has been gathered from the following sources:

- National Heritage List;
- Staffordshire Historic Environment Record (HER);
- Staffordshire Records Office;
- Historic Ordnance Survey mapping; and
- Available online aerial images.

6.5.2. A site visit was undertaken on 22nd January 2019 to: assess the condition of known heritage assets, establish the potential for unrecorded heritage assets within the draft DCO site boundary, and to assess the setting of designated heritage assets.

6.5.3. A list of designated and non-designated heritage assets has been provided within Appendix 6.1.

6.5.4. The desk-based review of available records confirms the following:

- no World Heritage Sites, scheduled monuments, Historic Battlefields, registered parks and gardens or conservation areas are present within the 1 km study area;
- 62 non-designated archaeological assets are recorded within the 1 km study area, dating from the prehistoric to the modern periods;
- a total of two Grade I, three Grade II* and 21 Grade II listed buildings are located within the 1 km study area; and
- a total of 21 historic buildings and structures are present within the 1 km study area, including eight locally listed buildings or structures.

6.5.5. The assets are described in more detail below. Each asset has a unique record number (indicated in brackets) which cross-relates to their location as shown on Figure 6.1 to 6.3 and summarised in Appendix 6.1.

Archaeological Remains

6.5.6. There are five sites of prehistoric date recorded in the study area. The earliest of these is the find spot of a Neolithic axe (c. 4000 to 2200 BC) (A50). Two find spots of a Bronze Age (c. 2200 to 700 BC) palstave axe (A49) and an unlooped palstave are also recorded. Prehistoric settlement evidence is very limited, and includes a possible burnt mound (A2) and the site of a possible barrow (SJ 94 05, exact

location unknown). It is possible that some of the cropmarks in the area (e.g. A22, A23, A25, A27, A34 and A36), of unknown date, may have their origins in the later prehistoric period, or the early part of the Roman period.

6.5.7. There are two recorded assets of Roman (AD 43 to 410) date within the study area. The exact location of all sites is unknown and they comprise the find spots of a silver denarius coin of Hadrian (A47) and a copper alloy Colchester brooch (A64). Just outside the study area, to the west, is the Roman road between Featherstone and Pennocrium, near the modern village of Penkridge, where there is a cluster of scheduled Roman settlement and military sites.

6.5.8. There are nine sites of early medieval date (AD 410 to 1066) recorded in the study area. These include the deserted settlement of Hilton or Haltone (A56), which is centred around Hilton Park. The settlement was first recorded in the very late 10th century and it is recorded in the Domesday Book. The date of desertion is not known, and no above-ground evidence survives within the current park. The villages of Featherstone to the west, and Essington to the south-east, were also first recorded in the 10th century (Ref 6.3). Four more settlements of early medieval origin are also recorded in the study area, at Essington/Eseningtone (A54), Little Saredon (A57), and Shareshill / Servesed (A58). Many of these settlements are recorded in the Domesday Book and have surviving earthworks relating to the former settlements. The settlement of Featherstone/Ferdestan (A55) may also have its origins in the early medieval period but it is not recorded in the Domesday Book.

6.5.9. There are two moated sites recorded as dating from the early medieval period. The first is located east of the church in Shareshill (A20) and the second is recorded at Little Saredon Manor (A18). The site of the Church of St Mary, Shareshill (A5) is documented from 1213 and its use continues into the subsequent periods. The final recorded asset of early medieval date is the find spot of a fragment of a probable cast copper alloy mount with enamel decorations (A48).

6.5.10. There are sixteen sites with evidence of medieval date (1066 to 1500). The majority of these are moated sites or associated with farming practices. The first is located at Hilton Park (A11), which has been built over by the 18th century house (B2). Other moats are located across the study area, including a 14th century example to the east, Black Lees (A3), and other examples in the vicinity of Shareshill (A1, A19 & two un-located in grid square SJ 94 06).

6.5.11. The remainder of the medieval sites are related to agricultural activity and include evidence for ridge and furrow (A13, A14, A15, A28 A37, and A38), as well as earthworks interpreted as the remains of a former tenement or croft (A21), and cropmarks of a medieval field system (A24), excavated as part of the construction works of the M6 Toll. This site also contained evidence of post-medieval field boundaries and trackways. The possible site of a church has also been identified from historic map analysis. The name ‘Church Field’ is recorded on the 1841 tithe map (A26). The place-name suggests a church may have been located in the vicinity, and a rectangular cropmark nearby may represent a former church building. Some of the ridge and furrow sites may also contain elements of post-medieval activity, such as site A13.

6.5.12. Nineteen recorded sites of post-medieval date (1500 to 1900) are located in the study area, in addition to those medieval sites that may have extended into this later period. These sites predominantly relate to the agricultural use of the landscape, as well as evidence for increasing industrial activity in the 18th and 19th centuries.

6.5.13. As well as the sites discussed in the medieval section (such as ridge and furrow, A13, and field systems, A24), agricultural evidence includes the site of Brook House Farm (A16), first shown on Yates' map of 1775, which is no longer extant. The remains of a windmill at Mill Farm are also recorded (A6). It is thought that a mill may have occupied this site from at least the 17th century. A second mill (A30) is also recorded at Little Saredon and dates to the later part of the post-medieval period. This mill is recorded as originally being wind powered and was later converted to steam. A well preserved pound (A29) is recorded at Little Saredon Dairy Farm, which may have been used to hold the cows before or after milking. Other extant agricultural buildings are discussed in the built heritage section below. A possible marl pit (A9) is also recorded, used to extract clay and lime which was used to improve agricultural land.

6.5.14. Industrial sites recorded in the study area are primarily related to brick and tile production, required to fulfil the needs of the nearby growing urban areas, such as Wolverhampton to the south-west. A brick and tile works at Holly Bank Farm (A12), is recorded in the eastern part of the study area. A possible earlier tile kiln is suggested by the find spot of 16th century tile (SJ 95 08, exact location uncertain), which is similar to tiles found on the roofs of nearby churches.

6.5.15. Other industrial sites are representative of extractive industries, including a colliery (A39). This site is named as Hilton Main Colliery but was originally known as Essington Wood Colliery but was later renamed as the Holly Bank Colliery by the early 20th century. The colliery included coal shafts, a tramway and mine buildings. It is no longer extant and has since been built over. The location of a former quarry (A33) has been identified from field name evidence but no features have been noted on the ground. Two smithies (A31 and A32), recorded close to Little Saredon, are also recorded on the HER.

6.5.16. The Streetway and Wordsley Green Turnpike Road (A59) was established in the mid-18th century. This largely follows the line of the A460 through the study area, joining the A4601 to the north of the M6 Toll. A possible boundary marker (A10), in the form of a low bank, may have also been followed by a former road or track.

6.5.17. The churchyard to the Church of St Mary and St Luke (A4) also dates to the post-medieval period. The churchyard contains a number of grave markers, tombs and headstones all dating to this period. Excavations within the churchyard have also revealed evidence for tombs, vaults and grave cuts.

6.5.18. The final two sites of post-medieval date are the find spots of post-medieval material (A42 and A43), including a hand-made brick and pottery. The landscape park around Hilton Hall (A40) is also recorded as dating from the post-medieval period on the HER. This is discussed in further detail in the historic buildings and historic landscapes sections below.

6.5.19. The modern period (1900 to present) is represented by 12 assets. The find spot (A42) and brickworks (A12) described in the post-medieval section above both contained evidence of modern date.

6.5.20. The formal garden at Moseley Old Hall (A41) was established by the National Trust in the second half of the 20th century and is recorded on the HER. Further information on Moseley Old Hall can be found in the historic buildings section below.

6.5.21. Three black and white finger posts (A51, A52 & A53) are also recorded within the study area. These are believed to date to the early 20th century and provide directional information in relation to local footpaths and highways.

6.5.22. The other three sites of modern date are related to the defences of the outskirts of the urban area near Wolverhampton and Birmingham. Four brick pillboxes are recorded which date from World War II (A7, A8 and A44) and the Cold War (A45). The remains of a Second World War anti-aircraft gun site is also recorded at Middle Hill, Saredon (A17).

6.5.23. The remaining sites are of unknown date and all are recorded from aerial photographs. Some of these, such as cropmarks of enclosures (A23, A25, and A27) or of possible settlement activity (A34), could be of later prehistoric or Roman date, while others may represent medieval or post-medieval field systems (such as A22, A23 & A35).

6.5.24. There is potential for previously unrecorded archaeological remains to be found along the route of the Scheme options. While remains of any period cannot be discounted, remains associated with the later prehistoric periods and the medieval and post-medieval landscape are considered to be most likely to be discovered.

Historic Buildings

6.5.25. There are 26 listed buildings within the 1 km study area, seven of which fall within the non-designated Hilton Park. Hilton Park is an 18th century historic park that has been encroached upon by two motorways to the east (M6) and south (M54). The principal building within the park is Hilton Hall (B2), an 18th century country house, in Baroque style. The Hall is three storeys, constructed of red brick with painted ashlar and plaster dressing, under a hipped slate roof. It is surmounted by the remains of a moat (A11) and is set within pleasure grounds and plantation woodland that, although modernised, still retain some of the 18th century character and appearance. Surviving woodland and water features within the park add to this character and appearance. A number of ancillary buildings constructed in the 18th and 19th century also survive. These include an early 19th century Conservatory (B4), a Coach House and Stable Block (B22), a pair of early 18th century gate piers (B3) and the Portobello Tower (B23). Hilton Hall (B2) and its Conservatory (B4) are the only Grade I listed buildings within the study area.

6.5.26. Views from the Hall extend to the surrounding parkland and views from within the park are mostly enclosed within it by surrounding woodland and belt of trees. The Portobello Tower is visible in long distance views to the south, from the Hall and within the parkland. It was constructed for Henry Vernon between 1739 and 1765 to commemorate the taking of Portobello by Admiral Vernon during the 'War of Jenkin's Ear' in 1739. The validity of this is in question as the young Vernon was only 16 at the time of the capture (Ref 6.4 and 6.5). The tower is currently in a very poor condition and is not accessible.

6.5.27. The setting of Hilton Hall and its associated buildings is defined by their location within the park and surrounding countryside. This setting has been eroded by the construction of the motorways to the south (M54) and east (M6). Views from and towards the Portobello Tower have also been affected by the construction of the motorways, mainly the motorway to the south (M54).

6.5.28. The remaining listed buildings are scattered around the study area. To the south-west, there is a group of buildings associated with Moseley Old Hall (B14), including Moseley Old Hall Cottage (B1) and Moseley Hall (B18). Moseley Old Hall is Grade II* listed and dates to the 16th century. It has a timber-framed core that was refaced in brown brick in the 19th century. The Old Hall is particularly famous for its association with Charles II as it provided a hiding place for the future king, following his defeat at the Battle of Worcester in 1651. The Moseley Old Hall and Moseley Old

Hall Cottage are located within extensive grounds, including a knot garden recently restored to a 17th century design and an ancient woodland parcel to the north-east of the Hall. The Old Hall and grounds are owned and managed by National Trust. A belt of trees planted in 1985 on top of an earth bund, screen the grounds of the Hall from the M54 to the north. The setting of the Old Hall and associated cottage include the extensive grounds and the woodland, and extend to the surrounding agricultural land, once in the same ownership with the Old Hall. The construction of the M54 to the north has eroded this extensive rural setting.

6.5.29. In the early 18th century, the Whitgreave family who owned Moseley Old Hall since the early 17th century, built and subsequently moved to Moseley Hall (B18) to the south of Moseley Old Hall. The 18th century Hall is Grade II* listed, of two storeys with attics, constructed of brick with ashlar dressings, built in Regency/early Georgian style. There are five listed buildings and structures associated with the 18th century Hall. These comprise the Coach House (B16), Moseley Hall Cottage (B15), gates, gatepiers and railings of the Hall (B17) and the Cottage (B19). Mosely Hall (B18) is now in private ownership and despite the historical association with Moseley Old Hall, they are no longer connected. The setting of the Hall is defined by its associated grounds, including a fishpond and woodland.

6.5.30. There is a single listed building in the village of Featherstone to the west of the proposed Scheme. This comprises the Grade II agricultural buildings associated with Featherstone Farmhouse (B21). They date to c. 1700, and are of timber frame construction with red brick infill. They are located just south-east of the former farmhouse and are mostly surrounded by agricultural land with New Road running to the south and the village of Featherstone extending to the south-east. The setting of this asset is mainly rural as it is located to the north-western end of the village of Featherstone and is surrounded mostly by agricultural land.

6.5.31. There are four listed buildings in the village of Shareshill, north-west of the proposed Scheme. These include the Manor Farmhouse and attached Malthouse (B12), constructed in the early 17th century and 18th century respectively, of timber framed construction with red brick infill; the Barn to the south-west of Home Farmhouse (B26) dating probably to the 15th century, with extensive later alterations, of timber framed construction and red brick; Woodberry House (B11), an 18th century house, of red brick and render, of symmetrical proportions; and the Grade II* listed Church of St Mary and St Luke (B25). The church dates to c. 1742 and incorporates a 15th or 16th century tower to the west. It comprises a conglomeration of materials with Classical details, mainly of brick, while the tower is of ashlar and the south Tuscan porch is painted white. To the rear (north) there is a glass link to a modern brick addition. The setting of these Grade II listed buildings is defined by their village location, to the west of A460. The setting of the church extends outside the village with its tower being visible from the hamlet of Little Saredon.

6.5.32. There are two listed buildings in the hamlet of Little Saredon. These are Little Saredon Manor (B10) and Little Saredon Dairy (B24). Little Saredon Manor stands within a moated site, and has an early 16th century timber-framed core that was almost entirely rebuilt in brick in the 18th and 19th centuries. The Dairy Farmhouse dates to the early 18th century and is constructed of red brick. The setting of both assets is defined by their location within the hamlet and is quite rural, as the hamlet is surrounded by countryside. Two motorways, the M6 and M6 Toll, to the east interrupt the rural setting of the hamlet; however, they are in a considerable distance from the assets.

6.5.33. There are five Grade II listed buildings in the hamlet of Great Saredon. They comprise Great Saredon Farmhouse (B6), dating to the 18th and 19th centuries, of brick construction; High View Cottage and Farm Cottage (B7), dating to the late 16th century, of timber-frame and brick construction; Hilltop Farmhouse (B8), an early 19th century farmhouse of red brick; Hilltop Cottages (B9), dating to the late 17th century, of timber framed construction and later refaced in brown brick; and Saredon Hall Farmhouse and attached Cowhouse (B5). Saredon Hall Farmhouse, constructed of brick with tiled roof and brick stacks, dates from the early 18th century with a mid to late 19th century addition, while the cowhouse dates mainly from the mid to late 19th century. The setting of these assets is defined by their location within the hamlet of Great Saredon and is quite rural, interrupted by the M6 Toll motorway, to the west.

6.5.34. Two listed buildings are located in the village of Essington just within the 1 km study area. These comprise Essington Hall Farmhouse (B20) and Pool Farmhouse (B13), dating from the early 19th and late 17th century respectively, both constructed of red brick. They both have a rural setting that extends up to the M54, to the north.

6.5.35. A number of non-designated built heritage assets have been identified within the 1 km study area. These include seven locally listed buildings as identified on the South Staffordshire Local List. According to their interest, the buildings in the South Staffordshire Local List are divided into three grades (Grade LLA, Grade LLB and Grade LLC). There are two Grade LLA, two Grade LLB and two Grade LLC locally listed buildings. The remaining historic buildings and structures are included on the Staffordshire HER.

6.5.36. Both Elms Public House (B28), dating from the mid-19th century, and Old Barn (B29), that was built around 1800, are listed at Grade LLA category and lie in Shareshill village. A windmill tower (B31) incorporated into a house in Little Saredon is also listed at Grade LLA category. There are two Grade LLB locally listed buildings, Blacklees Farm (B30), built in the early 19th century, and the remains of Essington Mill on the approach road to the village (B33). A small, modern, ex-Wolverhampton Corporation timber bus shelter (B27) at the south-eastern end of Shareshill and the remains of an anti-aircraft gun site (B32) to the north-east of the study area, are locally listed at Grade LLC category.

6.5.37. The rest of the non-designated built heritage assets include farm buildings that illustrate the agricultural history of the area (B36, B37 and B38); a Vicarage (B35) and its outbuilding (B37) and garden wall (B39) and Havergal Primary School (B34) in Shareshill.

Historic Landscape

6.5.38. The desk-based review and the site visit have established that the land within the draft DCO site boundary has remained rural in character and is predominantly used for agricultural activity. There has been a degree of urbanisation attributed to the development of transportation infrastructure associated with the M54 and M6, as well as the growth of Featherstone.

6.5.39. A number of non-designated historic landscapes have been identified within the study area. There are no designated historic landscapes within the study area. Of the non-designated landscapes, two form historic parks, and two are Historic Environment Character Zones (HECZ).

Hilton Park

6.5.40. The study area is dominated by Hilton Park, a non-designated historic park that has been defined as Historic Parkland within the South Staffordshire Local Plan. The park is associated with Hilton Hall and was probably established in the mid to late 18th century with some of the landscape work attributed to Humphry Repton (1752 – 1818). Originally, the park covered an extensive area of land, part of which is now covered by gravel pits, while the M6 and the M54 bisect the park to the south and east.

Formal garden, Old Moseley Hall

6.5.41. To the south-west of the study area there is a small formal garden that surrounds Old Moseley Hall. The existing garden was reconstructed in order to represent an earlier one dating from c. 1640.

Featherstone

6.5.42. This area is divided into three HECZs, Featherstone - Hilton Park (FSHECZ 1), Featherstone - North of Featherstone (FSHECZ 2) and Featherstone - Featherstone (FSHECZ 3). The key characteristics of this area include:

- The surviving components of the historic landscape park associated with Hilton Park, including the shelter belts, woodland, ornamental lake and parkland trees (FSHECZ 1).
- A well preserved historic field pattern surviving to the north of Featherstone, which may be associated with medieval assarting (conversion to agricultural use) (FSHECZ 2).
- Historic farmsteads surviving within FSHECZ 3 are testimony to the historic dispersed settlement pattern which probably had at least medieval origins across Featherstone parish.
- The remains of a probable World War II military site, associated with the Shell Filling Factory to the west of, and outside of, the study area, has the potential to further our understanding of this site and its role in the 20th century social and economic history of Featherstone (FSHECZ 3).

Great Wyrley

6.5.43. Only the HECZ including the area to the west of Cheslyn Hay is included within the study area, Great Wyrley - West of Cheslyn Hay (GWHECZ 2). The key characteristics of this zone include:

- Industrial archaeology, which is a particular feature of the study area with above and below ground remains being present in three of the four zones (including GWHECZ 2). These heritage assets include the sites of former collieries, brickworks, tramways and mineral railways as well as the remains of two branch canals. An edge tool works, which had its origins in the early 19th Century, has been the subject of an archaeological evaluation in advance of development at Churchbridge (GWHECZ 2).
- Historic farmsteads still form a feature of the historic landscape, some of which are associated with historic field patterns. Lodge Farm may lie on the site of a warrener's lodge which probably existed by the late 16th century (GWHECZ 2).
- Historic field patterns also survive within the landscape of the study area. The late 18th/19th century planned enclosure is still legible within GWHECZ 2 despite the construction of the M6 Toll.

6.6. Potential Impacts

6.6.1. The cultural heritage impact assessment is ongoing and will be reported in full in the Environmental Statement (ES), taking into account mitigation measures which are being developed. The information presented below provides a preliminary snapshot of the current status of the assessment (without mitigation), and thus the assessment findings are subject to change.

6.6.2. The value of a heritage asset (its heritage significance) is guided by its designated status but is also derived from its heritage interest which may be archaeological, architectural, artistic or historic as presented in Annex 2, Glossary of the National Planning Policy Framework (Ref 6.6).

Construction

6.6.3. Temporary construction impacts lasting for all or part of the construction phase of the proposed Scheme potentially include the following:

- The presence and movement of construction plant and equipment, which may impact on the setting of heritage assets.
- The siting of construction compounds and activities within working areas, including associated construction noise and lighting, which may impact on the setting of heritage assets.
- The use of traffic management and increased volumes of traffic on the local road network, which may impact on the setting of heritage assets.

6.6.4. Permanent construction impacts lasting beyond the construction phase potentially include the following:

- Physical impacts on known archaeological assets arising from construction activities such as earthworks excavation, the formation of construction compounds and the installation of drainage infrastructure.
- Physical impacts on historic landscapes associated with the loss of key landscape components as a consequence of construction, such as those resulting from site clearance activities.
- The disturbance, compaction or removal of previously unrecorded sub-surface archaeological deposits through construction activities.
- Impacts on archaeological remains, historic buildings and the historic landscape associated with the introduction of the physical form and appearance of the Scheme in their setting.

Operation

6.6.5. Operational impacts of the proposed Scheme potentially include the following:

- Changes to traffic movements (and associated vehicle lighting), which could affect the setting of heritage assets.
- Changes in road noise from vehicle movements, which may affect the setting of heritage assets.
- The operation of road lighting at junctions and on junction approaches, which may affect the setting of heritage assets.

6.7. Design, Mitigation and Enhancement Measures

6.7.1. Mitigation is currently being considered as part of the design and development of the proposed Scheme. This includes:

- Refinement of the alignment of the proposed Scheme to avoid assets, where possible.
- Minimising overall land-take requirements to reduce the extent to which the proposed Scheme would impact on known and potential cultural heritage assets.
- Considering the horizontal and vertical alignment of the proposed Scheme to reduce its visual prominence.
- The careful siting of signage and lighting to reduce visual intrusion.
- The sympathetic use of landscaping, earthworks and barriers to reduce visual and noise impacts on cultural heritage assets.

6.7.2. A programme of archaeological fieldwork is to be developed and undertaken as part of the mitigation strategy for the proposed Scheme. This will be developed further once the results of the geophysical survey and the archaeological monitoring of geotechnical trial pits, and, if required, evaluation excavation, are available, with the measures set out in the outline CEMP within the ES.

6.7.3. Construction activities would be undertaken by the appointed contractor in accordance with industry best practice, and in line with measures set out in their CEMP. Potential measures that could be adopted and implemented, based on the outcomes of the mitigation strategy, could include:

- The recording of built heritage and historic landscape character in advance of construction to provide a permanent documented record of the current form and condition of affected assets, and their compilation in an appropriate format.
- Undertaking archaeological investigations in advance of, or during, the construction phase.
- The application of a watching brief (archaeological supervision) during construction activities.
- The installation of physical protection measures around assets.

6.7.4. The design-based measures described above would serve to reduce types of operational impact on cultural heritage, particularly those associated with the introduction of the proposed Scheme (and associated traffic) into the setting of assets.

6.8. Assessment of Effects

Construction Impacts

Archaeological Remains

6.8.1. There would be no impacts on designated archaeological assets as a result of proposed Scheme construction; however, the following non-designated archaeological assets would potentially be impacted.

6.8.2. The line of the Streetway and Wordsley Green Turnpike Road (A59) a post-medieval highway now known as Cannock Road. Its archaeological and historic significance lies in its ability to provide information on the connections between places in this landscape. It is considered to be of no more than negligible value. Any buried

remains relating to this asset will likely have been lost during later modernisation. The proposed Scheme would potentially have a direct, physical adverse impact on part of this asset.

6.8.3. A number of cropmarks recorded from aerial photographs and interpreted as field boundaries (A22). The boundaries have archaeological and historical significance as they can provide information regarding the medieval agricultural process and land management of the area. Its value is considered to be no more than negligible. The proposed Scheme would potentially have a physical adverse impact on part of this asset.

6.8.4. Cropmark evidence identified from an aerial photograph of a group of faint, well-defined ditched enclosures of unknown date (A23). The asset has archaeological and historical significance as it can provide information regarding potential early settlement, historic agricultural process and land management of the area. Its value is considered to be no more than negligible. The proposed Scheme would potentially have a direct physical adverse impact on part of this.

6.8.5. A cropmark complex containing pits and other negative features[2] of unknown date (A36). The features hold archaeological and historical value as it can provide information regarding the historic land use and potential early settlement and industrial processes. Its value is considered to be no more than negligible. The proposed Scheme would potentially have a direct physical adverse impact on part of this asset.

Historic Buildings

6.8.6. The following designated and non-designated built heritage assets have the potential to be affected by the construction of the proposed Scheme.

6.8.7. The construction of the proposed Scheme would introduce a change to the setting of Hilton Hall, eroding the parkland that forms its setting. The Hall has historic interest as an early 18th century country house and architectural and artistic interest that derives from the aesthetic appreciation of its Baroque design, symmetry and architectural details. In addition, architectural interest derives from its setting within ornamental parkland, contributing to picturesque views. The construction of the proposed Scheme would result in works within the park and in close proximity to the Hall. Construction traffic movement will result in visual intrusion to views from the asset alongside aural intrusion. The proposed Scheme will potentially have an adverse impact on the asset, resulting in changes to the setting of the asset, which is of high value.

6.8.8. The proposed Scheme will introduce a change to the setting of the buildings associated with Hilton Hall. The Grade II listed Coach House and Stable Block have historic interest as they date to the early 19th century, and architectural interest that derives from their design and materials. They also have group value with the Hall. Their setting within the park and just north-east of the Hall contributes to their historic significance. The asset is of medium value and the construction of the proposed Scheme is anticipated to have an adverse impact upon that significance.

6.8.9. The Grade I listed Conservatory is located north-west of the Hall and is in close proximity to the proposed Scheme than the Hall. It is an asset of high value. It has historic interest as an early 19th century conservatory and high architectural interest deriving from its design. It also has group value with the Hall. It is anticipated that

[2] A negative feature is a ditch, hole or pit which has been filled in.

the construction of the proposed Scheme would have an adverse impact on the significance of this asset as its setting will be modified.

6.8.10. The Grade II listed pair of early 18th century gates at Hilton Park is of medium value. They have historic and some architectural interest deriving from their design. They also have group value with the Hall. The construction of the proposed Scheme is likely to have an adverse impact on the significance of this asset. Their setting only contributes to their significance in relation to their connection to the hall. This relationship will not be lost, although the wider parkland setting will be affected.

6.8.11. The Grade II Portobello Tower at Hilton Park is of medium value. It has historic interest as an 18th century tower that was built to commemorate a historic event, the victory in Portobello. It also has architectural interest that derives from its design and its contribution to picturesque views from the Hall and Hilton Park. The construction of the proposed Scheme would introduce a change to the setting of the tower. However, the relationship of the tower with the hall, including views of the tower and from the tower, will not be lost. The construction of the proposed Scheme is anticipated to have an adverse impact on the significance of the tower.

6.8.12. The Grade II* Moseley Old Hall is an asset of high value. It has historic significance that derives from its association with King Charles II and architectural interest that derives from its design, although most of its original design was concealed when the building was refaced in brick. The construction of the proposed Scheme has the potential to impact on the setting of the building in terms of the construction noise and increased traffic that would be experienced within its setting. The construction of the proposed Scheme is likely to have an adverse impact on the significance of this asset of high value.

Historic Landscape

6.8.13. The landscape park around the Grade I listed Hilton Hall holds historical and archaeological significance. The extant hall was built between 1720 and 1730 and it is likely that parts of the current parkland were established at this period. The historic development of the park is well documented and the park itself provides a setting for the listed buildings located within its boundary. The parkland also has historic significance due to its association with the late 18th century landscape gardener, Humphrey Repton. Its archaeological significance lies in the potential for previously unrecorded archaeological deposits relating to the creation and evolution of the historic landscape associated with the medieval and post-medieval estate, as well as with the reputed deserted medieval village in its grounds. The landscape park is considered to be of medium value. The proposed Scheme would have a direct physical adverse impact on part of this asset.

Operational Impacts

Archaeology

6.8.14. None of the identified archaeological assets would be affected by the operation of the proposed Scheme.

Historic Buildings

6.8.15. The following designated and non-designated built heritage assets would potentially be affected by operation of the proposed Scheme.

6.8.16. Hilton Hall would potentially experience increased noise as a result of the operation of the proposed Scheme. This would have an adverse impact on the ability to understand this high value asset.

6.8.17. The operation of the proposed Scheme would potentially result in increased noise experienced from the Conservatory, to the north-east of the Hall so that the setting of the asset could be modified. This would result in an adverse impact on this asset of high value. The operation of the proposed Scheme could result in increased noise experienced from the Coach House and Stable Block so that the setting of the assets would be modified. This would result in an adverse impact on this medium value asset.

6.8.18. The Portobello Tower at Hilton Park is of medium significance. The operation of the proposed Scheme could result in increased noise experienced from the asset and potential visual intrusion by traffic movements. However, the tower is already in proximity to the M54.

Historic Landscape

6.8.19. The landscape park around the Grade I listed Hilton Hall would potentially experience light and noise intrusion affecting the setting of the parkland. This could result in a potential adverse impact on this medium value asset.

6.8.20. Further work will be undertaken as part of the assessment to develop, refine and agree mitigation measures for cultural heritage. Once established and agreed with relevant statutory bodies, an assessment will be made of the role such measures would have in mitigating the above effects to reduce their significance. The final assessment findings will be reported in the ES.

7. LANDSCAPE AND VISUAL

7.1. Introduction

7.1.1. This chapter presents the findings of a preliminary assessment of temporary and permanent impacts on landscape character areas, landscape designations and existing views during construction and operation of the proposed Scheme.

7.1.2. For the purposes of this landscape and visual impact assessment (LVIA), a clear distinction is being drawn between landscape and visual impacts as follows:

- **Landscape Impacts:** These relate to direct impacts of the proposed Scheme upon the physical characteristics or components of the landscape which form its character (e.g. landform, vegetation, and buildings) and indirect impacts arising from changed perception of the landscape or its value.
- **Visual Impacts:** These relate to the changes arising from the proposed Scheme to individual 'receptors' with views of the landscape or townscape (e.g. local residents, users of public rights of way (PRoW), or passing motorists).

7.1.3. This chapter is supported by Figures 7.1 to 7.5. The legislative framework and assessment methodology for the full Environmental Impact Assessment (EIA) is provided in Chapter 8: Landscape and Visual, Sections 8.3 and 8.8 of the PCF Stage 3 EIA Scoping Report (Ref 7.1).

7.2. Stakeholder Engagement

7.2.1. To date, there has been some consultation undertaken with statutory and non-statutory bodies such as Staffordshire County Council and the National Trust. In November 2018, the locations for viewpoint photographs were agreed by the Landscape Officer at Staffordshire County Council, and a meeting was held in December 2018 to discuss (amongst other matters) the initial strategies for landscape mitigation. In January 2019, a meeting was held with the National Trust at Moseley Old Hall to discuss landscape mitigation at the southern end of the proposed Scheme. Viewpoint locations may be modified or added as a result of these consultations, particularly around Moseley Old Hall.

7.2.2. Following receipt of the EIA Scoping Opinion in February 2019, the scope of the landscape and visual impact assessment has been be reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- Further explanation on the rationale behind the location and extent of the proposed study area.
- The parameters used to establish the ZTV will address any uncertainty in scheme design that exists and if necessary adopt a worst-case scenario.
- Consideration of lighting impacts during construction and operation.

7.2.3. Consultation with Staffordshire County Council, the National Trust and other relevant bodies will continue through the EIA process to agree appropriate landscape mitigation measures; as well as to further refine the adopted study areas, discuss the magnitude of predicted impacts and the significance of landscape and visual effects.

7.3. Assessment Assumptions and Limitations

7.3.1. The assessment is based on, and limited to, the baseline conditions observed at the time of the landscape and visual site survey. Surveys cover the summer and winter, but do not include other seasons.

7.3.2. The PCF Stage 2 (options selection) LVIA (Refs 7.2 and 7.3) and this PEI Report do not consider the candidate sites identified for potential flood compensation, construction compounds, borrow pits and/ or ecological compensation.

7.3.3. The information presented in this chapter is based on the information available at the time of writing the report and based on an emerging design. The findings reported in this PEI Report may be subject to change as the design of the proposed Scheme is developed and refined through the EIA and consultation processes.

7.4. Study Area

7.4.1. Guidelines for Landscape and Visual Impact Assessment (GLVIA) 3 (Ref 7.4) suggests that the study area should cover the geographical area from which the development being assessed would potentially be visible, whilst the area also should be proportionate to the development (p.116). Guidance given in IAN 135/10 (Ref 7.5) suggests a 1 km study area, broadening to capture areas within the Zone of Theoretical Visibility (ZTV) sitting outside of the 1 km study area with capacity to experience significant effects as a result of a highway scheme. This approach is commonly adopted for highway projects and is adopted within this landscape and visual impact assessment.

7.4.2. For the purpose of the landscape character assessment, the desk-based study incorporates a 1 km study area from the route of the proposed Scheme. This was selected as the proposed Scheme and associated proposed Scheme boundary is focused nearby and parallel to the existing A460 road. However, for the purpose of the visual amenity assessment, potential receptors were identified outside of the 1 km boundary. Potential viewpoints were informed by a combination of desk-study, site surveys and in consultation with the local planning authorities.

7.4.3. The extent of the study area has therefore been determined to include the area of mapping illustrated on Figures 7.1 and 7.1A to C, study area and ZTV which outline the study area and ZTV for the proposed Scheme. The ZTV for the proposed Scheme has been split into four figures to show the theoretical visibility of the highway (Figure 7.1A), cars (Figure 7.1B) and HGVs (Figure 7.1C), as well as the combined visibility for all elements (Figure 7.1).

7.4.4. The ZTV has been established by initial analysis of topographic maps, 3D digital modelling and terrain analysis and is based on the maximum theoretical visibility of the proposed Scheme derived from points located along the highway surface. An indicative 10.0 m height has been allocated to prominent areas of vegetation and 7.5 m to areas of settlement within the wider study area, in order to provide a more refined ZTV output. The ZTV output is based on a viewer height of 1.7 m with the theoretical viewer located at 25 m centres throughout the study area. For the purposes of the Environmental Statement (ES), a ZTV will be run based on points of 1.5 m height located along the highway, which represents theoretical visibility of cars on the highway, theoretical visibility of 4.5 m HGVs and theoretical visibility of 12.5 m high lighting columns.

7.5. Baseline Conditions

7.5.1. The proposed Scheme links M54 Junction 1 and M6 Junction 11 near the settlements of Shareshill and Featherstone in south Staffordshire. There are a

number of rural and urban-fringe features within the study area including extensive mixed farmland, as well as the settlements of Shareshill, Featherstone, Hilton, Essington and Cheslyn Hay. Highway infrastructure already exerts an influence over the study area, with the presence of the M6, M54 and M6 Toll detracting from the surrounding landscape and having a negative influence on any perceived tranquillity.

7.5.2. The landscape and visual baseline has been determined through a combination of desk study and field work.

Landscape Baseline Conditions

7.5.3. At a national level, Natural England has defined a series of National Character Areas (NCAs) for England. The study area encompasses:

- NCA: 67 Cannock Chase and Cank Wood; and
- NCA 66: Mid Severn Sandstone Plateau.

7.5.4. Landscape character assessment is a hierarchical process descending from national to regional to local scale and ultimately to scheme-specific studies. It is unlikely that the proposed Scheme would have any significant effects on the character of these NCAs. This is because the key characteristics are regional and localised highway development which would be unlikely to result in a significant effect over the entire NCA. Therefore the LVIA provides a high level overview of them.

7.5.5. At a county level, Planning for Landscape Change Supplementary Planning Guidance (SPG) (1996-2011) (Ref 7.6) was originally published in 2000 by Staffordshire County Council, to provide guidance on Landscape Character within the county. The landscape of Staffordshire has been refined into 22 Landscape Character Types (LCTs), defined as broad tracts of landscape that convey a unity of character derived from their inclusion within specific regional character areas.

7.5.6. The footprint of the proposed Scheme is located within two Landscape Character Types (LCTs): Settled Plateau Farmland Slopes and Settled Heathlands. Landscape Character Types (LCTs) are shown on Figure 7.2.

7.5.7. Settled Plateau Farmland Slopes LCT comprises a gently undulating landscape with several small-scale valley characteristics, creating a number of long distance views from plateau tops. Land use within the LCT predominantly constitutes small scale pastoral farmland of low intensity management, with ancient hedgerow patterns and relatively dense tree cover which limits views. Changes in vegetation cover ensure diversity in character across the LCT; tree species are predominantly ash or oak, with examples of alder and willow along watercourses. Unmanaged hedgerows contribute to the screening of potential views across the wider landscape. Where hedgerows have been managed, scale has a tendency to become larger, putting more emphasis on the landform. Nearer to urban areas the landscape tends to become more open, heavily influenced by surrounding residential areas and other built and man-made elements.

7.5.8. Within the Settled Heathlands LCT, the landscape is flat to gently rolling and supports a mix of arable and pastoral farming activities. Adjacent to urban areas, the field pattern was originally medium scale. However, over the years this has deteriorated and a large scale field pattern is now evident, bounded by gappy hedgerows. Away from urban development, the landscape is more intact. Given the origins of the LCT as heathland, indicators of this past land cover, such as bracken and birch, are evident across the LCT. There are a number of wooded stream valleys throughout the landscape. Transport infrastructure and urban development both have a negative influence on the landscape quality.

7.5.9. In summary, within the Planning for Landscape Change SPG (Staffordshire County Council), the study area encompasses, from south to north:

- Coalfield Farmlands LCT;
- Settled Plateau Farmland Slopes LCT; and
- Settled Heathlands LCT.

7.5.10. Within the far south-western corner of the study area is an area of townscape contained within the study area for the Black Country Historic Landscape Characterisation, published by the Black Country Archaeology Service in 2009 (Ref 7.7). This townscape belongs to the Pendeford, Fordhouse and Bushbury Character Area which contains relatively new housing and is the most recently developed suburb of the city of Wolverhampton. Around half of the land within the character area comprises housing, with other uses such as industry, public services and recreational facilities present.

Visual Baseline Conditions

7.5.11. Assessment of the value of views forms a component of the LVIA baseline and is required to establish sensitivity. Value of views is typically more subjective and may vary from viewer to viewer. However, factors to be considered include views of or from heritage assets (such as Hilton Hall); designated landscapes or views; or named or promoted views found in guidebooks or tourist literature.

7.5.12. Views are predominantly in close proximity to the proposed Scheme, including from the residential areas of Featherstone, Hilton, Shareshill, Essington, Little Saredon, and Laney Green. The majority of views are within 1 km of the proposed Scheme and include a baseline which is heavily influenced by the existing M54, M6 and M6 Toll highway corridors.

7.5.13. Views are also obtained from PRoW adjacent to the proposed Scheme including a number of footpaths and bridleways. Intervening vegetation across the study area acts as a visual barrier to parts of these PRoW, restricting accessible views to the proposed Scheme.

7.5.14. Viewpoints have been recorded from a total of 19 locations (see Figure 7.5) and were selected to represent a range of location types and viewing distances. The viewpoints are displayed at a viewing distance of 300 mm in accordance with the Photography and Photomontage in Landscape and Visual Impact assessment Advice Note 01/11 published by the Landscape Institute in 2011 (Ref 7.8).

<u>Value of the Environmental and Resource Receptors</u>

7.5.15. Under GLVIA3 value of landscape resources is a function of the factors listed below, which may be encompassed within a designation of landscape value:

- landscape quality;
- scenic quality;
- rarity;
- representativeness;
- conservation interest;
- recreation value;
- perceptual aspects (including tranquillity); and

- associations.

7.5.16. The LVIA assesses landscape value based on these criteria and by reference to landscape designations within the study area. An overview of landscape designations is provided below.

Landscape Designations

7.5.17. There are no international or national designations of landscape quality or value within the study area.

7.5.18. Hilton Park, within the south of the study area, constitutes a Historic Landscape Area (HLA) as designated by South Staffordshire District Council and subject to additional protection through the Adopted Core Strategy (Ref 7.9). HLAs were selected for the strong historic landscape character and the desirability of conserving and restoring it.

7.5.19. There are no other local landscape designations within the study area.

7.5.20. Much of the study area is designated as green belt. Green belt is a designation of landscape value related primarily to openness between settlements rather than an indication of landscape quality.

Summary of Landscape and Visual Amenity Sensitivity

7.5.21. The value/susceptibility and sensitivity of the landscape within the study area is given in Table 7.1, whilst Table 7.2 summarises value/susceptibility and the sensitivity of the potential visual receptors/viewers of the proposed Scheme.

Table 7.1: Summary of value, susceptibility and sensitivity of landscape receptors to the proposed Scheme

Receptor	Value	Stage	Susceptibility	Sensitivity
Settled heathlands LCT	Low	Construction	Low	Low
		Year 1 of Operation	Low	Low
		Year 15 of Operation	Low	Low
Settled plateau farmland slopes LCT	Low	Construction	Low	Low
		Year 1 of Operation	Low	Low
		Year 15 of Operation	Low	Low
Pendeford, Fordhouses & Bushbury LCA	Low	Construction	Low	Low
		Year 1 of Operation	Low	Low
		Year 15 of Operation	Low	Low

Table 7.2: Summary of value of view, susceptibility and sensitivity of visual receptors to the proposed Scheme

Receptor	Value	Stage	Susceptibility	Sensitivity
Viewpoint 1	Low	Construction	Moderate	Low
		Year 1 of Operation	Moderate	Low
		Year 15 of Operation	Moderate	Low
Viewpoint 2	Low	Construction	Moderate	Moderate
		Year 1 of Operation	Moderate	Moderate

Receptor	Value	Stage	Susceptibility	Sensitivity
		Year 15 of Operation	Moderate	Moderate
Viewpoint 3	Low	Construction	Moderate	Low
		Year 1 of Operation	Moderate	Low
		Year 15 of Operation	Moderate	Low
Viewpoint 4	Low	Construction	Low	Low
		Year 1 of Operation	Low	Low
		Year 15 of Operation	Low	Low
Viewpoint 5	Low	Construction	Low	Low
		Year 1 of Operation	Low	Low
		Year 15 of Operation	Low	Low
Viewpoint 6	Moderate	Construction	Moderate	Moderate
		Year 1 of Operation	Moderate	Moderate
		Year 15 of Operation	Moderate	Moderate
Viewpoint 7	Low	Construction	Moderate	Moderate
		Year 1 of Operation	Moderate	Moderate
		Year 15 of Operation	Moderate	Moderate
Viewpoint 8	Moderate	Construction	Low	Low
		Year 1 of Operation	Low	Low
		Year 15 of Operation	Low	Low
Viewpoint 9	Low	Construction	Moderate	Moderate
		Year 1 of Operation	Moderate	Moderate
		Year 15 of Operation	Moderate	Moderate
Viewpoint 10	Low	Construction	Moderate	Low
		Year 1 of Operation	Moderate	Low
		Year 15 of Operation	Moderate	Low
Viewpoint 11	Low	Construction	High	Moderate
		Year 1 of Operation	High	Moderate
		Year 15 of Operation	High	Moderate
Viewpoint 12	Low	Construction	Moderate	Low
		Year 1 of Operation	Moderate	Low
		Year 15 of Operation	Moderate	Low
Viewpoint 13	Moderate	Construction	High	Moderate
		Year 1 of Operation	High	Moderate
		Year 15 of Operation	High	Moderate
Viewpoint 14	Moderate	Construction	High	Moderate
		Year 1 of Operation	High	Moderate

Receptor	Value	Stage	Susceptibility	Sensitivity
		Year 15 of Operation	High	Moderate
Viewpoint 15	Moderate	Construction	High	Moderate
		Year 1 of Operation	High	Moderate
		Year 15 of Operation	High	Moderate
Viewpoint 16A	High	Construction	High	High
		Year 1 of Operation	High	High
		Year 15 of Operation	High	High
Viewpoint 16B	High	Construction	High	High
		Year 1 of Operation	High	High
		Year 15 of Operation	High	High
Viewpoint 17	Moderate	Construction	Moderate	Moderate
		Year 1 of Operation	Moderate	Moderate
		Year 15 of Operation	Moderate	Moderate
Viewpoint 18	Low	Construction	Moderate	Moderate
		Year 1 of Operation	Moderate	Moderate
		Year 15 of Operation	Moderate	Moderate

7.5.22. Baseline landscape and visual data for the study area has been gathered from the following sources:

- Planning for Landscape Change SPG (Staffordshire County Council) (Ref 7.5); and
- The Black Country - A Historic Characterisation (Black Country Archaeology Service) (Ref 7.6).

7.6. Potential Impacts

7.6.1. Mitigation measures are being incorporated in the design and construction of the proposed Scheme; these are set out in Section 7.7. Prior to implementation of mitigation, a summary of the potential landscape and visual impacts (both beneficial and adverse) associated with the construction and operation of the proposed Scheme is outlined below.

Construction

Landscape

7.6.2. The proposed Scheme would be accommodated on land to the east of the existing A460 corridor. The immediate surroundings of the proposed Scheme are currently a mix of existing highway, arable farmland, woodland, residential properties and parkland. It is considered that implementation of the proposed Scheme would constitute a loss of characteristic landscape elements such as historic parkland, farmland and trees through the construction process. In addition, construction activity would appear relatively incongruous in the semi-rural context.

Visual

7.6.3. Visually, a number of receptors (including users of local PRoW, residents and highway users) would be affected by the presence of construction vehicles, construction compounds, soil stockpiles and other construction activity within views. These views would be partially screened in places by undulating landform, as well as intervening vegetation and built form.

Operation

Landscape

7.6.4. As set out above, the existing landscape baseline is characterised by the presence of highway infrastructure within the study area. The addition of the proposed Scheme at operation would therefore result in an intensification of the highway infrastructure, but would not necessarily result in the addition of incongruous elements to the landscape context.

Visual

7.6.5. At operation, the proposed Scheme would be visually poorly defined within the wider landscape due to the effects of topography, intervening vegetation and built form. Direct views would therefore be predominantly obtained from highway locations in the approach to junctions with or the crossing of the proposed Scheme, as well as footpaths and bridleways immediately adjacent (particularly those near Shareshill). The context of the proposed Scheme has variable levels of existing lighting due to its semi-rural and urban fringe nature.

7.7. Design, Mitigation and Enhancement Measures

7.7.1. Environmental considerations will be taken into account during further development of the proposed Scheme design, including consideration of avoiding and reducing potential landscape and visual effects through minimising land take, building demolition and tree felling requirements throughout the alignment.

7.7.2. As detailed in Chapter 3, in defining the proposed Scheme design, a range of alternative alignments have been subject to review, including various alignments which bring the proposed Scheme closer to the existing route of the M6 motorway. Landscape and visual issues were taken into account as part of the evaluation process.

7.7.3. The proposed Scheme would include an appropriate landscape design which incorporates tree and shrub planting; as well as earthworks mitigation measures such as bunds, false cuttings, and use of natural landform. The landscape design will help to mitigate some of the landscape and visual impacts by integrating and replacing landscape features, enhancing landscape character and providing screening for visual receptors. Figure 2.2, Draft Masterplan, illustrates an indicative landscape design; this landscape design would be further developed during the environmental assessment to support the DCO application. In particular, the future development of the landscape design will take account of the ecological mitigation requirements as detailed in Chapter 8: Nature Conservation; and heritage features as detailed in Chapter 6: Cultural heritage. The landscape design team will also canvas the opinions of stakeholders, including the Staffordshire County Council Landscape Officer and applicable local resident groups if possible.

7.7.4. As detailed in Section 2.4, a Construction Environmental Management Plan (CEMP) would be prepared and implemented by the selected construction contractor. The CEMP would include a range of best practice measures associated with mitigating

potential environmental impacts, e.g. limiting construction lighting and signage to that which is absolutely necessary to reduce additional visual clutter and minimise effects on both landscape character and visual amenity.

7.7.5. The impact avoidance and mitigation measures as detailed above have been taken into account during the estimation of potential impacts and effects as detailed in Section 7.8.

7.8. Assessment of Effects

Construction

7.8.1. During proposed Scheme construction, landscape effects on the Settled Plateau Farmlands LCT and Settled Heathlands LCT are anticipated to be adverse; whilst in Pendeford, Fordhouses & Bushbury LCA, landscape effects are considered to be neutral.

7.8.2. The majority of effects on visual amenity during construction are considered to be adverse, although some are predicted to be neutral.

7.8.3. The type of effects during construction of the proposed Scheme are summarised in Table 7.3, whilst the type of effects on visual amenity during construction of the proposed Scheme are summarised in Table 7.4.

Table 7.3: Type of landscape effects arising from proposed Scheme construction

Receptor	Stage	Type of effect
Settled Heathlands LCT	Construction	Adverse
Settled Plateau Farmland Slopes LCT	Construction	Adverse
Pendeford, Fordhouses & Bushbury LCA	Construction	Neutral

Table 7.4: Type of visual effects arising from proposed Scheme construction

Receptor	Stage	Type of effect
Viewpoint 1	Construction	Adverse
Viewpoint 2	Construction	Adverse
Viewpoint 3	Construction	Adverse
Viewpoint 4	Construction	Adverse
Viewpoint 5	Construction	Adverse
Viewpoint 6	Construction	Neutral
Viewpoint 7	Construction	Adverse
Viewpoint 8	Construction	Adverse
Viewpoint 9	Construction	Adverse
Viewpoint 10	Construction	Adverse
Viewpoint 11	Construction	Adverse
Viewpoint 12	Construction	Neutral
Viewpoint 13	Construction	Adverse
Viewpoint 14	Construction	Adverse

Receptor	Stage	Type of effect
Viewpoint 15	Construction	Adverse
Viewpoint 16A	Construction	Adverse
Viewpoint 16B	Construction	Adverse
Viewpoint 17	Construction	Adverse
Viewpoint 18	Construction	Neutral

Operation

7.8.4. During proposed Scheme operation, landscape effects on the Settled Plateau Farmlands LCT and Settled Heathlands LCT are anticipated to be adverse (Year 1 and Year 15); whilst in Pendeford, Fordhouses & Bushbury LCA, landscape effects are predicted not to change (Year 1 and Year 15).

7.8.5. During proposed Scheme operation, the majority of visual amenity effects are predicted to be adverse at proposed Scheme opening (Year 1) with some considered to be neutral. At Year 15, there are more neutral effects and two effects are anticipated to be beneficial, following maturation of the proposed Scheme landscape mitigation (Year 15).

7.8.6. The type of effects during proposed Scheme operation are summarised in Table 7.5, whilst the type of effects on visual amenity are summarised in Table 7.6.

Table 7.5: Type of landscape effects arising from proposed Scheme operation

Receptor	Stage	Type of effect
Settled Heathlands LCT	Year 1 of Operation	Adverse
	Year 15 of Operation	Adverse
Settled Plateau Farmland Slopes LCT	Year 1 of Operation	Adverse
	Year 15 of Operation	Adverse
Pendeford, Fordhouses & Bushbury LCA	Year 1 of Operation	Neutral
	Year 15 of Operation	Neutral

Table 7.6: Type of visual effects arising from proposed Scheme operation

Receptor	Stage	Type of effect
Viewpoint 1	Year 1 of Operation	Adverse
	Year 15 of Operation	Adverse
Viewpoint 2	Year 1 of Operation	Adverse
	Year 15 of Operation	Beneficial
Viewpoint 3	Year 1 of Operation	Adverse
	Year 15 of Operation	Neutral
Viewpoint 4	Year 1 of Operation	Adverse
	Year 15 of Operation	Neutral
Viewpoint 5	Year 1 of Operation	Neutral
	Year 15 of Operation	Neutral

Receptor	Stage	Type of effect
Viewpoint 6	Year 1 of Operation	Neutral
	Year 15 of Operation	Neutral
Viewpoint 7	Year 1 of Operation	Adverse
	Year 15 of Operation	Beneficial
Viewpoint 8	Year 1 of Operation	Adverse
	Year 15 of Operation	Adverse
Viewpoint 9	Year 1 of Operation	Neutral
	Year 15 of Operation	Neutral
Viewpoint 10	Year 1 of Operation	Neutral
	Year 15 of Operation	Neutral
Viewpoint 11	Year 1 of Operation	Adverse
	Year 15 of Operation	Adverse
Viewpoint 12	Year 1 of Operation	Neutral
	Year 15 of Operation	Neutral
Viewpoint 13	Year 1 of Operation	Adverse
	Year 15 of Operation	Adverse
Viewpoint 14	Year 1 of Operation	Adverse
	Year 15 of Operation	Adverse
Viewpoint 15	Year 1 of Operation	Adverse
	Year 15 of Operation	Adverse
Viewpoint 16A	Year 1 of Operation	Neutral
	Year 15 of Operation	Neutral
Viewpoint 16B	Year 1 of Operation	Adverse
	Year 15 of Operation	Adverse
Viewpoint 17	Year 1 of Operation	Adverse
	Year 15 of Operation	Adverse
Viewpoint 18	Year 1 of Operation	Neutral
	Year 15 of Operation	Neutral

7.8.7. The preliminary assessment has concluded that, prior to the implementation of mitigation measures, there is the potential for significant landscape and visual effects – such effects could arise from:

- The realigned junction on the M54 which would introduce new slip roads and lighting outside the existing M54 corridor to users of the PRoW, Moseley Old Hall and local roads.
- The offline link road, although mostly set in cutting and passing to the east of Featherstone, Hilton and Shareshill, as well as to the west of Hilton Park, is

extensive and would be in close proximity to several PRoW and residential properties.

- The remodelled junction 11 of the M6 which would realign the existing roundabout.
- Modifications to the local road network, including stopping up roads such as the existing A460.

7.8.8. Further work will be undertaken as part of the assessment to develop, refine and agree mitigation measures for landscape and visual aspects. Once established and agreed with relevant statutory bodies, an assessment will be made of the role such measures would have in mitigating the above effects to reduce their potential significance.

8. BIODIVERSITY

8.1. Introduction

8.1.1. This chapter presents the findings of a preliminary assessment of temporary and permanent impacts on biodiversity during construction and operation of the proposed Scheme. This chapter considers potential impacts on the following:

- statutory designated sites: Special Protection Areas (SPA), potential SPA (pSPA), Special Areas of Conservation (SAC), possible SAC (pSAC), Ramsar sites, Sites of Special Scientific Interest (SSSI) and Local Nature Reserves (LNR);
- non-statutory designated sites: Local Wildlife Sites (LWS), Sites of Biological Interest (SBI), Biodiversity Action Sites (BAS) and Sites of Nature Conservation Importance (SNCI);
- ancient woodland;
- priority habitats; and
- protected and notable species.

8.1.2. With regards to SSSIs, only those designated for nature conservation are considered in this chapter. Any SSSIs designated for their geological interest are considered in Chapter 10 Geology and Soils.

8.1.3. This chapter is supported by Figures 8.1 to 8.4. The legislative framework and assessment methodology for the full Environmental Impact Assessment (EIA) is provided in Chapter 9: Biodiversity, Sections 9.3 and 9.8 of the PCF Stage 3 EIA Scoping Report (Ref 8.1).

8.1.4. The assessment is being undertaken in accordance with best practice guidance and standards relating to the identification, assessment and evaluation of effects on biodiversity associated with highway-based improvements, including where appropriate guidance from the Design Manual or Roads and Bridges (DMRB) (Ref 8.2 and 8.3). The assessment is supported by a series of technical appendices in PEI Report Volume III (see Appendix 8.1 to 8.5):

- Extended Phase 1 Habitat Report, Appendix 8.1;
- Great Crested Newt Report, Appendix 8.2;
- Otter and Water Vole Report, Appendix 8.3;
- Reptile Report, Appendix 8.4; and
- Barn Owl Survey, Appendix 8.5.

8.1.5. Other surveys that are ongoing are described in paragraphs 8.5.15 and 8.5.16. The results of all completed ecological surveys will be presented in the Environmental Statement (ES) and will be used to inform the biodiversity impact assessment.

8.2. Stakeholder Engagement

8.2.1. Engagement with Natural England, the Staffordshire County Council Ecologist and Senior Planning Officer at the Staffordshire Wildlife Trust is ongoing.

8.2.2. Following receipt of the EIA Scoping Opinion in February 2019, the scope of the ecological assessment has been reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate and other statutory consultees. In summary these include:

- Further information on impact pathways will be provided in the ES. Where it is considered that there is no impact pathway to a receptor, sufficient evidence to support this statement will be presented in the ES.
- Further consideration of the potential impacts on Barn Owl (*Tyto alba*) will be considered in the ES, should this assessment be scoped out further evidence and justification will be provided.
- Road mortality impacts to bats will be considered as part of the assessment of impacts on biodiversity and any impacts will be clearly outlined in the ES.

8.2.3. The Planning Inspectorate agreed to scope out further assessment of reptiles, great crested newt, water vole and otter. However, due to the change in the extent of the draft DCO site boundary (see paragraph 2.2.5) and limitations of surveys completed to date, further surveys and assessment for these species will be undertaken where appropriate.

8.2.4. Consultation with Staffordshire County Council, Staffordshire Wildlife Trust and Natural England will continue through the EIA process to agree assessment methodology and survey requirements, share survey findings, and where appropriate agree proportionate mitigation measures.

8.3. Assessment Assumptions and Limitations

8.3.1. The assessment has partly been based on data received from databases held and maintained by third parties. Information obtained during the course of a desk study is dependent upon people and organisations having made and submitted records for the area of interest. As such, a lack of records for a particular habitat or species does not necessarily mean that the habitats or species do not occur in the study area. Likewise, the presence of records for particular habitats and species does not automatically mean that these still occur within the area of interest or are relevant in the context of the proposed Scheme.

8.3.2. Due to incomplete survey information at this stage the assessment for all habitats and species is high level and it has not been possible to anticipate all impacts resulting from the proposed Scheme within this assessment.

8.3.3. Whilst some targeted habitat and species specific surveys have been undertaken, the survey coverage was limited in some areas due to access restrictions. For areas with restricted access survey data on the relative nature conservation value and habitat extent or population size is not available.

8.3.4. By necessity, some aspects of the assessment is high level and will be subject to further review and update as further targeted surveys are undertaken and new information becomes available. Until this information is available, the assessment has been based on a reasonable precautionary approach (considering existing knowledge of the feature, citing supplementary information where deemed relevant and necessary and applying professional judgement).

8.3.5. The information presented in this chapter is based on the information available at the time of writing the report and based on an emerging design. The findings reported in this PEI Report may be subject to change as the design of the proposed Scheme is developed and refined through the EIA and consultation processes.

8.4. Study Area

8.4.1. The biodiversity study area reflects good practice, including DMRB guidance for assessing the impacts of a road scheme on certain species, and the scoping distances that statutory consultees would typically expect to be considered for

identification of ecological features that might experience direct or indirect effects as a result of the proposed Scheme. Definition of the appropriate study area has been informed by published guidance and professional judgement, with reference to the geographic location, nature and scale of the proposed Scheme. A visual representation of the biodiversity study area is provided in Figures 8.1 to 8.4.

8.4.2. The following study areas were used for the desk study to obtain existing records of designated sites, habitats and species:

- international statutory designated SAC or pSAC within 30 km of the draft DCO site boundary to identify sites where bats are a primary reason for designation (Figure 8.1);
- other international statutory designated sites for nature conservation within 10 km of the draft DCO site boundary e.g. SAC, pSAC, SPA, pSPA and Ramsar sites (Figure 8.1);
- national statutory designated sites for nature conservation within 2 km of the draft DCO site boundary e.g. SSSI and LNR (Figure 8.1 and 8.2), this will be extended as appropriate to encompass sites within 200 m of the affected road network (ARN). The ARN is currently unknown but will be outlined in the air quality chapter of the ES.;
- non-statutory designated sites for nature conservation within 2 km of the draft DCO site boundary e.g. LWS, SBI, BAS and SNCI and Ancient Woodland (Figure 8.2); and
- protected and notable species and priority habitat within 2 km of the draft DCO site boundary.

8.4.3. Habitat and protected species surveys will be used to inform the assessment. The study areas used to gather information are as follows:

- Phase 1 Habitat Survey – Habitats within and up to 250m from the draft DCO site boundary (Figure 8.3).
- Ancient Semi-Natural Woodland - Woodlands present within and up to 100 m from the draft DCO site boundary (Figure 8.4).
- Badger (*Meles meles*) - Within and up to 250 m of the draft DCO site boundary.
- Tree summer roost survey - Trees within and up to 50 m of the draft DCO site boundary identified as providing moderate or high bat roost potential during the Phase 1 Habitat Survey.
- Tree hibernation survey - Trees within and up to 50 m of the draft DCO site boundary identified as providing moderate or high bat roost potential during the Phase 1 Habitat Survey.
- Building scoping - Buildings within and up to 50 m of the draft DCO site boundary identified within the Phase 1 Habitat Survey as having bat roost potential were scoped to identify those which could hold bat roosts.
- Building emergence and re-entry surveys – Buildings within and up to 50 m of the draft DCO site boundary identified within the building scoping surveys as buildings with potential to hold roosts.
- Bat transect surveys – Areas within and up to 100 m of the draft DCO site boundary to identify any important bat flight lines and foraging areas.

- Barn Owl (*Tyto Alba*) survey - Barn Owl roosting habitat within and up to 500 m of the draft DCO site boundary.
- Wintering Birds – Within and up to 250 m from the draft DCO site boundary.
- Breeding Birds – Within and up to 250 m from the draft DCO site boundary.
- Great crested newts (GCN) (*Triturus cristatus*) - Waterbodies located within and up to 500 m from the draft DCO site boundary.
- Invasive plant species - Within and up to 250 m from the draft DCO site boundary.
- Otter (*Lutra lutra*) and water vole (*Arvicola amphibious*) –Watercourses within and up to 100 m from the draft DCO site boundary.
- Reptile – suitable habitats within and up to 250 m from the draft DCO site boundary.
- Terrestrial Invertebrates – Potential terrestrial invertebrate habitat within and up to 250 m from the draft DCO site boundary.
- Aquatic Invertebrates – (including white clawed crayfish (*Austropotamobius pallipes))* watercourses and waterbodies within the draft DCO site boundary.

8.5. Baseline Conditions

8.5.1. This section describes existing baseline conditions as determined through desk study, the Phase 1 habitat survey and protected species surveys undertaken across 2015, 2017 and 2018. A number of habitat and protected species surveys are ongoing, see paragraphs 8.5.16 to 8.5.17 for details.

8.5.2. Baseline data for the study area(s) has been gathered from the following sources:

- Staffordshire Ecological Record (SER) (Ref 8.4);
- Magic Map (Ref 8.5);
- NBN Atlas, freely available data (Ref 8.6);
- Natural England (Ref 8.7);
- OS Maps (Ref 8.8);
- Birmingham and the Black Country Ecological record Centre (EcoRecord) (Ref 8.9);
- M54-M6/M6 Toll Link Road Scheme, PCF Stage 2 Environmental Assessment Report (Ref 8.10); and

8.5.3. Regarding species, only recent records (i.e. those within the past 10 years) have been reported, unless there is an absence of a record of a species in this time period. If this is the case, historical records of species being present have been reported to provide context to the assessment.

Designated Sites

8.5.4. There are no SAC within 30 km of the proposed Scheme where bats are a primary reason for designation.

8.5.5. Designated sites and areas of Ancient Woodland within the study area are detailed in Table 8.1 and illustrated in Figure 8.2.

8.5.6. Other areas of potential ancient woodland, not identified in the desk study (woodland of less than 2 ha is not recognised within the Ancient Woodland Inventory (AWI) were identified during the Phase 1 habitat and Ancient Semi-Natural Woodland (ASNW) surveys and are shown on Figure 8.4. National Vegetation Classification (NVC) surveys and the interrogation of historical maps are being undertaken to confirm if the woodlands are ASNW or Plantation on Ancient Woodland Sites (PAWS).

Table 8.1: Designated Sites

Designation	Distance from draft DCO site boundary (approx.)	Reason for Designation	Nature Conservation Importance	Relationship to the proposed Scheme
European Statutory Designated Sites (as shown on Figure 8.1)				
Cannock Extension Canal SAC &SSSI	5.7 km east	This 5.47 ha canal has low boat traffic and has been allowed to develop a diverse range of aquatic flora. It has been designated specifically because of the floating water-plantain (*Luronium natans*) which is an Annex 2 species under the Habitats Directive.	European	The M6, A462 and A34 are major barriers between the site and the proposed Scheme.
Cannock Chase SAC & SSSI	7 km north-east	This 1264.3 ha site contains a large diversity of semi natural habitats including European dry heath and Northern Atlantic wet heaths, both of which are designated as Annex 1 habitats under the Habitats Directive and the reason why the site is designated as a SAC.	European	There are no obvious habitat links between Cannock Chase and the proposed Scheme. The A34 and Cannock are major barriers between the site and the proposed Scheme.
National Statutory Designated Sites (as shown on Figure 8.1 and 8.2)				
Stowe Pool and Walk Mill Clay Pit SSSI	1.2 km north-east (only Walk Mill Clay Pit is within the study area)	The only section of this SSSI that is within the Scheme's catchment is Walk Mill Clay Pit. This site has historically supported a large and significant population of white clawed crayfish.	National	The M6 Toll and the M6 are significant major barriers between the site and the proposed Scheme.
Wryley and Essington Canal LNR and LWS	1.4 km east	This site has been restored and converted into a LNR over several years. Bat and great crested newt records are located within this nature reserve.	National	Warstone Road and the M6 are major barriers between the site and the proposed Scheme.
The Chasewater and South Staffordshire Coalfield	6.4 km east	Nationally important for wet and dry lowland heath, fens, standing open water and populations of floating water plantain and round-leaved wintergreen.	National	The M6 and A34 are major barriers between the site and the proposed Scheme. (Identified as a potential receptor for changes to air quality in the

Designation	Distance from draft DCO site boundary (approx.)	Reason for Designation	Nature Conservation Importance	Relationship to the proposed Scheme
Heaths SSSI				preliminary air quality assessment (Refer to Chapter 5))
Belvide Reservoir SSSI	8 km north-west	A canal feeder reservoir, notified for wintering and breeding bird assemblage.	National	Located north-west of the proposed Scheme. The A449 and Shropshire Union Canal separate the SSSI from the proposed Scheme. (Identified as a potential receptor for changes to air quality in the preliminary air quality assessment (Refer to Chapter 5))
Non-statutory Designated Sites (as shown in Figure 8.2)				
Brookfield Farm, Shareshill, SBI and LWS	Within the footprint of the proposed Scheme	An area of wet woodland comprising alder (*Alnus glutinosa)* and willow (*Salix sp*) carr that is drying out in some areas of the site. Sycamore (*Acer pseudoplatanus*) is common in the drier parts of the wood.	County	The proposed Scheme crosses the western end of the SBI.
Lower Pool SBI and LWS	Within the footprint of the proposed Scheme	A large ornamental pool with both emergent and floating vegetation.	County	The proposed Scheme crosses the western edge of the SBI, with the draft DCO site boundary encompassing the central area of the SBI.
The Hag retained BAS	65 m east	Woodland dominated by sycamore, with some oak and much hawthorn around the edges. Within the wood is a very steep-sided pond without emergent vegetation.	Local	There is arable land, hedgerows and woodland connecting the BAS to the proposed Scheme. There are no hydrological links between the site and the proposed Scheme.
Saredon Hall Farm retained BAS (south-	115 m north	An area of oak (*Quercus* sp.) woodland with a small pond.	Local	The site is adjacent to the northern end of the proposed Scheme. The M6 Toll acts as a major barrier between

Designation	Distance from draft DCO site boundary (approx.)	Reason for Designation	Nature Conservation Importance	Relationship to the proposed Scheme
east of)				the site and the proposed Scheme.
Coven Heath SBI and LWS	175 m west	An area of wet heath, which is now drying, part of which has been ploughed.	County	Located to the southern end of the proposed Scheme. Separated from the proposed Scheme by Stafford Road.
Keepers Wood, Hilton Park SBI and LWS	355 m east	Mature mixed deciduous/conifer plantation. Site also listed on the AWI, see below.	County	The site is linked to the proposed Scheme through arable farmland and hedgerows.
Westcroft retained BAS (woods north of)	495 m south-west	A mixed wood containing mainly pedunculate oak (*Quercus robur*), sycamore and Scots pine (*Pinus sylvestris*). The understorey is dominated by elder (*Sambucus nigra*) and hawthorn (*Crataegus monogyna*).	Local	There are major barriers between the site and the proposed Scheme, including the M54 and a large industrial park.
Moseley Hall SNCI	480 m south-west	Mature semi-natural and amenity woodland along course of Waterhead Brook and large former mill pond. Parts of woodland pre-date 1816 and may be 'ancient' as defined by Natural England.	County	The M54 acts as a major barrier between the site and the proposed Scheme.
Northycote Farm Parkland SNCI	785 m south-west	Mature parkland with areas of recent planted woodland and strip of diverse semi-natural woodland along course of Waterhead Brook (this pre-dates 1830s and may be 'ancient' as defined by Natural England).	County	The M54 acts as a major barrier between the site and the Scheme.
Northycote Farm Coppice SNCI	1.1 km south-west	Small broad-leaved coppice woodland that pre-dates 1816 and may be 'ancient' as defined by Natural England. Site forms part of Northycote Farm Country Park.	County	The M54 acts as a major barrier between the site and the Scheme.
Hatherton	1 km north	The section of canal between the M6 and Oak Lane	Local	Arable fields, hedgerows and

Designation	Distance from draft DCO site boundary (approx.)	Reason for Designation	Nature Conservation Importance	Relationship to the proposed Scheme
Branch Canal retained BAS		is largely choked by reed sweet-grass (*Glyceria maxima*).		drainage ditches may provide limited connectivity to the northern section of the proposed Scheme.
Westcroft Farm (land north of), Bushbury, SBI and LWS	1.1 km south-west	A linear strip of alder/crack willow woodland along the stream with sycamore abundant in the canopy away from the stream. Hazel (*Corylus avellana*) frequents the understorey throughout the woodland, with scattered elder and holly (*Ilex aquifolium*).	County	There are major barriers between the site and the proposed Scheme, including the M54 and a large industrial park.
Lodge Hill (north-east of) BAS	1.2 km north-east	A small damp depression at the edge of an arable field.	Local	The M6 Toll, the M6 and the A4601 are major barriers between the site and the proposed Scheme. There are no hydrological links.
Hatherton Reservoir, Cheslyn Hay SBI (LWS)	1.3 km north-east	Reservoir with high quality water and diverse emergent and submerged vegetation.	County	A large industrial estate, quarry and the M6 act as major barriers between the site and the proposed Scheme. There is a potential hydrological connection through Wyrley Brook and Saredon Brook to a pond that is adjacent to the northern end of the proposed Scheme.
Ashmore Lodge, Essington (disused mineral railway line), Retained BAS	1.3 km south-east	An old dismantled mineral line now covered by neutral grassland with some wooded areas.	Local	The M54 and Bognop Road are major barriers between the site and the proposed Scheme.
Hatherton Pines retained	1.3 km north-east	An area of plantation coniferous woodland, situated between the two Hatherton Pools. The area of most importance is the grassland between the plantations	Local	The M6 Toll, the M6 and the A4601 are major barriers between the site and the proposed Scheme. There are

Designation	Distance from draft DCO site boundary (approx.)	Reason for Designation	Nature Conservation Importance	Relationship to the proposed Scheme
BAS		which has a rich flora due to poor soil conditions, including kidney vetch (*Anthyllis vulneraria*) and bilberry (*Vaccinium myrtillus*).		no hydrological links.
Essington Pools retained BAS	1.4 km south-east	As well as the open water there are two areas of woodland, an area of tall planting and amenity grassland. The amenity grassland is regularly mown.	Local	The village of Essington is a major barrier between the site and the proposed Scheme. There are no hydrological links.
Hatherton Bridge (by) Hatherton SBI	1.6 km north-west	Rough semi-improved field with many ruderal species.	County	The site is separated from the proposed Scheme by Great Saredon Road.
Pennymore Hay Farm SBI	1.8 km north-west	An area of remnant species rich marsh that has been damaged by tipping.	Local	There are no obvious habitat links between Penny-more Hay Farm and the proposed Scheme. The A496 is a major barrier between the site and the proposed Scheme.
Ancient & Semi-Natural Woodland (Ancient Woodland Inventory, as shown in Figure 8.2)				
Oxden Leasow (Whitgreaves Wood)	Immediately adjacent to DCO site boundary	Ancient & Semi-Natural Woodland	National	The draft DCO site boundary incorporates the northern boundary of the woodland. The alignment of the proposed Scheme is located immediately adjacent to the site.
Beech Head	340 m east	Ancient & Semi-Natural Woodland	National	The M54 is a major barrier between the site and the proposed Scheme. No pathways to the receptor.
Keeper's Wood	375 m east	Ancient & Semi-Natural Woodland	National	The land between the site and the scheme route is predominantly agricultural land with small pockets of woodland. No clear pathway to the

Designation	Distance from draft DCO site boundary (approx.)	Reason for Designation	Nature Conservation Importance	Relationship to the proposed Scheme
				receptor.
Spring Coppice	1 km east	Ancient & Semi-Natural Woodland	National	The M54 is a major barrier between the site and the proposed Scheme. No pathways to the receptor.
Burns Wood (west)	1.1 km east	Ancient & Semi-Natural Woodland	National	The land between the site and the scheme route is predominantly agricultural land with small pockets of woodland. No clear pathway to the receptor.
Burns Wood (east)	1.2 km east	Ancient & Semi-Natural Woodland	National	The M6 and A462 are major barriers between the site and the proposed Scheme.
Essington Wood	1.7 km east	Ancient & Semi-Natural Woodland	National	The M6 is a major barrier between the site and the proposed Scheme.

Habitats and Flora

Priority Habitats

8.5.7. Priority Habitat Inventory Data identified on MAGIC indicate that priority habitat deciduous, broad-leaved and wet woodland is present within the Phase 1 study area, refer to Figure 8.3.

Phase 1 Habitat Survey

8.5.8. The Phase 1 habitat survey (undertaken in April and May 2018) identified the following habitat types within the Phase 1 habitat survey area (refer to Figure 8.3 and Appendix 8.1). Habitats are listed in descending order of area:

- semi-improved neutral grassland;
- arable land;
- broad-leaved semi-natural woodland;
- built-up areas;
- standing water;
- hedgerows including: species poor intact hedge, species poor defunct hedge, species rich intact hedge;
- scrub;
- improved grassland;
- running water;
- amenity grassland;
- bare ground; and
- lines of trees.

Potential Ancient Woodland

8.5.9. Botany surveys were undertaken in April and May 2018 which identified 14 areas of deciduous woodland which had potential for Ancient Woodland Interest status due to the presence of several species of Ancient Woodland Vascular Plant (AWVP) refer to Figure 8.4. Table 8.2 provides a summary of the AWVP species encountered during the surveys with a comment on the potential status of the woodland based on the ecological findings from these surveys[3].

Table 8.2: Results of botanical survey of woodland areas

Woodland label (Fig 8.5)	Habitat type	AWVP (Species Recorded)	Status
1	Wet Woodland	0	Not ASNW or PAWS
2	Broad-leaved Woodland	Bluebell (*Hyacinthoides non-scripta),* dog's mercury (*Mercurialis perennis),* holly (*Ilex aquifolium),* ramsons (*Allium ursinum),* wood anemone	Possible PAWS

[3] Note: Ancient woodland is not only designated based on ecological factors; this table purely identifies woodland sites which have potential ancient woodland status based on the woodland species present.

Woodland label (Fig 8.5)	Habitat type	AWVP (Species Recorded)	Status
		(*Anemone nemorosa)* and wood-sorrel (*Oxalis stricta)*	
3	Broad-leaved Woodland	N/A	Requires survey
4	Wet Woodland	Ramsons	Possible ASNW or PAWS
5	Wet Woodland	Bluebell and ramsons	Possible ASNW or PAWS
6	Broad-leaved Woodland	Large bittercress (*Cardamine amara)*	Possible PAWS
7	Broad-leaved Woodland	0	Not ASNW or PAWS
8	Broad-leaved Woodland	Bluebell, herb-robert (*Geranium robertianum),* holly, red campion (*Silene dioica) and* Possibly forget-me-knot (*Mycosotis scorpioides)*	Possible ASNW or PAWS
9	Broad-leaved Woodland	Holly	Possible ASNW or PAWS (due to link with historic parkland)
10	Wet Woodland	0	Possible ASNW or PAWS (due to link with site 9 and historic parkland)
11	Broad-leaved Woodland	Dog's mercury and greater stitchwort (*Stellaria holostea)*	Possible PAWS
12	Broad-leaved Woodland	Bluebell, dog's mercury, greater stitchwort, hazel (*Corylus avellana),* holly, lords-and-ladies (*Arum maculatum),* rowan (*Sorbus domestica),* wood anemone and wood-sorrel	Confirmed ASNW, listed on the AWI (Oxden Leasow)
13	Broad-leaved Woodland	0	Not ASNW or PAWS
14	Broad-leaved Woodland	Dog's mercury	Possible PAWS
15	Broad-leaved Woodland	Bluebell, dog's mercury, hazel, herb-robert, holly, lords-and-ladies, red campion and wych elm (*Ulmus glabra)*	Possible ASNW or PAWS
16	Broad-leaved Woodland	Dog's mercury, dogwood, hazel, hedge woundwort (*Stachys sylvatica),* holly and red campion	Possible ASNW or PAWS
17	Wet Woodland	Red currant (*Ribes robrum)*	Possible ASNW or PAWS
18	Broad-leaved Woodland	Hazel, herb-robert and ramsons	Possible ASNW or PAWS
19	Broad-leaved	Ramsons	Possible ASNW or PAWS

Woodland label (Fig 8.5)	Habitat type	AWVP (Species Recorded)	Status
	Woodland		

8.5.10. Of the 18 sites surveyed, one site was confirmed Ancient Woodland as it is listed on the AWI and had nine AWVP present. A further 14 sites have been evaluated as possible ASNW or PAWS following initial investigations and historic map regression. Woodlands with fewer AWVPs should not be discounted as there were a number of access restrictions. The botany assessment was undertaken in April and May and although this is within the optimal period for botany surveys there is the potential that species more apparent at other times of the year may not have been identified during the survey. Woodlands with no indicator species found should also be considered candidates if they are in close proximity to sites with AWVPs. Tree species in the majority of sites would indicate that these are more likely to be replanted woodlands (PAWS) rather than semi-natural (ASNW). Further surveys are required to confirm the classification of these areas of woodland.

Invasive Plant Species

8.5.11. Invasive species identified during the course of the Phase 1 habitat survey were recorded and are shown on Figure 8.3 as target notes. The following species were noted as being present within or immediately adjacent to the study area:

- Japanese knotweed (*Fallopia japonica*) - Stands of Japanese knotweed have been identified to the south of the study area, within areas where there were high levels of public presence. It is anticipated that the stands will have resulted from incidences of fly-tipping (TN1, TN2 and TN5).
- Himalayan balsam (*Impatiens glandulifera*) - Areas of Himalayan balsam have been identified along and adjacent to a watercourse (Watercourse 4) which would be crossed by the proposed Scheme (TN3).
- Rhododendron (*Rhododendron sp*) - Large bushes of rhododendron have been located throughout the woodland within Lower Pool SBI (TN6).

Protected Species

8.5.12. The desk study and site surveys undertaken in 2018 returned records for protected / notable species (see Section 8.4 for details of all surveys). Records within the study area from the surveys in 2018 and the desk study are detailed in Table 8.3 which also summarises the conservation status of each species and provides comment on the likelihood of presence.

8.5.13. Species present on site are those for which recent direct observation or field signs have confirmed presence. Species which are possibly present are those for which there is potentially suitable habitat based on the results of the field study.

Table 8.3: Protected and notable species relevant or potentially relevant to the proposed Scheme

Species	Legally Protected Species?	Species of Principal Importance?	Present on Site?	Possibly Present on Site?	Present/Potentially Present in Wider Zone of Influence?	Supporting Comments
Birds	✓	✓	✓		✓	The data search returned hundreds of bird records from Essington quarry pool (SJ 9478 0350), with a large range of species. Habitats present within the proposed Scheme footprint provide suitable breeding and feeding habitat for bird species. Wintering bird surveys were undertaken in the winter of 2017-2018 & 2019, the results of which will be reported in the Environmental Statement. Breeding bird surveys were undertaken between April and July 2018. These surveys identified a total of 46 bird species. Two red listed BoCC species (greylag goose (*Anser anser*) and lapwing (*Vanellus vanellua*) were confirmed as breeding during the surveys. A single amber listed BoCC species was confirmed breeding. The results indicate that the habitats within the draft DCO site boundary are of moderate importance for breeding bird species preferring woodland, hedgerows and open water areas.
Barn owl (*Tyto alba)*	✓	✓		✓	✓	Barn owl records were returned within 2 km of the proposed Scheme as part of the desk study, including along the M54 corridor near Junction 2. No signs of roosting barn owls were identified during surveys in 2018 and areas accessed within the draft DCO site boundary did not identify suitable roosting areas. During the bat transect surveys in the north-western section of the survey area sightings of barn owls were recorded both within and adjacent to the draft DCO site boundary (see Appendix 8.5). Local landowner indicated that roosting owls have been present in a barn within 100 m of the proposed Scheme. Further survey and assessment will be undertaken in 2019, which will be reported in the Environmental Statement.
Bats	✓	✓	✓		✓	Six records of bats within the last 10 years are within 2 km of the draft DCO site boundary; five records are for individual bat sightings and a roost identified within the village of Shareshill

Species	Legally Protected Species?	Species of Principal Importance?	Present on Site?	Possibly Present on Site?	Present/Potentially Present in Wider Zone of Influence?	Supporting Comments
						approximately 200 m north-west of the draft DCO site boundary. The landscape within the draft DCO site boundary provides foraging opportunities for bat species. The woodland areas have potential to support species such as brown long-eared bats (*Plecotus auritus);* and such species were recorded during the transect and Bat roost potential surveys. The majority of the draft DCO site boundary is considered isolated form the wider landscape due to the presence of the four major roads (M6, M6 Toll, M54 and A460) within and adjacent to the study area. Ground -based external scoping assessments identified 143 trees or groups of trees which had low to high bat roosting potential and two clusters of buildings with various levels of potential for bat roosts which required additional surveys. Emergence and re-entry surveys for the building clusters identified smaller day roosts of locally common species. Further details regarding the roosts identified can be found in the bat assessment report. Results will be reported in the Bat Assessment Report to support the Environmental Statement. Bat transects were conducted along the length of the proposed Scheme. Each transect identified varying activity levels and flight routes of several bat species. Results will be reported in the Bat Assessment Report to support the Environmental Statement. Further survey and assessment will be undertaken in 2019, which will be reported in the Environmental Statement.
Badger	✓	✓	✓		✓	The desktop study revealed seven badger setts present within 2 km of the draft DCO site boundary. Several badger dung pits and setts were identified during the badger surveys completed in April and May 2018. These included active and inactive setts, main, outlier and possible badger setts. The details of these results are confidential. Due to limitations, such as access and vegetation cover, not all areas could be fully assessed, therefore there may be additional setts within the survey area. The wider landscape is considered to isolate the proposed Scheme by the four major (M6, M6

Species	Legally Protected Species?	Species of Principal Importance?	Present on Site?	Possibly Present on Site?	Present/Potentially Present in Wider Zone of Influence?	Supporting Comments
						Toll, M54, and A460) traffic routes. Further surveys are recommended and will be undertaken in 2019 to record the activeness of setts, and territorial boundaries of clan(s) present as well as accessing those areas of the study area that have not currently been subject to any surveys. Results will be reported in the Badger Assessment Report to support the Environmental Statement.
Great Crested Newt	✓	✓			✓	There are records of GCN within 500 m of the draft DCO site boundary. Habitat Suitability Index (HSI) and presence / likely absence surveys on ponds within 500 m of the proposed Scheme were undertaken in 2015. The surveys did not record any GCN. It should be noted however that access restrictions meant that several ponds couldn't be surveyed and therefore on a precautionary basis GCN presence was assumed in those ponds until further survey work could be completed. Updated HSI and presence / absence surveys were completed in 2018. The GCN HSI assessments from 2018 highlighted three ponds to have average or above suitability for GCN. Two of the three ponds were subject to presence / absence surveys for GCN and revealed no presence of GCN. Further assessment of the ponds within 500 m of the draft DCO site boundary, including those which couldn't be accessed in 2018, will be undertaken in 2019 to determine the presence or likely absence of this species within the DCO site boundary.
Reptiles	✓	✓			✓	There are no records of reptiles within 2 km of the draft DCO site boundary. Habitats considered suitable for reptiles were highlighted within the Phase 1 habitat surveys undertaken in April 2018. Suitable reptile habitat was subject to survey in May and September 2018. No reptiles were recorded during the surveys (see Appendix 8.4). Further areas of suitable reptile habitat will be surveyed in 2019 to determine the presence or

Species	Legally Protected Species?	Species of Principal Importance?	Present on Site?	Possibly Present on Site?	Present/Potentially Present in Wider Zone of Influence?	Supporting Comments
						likely absence of these species within the DCO site boundary.
Otter	✓	✓		✓	✓	There is one record of otter within 2 km of the draft DCO site boundary. A single otter record is present in Walk Mill Clay pits SSSI and is in territory range of canals that link to a pond adjacent to the site. No signs of otter were recorded during the surveys undertaken in 2015. Watercourses were assessed for otter signs and habitat suitability in 2018. No signs were identified (see Appendix 8.3). Not all watercourses and waterbodies were accessed due to land access restrictions. In addition, several watercourses which were revisited in September were restricted due to dense vegetation obscuring the banks of the watercourse. Further surveys of suitable habitat will be undertaken in 2019 to determine the likely impacts of the proposed Scheme on this species.
Water vole	✓	✓		✓	✓	Two records of water vole were recorded within 2 km of the draft DCO site boundary. No water vole signs were recorded during the surveys undertaken in 2015. Watercourses were assessed in 2018 for water vole signs and habitat suitability. No signs were identified (see Appendix 8.3). Not all watercourses and waterbodies were accessed due to land access restrictions. In addition, several watercourses which were revisited in September were restricted due to dense vegetation obscuring the banks of the watercourse. Further surveys of suitable habitat will be undertaken in 2019 to determine the likely impacts of the proposed Scheme on this species.
White clawed crayfish	✓	✓		✓	✓	Watercourses and waterbodies were assessed for signs and habitat suitability for white-clawed crayfish during the Phase 1 habitat surveys within April and May 2018. All watercourses assessed within the draft DCO site boundary were evaluated to have low suitability to support the species. Not all watercourses were accessed due to land access restrictions. Further surveys will be

Species	Legally Protected Species?	Species of Principal Importance?	Present on Site?	Possibly Present on Site?	Present/Potentially Present in Wider Zone of Influence?	Supporting Comments
						undertaken in 2019 to determine the likely impacts of the proposed Scheme on this species.
Invertebrates	✓	✓		✓	✓	No protected invertebrate records are present within 2 km of the draft DCO site boundary. Terrestrial invertebrate surveys revealed high potential for the presence of endangered species within the draft DCO site boundary. The highest potential for such species are located within the woodlands present within the proposed Scheme, in particular the woodland areas which are possibly replanted ancient woodland. If such species are present within the proposed scheme, it is likely that metapopulations will include populations within 'newer' woodland provided these contain suitable features for the species. Results will be reported in the ES.
Hazel dormouse	✓	✓				Hazel dormouse is an exceptionally rare species in Staffordshire (Ref 8.11). No record of the species was returned from the desk study. A sustainable hazel dormouse population requires suitable woodland of 20 ha or more, or smaller areas of woodland well connected by hedgerows (Ref 8.12). These conditions do not exist within or adjacent to the proposed Scheme. In combination with the lack of habitat, the four major (M6, M6 Toll, M54, and A460) traffic routes form a barrier to hazel dormouse and isolate most of the proposed Scheme from the wider landscape. Hazel dormouse is considered likely absent from the draft DCO site boundary and the wider zone of influence of the proposed Scheme.

8.5.14. Further surveys required to support the Environmental Statement include the following:

- badger bait marking;
- badger sett monitoring;
- bat crossing point surveys;
- NVC surveys;
- terrestrial invertebrate surveys;
- fish surveys;
- aquatic invertebrate surveys (including white-clawed crayfish); and
- winter hibernation roost surveys for bats.

8.5.15. Additional surveys will be required to provide full site coverage of the study areas where access was restricted or outside of the study area during the 2018 surveys. Infill surveys for the following ecological features will be undertaken in 2019:

- habitats;
- reptiles;
- great crested newt;
- otter and water vole;
- barn owl;
- badger;
- bats (roosting);
- bats (commuting); and
- invasive non-native plants.

8.6. Potential Impacts

8.6.1. Mitigation measures are being incorporated in the design and construction of the proposed Scheme; these are set out in Section 8.7. Prior to implementation of mitigation a summary of the potential ecological impacts (both beneficial and adverse) associated with the construction and operation of the proposed Scheme is outlined below.

Construction

8.6.2. During construction of the proposed Scheme, the following impacts could affect local biodiversity:

- Potential indirect impact from emissions to air upon statutory designated sites including, but not limited to, Cannock Chase SAC, and Stowe Pool and Walk Mill Clay Pit SSSI. Air quality modelling is required to determine whether there are any potential air quality effects on such sites.
- Potential indirect impact from emissions to air upon non-statutory designated sites. Air quality modelling is required to determine whether there are any potential air quality effects on such sites.

- Direct impacts from loss of habitat, severance, and hydrological changes upon locally non-statutory designated sites.
- Direct impacts upon local ancient & semi-natural woodland, and woodland identified as ASNW or PAWS from root compaction.
- Priority habitat including ponds, hedgerows, and running water, would be impacted through loss, severance, hydrological changes, and air quality.

8.6.3. Protected and notable species present within the study area could be affected during construction in the following ways:

- Loss of habitat including foraging areas, and resting sites, including badger setts.
- Direct mortality from road collisions and construction activities.
- Disturbance from artificial lighting, construction plant and people.
- Temporary or permanent changes in air and water quality.

8.6.4. As detailed above, further survey work is required before potential impacts to ecological receptors can be assessed in detail.

Operation

8.6.5. Potential operational impacts of the proposed Scheme on ecological receptors include the following:

- Potential indirect impact from emissions to air and water upon statutory and non-statutory designated sites, ancient and semi-natural woodland, and woodland identified as ASNW or PAWS. Air quality modelling is required to determine whether there are any potential air quality effects on these sites.
- Impacts upon priority habitat such as hedgerows, running water, and ponds, from emissions to air and water. Air quality modelling is required to determine whether there are any potential air quality effects on these habitat types.

8.6.6. Protected species present within the study area could be affected during operation in the following ways:

- Severance of commuting routes between resting, breeding and hibernation sites, and foraging areas.
- Increased road mortality rates.
- Disturbance from increased rates of traffic and artificial lighting.

8.6.7. As detailed above, further survey work is required to before potential impacts to ecological receptors can be assessed in detail.

8.7. Design, Mitigation and Enhancement Measures

8.7.1. Environmental considerations will be taken into account during further development of the proposed Scheme design. This section considers how potential ecological impacts have or would be avoided, prevented, reduced or offset through design and/or management in relation to the proposed Scheme with respect to ecology and nature conservation.

8.7.2. The implementation of the measures necessary to ensure legislative compliance in relation to the construction of the proposed Scheme would form part of a Construction Environment Management Plan (CEMP). This would include measures

to control construction-related noise, pollution and fugitive dust emissions and therefore these topics have been scoped out of this assessment.

8.7.3. The operation of the proposed Scheme would be in accordance with the relevant statutory instruments to minimise the risk of adverse effects on environmental features.

8.7.4. At this stage, it is not possible to provide detailed information on mitigation measures for the proposed Scheme. The location of designated sites and priority habitats is understood, however, habitat and full protected species surveys have not been fully completed. The completion of these would be required to confirm the presence / likely absence of protected species and habitats of ecological value (ecological features) across the whole study area, to inform the impact assessment, enable the consideration of avoidance options and iterative design, and to identify appropriate mitigation measures to address any specific and design constraints.

8.7.5. The Highways England Biodiversity Plan (Ref 8.13) states that by 2020, Highways England must deliver no net loss of biodiversity and that by 2040 it must deliver a net gain in biodiversity. These objectives will be implemented as far as reasonably practicable to do so when designing the proposed Scheme and its associated mitigation, and when considering options for additional ecological enhancements that could be delivered as a result of the proposed Scheme.

8.7.6. As part of the mitigation design for the proposed Scheme, where required, monitoring measures will be proposed to assess the effectiveness of the mitigation proposals. Monitoring and mitigation measures will be discussed with the relevant stakeholders as the proposed Scheme design continues to develop – such stakeholders will be given the opportunity to provide comment as part of on-going consultation.

8.7.7. During the outline design of the proposed Scheme, methods for impact avoidance and mitigation requirements have been considered - those that might reasonably be expected are outlined below.

Designated Sites

Lower Pool, SBI (LWS) & Brookfield Farm (north east of), Shareshill SBI (LWS)

8.7.8. These sites will be directly and indirectly impacted by the proposed Scheme. Mitigation measures would be required to minimise impacts during construction and operation and could include:

- reduce habitat loss through altering and minimising scheme footprint and working area in these sites;
- the creation/extension of habitats of a similar nature in alternative locations;
- management to improve the quality of remaining habitat at a site;
- improvement/management of 'local designated sites' within the wider environment of the proposed Scheme;
- the inclusion of noise reduction measures during construction and operation;
- the inclusion of dust suppression measures during construction;
- the design and implementation of a sensitive lighting scheme for mammals during construction and operation; and
- maintain hydrological connectivity across the site during construction and operation.

Ancient woodland and potential ASNW or PAWS

8.7.9. Subject to further targeted surveys, potential ASNW or PAWS may be directly and / or indirectly impacted by the proposed Scheme. Mitigation measures would be required to minimise impacts during construction and operation and could include (as outlined in the updated Government Guidance Document Ancient woodland and veteran trees: protecting them from development (Ref 8.14)):

- designing the scheme to minimise direct and indirect loss wherever possible;
- the installation of barriers to protect woodland from dust and pollution;
- the connection of woodlands that would be separated by the proposed Scheme with targeted planting; and
- ensuring there is a buffer from retained woodlands of at least 15 m.

8.7.10. Ancient woodland (including replanted ancient woodland) is an irreplaceable habitat, therefore where ancient woodland would be lost to the proposed Scheme, compensation measures must be considered and could include (as outlined in the updated Government Guidance document – Ancient Woodland and veteran trees: protecting them from development, Ref 8.14):

- Planting new areas of ancient woodland. It should be acknowledged that this is not a direct replacement for loss of woodland, but planning authorities may accept offset woodland planting as a compensation measure, alongside other measures which could include translocation of soil from the area of woodland lost to the proposed Scheme.
- Restoration of plantation woodland planted on ancient woodland sites. Enhancing existing ancient woodland sites by sensitive management of such areas.

Priority & Other Habitats

Hedgerows

8.7.11. Hedgerows may be directly and / or indirectly impacted by the proposed Scheme. Mitigation measures would be required to minimise impacts during construction and operation and could include;

- implementation of BS 5837:2012 trees in relation to design, demolition and construction, to safeguard root protection zones during construction.
- translocation of important/species rich hedgerows.
- planting new sections of hedgerow with native species found in existing hedgerows and of local provenance.
- connecting existing habitats through new hedgerow planting.

Watercourses (Ponds and Running water)

8.7.12. Other habitats for which an assessment has been carried out that would be directly impacted include watercourses and ponds. Where watercourses are crossed, oversized structures will be considered to ensure that the channel and bank structure can be maintained. Replacement wildlife ponds will be provided to compensate for the direct loss of pond habitat.

Grassland

8.7.13. Appropriate nature conservation and biodiversity driven native landscape design will be proposed, including early consideration of options for natural regeneration and the re-instatement of species-rich grassland planting to achieve these nature conservation objectives and minimise risks associated with planting stock provenance and pathogens.

Protected and Notable Species

8.7.14. In terms of protected species mitigation measures that could be reasonably expected include:

- mammal ledges on watercourse crossing structures to ensure that faunal species can still easily move along watercourses;
- mammal fencing to minimise the risk of large mammals such as badger gaining access to the road;
- tree and scrub planting to guide animals away from the road / provide crossing points 'at height' above the carriageway;
- landscaping planting to provide replacement foraging, resting and breeding habitat;
- provision of breeding sites such as bat and bird boxes and log piles; and
- the development of a sensitive lighting scheme for bats in line with guidance provided in Bat Conservation Trust Guidance Note 08/18 (Ref 8.15)

Enhancement Measures

8.7.15. There may be the potential to provide enhancement measures, however, these will be considered following the completion of the habitat and protected species surveys and a full evaluation of the final design undertaken.

8.7.16. Potential enhancement measures could include the following:

- construction of otter holts along watercourses to facilitate range expansion of any otter populations present in the wider environment;
- construction of wildlife ponds, connecting wildlife ponds, as stepping stones, in the wider environment;
- creation of hibernacula piles adjacent to wildlife ponds to provide hibernation shelter for amphibians and other species including reptiles and hedgehogs etc.;
- creation of bug hotels within suitable habitats for terrestrial invertebrates; and
- erecting bat and bird boxes within suitable woodland (away from the proposed Scheme to avoid road collisions).

8.8. Assessment of Effects

8.8.1. A summary of the potential ecological impacts (both beneficial and adverse) associated with the construction and operation of the proposed Scheme is shown in Tables 8.4 and 8.5 above. In the absence of mitigation, there is the potential for significant biodiversity effects to be generated as a result of the proposed scheme construction and operation activities. These effects range from impacts to habitats and individual species with differing levels of importance.

8.8.2. Mitigation measures are being incorporated in the design and construction of the proposed Scheme; these are set out in Section 8.7. Following completion of the surveys as detailed herein, and finalisation of the proposed scheme design, biodiversity mitigation measures will be confirmed taking account of Highway England's no net loss to biodiversity objective. With appropriately designed mitigation, it would be envisaged that some of the potentially significant effects highlighted herein could be reduced to not-significant levels. However, this will be confirmed and reported in the ES.

9. GEOLOGY AND SOILS

9.1. Introduction

9.1.1. This chapter presents the findings of a preliminary assessment of temporary and permanent impacts on geology and soils during construction and operation of the proposed Scheme. This chapter considers potential impacts on the following:

- geology (superficial, bedrock, structural and engineering);
- geological designated sites: geological Sites of Special Scientific Interest (SSSI) and Local Geological Sites (LGS);
- controlled waters; and
- agricultural land.

9.1.2. This chapter is supported by Figures 9.1 and 9.2. The legislative framework and assessment methodology for the full Environmental Impact Assessment is provided in Chapter 10: Geology and Soils, Sections 10.3 and 10.8 of the PCF Stage 3 EIA Scoping Report (Ref 9.1).

9.2. Stakeholder Engagement

9.2.1. Information used in the scoping and assessment processes has been obtained from publicly available sources to establish the baseline conditions.

9.2.2. Following receipt of the EIA Scoping Opinion in February 2019, the scope of the Soils and Geology assessment has been be reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- further explanation and justification of the study area will be provided;
- groundwater abstractions and private water supplies will be cross referenced in the Road Drainage and Water Environment Chapter;
- an assessment of potential contamination issues will be related to the use of SuDS in the Geology and Soils Chapter of the ES; and
- the potential for subsurface archaeological remains to be present within the study area during the ground investigation works will be considered.

9.2.3. The need to undertake consultation will be kept under review as the project progresses.

9.3. Assessment Assumptions and Limitations

9.3.1. The information presented in this chapter is based on the information available at the time of writing the report and based on an emerging design. The findings reported in this PEI Report may be subject to change as the design of the proposed Scheme is developed and refined through the EIA and consultation processes.

9.3.2. The assessment undertaken during the PEI Report has been based on the collation and evaluation of available information obtained from the Environment Agency (EA), British Geological Survey (BGS), Envirocheck Report and other sources made available including the following:

- M54-M6/M6 Toll Link Road PCF Stage 2 Environmental Assessment Report Addendum (Ref 9.2); and

- M54-M6/M6 Toll Link Road Preliminary Sources Study Report Addendum 2 (Ref 9.3).

9.3.3. A ground investigation will be required to provide site specific data to assess the geological and contamination status of ground along the route of the proposed Scheme and to inform foundation design of structures for the proposed Scheme and undertake site specific human health and controlled waters risk assessments.

9.3.4. An Agricultural Land Classification survey will be required to identify the grade of agricultural land along the route of the proposed scheme and to determine the sub-grade of areas that are currently identified on publically available mapping as Grade 3 “good to moderate quality” (section 9.5.12), e.g. is the grade 3 land “good quality” (Grade 3a) or “moderate quality” (Grade 3b).

9.4. Study Area

9.4.1. The study area for land contamination includes the draft DCO site boundary and an additional buffer of 250 m. This area is considered appropriate for the consideration of historical and current potentially contaminative land uses and it aligns with established industry practice and professional judgement for defining land contamination study areas for EIA. This area is herein referred to as the ‘geology study area’.

9.4.2. The study area for geological designated sites also includes the draft DCO site boundary with an additional buffer of within 250 m. This area is considered appropriate as intrusive works may impact upon designated geological sites during the design and construction phase of the proposed Scheme.

9.4.3. An extended study area of 500m from the draft DCO site boundary has been considered appropriate for groundwater, surface water and potable water abstractions. This is considered to include potential receptors to any land contamination.

9.4.4. For the remainder of the topics assessed within this chapter, including the description of geography and topography, geology and agricultural land and farm holdings the study area is limited to the draft DCO site boundary. These aspects are only likely to be impacted where the proposed Scheme directly crosses or interfaces with them.

9.4.5. The study areas for geology and soils, as detailed above are illustrated on Figure 9.1.

9.5. Baseline Conditions

Geography and Topology

9.5.1. Starting from the M54 Junction 1 approach the current land use along the alignment of the proposed Scheme is primarily fields and farm land with some small wooded areas. As the route heads north-east through farm land and fields it by-passes the villages of Featherstone to the west and goes through a wooded area west of Hilton Hall, passing through the Lower Pool SBI. The proposed Scheme continues through existing fields and farm land past Brookfield Farm to the west.

9.5.2. A review of Ordnance Survey (OS) 1:50, 000 and 1:25, 000 scale maps, sheets 127 and 244, shows the topography from M54 Junction 1 along the proposed Scheme rises approximately 5 m to 140 m above ordnance datum (AOD) towards Lower Pool SBI to the north-east. The topography is between 140 m and 130 m AOD between Lower Pool SBI and the area to the east of Brookfield Farm, falling to 125 m AOD at Junction 11 of the M6.

Published Geology

9.5.3. The 1:50,000 scale Solid and Drift geological map for Wolverhampton (Ref 9.4) and the BGS GeoIndex (Ref 9.5) mapping, provide information on the published geology in the area of the proposed Scheme. The geology along the proposed Scheme is shown in Figure 9.2.

9.5.4. Several deposits of Made Ground are present within the study area. At the existing M54 Junction 1 'artificial ground' is noted to be present on the BGS mapping. An area (approx. 600 m^2), immediately south of the M54 Junction 1 is considered to consist of Made Ground described as 'infilled ground'. This is likely to be colliery spoil associated with the former Hilton Colliery. Made Ground described as 'worked ground' is also present at Junction 11 of the existing M6. A further area of infilled ground is present east of the M6 approximately 510 m east of the proposed Scheme.

9.5.5. The BGS maps indicate that the superficial deposits underlying the majority of the proposed Scheme are the Devensian Till described by the BGS as "variable lithology, usually sand, silty clay with pebbles, but can contain gravel rich, or laminated sand layers; varied colour and consistency". Variations to this include a strip of alluvium associated with an unnamed watercourse which runs north-east to south-west across the A460 and M6. The alluvium is described as "normally soft to firm consolidated, compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. A stronger, desiccated surface zone may be present". No superficial deposits are present in areas around the Tower House Farm (North of M54), Rosemary House (on Hilton Lane) and the immediate area south of the alluvium strip. From Junction 2 of the M54 travelling eastwards for approx. 1.5 km to Cat and Kittens Lane, the superficial deposits underlying the proposed Scheme are Glacial Fluvial Deposits of Devensian sands and gravels.

9.5.6. The BGS maps indicate that the solid geology underlying the majority of the proposed Scheme is the Chester Formation (Sandstone and Conglomerate Interbedded) of the Sherwood Sandstone Group. Along the eastern boundary of the draft DCO site boundary there are areas of the Clant Formation and Enville Formation, classified by the BGS as undifferentiated mudstone and sandstone. To the east of the M54 Junction 1 a relatively thin strip of the Chester Formation (mudstone) crosses the M54 in a north-south orientation, overlying the interbedded sandstone and conglomerate. The Chester Formation in the West Midlands area generally comprises conglomerates and reddish brown, cross-bedded, pebbly sandstones with subordinate beds of red-brown mudstone. The BGS website describes this formation as "pebble conglomerates and reddish brown sandstones. The sandstones are cross-bedded and pebbly. The conglomerates have a reddish brown sandy matrix and consist mainly of pebbles of brown or purple quartzite, with quartz conglomerate and vein quartz".

9.5.7. The bedrock geology of the section from Junction 2 of the M54 is Helsby Sandstone Formation, described by the BGS as fine to medium grained locally micaceous, cross bedded and flat bedded sandstones, with weathering to sand near the surfaces. The sandstones are fluvial (sub-angular to sub rounded grains) and Aeolian (well-rounded grains) facies. Pebbles may be common near the base of the formation with thin units of hard intraformational conglomerate occurring. Thin lenticular beds of reddish brown siltstone and mudstone occur and may be common in fining upward sequences. Calcretes and rhizocretions occur at some horizons.

9.5.8. There is a section from the railway east of Junction 2 of the M54 for approx. 280 m to Cat and Kittens Lane where the bedrock geology is Wildmoor Sandstone Member

consisting of generally silty or argillaceous sandstones, fine to medium grained, bright orange red to dark brick red, with subordinate siltstone and mudstone and rare pebbles.

9.5.9. The small section of the proposed Scheme along the A462 (east of M6) is underlain by the Halesowen Formation (mudstone, siltstone and sandstone).

9.5.10. The Holy Bank Fault trending north-east to the south intersects the draft DCO site boundary on the A462 and the M6. An unnamed fault trending north-west to south-east intersects the study area in the area south of the A460 and east of the M6. The unnamed fault lies approximately 275 m west of the M6 and 385 m south of M6 Junction 11.

9.5.11. There are no Local Geological Sites (formerly referred to as Regionally Important Geological and Geomorphological Sites (RIGS)) within 250 m of the draft DCO site boundary.

9.5.12. There is potential for archaeological remains to be present within the study area, which are discussed in Chapter 6 Cultural Heritage.

Current Land Use

9.5.13. The current land use within the study area is predominantly fields and farmland with some wooded areas east, north and north-east of Junction 1 of the M54. South of the M54 Junction 2 and north-west of Junction 1 are areas of residential development. South of the M54, Junction 1 is an Industrial Estate. The villages of Featherstone, Hilton and Shareshill are located to the west as the alignment of the proposed Scheme passes through agricultural land. The route of the proposed Scheme continues through the wooded area to the west of Hilton Hall, passing through the Lower Pool SBI.

9.5.14. The proposed Scheme continues across land between Hilton Lane and M6 Junction 11 which is predominantly in agricultural use, with Brookfield Farm located to the west of the proposed Scheme. The alignment of the proposed Scheme then joins the existing M6 at Junction 11.

Potential Sources of Land Contamination

9.5.15. The Preliminary Source Study Report which included site sensitivity maps and historical OS maps from 1888 to present day has been reviewed. Potential sources of land contamination within the study area are summarised as follows:

- Made Ground (infilled land) associated with the historical Hilton Colliery present at the existing M54 Junction 1.
- Infilled ponds present to the east of A460 and north of M54.
- Historical landfill present to the immediate north of A460 and west of M6 Junction 11.
- Historical landfill approximately 390 m west of M54 Junction 2.

Mining History

9.5.16. The Coal Authority Interactive online map, (Ref 9.6) notes that the alignment of the proposed Scheme is within a Coal Mining Reporting Area and a Coalfield Consultation Area. The proposed Scheme does not lie within a Development High Risk Area. There is evidence on the Interactive online map of historical underground mining circa 1940s beneath the draft DCO site boundary at depths of circa 317 m

below ground level (bgl). There are no records on the Interactive map of shallow underground workings beneath the area of the draft DCO site boundary.

Agricultural Land Use

9.5.17. Publically available mapping sources were reviewed to identify the agricultural land classification along the route of the proposed Scheme.

9.5.18. The Natural England Provisional Agricultural Land Classification (ALC) 1:250,000 map for the West Midlands Region (Ref 9.7), the Natural England ALC Grades - Post 1988 survey maps (Ref 9.8) and the Natural England Technical Information Note (TIN049) (Ref 9.9) have been reviewed to determine the agricultural land classification within the draft DCO site boundary. The Natural England Information Technical Note defines best and most versatile (BMV) land as Grades 1 (excellent quality), 2 (very good quality), and 3a (good quality).

9.5.19. The Natural England ALC Grades - Post 1988 Survey map is only available for the area north of Hilton Lane. The map indicates that the majority of the area along the route of the proposed Scheme is classified as Grade 2 (very good) agricultural land.

9.5.20. There are small areas along the route of the proposed Scheme classified as Grade 3a (good) and 3b (moderate) agricultural land. However, the area located to the north-east of the A462 is classified as Grade 3a (good) agricultural land.

9.5.21. Agricultural land to the south of Hilton Lane has been classified by the Natural England Provisional ALC 1:250,000 map as Grade 3 (good to moderate), but has not been subdivided into Grades 3a and 3b.

9.5.22. Agricultural land from the M54 Junction 2 to Junction 1 has been classified as Grade 3 (good to moderate). However, this area has not been subdivided into Grades 3a (good) and 3b (moderate).

Hydrology and Hydrogeology

9.5.23. There are multiple small ponds throughout the agricultural land and wooded areas, along and adjacent to the draft DCO site boundary. The surface waterbodies within the study area are discussed in greater detail within Chapter 13 Road Drainage and the Water Environment. The main ponds that could be impacted by the proposed Scheme, listed from south to north include the following (refer to Figure 13.1)::

- several fisheries lakes operated by Millride Country Sports near Hill Farm, immediately (approx.130 m) south-east of M54 Junction 1;
- a lake at Tower House Farm, approximately 90 m) north-east of M54 Junction 1;
- four large ponds to the west of Hilton Hall; from west to east, Lower Pool pond associated with Lower Pool SBI, two fishing ponds and a large ornamental pond adjacent to Hilton Hall;
- several lakes and large ponds at Kings Pools Fishery west of the A460 Cannock Road;
- three ponds south-east of Brookfield Farm, the closest approximately 50 m away and online with Watercourse 4;
- four ponds associated with Brookfield Fishery 55 m north-west and 280 m north-east of the farm buildings at Brookfield Farm. The ponds lie alongside Latherford Brook and Watercourse 4;
- ;

- Latherford Brook, a tributary of Saredon Brook running south-east to north-west between the M6 and A460;
- Staffordshire and Worcestershire Canal approximately 440 m west of M54 Junction 2; and
- A drain lies along the eastern edge of the railway line east of M54 Junction 2.

9.5.24. The superficial deposits alluvium is designated as a Secondary 'A' aquifer and the Devensian Till is designated as a Secondary (Undifferentiated) aquifer. The Sherwood Sandstone is designated a 'Principal' aquifer by the Environment Agency. The Clent and Enville Formation are designated as 'Secondary A' aquifers and the alluvium is classified as a Secondary undifferentiated aquifer.

9.5.25. The majority of the alignment of the proposed Scheme does not lie within a Source Protection Zone. However, from the M54 Junction 2 eastwards for approximately 1.2 km and an area approximately 950 m west of the A460 at Featherstone are within a Source Protection Zone 2, refer to Figure 13.2. There are three recorded groundwater abstractions within 500 m of the proposed Scheme. One lies approximately 400 m south-east of M6 Junction 11, Hollybush Nurseries for spray irrigation. One is approximately 240 m south of M54 Junction 1, Tarmac Building Products for process water. The third is approximately 425 m south of the M54 east of Junction 11, Essington Fruit Farm for spray irrigation. Reference to groundwater abstractions and private water supplies extending beyond the study area for Geology and Soils are recorded within the Road Drainage and Water Environment Chapter (Chapter 13).

9.6. Potential Impacts

9.6.1. Mitigation measures are being incorporated in the design and construction of the proposed Scheme which are set out in Section 9.7. Prior to the implementation of mitigation measures, a summary of the potential impacts on geology and soils (both beneficial and adverse) associated with the construction and operation of the proposed Scheme is outlined below.

Construction

9.6.2. In relation to potentially contaminative land uses, the following adverse impacts could potentially arise as a result of construction of the proposed Scheme:

- mobilising existing contamination in soil and groundwater as a result of ground disturbance and de-watering during construction;
- increasing the potential for contaminants in unsaturated soils to leach to groundwater in open excavations during construction;
- increasing the potential for contaminated surface run-off to migrate to surface water and groundwater receptors as a result of leaching from uncovered stockpiles;
- introducing new sources of contamination, such as fuels, chemicals and oils used during construction activities;
- increasing the potential of construction workforces (from handling, storage and exposure) to possibly unknown contaminants/ waste as a result of working through known historical landfills; and

- creating preferential pathways for the migration of soil contamination and gases, for example along new below ground service routes, service ducts and as a result of dewatering.

9.6.3. The preliminary assessment has concluded that such effects have the potential to affect human, ecological and controlled water receptors, and are likely to inform the continued design-development of the proposed scheme.

9.6.4. With regard to existing geological and soils resources, construction has the potential to result in the following adverse impacts:

- Degradation of soil resources from the compaction of soil due to heavy construction vehicle movement, changes in topography, exacerbation of erosion through the handling and storage of soils, or ground stability impacts.
- The temporary and permanent loss of best and most versatile agricultural soils through land-take.
- The generation of waste soils that cannot be reused elsewhere on the proposed Scheme, requiring off-site disposal as waste.
- The sterilisation of mineral resources.

9.6.5. Some, albeit limited, potential exists for construction to result in beneficial impacts through the following:

- Creation of a new geological features or attributes, for example through fresh exposure of a geological sequence in a road cutting.
- Removal or treatment of contaminated soil, with the effect that existing adverse effects on receptors are removed.
- A reduction in soil erosion through improved drainage.

Operation

9.6.6. No potential adverse impacts are likely to result from the long term operation of the proposed Scheme, other than the potential risk for controlled waters (considered in Chapter 13, Road Drainage and the Water Environment) or geology and soils to be affected by from spillages arising from road accidents or faulty vehicles.

9.6.7. Should beneficial impacts be identified during the construction phase, it is expected that some of these could continue into the operational phase, for example the removal or treatment of contaminated soil would provide a benefit in future years.

9.7. Design, Mitigation and Enhancement Measures

9.7.1. Environmental design and management measures will be implemented in order to manage potential impacts associated with soils and geology during construction and operation of the proposed Scheme. In addition environmental considerations will be taken into account during further development of the proposed Scheme design, including consideration of the use of imported materials and disposal or re-use of excavated material.

Construction

9.7.2. A ground investigation will be designed to investigate geo-environmental, geotechnical and mining issues along the route of the proposed Scheme. An archaeological and ecological watching brief and method statement are included in the Ground Investigation Specification for the proposed works. A Ground Investigation Report will be prepared following the site works and monitoring.

9.7.3. A Geotechnical Design Report will be prepared to assess the requirements for design of foundations, embankments and cuttings and will include mitigation measures for ground stability and land contamination which will be undertaken as part of the construction phase of works. The Ground Investigation Report and Geotechnical Design Report will used to inform the Environmental Impact Assessment and will also be utilised to develop the Construction Environmental Management Plan (CEMP).

9.7.4. Depending on the results from the ground investigation it may be necessary to prepare a remediation strategy to mitigate risks associated with elevated contamination concentrations.

9.7.5. A CEMP would be prepared and implemented by the construction contractor which would include a range of measures associated with mitigating potential impacts associated with land contamination. Such measures would accord with legal compliance and best practice guidance when working with or around contaminated materials. Potential impacts on off-site receptors would be addressed through the adoption of the following measures:

- damping of ground with water to minimise dust;
- sheeting of lorries transporting spoil off site and the use of dust suppression equipment on plant;
- groundwater level controls (as required);
- adequate fuel and chemical storage facilities e.g. bunded tanks, hard standing and associated emergency response and spillage control procedures;
- well maintained plant and associated emergency response and spillage control procedures; and
- any temporary onsite storage of contaminated material would be stored on sheeting and covered to minimise the potential for leachate and run off from the stockpile being generated.

9.7.6. The construction and maintenance phases would be undertaken in a manner that appropriately protects the health and safety of workers. Potential impacts specific to construction workers during site construction phase will be mitigated by working in accordance with CIRIA C692 3rd Edition 'Environmental Good Practice on Site (2010) and by the following measures:

- Provision of appropriate personal protective equipment (PPE), such as gloves, overalls, barrier cream etc. to minimise direct contact with soils.
- Monitoring of confined spaces for potential ground gas accumulations restricting access to confined spaces, i.e. by suitably trained personnel, and use of specialist PPE where necessary.
- Preparation and adoption of a site and task specific health and safety plan, taking into account the findings of the proposed ground investigation.

9.7.7. The prevention of pollution of groundwater and/or surface waters would be achieved via the mitigation measures as detailed in Chapter 13: Road Drainage and Water Environment. Mitigation measures to protect controlled waters would take into account the results and findings of the proposed ground investigation and prepare an appropriate strategy to remediate areas posing risks to controlled waters. The mitigation measures would also aim to ensure that the surface water run-off from the construction site (site preparation, earthworks and construction activities) do not

have a detrimental effect on any receiving watercourses in the area. Construction involving piling and/ or penetrative ground improvement would require a location-specific risk assessment to establish the means of mitigating the risks of causing new pollutant linkages and/ or worsening existing ones with respect to risks to controlled waters at the construction stage.

9.7.8. The prevention of dust pollution onto crops and noise pollution to local residents would be achieved via mitigation measures as detailed in Chapter 5: Air Quality and Chapter 11: Noise and Vibration, respectively.

9.7.9. The optioneering and design process completed to date has been undertaken with an aim to minimise the loss of BMV wherever possible. No further mitigation measures are available for the loss of the best and most versatile agricultural land within the footprint of the proposed Scheme. The inclusion of an accommodation bridge and access roads within the design of the proposed Scheme is anticipated to minimise disruption to agricultural land and farm holdings in the area. In addition identifying soil resources at an early stage in the development process and by implementing an improved soil use plan and minimising land-take these actions will reduce impacts upon agricultural land.

9.7.10. Potential impacts to soil resources would be mitigated by following best practice as contained within Construction Code of Practice for sustainable use of soils on construction sites (Ref 9.10) and BS 3882:2015 (Ref 9.11).

Operation

9.7.11. The proposed Scheme operation would not include any activities that are likely to generate contaminants that could pose significant risk to controlled waters and surrounding soil resources. The highway drainage system (refer to Chapter 13: Road Drainage and Water Environment) would incorporate appropriate measures to minimise impacts associated with accidents and spillages.

9.7.12. The inclusion of an accommodation bridge and access track within the design would minimise disruption to farm holdings during operation, allowing access across the proposed Scheme.

9.8. Assessment of Effects

9.8.1. The following section summarises any temporary and permanent effects upon geology and soils that are likely to arise from construction and/or operation of the proposed Scheme.

Construction

Land Contamination

9.8.2. During construction, temporary adverse effects associated with the proposed Scheme include the potential to create a pathway of possible contaminated materials and ground gases. Disturbance of potential contamination in the ground may result in the release of contaminants to the environment and controlled water.

9.8.3. There is a minor adverse risk to the environment should a pathway be created for potential contaminated materials and ground gases.

Soil Resources

9.8.4. The traffic movements of construction vehicles during construction works may have a minor adverse effect on soils as a resource.

Agricultural Land

9.8.5. Construction of the proposed Scheme would require temporary and permanent use of agricultural land for construction activities which may result in a significant adverse effect on agricultural operations.

Operation

Land Contamination

9.8.6. During the operation of the proposed Scheme the possibility to create a pathway for potential contamination to receptors will have been mitigated during the construction phase. Therefore, it is considered that no additional impacts would be incurred to the environment and controlled waters during the operational phase.

Soil Resources

9.8.7. The effect of any impact to the loss of soil as a resource would also have been realised during the construction phase and therefore no additional effect is considered during operational of the proposed Scheme.

10. MATERIAL ASSETS AND WASTE

10.1. Introduction

10.1.1. This chapter presents the findings of a preliminary assessment of temporary and permanent impacts on material assets and the generation and management of waste during construction and operation of the proposed Scheme.

10.1.2. For the purpose of this chapter, material assets and wastes are defined as comprising:

- the use of material resources; and
- the generation and management of waste.

10.1.3. Material resources are defined by IAN 153/11 (Ref 10.1) as “the materials and construction products required for the construction, improvement and maintenance of the trunk road network. Material resources include primary raw materials such as aggregates and minerals, and manufactured construction products”.

10.1.4. Waste is defined as per the Waste Framework Directive (2008/98/EC) (Ref 10.2) as “any substance or object which the holder discards or intends or is required to discard."

10.1.5. This chapter is supported by Figure 10.1. The legislative framework and assessment methodology for the full Environmental Impact Assessment (EIA) is provided in Chapter 11: Materials Assets and Waste, Sections 11.3 and 11.8 of the PCF Stage 3 EIA Scoping Report (Ref 10.3).

10.2. Stakeholder Engagement

10.2.1. Statutory and non-statutory bodies have been engaged as part of the assessment process to obtain background data, information and to develop the assessment scope.

10.2.2. Following receipt of the EIA Scoping Opinion in February 2019, the scope of the Material Assets and Waste assessment has been be reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- Material use and waste generation during operation is scoped out of further assessment.
- Appropriate mitigation measures to safeguard mineral resources including the mineral site with permitted reserves at Hilton Park and the 250 m mineral consultation zone surrounding that site will be considered.
- A draft or Outline Environmental Management Plan (OEMP) and Site Waste Management Plan will be provided as appendices to the ES.
- The potential to encounter hazardous (and non-hazardous waste) at unexpected locations during construction and associated mitigation measures will be considered.

10.3. Assessment Assumptions and Limitations

10.3.1. The information presented in this chapter is based on the information available at the time of writing the report and based on an emerging design. The findings reported in this PEI Report may be subject to change as the design of the proposed Scheme is developed and refined through the EIA and consultation processes.

10.3.2. Data on the waste generated by the proposed Scheme and materials required to construct the proposed Scheme are not currently available. This information will be generated as the proposed Scheme design continues to develop.

10.3.3. Information on the current permitted regional landfill capacity is provided in Table 10.1 and Table 10.2. There is no available information on any potential changes to this permitted capacity prior to construction of the proposed Scheme.

10.3.4. This assessment does not consider the environmental impacts associated with the extraction of raw materials and the manufacture of products, nor the impact at waste management facilities. It is assumed that any such issues would have been subject to the applicable environmental assessment/ permitting and planning approval for the relevant facilities.

10.4. Study Area

10.4.1. The study area for waste generation is defined by the draft DCO site boundary, within which waste would be generated. The study area is deemed to include the footprint of the proposed Scheme, together with any temporary land requirements during the construction. This may include temporary offices, compounds and storage areas.

10.4.2. The study area for waste management comprises the wider region within which waste management infrastructure, specifically landfill capacity is located i.e. the West Midlands region (the shire counties of Staffordshire, Warwickshire, Worcestershire, the unitary counties of Herefordshire, Shropshire, the metropolitan boroughs of Birmingham, Coventry, Dudley, Sandwell, Solihull, Walsall, Wolverhampton, the city of Stoke-on Trent and the borough of Telford and Wrekin).

10.4.3. The study area for the use of material resources in the construction of the proposed Scheme and for consideration of the sterilisation of mineral safeguard sites and/or peat resources is defined by the draft DCO site boundary.

10.4.4. The study area for alternative materials (secondary and recycled aggregates) is the West Midlands region and England.

10.5. Baseline Conditions

Waste

10.5.1. Baseline information consists of the current landfill capacity in the waste disposal authority (Staffordshire), and in the wider West Midlands region as defined in paragraph 10.4.2.

10.5.2. Detailed information has been collected from sources including data on landfill capacity published by the Environment Agency.

10.5.3. The Environment Agency's Waste Management Information for England 2017 (published in 2018 (Ref 10.4) includes the following information about remaining landfill capacity in Staffordshire, and in the wider West Midlands region in 2017.

Table 10.1: Staffordshire landfill capacity 2017

Landfill Type	Capacity (000 m^3)
Hazardous Merchant	-
Hazardous Restricted	-
Non Hazardous with SNRHW* cell	2,453
Non Hazardous	7,830

Landfill Type	Capacity (000 m^3)
Non Hazardous Restricted	108
Inert	4,731
Total	15,123

Table 10.2: West Midlands landfill capacity 2017

Landfill Type	Capacity (000 m^3)
Hazardous Merchant	-
Hazardous Restricted	535
Non Hazardous with SNRHW* cell	10,010
Non Hazardous	32,360
Non Hazardous Restricted	108
Inert	14,377
Total	57,390

*SNRHW = selected non-reactive hazardous waste

Materials Resources

10.5.4. The baseline target for recovery of construction and demolition waste is 70% by weight, as set out in the EU Waste Framework Directive and the Waste Plan for England. Uncontaminated excavated soil and stones (European Waste Code 17 05 04) are specifically excluded from this target.

10.5.5. The baseline targets for alternative aggregates (which comprise both secondary aggregates, which are by-products from industrial and mining operations, and recycled aggregates, which are produced from construction waste) are set out in the National and Regional Guidelines for Aggregates Provision in England 2005 to 2020 and are summarised in Table 10.3 below (Ref 10.5). The relevant target for the proposed Scheme is the 27% guideline set for the West Midlands region.

Table 10.3: National and Regional Guidelines for Aggregates Provision

Region	Total aggregate provision (million tonnes)	Alternative materials targets (secondary and recycled aggregates)
South East	502	26%
London	197	48%
East	382	31%
East Midlands	784	14%
West Midlands	370	27%
South West	656	22%
North West	392	30%
Yorkshire & the Humber	431	31%
North East	193	26%

Region	Total aggregate provision (million tonnes)	Alternative materials targets (secondary and recycled aggregates)
England (total)	3,908	25%

10.5.6. The Minerals Local Plan for Staffordshire (2015-2030) (Ref 10.6) was adopted by Staffordshire County Council on the 16 February 2017. The proposed Scheme is located within a Mineral Safeguarding Area as illustrated in the Policies and Proposals Map included in the Minerals Local Plan. There are no active mineral site allocations within the boundary of the proposed Scheme, however a mineral site with permitted reserves is located at Hilton Park. This site has a 250 m consultation zone drawn around the site.

10.6. Potential Impacts

10.6.1. Mitigation measures are being incorporated in the design and construction of the proposed Scheme; these are set out in Section 10.7. Prior to implementation of mitigation a summary of the potential impacts associated with the construction and operation of the proposed Scheme is outlined below.

Construction

10.6.2. There is potential for the following impacts relating to material resources and waste arising to occur during construction of the proposed Scheme:

- impacts on-site generated materials (e.g. soils) and waste arisings have on the existing capacity of landfill; and
- impacts on the use of primary (i.e. non-recycled) material resources used for construction.

10.6.3. Table 10.1 below summarises the types of materials used and wastes that may potentially be generated during construction.

Table 10.1: Potential Material Use and Waste Arisings – Construction

Project Activity	Material use	Potential waste arisings
Site remediation/ preparation/ earthworks	Fill material for construction purposes Primary aggregates for ground stabilisation	Surplus excavated materials. Stripping of topsoil and subsoil. Potential to encounter contaminated soils
Demolition	Materials are not required for demolition works	Waste arisings from the demolition of any existing buildings or structures
Site construction	Construction materials including: • concrete; • asphalt and bituminous material; • cement bound granular material; • well graded granular	• Packaging material. • Excess construction materials and broken/ damaged construction materials. • Existing highway infrastructure and technology as removed by excavation works.

Project Activity	Material use	Potential waste arisings
	material; • precast concrete kerb; • timber; • plywood; • cementitious grout; • reinforcing steel; • reinforcing fabric; • geotextile; • geo-composite drainage system; • pipe bedding aggregate; and • filter drain material.	• Waste oils from construction vehicles. • Construction worker generated wastes.

10.6.4. For the majority of highways schemes, the largest quantities of materials and waste are generally those associated with earthworks, especially in those cases where a balance between excavation ("cut") and material placement ("fill") cannot be achieved.

10.6.5. The proposed Scheme design is currently being progressed to optimise the requirements for cut and full and where possible this will be minimised to reduce the import and export of materials and waste. The project design team aim is to achieve a cut-fill balance, however predicted cut and fill for the proposed Scheme is likely to be imbalanced and importation of material would be required. There are mineral sources within the West Midlands region, such that materials required for the proposed Scheme could be sourced locally in order to minimise travel distances.

Operation

10.6.6. Table 10.5 summarises the types of materials used and wastes that may potentially be generated during operation of the proposed Scheme.

Table 10.5: Potential Material Use and Waste Arisings – Operation

Project Activity	Material Use	Potential Waste Arising
Operation and maintenance	Routine maintenance of infrastructure and technology including surfacing asphalt and servicing of electronic equipment.	Waste arising during operation and maintenance expected to be minimal.

10.6.7. Material use and waste generation is expected to be very small during operation of the proposed Scheme. Routine maintenance will include gully emptying and litter collection. Periodically, maintenance activities such as resurfacing will be required. Waste arising from these maintenance activities is expected to be generally the same (in both type and quantity) to that generated by the existing road; and the wastes will be managed using the established procedures and facilities that are used across the strategic highways network.

10.6.8. For these reasons, materials and waste during the operational phase have been scoped out of the assessment.

10.7. Design, Mitigation and Enhancement Measures

10.7.1. The proposed Scheme will aim to prioritise waste prevention, followed by preparing for re-use, recycling and recovery and lastly disposal to landfill as per the internationally recognised waste hierarchy (see Figure 10.1).

10.7.2. The following mitigation measures will be considered and implemented during the design phase and subsequent construction work:

- waste arisings will be prevented and designed out where possible;
- opportunities to re-use material resources will be sought where practicable;
- opportunities to support the circular economy will be considered during the design phase; and
- where re-use and prevention are not possible, waste arisings will be managed in line with the waste hierarchy).

Figure 10.1 Waste hierarchy

10.7.3. An Outline Environmental Management Plan (OEMP) will be prepared as an iterative process in parallel with the development of the proposed Scheme design and construction methodology. Measures within it will include design, construction and operational mitigation, which have been defined in part by the requirements which will arise from the technical assessments presented in the ES.

10.7.4. The construction of the Scheme would be subject to measures and procedures defined within a Construction Environmental Management Plan (CEMP). The CEMP would be based on the OEMP and would include the implementation of industry standard practice and control measures for environmental impacts arising during construction, such as the control of dust and the approach to waste management on site. The CEMP would be produced by the construction contractor prior to works commencing in accordance with IAN 183/14 and would include a Site Waste Management Plan (SWMP).

10.8. Assessment of Effects

10.8.1. The existing landfill capacity in the West Midlands (of all types) has been determined, from Environment Agency data, as being approximately 57.4 million cubic metres.

10.8.2. Given the relatively large landfill capacity in the West Midlands and the potential for the reuse of most of the excavated material on site and recovery of construction and demolition waste, it is considered unlikely that the proposed Scheme would result in a significant reduction in the available landfill capacity in the wider region, and hence significant effects are not anticipated (≤1% reduction or alteration in the regional capacity of landfill likely).

10.8.3. Should the proposed Scheme be unable to meet the target of 27% for use of recycled and secondary aggregate this would result in a moderate adverse effect. Whilst this would constitute a significant effect in terms of sustainable use of material resources, the effect would be on the ability to achieve a regional target and as such

there would be no direct impact on sensitive receptors within or around the proposed Scheme itself.

11. NOISE AND VIBRATION

11.1. Introduction

11.1.1. This chapter presents the findings of a preliminary assessment of temporary and permanent impacts on sensitive receptors as a result of changes to noise and vibration levels during construction and operation of the proposed Scheme. Sensitive receptors are predominantly residential properties but can also include educational buildings, medical buildings, community facilities, ecologically designated sites, scheduled monuments and public footpaths.

11.1.2. This chapter is supported by Figure 11.1. The legislative framework and assessment methodology for the full Environmental Impact Assessment (EIA) are provided in Chapter 12: Noise and Vibration, Sections 12.3 and 12.8 of the PCF Stage 3 EIA Scoping Report (Ref 11.1).

11.2. Stakeholder Engagement

11.2.1. Discussions have been held with the Environmental Health Department of South Staffordshire Council regarding the baseline noise monitoring survey. The proposed monitoring methodology and preferred monitoring locations have been agreed. Consultation with South Staffordshire Council will continue through the EIA process.

11.2.2. Following receipt of the EIA Scoping Opinion in February 2019, the scope of the noise and vibration assessment has been reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- To consider impacts on ecological receptors due to operational ground borne vibration.
- To provide further explanation of the reason for a qualitative assessment of operational impacts for receptors located between the 600 m quantitative study area and the wider 1 km study area.
- To provide further explanation of the process for identifying construction noise and vibration receptors.
- To agree the methodology for the baseline noise monitoring survey with the Environmental Health Department of South Staffordshire Council.
- To consider offices/commercial and sensitive ecological receptors.
- To ensure assumptions regarding low noise surfacing are included in the Environmental Statement (ES).
- To clearly set out mitigation measures.
- To explain when the ‘low flow’ correction in the traffic noise prediction methodology is employed.
- To explain how annoyance due to operational traffic airborne vibration will be determined.

11.3. Assessment Assumptions and Limitations

11.3.1. At this stage, details of the construction traffic, construction schedule, construction methodology and plant requirements are not yet confirmed. The construction noise and vibration assessment is therefore qualitative and has assumed best practice measures would be in place during construction (refer to Section 11.7). A quantitative assessment of noise and vibration impacts arising from construction

works will be undertaken as part of the EIA and reported within the ES that will be submitted with the DCO application.

11.3.2. The operation of the proposed Scheme would affect traffic noise and vibration levels as experienced by sensitive receptors, including occupiers of residential properties in the vicinity of the proposed scheme and along affected roads on the local road network. In this PEI Report a description is provided of the potential increases and decreases in traffic noise levels based on traffic data estimated for the options selection stage using the preliminary design for the proposed Scheme. The detailed noise and vibration assessment reported in the ES will be based on detailed traffic modelling data, which is currently being prepared, and the final preliminary design for the proposed Scheme. Therefore, the findings reported in this PEI Report may be subject to change as the design of the proposed Scheme is developed and refined through the EIA and consultation processes and the traffic modelling is completed.

11.3.3. Impacts on quiet areas and tranquillity will be considered as part of the landscape and visual effects assessment, and noise and vibration impacts on ecologically sensitive receptors will be considered as part of the biodiversity assessment.

11.3.4. Ordnance Survey (OS) Address Base data have been used to identify potentially sensitive buildings.

11.4. Study Area

11.4.1. The study area has been defined in accordance with guidance given in the DMRB which aims to identify any potentially significant effects of the proposed Scheme.

11.4.2. The study area for the qualitative assessment of construction phase noise and vibration impacts has been focussed on the closest identified receptors to the various works.

11.4.3. The study area for the assessment of operational phase noise impacts comprises an area extending to 1 km from the proposed Scheme and the existing sections of road replaced by the proposed Scheme.

11.4.4. The proposed Scheme, the 1 km study area and sensitive receptors within the study area are shown in Figure 11.1.

11.5. Baseline Conditions

Overview

11.5.1. The study area consists of a mixture of agricultural land use, built up areas, including Featherstone, Hilton and Shareshill, individual or small groups of properties and major transport infrastructure including the M54, M6 and M6 Toll. These motorways and the ‘A’ roads A460, A462 and A4601 are the main existing noise sources in the area.

11.5.2. Residential properties are concentrated in the built up areas of Featherstone and Shareshill. Smaller areas of residential properties are located close to the proposed Scheme at Dark Lane, Hilton Lane (These two toads are part of the parish of Hilton) and Brookfield Farm. Non-residential potentially sensitive receptors including educational buildings, medical buildings and community facilities are concentrated in Featherstone and Shareshill.

11.5.3. No international or national designated areas (Scheduled Monument, World Heritage Site, Special Area of Conservation (SAC), Special Protection Area (SPA), Sites of Special Scientific Interest (SSSI), National Park or Area of Outstanding Natural Beauty (AONB)) have been identified within the study area.

11.5.4. Under the Environmental Noise Directive (END) strategic noise mapping of major roads, railways, airports and agglomerations has been completed across England, including for the major roads in the study area. Three 'Noise Important Areas' (those areas most exposed to noise) were identified in the Round 2 strategic noise mapping (carried out in 2012) in the 1 km study area. One is located on the M54 (7365), and two on the A460 (11490 and 7364). Two of the noise important areas are the responsibility of Highways England (7365 and 7364) and one is the responsibility of the local highways authority Staffordshire County Council (11490).

11.5.5. Figure 11.1 illustrates the identified potentially sensitive receptors in the study area and the designated Noise Important Areas.

Baseline Noise Monitoring

11.5.6. Limited baseline noise monitoring on the A460 was completed in 2006 - 2008, as referred to in the 2015 EAR (Ref 11.2). A baseline noise survey is proposed as part of the EIA. Subject to access to secure locations being available, long term monitoring over a minimum of one week is proposed at a selection of locations in close proximity to the proposed Scheme. The monitoring procedures will be based on the approach in BS 7445: 2003 'Description and Measurement of Environmental Noise' (Ref 11.4) and Calculation of Road Traffic Noise (CRTN). Details of the proposed monitoring locations and methodology have been discussed and agreed with South Staffordshire Council.

Existing Noise Barriers

11.5.7. Within the study area a section of existing timber noise barrier has been identified from the Highways England Highways Agency Pavement Management System (HAPMS) database on the M54 eastbound carriageway at Junction 1. The HAPMS database does not include any details of the barrier height, however, based on Lidar data the barrier height has been determined as 1.8 m. A solid metal parapet is included across the two sections of overbridge at the junction, however as a conservative approach these two sections will not be included as a noise barrier as a site visit has determined that there is a gap between the base of the metal parapet and the bridge.

11.5.8. The existing barrier at Junction 1 of the M54 is assumed to be retained with the proposed Scheme, though some slight adjustment for the proposed Scheme would be required.

Existing/Future Low Noise Surfacing

11.5.9. In agreement with the design team, and taking into account surfacing information in the HAPMS database, new low noise surfacing will be assumed to be in place on the M54, M6, M6 Toll and A449 throughout the study area, in the opening year and future assessment year, without the proposed Scheme. Low noise surfacing is proposed as part of the proposed Scheme on the new link road (including slip roads) and connections to the M6 and M54.

11.5.10. In accordance with the guidance in the DMRB, low noise surfacing is assigned a correction of -3.5 dB at speeds ≥75 km/hr. At speeds below 75 km/hr low noise surfacing is assigned the same correction as a standard surface of -1 dB.

11.5.11. All other roads included in the detailed quantitative noise modelling will be assumed to be standard hot rolled asphalt (HRA) in all scenarios. The road surface correction for standard HRA surfacing is -1 dB at speeds <75 km/hr and -0.5 dB at speeds ≥75 km/hr.

11.6. Potential Impacts

11.6.1. Mitigation measures are being incorporated in the design and construction of the proposed Scheme; these are set out in Section 11.7. Prior to implementation of mitigation a summary of the potential noise and vibration impacts (both beneficial and adverse) associated with the construction and operation of the proposed Scheme is outlined below.

Construction

11.6.2. The main construction activities that would take place are site clearance, earthworks, bridge construction works and road construction works.

11.6.3. The construction of the proposed Scheme has the potential to result in temporary adverse noise impacts at the closest receptors to the works. The potential for temporary construction vibration impacts is dependent on the need for construction activities which are a potentially significant source of vibration, such as works using vibratory rollers and some types of piling.

11.6.4. The addition of construction traffic onto existing roads would have a temporary impact on sensitive receptors located along the existing roads used by these vehicles. The potential for such impacts is dependent on the volume and route of construction traffic. Diversions or night-time road closures, if required, would cause short term changes in traffic conditions and therefore traffic noise levels. In addition, re-routing of existing traffic onto alternative roads during the construction works would also be a potential source of temporary impacts.

Operation

11.6.5. The operation of the proposed Scheme has the potential to result in both beneficial and adverse permanent traffic noise impacts as traffic is moved closer to some receptors and further from other receptors. The closure of some roads, such as the link between Hilton Lane and the A460 via Dark Lane, would result in traffic re-routing. In addition, the presence of the proposed Scheme would attract traffic into the area as the existing traffic issues on the A460 are addressed by the proposed Scheme.

11.6.6. The magnitude of the operational traffic noise impact at a receptor is dependent on a range of factors including the traffic flow, composition, speed, road surface, ground topography, the presence of intervening buildings/structures and the distance to the road.

11.7. Design, Mitigation and Enhancement Measures

Construction

11.7.1. A Construction Environmental Management Plan (CEMP) would be prepared and implemented by the selected construction contractor. The CEMP will include a range of best practice measures to mitigate potential noise and vibration impacts. Such measures are described below:

- selection of quiet and low vibration equipment;
- review of construction programme and methodology to consider low noise/ low vibration methods (including non-vibratory compaction plant and low vibration piling methods, where required);
- optimal location of equipment on site to minimise noise disturbance;
- the provision of acoustic enclosures to static plant, where necessary;

- use of less intrusive alarms, such as broadband vehicle reversing warnings;
- local screening of equipment and employment of perimeter hoarding as necessary; and
- implementation of a traffic management plan to mitigate traffic impacts during construction, for example, through the choice of routes, the varying of routes and timing of construction traffic.

11.7.2. During the proposed Scheme construction phase, appropriate mechanisms to communicate with local residents would be set up to highlight potential periods of disruption. Residents would be provided with a point of contact for any queries or complaints.

11.7.3. An information web-page would be provided and kept up-to-date on the Highways England website to reflect construction and community liaison requirements. In addition, the Highways England Customer Contact Centre would also be available to deal with queries from the public. This includes an information line staffed by Highways England 24/7.

11.7.4. A complaint management system would be in place, in line with systems used by Highways England on other major infrastructure projects. Any noise and vibration complaints would be investigated and appropriate action taken as required. The complainant would be provided with a response outlining the results of the investigation and any action taken.

Operation

11.7.5. Traffic noise reduction measures will be incorporated into the design of the proposed Scheme by means of the vertical and horizontal alignment, false cuttings or bunds and through the proposed use of a thin surfacing system (low noise surface), which results in lower levels of noise generation than a standard hot rolled asphalt surface.

11.7.6. The need for further measures, such as noise barriers, will be determined as part of the EIA process in conjunction with other environmental disciplines, to avoid secondary impacts (including, for example, upon landscape and visual). Initial indications are that noise barriers in the vicinity of the eastern end of Dark Lane, in combination with mitigation incorporated into the proposed Scheme design, will be required. The potential benefits of noise barriers in other areas will also be investigated.

11.8. Assessment of Effects

Construction

11.8.1. At this stage of the design for the proposed Scheme, details regarding likely construction works are not available. However, a qualitative assessment indicates that the construction of the proposed Scheme would result in temporary adverse noise and vibration impacts to sensitive receptors in the vicinity of the works. Industry standard best practice mitigation measures (as set out in Section 11.7) would be employed throughout the construction works to minimise noise and vibration. It is expected that some of these significant effects can be reduced by employment of best practice mitigation.

11.8.2. Given the close proximity of some receptors to the proposed Scheme there is the potential for significant adverse construction noise effects at the closest receptors such as the eastern edge of Featherstone, Dark Lane, Hilton Lane, Brookfield Farm and properties at the southern end of Wolverhampton Road close to the bridge works at the M6 Junction 11.

11.8.3. The risk of construction vibration induced building damage is considered to be very low. However, there is the potential for significant construction vibration annoyance effects at the very closest receptors, if works which are a potential source of vibration are proposed in close proximity.

11.8.4. Construction traffic, including re-routing of existing traffic and the operation of any required diversion routes, would have an adverse impact on sensitive receptors located along existing roads used by these vehicles. The potential for traffic impacts during construction is dependent on the traffic volume and route.

Operation

11.8.5. The overall trend in the study area is likely to be a negligible/minor (not significant) increase in traffic noise levels as the proposed Scheme would attract traffic to the area by resolving the existing issues on the A460.

11.8.6. The proposed Scheme would introduce a new source of road traffic noise away from the immediate vicinity of existing roads. Significant increases in traffic noise are likely at receptors very close to the proposed Scheme on Dark Lane, Hilton Lane and around Brookfield Farm. As detailed in Section 11.7, the need for mitigation measures will be determined as part of the EIA process. It is expected that some of these significant effects can be reduced by the inclusion of mitigation.

11.8.7. The closure of Dark Lane where it is intercepted by the proposed Scheme would result in a transfer of traffic onto the western end of Hilton Lane.

11.8.8. A large reduction in traffic on the A460 west of the M6 is anticipated as through traffic currently using this route would transfer onto the proposed Scheme, resulting in reductions in traffic noise levels at receptors which face onto the existing A460. A reduction in traffic on the M54 east of Junction 1 would occur as the proposed Scheme would be used in preference to the existing road network. The existing A460 north-east of the M6 is anticipated to experience an increase in traffic, which would result in corresponding increases in traffic noise at nearby receptors on Wolverhampton Road. The re-routing of traffic on a number of surrounding roads is would be likely to occur resulting in corresponding increases and decreases in traffic noise on affected roads.

12. POPULATION AND HEALTH

12.1. Introduction

12.1.1. This chapter presents the findings of a preliminary assessment of temporary and permanent impacts on motorised and non-motorised users (NMUs), community and private assets, development land and human health during construction and operation of the proposed Scheme. For the purposes of this report NMUs are defined as pedestrians, cyclists and equestrians.

12.1.2. This chapter is supported by Figures 12.1 and 12.2. The legislative framework and assessment methodology for the full Environmental Impact Assessment is provided in Chapter 13: Population and Health, Sections 13.3 and 13.8 of the PCF Stage 3 EIA Scoping Report (Ref 12.1).

12.2. Stakeholder Engagement

12.2.1. Following receipt of the EIA Scoping Opinion in February 2019, the scope of the population and health assessment has been be reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- It was agreed that the assessment of impacts on community land can be scoped out of further assessment.
- The assessment will consider access to healthcare services and other social infrastructure, access to open space and nature, air quality, noise and neighbourhood amenity, accessibility and active travel, access to work and training. Social cohesion and neighbourhoods, minimising the use of resources and climate change in relation to impacts on physical and mental health.

12.2.2. Consultation with Staffordshire County Council and South Staffordshire District Council will continue through the EIA process to agree Public Right of Way (PRoW) diversions and potential disruptions during construction. Consultation with the local Director for Health and Care, the National Health Service and Public Health England is ongoing in relation to the assessment of human health.

12.3. Assessment Assumptions and Limitations

12.3.1. The information presented in this chapter is based on the information available at the time of writing the report and based on an emerging design. The findings reported in this PEI Report may be subject to change as the design of the proposed Scheme is developed and refined through the EIA and consultation processes.

12.4. Study Area

12.4.1. The assessment of Population and Health considers topics largely grouped into, impacts on NMUs (pedestrians, cyclists and equestrians), motorised users, land use (private assets, community land and development land) and human health. The study area for assessment will vary depending on the impact or type of resource and/or receptor being assessed, refer to Figure 12.1. The following study areas are proposed:

- **NMUs:** The study area will consider NMU facilities (Public Rights of Way ((PRoW) footpaths, bridleways and byways), cycle routes and footways) within 500 m of the DCO site boundary.
- **Motorised Users:** This assessment will consider two aspects:

  - **Views from the Road:** The study area for the assessment of views from the road would use the Zone of Theoretical Visibility (ZVT) which identifies the likely extent of visibility of the proposed Scheme). The ZTV is outlined in Chapter 7: Landscape and Visual, Section 7.2.
  - **Driver Stress**: The study area will consider motorised users on local roads within 500 m and users of the strategic network within 2 km of the DCO site boundary.

- **Private Assets and Development Land:** The study area will consider land within the DCO site boundary that has the potential to be directly impacted. This will consider the temporary and permanent loss of land or property as a result of the proposed Scheme.
- **Community Severance:** The study area for community facilities and severance would consider the direct and indirect impacts and effects of the proposed Scheme associated with motorised severance for the communities of Featherstone, Shareshill and Hilton and the main traffic routes within 500 m of the DCO site boundary.
- **Human Health:** The study area will consider residents within the wards of, Essington, Featherstone & Shareshill and Cheslyn Hay North & Saredon due to their proximity to the proposed Scheme (Figure 12.1).

12.5. Baseline Conditions

Non-Motorised Users

12.5.1. There are a number NMU facilities located within the study area these are listed in Table 12.1 and illustrated on Figure 12.2. The majority of PRoW (footpaths, bridleways and byways) within the study area are largely located to the north of Hilton Lane between the A460 and M6.

12.5.2. There are a number of formal crossing points on the A460, these include:

- an uncontrolled at grade crossing point at Shareshill;
- a signalised crossing point at the northern extent of Featherstone;
- signalised crossing points on New Road and northern arm of the A460 at the New Road/A460/Dark Lane junction (the other arms of the junction utilise traffic lights however, there are no signalised crossing points in place); and
- an uncontrolled at grade crossing point south of the Avenue.

12.5.3. NMUs utilising these facilities along the A460 are exposed to heavy traffic, a high proportion of which are HGVs. There are a number of school and local buses which utilise bus stops along the A460.

12.5.4. There are no routes designated under the National Cycle Network within the study area. However, there is a traffic free cycle route along the Staffordshire and Worcestershire Canal north of M54 Junction 2 and a short approximate 80 m section of cycleway painted on the carriageway of the northbound A460 south of New Road. The cycleway along the A460 does not appear to be connected to additional cycling infrastructure and therefore is considered to have low sensitivity. The ‘Cycle Map and Information Guide’ for South Staffordshire, produced by Staffordshire County Council shows an ‘advisory cycle route’ along Hilton Lane and Dark Lane.

Accidents

12.5.5. Accident data over a four year period (between 2012 and 2016) recorded twelve accidents involving pedestrians and cyclists NMUs, ten slight and two serious accidents. This data highlights that the majority of pedestrian accidents in the vicinity of the proposed Scheme occurred in the village of Featherstone. Cycle accidents predominantly occurred at key points of traffic interaction such as the M54 Junction 1, and side road junctions along the A462, with the two serious accidents involving cyclists at Junction 11 of the M6.

Table 12.1: PRoW and Public Access Routes

NMU routes	Details	2017 NMU survey results*		Sensitivity
		Weekend	Weekday	
Traffic Free Cycle Route along Staffordshire and Worcestershire Canal	A traffic free cycle route that runs adjacent to the Staffordshire and Worcestershire Canal.	NMU surveys were not undertaken for this route, as they were outside the initial study area. Further consideration of whether surveys are required will be considered in the Environmental Statement (ES).		High
The Monarch's Way Recreational Route/ National Trail	Part of the Monarch's Way, a 625 mile long footpath that follows the approximate escape route of King Charles II in 1651 after being defeated in the Battle of Worcester. It follows sections of the Staffordshire and Worcestershire Canal, travelling south down Cat and Kittens Lane and under the M54 to Moseley Old Hall.	NMU surveys were not undertaken for this route, as they were outside the initial study area. Further consideration of whether surveys are required will be considered in the ES.		High
Featherstone 3 (Bridleway)	A bridleway which runs adjacent to the M54 and through Whitgreaves Wood (AWI - Oxden Leasow Wood) which joins a track to Moseley Road.	NMU surveys were not undertaken for this route. However surveyors observed that this route appeared to be in use.		Medium
Shareshill 1 (Bridleway)	Part of the footpaths and bridleways which form a grid in between the A460, Hilton Lane and the M6, Shareshill 1 is a bridleway located south of Brookfield Farm providing an east to west link across the fields. Shareshill 1 links the A460 to Shareshill 17.	1 pedestrian 0 cyclists 0 equestrians	1 pedestrian 0 cyclists 0 equestrians	Low
Shareshill 3(Footpath)	Part of the footpaths and bridleways which form a grid in between the A460, Hilton Lane and the M6, Shareshill 3 runs in a north-south direction linking Shareshill 1 and 5. Shareshill 3 has been planted over and there is little evidence of use.	2 pedestrians 0 cyclists 0 equestrians	1 pedestrian 0 cyclists 0 equestrians	Low
Shareshill 4/ Saredon 8 (Footpath)	Part of the footpaths and bridleways which form a grid in between the A460, Hilton Lane and the M6, Shareshill 4 branches off perpendicular to Shareshill 1 heading north-east towards Junction 11 of the M6. Shareshill 4 merges into Saredon 8 as the footpath crosses Latherford Brook.	0 NMUs recorded	0 NMUs recorded	Low
Shareshill 5	Part of the footpaths and bridleways which form a grid in between the A460,	1 pedestrian	3 pedestrian	Low

NMU routes	Details	2017 NMU survey results*		Sensitivity
		Weekend	Weekday	
(Footpath)	Hilton Lane and the M6, Shareshill 5 provides an east to west across fields north of Hilton Lane. The footpath links Hilton Lane and Shareshill 18.	0 cyclists 0 equestrians	0 cyclists 0 equestrians	
Shareshill 17 (Footpath)	Part of the footpaths and bridleways which form a grid in between the A460, Hilton Lane and the M6, Shareshill 17 is a footpath which provides an east to west link. The footpath merges into Shareshill 1 to the east and joins Shareshill 1R/2216 directly east of the M6. This path could not be located during the NMU survey. It was assumed the track that runs alongside is used.	0 NMUs recorded	0 NMUs recorded	Low
Shareshill 18 (Bridleway)	A bridleway that runs from Hilton Lane (west of Yells Farm) in a north east direction to tie into Shareshill 17.	0 NMUs recorded	0 NMUs recorded	Low
Saredon 13 (Bridleway)	Accessed from Windy Arbour Lane north east of the M6/ M6 Toll. Bridleway goes under the M6 Toll and alongside the M6; it runs alongside the A460 and terminates at M6 Junction 11.	0 NMUs recorded	0 NMUs recorded	Low
Dark Lane	Footway on the northern side of the road. There is an advisory cycle route along Dark Lane, though there are no cycling facilities along this route.	23 pedestrians 8 cyclists 0 equestrians	6 pedestrian 5 cyclists 0 equestrians	Medium
Hilton Lane (Near A460 Junction)	Footway along the northern carriageway of Hilton Lane as far as Majestic travel. There is an advisory cycle route along Hilton Lane, though there are no cycling facilities along this route.	9 pedestrians 24 cyclists 0 equestrians	6 pedestrian 1 cyclists 0 equestrians	Medium
Hilton Lane (Near M6)	There are no pedestrian, equestrian or cycling facilities along this route.	5 pedestrians 40 cyclists 0 equestrians	3 pedestrian 8 cyclists 0 equestrians	Medium
A460 (M54 Junction 1)	There is a footway to the east and west of the A460. These footways continue south around the M54 Junction 1 utilising uncontrolled crossings.	22 pedestrians 32 cyclists 2 equestrians	30 pedestrian 19 cyclists 0 equestrians	Medium
A460 (Featherstone to	There is a footway to the east and west of the A460 through Featherstone. North of Featherstone the eastern footway is discontinued, reoccurring further north at	23 pedestrians 39 cyclists	42 pedestrian 19 cyclists	Medium

NMU routes	Details	2017 NMU survey results*		Sensitivity
		Weekend	Weekday	
Shareshill)	the junction with Shareshill providing access to a local bus stop on the southbound carriageway. There is a small section of on road cycle path near the junction with Dark Lane.	0 equestrians	0 equestrians	
A460 (Shareshill to M6 Junction 11)	There is a footway along the northbound carriageway of A460 between Shareshill and Junction 11 of the M6.	7 pedestrians 22 cyclists 0 equestrians	2 pedestrian 5 cyclists 0 equestrians	Medium
A460 (M6 Junction 11 to M6 Toll JT8)	The is a footway along the southbound carriageway of the A460 between M6 Junction 11 and M6 Toll Junction T8	3 pedestrians 2 cyclists 0 equestrians	1 pedestrian 0 cyclists 0 equestrians	Low

Motorised Users

12.5.6. The main road network surrounding the proposed Scheme consists of (refer to Figure 12.1):

- A460 – a single carriageway road which runs in a north-easterly direction across southern Staffordshire, providing a connection between the M54 and M6. Speed limit: 40 mph. Accident rates for the A460 through Featherstone are higher than the national average for this category of road.
- M54 - a two-lane dual carriageway running in an east/west direction through Shropshire and Staffordshire connecting to the M6 via a spur just north of Essington to the south-east of the proposed Scheme extent. Speed limit: 70 mph.
- M6 - a three-lane dual carriageway running in a north/south direction connecting to the M54 and the M6 Toll within the study area. Speed limit: 70 mph.
- M6 Toll – a three-lane dual carriageway which runs between M6 Junction 11A (within the study area) and the M6 Junction 3a. Speed limit: 70 mph.
- A449 – a two-lane dual carriageway running in a north/south direction connecting the M54 to the A5 and the M6. Speed limit: 40mph and 60mph.
- A5 – a single carriageway road which runs in an east/west direction between Tamworth and Telford. Speed limit: 60 mph.

12.5.7. The main bus routes in the immediate vicinity of the proposed Scheme are as follows:

- Route 67 between Cannock and Wolverhampton via Shareshill and Featherstone;
- Route 70 between Cannock and Wolverhampton via Cheslyn Hay and Featherstone;
- Route 854 between Cheslyn Hay High School and Brinsford via Featherstone;
- Route 71 between Cannock and Wolverhampton via Cheslyn Hay and Essington; and
- Route 868 from Bloxwich to Cheslyn Hay High School is operated by National Express West Midlands Bus Company.

Views from the Road

12.5.8. Views from the existing road network, the M6, M54 and A460 are quite limited with drivers experiencing intermittent views of the surrounding area.

12.5.9. The A460 is generally at ground level with existing vegetation in the form of hedgerows and trees lining the road to the east and west. Through Featherstone and Shareshill the vegetation to the west is replaced by views of residential and commercial properties with wider views blocked by this built form. It is considered that existing users experience restricted views for the majority of the A460, however these open out to the north of the study area between Junction 11 of the M6 and Junction T8 of the M6 Toll. Here views are intermittent for vehicles travelling southbound with views of the fields to the south west.

12.5.10. The M54 Junction 2 is on a slight embankment with vegetation either side of the carriageway restricting views outside of the carriageway. Directly west of Junction 1 of the M54 the road is in partial cutting with thick vegetation and fencing limiting

views from the M54 as drivers pass over Junction 1. Travelling east from Junction 1 the road is lined with trees and the road entering into cutting as the M54 merges with the M6. Driver views are restricted when using this route.

12.5.11. North of the M6 Junction 10a drivers on the M6 experience largely restricted views due to dense vegetation and some areas of partial cutting. North of Hilton Lane these views open out to the east and west with intermittent views of the surrounding agricultural land before entering into partial cutting at Junction 11.

Driver Stress

12.5.12. The existing road network currently experiences high levels of traffic, particularly during peak hours. As a result the M54 Junction 1 and the M6 Junction 11 are heavily congested during peak hours. The A460 and A449 are also under pressure from high levels of traffic including HGVs using the route as a direct route between the M54 and M6. This results in extended and unreliable journey times. The congestion of the A460 can make it difficult for local traffic from Featherstone and Shareshill to enter and exit from the A460. This may result in driver frustration and an increased fear of accidents occurring as a result of the impatience displayed by other drivers.

Private Assets and Development Land

12.5.13. The study area surrounding the proposed Scheme is predominantly rural in nature consisting of arable land and small areas of scattered woodland. To the south of the study area there is an area of historic parkland associated with 18th century Hilton Hall.

12.5.14. There are a number of small settlements in proximity to the draft DCO site boundary; these include the villages of Featherstone Shareshill and Hilton. There are also a number of isolated dwellings and farm holdings.

Private Assets

12.5.15. There are a number of private businesses within the study area these include:

- Hilton Hall Business Centre– office, corporate function and wedding venue;
- Two fishing ponds west of Hilton Hall utilised by Chubb Angling Club;
- Brookfield Livery and Events Centre (Brookfield Farm);
- Brookfields Fishery (Brookfield Farm);
- possible fishing ponds to the west of Brookfield Farm;
- stables, west of M6 Junction 11;
- the site of Featherstone car boot; and
- the site of Shareshill car boot.

12.5.16. There are no known residential properties located within the study area.

12.5.17. Areas of agricultural land would be directly impacted by the proposed Scheme. This is covered under Chapter 9 Geology and Soils.

Development Land

12.5.18. There are at the time of writing this assessment, no existing planning applications were located within the study area.

12.5.19. There is one site allocated (Hilton Cross Business Park) as a strategic development site by South Staffordshire District Council (Ref 12.2) to the south of the study area, refer to Figure 12.2.

Community Facilities

12.5.20. Community facilities within the village of Featherstone include Featherstone Academy primary school, Featherstone Methodist Church, Featherstone and Hilton Community Centre, Featherstone Family Health Centre, a post office and a number of local shops. Community facilities within the village of Shareshill include Havergal Church of England Primary School, St Mary and St Luke Church, Shareshill Village Hall, a post office and a number of local shops. There are no community facilities located within Hilton, it is considered that the residents of Hilton would utilise community facilities within Featherstone and Shareshill.

12.5.21. There are no secondary schools within the villages of Featherstone or Shareshill. The catchment school for these villages is Cheslyn Hay Sport and Community High School in Cheslyn Hay.

12.5.22. There are no areas of land designated for use by the community such as village greens, community land or areas of public open space within the study area.

Human Health

12.5.23. The proposed Scheme is located in the County of Staffordshire within the district of South Staffordshire which has an estimated population of 111,900 (Ref 12.3). In 2016, the total population of the wards of Featherstone & Shareshill, Cheslyn Hay North & Saredon and Essington was estimated to be 16,658 people, with the largest population within the ward of Featherstone & Shareshill, at 7,573 people (Ref 12.4).

12.5.24. Table 12.2 provides a comparison of local health indicators with the national (England) averages. A brief summary of each ward is provided below.

12.5.25. In Featherstone & Shareshill the proportion of the population which are considered to have a health classification of ‘bad or very bad’ or are considered to have a long term illness or disability, is below the national average. Featherstone & Shareshill records a higher ratio of adults and children considered to be obese than the national average.

12.5.26. In Essington the proportion of the population which are considered to have a health classification of ‘bad or very bad’ or are considered to have a limiting long term illness or disability is considered to be statistically significantly worse than the national average. Records in Essington document a higher ratio of obesity within adults and children than recorded nationally.

12.5.27. In Cheslyn Hay North & Saredon the proportion of the population which are considered to have a health classification of ‘bad or very bad’ or are considered to have a limiting long term illness or disability is higher than the national average. Cheslyn Hay North & Saredon records a higher ratio of obesity in adults and children than recorded nationally, however, the life expectancy for both males and females is considered to be higher than the national average.

12.5.28. All of the wards have a much lower percentage of pensioners living alone than the national average.

Table 12.2: Human health profile within the study area

Local Health Indicator	Ward			England
	Featherstone & Shareshill	Essington	Cheslyn Hay North & Saredon	
Population	7,164	5,179	4,337	54,786,327
Population aged under 16 (%)	12.0%	16.1%	16.4%	19.%
Population aged over 65 (%)	12.4%	23.8%	22.5%	17.8%
Income deprivation (people living in income-deprived households as % of population)	13.7	12.0	10.8	14.6
Long term unemployment (measures as claimants of jobseekers allowance (per 1,000 population aged 16-64) for over 12 months)	3.1	5.5	2.3	4.6
General health - bad or very bad (%)	5.1	8.7	6.2	5.5
Limiting long term illness or disability (%)	16.6	21.5	20.3	17.6
Obese adults (%)	28.3	28.6	29.2	24.1
Obese children (reception year) (%)	10.1	10.7	12.8	9.3
Emergency hospital admissions for Chronic Obstructive Pulmonary Disease (SAR)	54.6	77.7	66.1	100
Life expectancy at birth - males, 2011-2015 (years)	80	78.9	79.9	79.4
Life expectancy at birth - females, 2011-2015 (years)	84.5	81.3	85.1	83.1
(Standardised Admissions Ratio (SAR): The ratio of the observed number of admissions in a ward to the number expected if the ward had the same age-specific rates as England. Standardised Mortality Ratio (SMR): The ratio of the observed number of deaths in a ward to the number expected if the ward had the same age specific rates as England.)				

12.5.29. Baseline data for the study areas has been gathered during a desktop study from the following sources:

- South Staffordshire Borough Council, Site Allocations Policy Map;
- Natural England, MAGIC maps (Ref 12.5);
- Sustrans, National Cycle Network (Ref 12.6);
- Staffordshire County Council, Cycling Maps (Ref 12.7); and
- Public Health England, Local Health.

12.6. Potential Impacts

12.6.1. Mitigation measures are being incorporated in the design and construction of the proposed Scheme, these are set out in Section 12.7. Prior to implementation of mitigation a summary of the potential impacts on Population and Health (both beneficial and adverse) associated with the construction and operation of the proposed Scheme is outlined below.

Non-motorised Users

12.6.2. With regards to NMUs, potential impacts include:

- temporary closures or diversion of NMU facilities severed by the proposed Scheme during construction;
- temporary impacts on severance and connectivity of NMU facilitates due to changes in traffic flows as a result of construction traffic and temporary traffic management;
- permanent realignment of NMU facilities as a result of permanent land take to facilitate the footprint of the proposed Scheme; and
- permanent reductions in severance due to the redistribution of traffic to utilise the proposed Scheme, reducing traffic flows on local routes such as the A460.

Motorised Users

12.6.3. With regards to motorised users, potential impacts include:

- temporary increases in driver stress due to increased congestion as a result of construction traffic and temporary traffic management;
- permanent reductions in driver stress due to reduced congestion, improved journey reliability and perceived improvements in safety; and
- change in views from the road associated with the use of a new route.

Private Assets and Development Land

12.6.4. Identified potential impacts on private residences and local businesses:

- temporary loss of land associated with commercial properties required to construct the proposed Scheme;
- permanent loss of land associated with commercial properties to accommodate the footprint of the proposed Scheme and any essential mitigation measures, including land associated with the businesses located in proximity to Brookfield Farm and Hilton Hall; and
- an area of 8,500m^2 of the strategic employment site Hilton Cross Business Park is within the draft DCO site boundary, allocated as a strategic employment site. This has the potential to impact on the use of this site temporarily and permanently.

Community Severance

12.6.5. Potential impacts in terms of community severance include:

- temporary increases in community severance due to increases in congestion as a result of construction activities and associated vehicle movements; and
- permanent reductions in community severance due to the redistribution of traffic away from local routes such as the A460.

Human Health

12.6.6. Potential impacts in terms of human health include:

- temporary changes in air quality, noise and vibration and amenity arising from construction activities and associated vehicle movements;
- permanent changes in air quality, noise and vibration and amenity arising from operation of the proposed Scheme;
- temporary and permanent impacts on access to healthcare service and social infrastructure as a result in changes in severance; and
- temporary and permanent impacts on social cohesion associated as a result of changes in severance.

12.7. Design, Mitigation and Enhancement Measures

12.7.1. Environmental considerations will be taken into account during the further development of the proposed Scheme design, including:

- minimising temporary and permanent land take to minimise impacts of private property and development land;
- the temporary and permanent realignment/ diversion of PRoW to minimise severance and reduce disruption to NMUs;
- the use of an accommodation bridge and access track to minimise severance;
- changes to route alignment (within the draft DCO site boundary) to minimise impacts on private property; and
- changes in route alignment (within the draft DCO site boundary) to minimise impacts on health from air quality and noise and vibration.

12.7.2. During the construction of the proposed Scheme, a number of measures would be put in place to reduce potential impacts upon people and communities as follows:

12.7.3. Construction of the proposed Scheme would be subject to measures and procedures defined within a CEMP. A CEMP will be prepared and will be further developed and implemented by the selected construction contractor. The CEMP would include a range of good practice measures associated with mitigating potential environmental impacts.

12.7.4. In addition to the CEMP, the construction contractor would define the requirements relating to traffic management. The construction contractor would liaise with South Staffordshire District Council to agree and implement a Traffic Management Plan. The Traffic Management Plan would take account of local public and business access requirements in order to reduce severance and disruption to local traffic movements during construction.

12.7.5. During the construction phase appropriate mechanisms to communicate with local residents would be set up to highlight potential periods of disruption (e.g. web-based, newsletters, newspapers, radio announcements etc.). An information web-page would be provided on the Highways England website to reflect construction and community liaison requirements. It is envisaged that the web-page would provide information on the progress of the construction works, areas affected by construction, mitigation in place to reduce adverse effects, information regarding planned construction works and works recently completed. These communication

approaches would help drivers to plan their journeys and take account of potential disruption due to Scheme construction.

12.8. Assessment of Effects

Non-motorised Users

12.8.1. The construction of the proposed Scheme would sever a number of existing PRoW which is likely to result in temporary and permanent changes in journey length and local travel patterns during construction and operation. Those routes directly impacted by the proposed Scheme would experience an adverse effect on the amenity of these routes due to the close proximity of construction activities and construction traffic.

12.8.2. During operation the proposed Scheme is anticipated to result in traffic moving away from the A460 to utilise the new link road. This is anticipated to result in a beneficial effect on NMUs utilising the footway along the A460 with improvements in amenity and a reduction in severance. Further traffic modelling is required to determine the potential severance effects on NMUs.

Motorised Users

Views from the Road

12.8.3. Driver views are anticipated to be largely unchanged for the majority of the construction period with the majority of the construction works being undertaken offline, away from existing roads. It is anticipated that there would be temporary adverse effects on driver views during construction at the connecting junctions (M54 Junction 1 and M6 Junction 11), as users would experience some views of construction activities.

12.8.4. During proposed Scheme operation the view from existing roads would be largely unchanged as a result of screening provided by existing vegetation.

Driver Stress

12.8.5. The proposed Scheme would be constructed mainly offline, with the exception of the works at Junction 11 of the M6 and Junction 1 of the M54. This would limit disruptions to motorised users and the need for temporary traffic management works. Construction would result in an increase in HGV movements and associated construction traffic. It is therefore anticipated that proposed Scheme construction would result in a temporary adverse effect on driver stress.

12.8.6. The operation of the proposed Scheme is intended to transfer long distance traffic from the A460 and other local roads onto the new link road. This is anticipated to reduce congestion and fear of potential accidents. Appropriate signage will be designed to reduce driver uncertainty when using the proposed Scheme. It is therefore anticipated that the proposed Scheme would have a beneficial effect on driver stress, however, further traffic modelling is required to determine this.

Private Assets and Development Land

12.8.7. No residential properties or land associated with residential properties would be required to accommodate the proposed Scheme. It is therefore anticipated that there would be no direct impacts on residential properties.

12.8.8. The proposed Scheme would not result in the demolition of private property however; it would result in the temporary and permanent loss of private land. The majority of these areas are associated with agricultural holdings and therefore the effects on these assets will be assessed within the Geology and Soils chapter of the

Environmental Statement (ES). Consultation with business and landowners will be undertaken to determine the existing land management practises and how the proposed Scheme would impact potential business viability/ operations.

12.8.9. The current draft DCO site boundary would result in the loss of up to 4.7% of the Hilton Cross Business Park strategic employment site. Though it is likely that this area will be reduced through preliminary design and therefore would not affect the use and viability of the site for its allocated use, further assessment is required.

Community Severance

12.8.10. There is potential for temporary adverse effects on community severance due to additional traffic associated with construction of the proposed Scheme and the use of temporary traffic management measures.

12.8.11. Operation of the proposed Scheme is intended to redistribute traffic away from the local road network resulting in reduced traffic flows and congestion on the local roads such as the A460. This is anticipated to reduce severance between villages and improve access to community facilities outside of the village in which residents reside.

Human Health

12.8.12. Information at this stage is not sufficient to assess the effects on human health during construction and operation of the proposed Scheme. The preliminary assessment has concluded that, prior to the implementation of mitigation measures there is the potential for impacts on people and their communities as a result of construction and operation of the proposed Scheme.

12.8.13. Further work is planned to fully establish the existing conditions against which detailed impact assessments will be undertaken and reported in the ES. Surveys and consultation will also be carried out to inform the proposed Scheme design-development process and refine the preliminary mitigation measures, such that an assessment can be made of their role in reducing potentially significant effects on NMUs, motorised users, private assets, development land, community severance and human health.

13. ROAD DRAINAGE AND THE WATER ENVIRONMENT

13.1. Introduction

13.1.1. This chapter presents the findings of a preliminary assessment into the potential temporary and permanent effects of the proposed Scheme on surface water, groundwater, flood risk and hydromorphology of water bodies.

13.1.2. This chapter is supported by Figures 13.1 and 13.2. The legislative framework and assessment methodology for the full Environmental Impact Assessment (EIA) is provided in Chapter 14: Road Drainage and the Water Environment, Sections 14.3 and 14.8 of the PCF Stage 3 EIA Scoping Report (Ref 13.1).

13.1.3. The objective of this assessment is to provide a preliminary assessment to identify any potentially significant effects upon road drainage and the water environment that are likely to arise from construction and/or operation of the proposed Scheme.

13.1.4. The assessment is being undertaken in accordance with best practice guidance and standards relating to the identification, assessment and evaluation of water environment effects associated with highway-based improvements.

13.2. Stakeholder Engagement

13.2.1. Following receipt of the EIA Scoping Opinion in February 2019, the scope of the road drainage and water environment assessment has been reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate and other consultees. In summary these include:

- the following return periods 1 in 20 year, 1 in 100 year, 1 in 100 year plus climate change (50%) and 1 in 1000 year will be modelled as part of the Flood Risk Assessment (FRA).

13.2.2. Consultation will continue with the Environment Agency (EA), and Staffordshire County Council (who are the Lead Local Flood Authority (LLFA)) throughout the EIA process to: further refine the adopted study area (described in Section 13.4); the proposed surface water management system; the magnitude of predicted impacts and the significance of effect on the water environment; and agree appropriate mitigation measures. Severn Trent Water (STW) will also be consulted if the management of surface water intends to discharge to the public sewer system or of if there are any sewer or water main diversions.

13.3. Assessment Assumptions and Limitations

13.3.1. The information presented in this chapter is based on the information available at the time of writing the report and based on an emerging design. The findings reported in this Preliminary Environmental Information (PEI) Report may be subject to change as the design of the proposed Scheme is developed and refined through the EIA and consultation processes.

13.3.2. This preliminary assessment is a qualitative assessment, no quantitative risk assessment of road runoff or spillage risk has been carried out at this stage.

13.4. Study Area

13.4.1. The scoping process defined an approximate 1 km study area around the draft DCO site boundary, which was deemed appropriate to identify any potential effects on the water environment. Within this area, the known surface water features and their attributes have been identified, the extent of known flood risk has been determined and the current groundwater conditions described.

13.4.2. Consideration will also be given to any surface water or groundwater bodies or water dependent ecological sites outside this study area up to 2 km from the draft DCO site boundary. These receptors will be considered if it is judged that they are hydraulically linked to features within the study area and could be affected by the proposed Scheme. Professional judgment has been applied to identify the extent to which such features are included.

13.4.3. The flood risk study area comprises the Environment Agency Flood Zones along the watercourses that may be affected by the proposed Scheme. The Environment Agency designates flood risk zones on the basis of the annual probability of a flood event to occur as follows:

- Zone 1 is less than 0.1% annual probability of flood risk (i.e. a very low risk of flooding).
- Zone 2 between 0.1 - 1% annual probability of flood risk (i.e. a low risk of flooding).
- Zone 3 is more than 1% annual probability of flood risk (i.e. a medium risk of flooding).

13.4.4. The flood risk study area will include constructing models to cover the extents of the six watercourses 1 km upstream and 1 km downstream of the crossing locations.

13.5. Baseline Conditions

Topography, Rainfall and Land Use

13.5.1. Topographic data for the study area has been obtained from the Highways Agency Drainage Data Management System (HADDMS) and Ordnance Survey mapping. The study area slopes from 190 m above ordnance datum (AOD) just south of the M54 at the Essington Industrial Estate towards the Latherford Brook(refer to Figure 13.1 below) to the north, which flows beneath the M6 to the east of Brookfield Farm (SJ 95930 06067). Latherford Brook flows from close to Hilton Park Services (M6) towards the north-west. Where the Latherford Brook crosses the M6 south of Junction 11, the elevation is between 130 m and 125 m AOD. The land rises to the west of Latherford Brook, west of M6 Junction 11, towards the village of Shareshill (135 m AOD). To the north of Latherford Brook land rises towards Saredon Hill (154 m AOD) and Great Saredon (135 m AOD), and to the east of Latherford Brook the land rises towards Holly Bush Farm (158 m AOD), which is to the east of the M6. West of M54 Junction 1 the elevation falls from in the region of 135 m AOD at Junction 1 to 108 m AOD at Junction 2. West of Junction 2, the topography falls more gently to approximately 105 m AOD 1 km west of the draft DCO site boundary.

13.5.2. On the Meteorological Office website there is a weather station located at Penkridge, 8 km north-east of M6 Junction 11. The study area experiences an average of 681 mm of rainfall per year, with it raining more than 1 mm on around 125 days per year. The average rainfall varies throughout the year, with it being wettest in the autumn-winter period and driest in late winter and early spring.

13.5.3. The land use in the study area is predominantly agricultural and comprises arable, as well as sheep and equine grassland. There are also some urban land uses to the west around Featherstone, Hilton and Shareshill. In addition, there is a commercial fishery and equestrian centre located immediately adjacent to the southern extent of the draft DCO site boundary. There are four large ponds to the south-west of Hilton Hall, Lower Pool (within the footprint of the proposed Scheme) and three fishing ponds.

Surface Water Receptors

13.5.4. A site visit was undertaken on 11th February 2019. Based on the site visit and a review of available data, the following surface water bodies have been identified as present within the study area (refer to Figure 13.1):

- Watercourse 1 – 4, ordinary watercourses;
- Watercourse 5 (Latherford Brook) an Ordinary watercourse and designated as Water Framework Directive (WFD) Saredon Brook from Source to River Penk;
- Watercourses 6 and 7, ordinary watercourses;
- Watercourse 8 (Waterhead Brook) an Ordinary watercourse, tributary to River Penk WFD waterbody;
- Staffordshire and Worcestershire Canal, designated as WFD Staffordshire and Worcestershire Canal, Summit to Lower Penn; and
- Several ponds of varying sizes.

13.5.5. The River Penk (WFD waterbody, 2.5 km downstream of where Waterhead Brook is crossed by the M54) is located outside of the study area, however, this watercourse is downstream of the watercourses directly affected by the proposed Scheme.

Watercourses

13.5.6. Watercourse 1 is a very minor watercourse approximately 600 m long that flows in a south-east to north-westerly direction, having risen from its source approximately 0.5 km to the south of M54 Junction 1. It flows beneath the M54 and joins Watercourse 2 to the south of Featherstone. A review of online maps suggests that the watercourse may have been modified (straightened).

13.5.7. Watercourse 2 has its source to the east of M54 Junction 1 close to Tower House Farm. It flows west passing beneath the A460 and along the southern border of Featherstone. Watercourse 1 joins from the south at the south-west corner of Featherstone. From this confluence the watercourse continues in a generally north-westerly direction and crosses the Staffordshire and Worcestershire Canal before joining the Watershed Brook. This then discharges into the River Penk to the south-west of Coven. The Staffordshire and Worcestershire Canal is over 1 km from the proposed Scheme and therefore beyond the study area.

13.5.8. Watercourse 3 emanates from the ponds at Hilton Park and flows in a north-westerly direction, crossing the A460 before flowing on towards the farm ponds between Hilton and Shareshill at Watt Meadow Farm. The watercourse then continues west towards Featherstone Lane before again flowing north-west to the Staffordshire and Worcestershire Canal.

13.5.9. Watercourse 4 rises to the east of the Hilton Park ponds and flows north and north-east to cross Hilton Lane, before changing direction towards the north-west where it passes through the Brookfield Farm ponds and then flows under the A460. The watercourse continues towards the north-west to meet Watercourse 5 to the north-east of Shareshill and south of Little Saredon.

13.5.10. Watercourse 5 (Latherford Brook) is a tributary of Saredon Brook and is designated under the WFD as 'Saredon Brook from Source to River Penk' (GB104028046740) within the Humber River Basin District. The source is close to the M6 Junction 10a and it flows to the north-east beneath the slip roads at Junction 10a and to the east of the Hilton Park Services. A small tributary that rises to the east of the M6 meets Watercourse 5 to the north of Hilton Lane. The watercourse then flows to the north-

west and crosses beneath the M6 approximately 600 m south of Junction 11. It continues north-west beneath the A460 before passing the village of Shareshill on its northern side. It then discharges into Saredon Brook at grid reference SJ 928 082.

13.5.11. The Environment Agency Catchment Explorer website indicates that the 'Saredon Brook from Source to River Penk' is designated as a heavily modified water body that is 25.16 km in length and drains a catchment of 70.4 km^2. The water body is currently at Moderate ecological potential (also Moderate in 2009) but is at Good chemical status. The reasons for not achieving Good ecological potential are invertebrates, dissolved oxygen, ammonia and phosphates concentrations.

13.5.12. The proposed Scheme must not cause deterioration of any relevant WFD parameter (i.e. the reduction in class of any parameter) in the waterbodies described above, or prevent the potential for improvement to meet future WFD objectives. This also means that any discharges to the non-WFD waterbodies must not impact on the WFD waterbodies further downstream (i.e. the Saredon Brook).

13.5.13. Watercourse 6 has its source to the east of M6 Junction 11 and Laney Green. It flows in a north-west direction, passing beneath the A460 and the M6 Toll before taking a more northerly direction, crossing Saredon Road. It continues north to discharge into Saredon Brook north of Wood Lane.

13.5.14. Watercourse 7 has its course to the south of the M54, at Greenfield Lane in Bushbury. It flows in a south to north direction, passing beneath the M54. This joins Watercourse 1 at a confluence to the west of Cat and Kittens Lane.

13.5.15. Watercourse 8 (Waterhead Brook) has its source south-west of Essington. It flows in an east to west direction through the grounds of Moseley Hall and through the town of Bushbury. It passes underneath the A449, and then underneath the M54 near Junction 2. Watercourse 8 joins the River Penk south of the village of Coven over 2 km north-west from the draft DCO site boundary.

13.5.16. The Staffordshire and Worcestershire Canal passes north to south underneath the M54 approximately 250 m west of the M54 Junction 2. It then turns north-east and passes under the A449 approximately 800 m north of Junction 2. The canal is designated under the WFD as 'Staffordshire and Worcestershire Canal, Summit to Lower Penn'. It is designated as an artificial waterbody (ID GB40410266). The waterbody is currently at Moderate ecological potential, but is good chemical status. The reasons for not achieving Good ecological potential are phosphate and zinc concentrations.

13.5.17. All of the watercourses described above are located within the Penk Rivers and Lakes Operational Catchment, within the Trent Valley (Staffordshire) Management Catchment, within the wider Humber River Basin District.

Ponds, Lakes and Other Waterbodies

13.5.18. There are numerous ponds in the study area that could be impacted by the proposed Scheme, these include from south to north:

- several fisheries lakes associated with Millride Country Sports, immediately south-east of M54 Junction 1;
- a large pond west of Tower House Farm;
- four large ponds to the west of Hilton Hall; from west to east, Lower Pool pond associated with Lower Pool SBI, two fishing ponds and a large ornamental pond adjacent to Hilton Hall;

- several lakes and large ponds at Kings Pools Fishery to the west of the A460 Cannock Road;
- four ponds south-east of Brookfield Farm, the closest approximately 50 m away, online with Watercourse 4;
- fishery ponds associated with Brookfield Fishery,55 m north-west and 280 m north of the farm buildings at Brookfield Farm some of which appear to be online with Watercourse 4and are used for recreational and competition fishing; and
- a small pond located within the centre of the triangle of land formed by the M6, M6 Toll and A460.

13.5.19. Within the study area, there are several small isolated ponds to the east of the proposed Scheme in the Keeper's Wood area, to the south of M54 Junction 1 former sand and gravel pits, and to the east of M6 Junction 11 in the area of the Nursery. South of Moseley Old Hall there is a pond which from the Ordnance Survey mapping, appears to be online with Watercourse 7, upstream of the M6. There is also a pond south-west of M54 Junction 2 to the west of the Staffordshire and Worcestershire Canal. The ponds are shown on Figure 13.1.

13.5.20. The following fisheries are located in the area: to the south of Junction 1 of the M54, Millride Country Sports; Brookfields Fishery is advertised as a recreational and competitive fishery location; and Kings Pool fishery to the west of the A460 at the area on the OS mapping known as Villa Farm. There are also two fishing ponds utilised by Chubb Angling Club west of Hilton Hall.

Water Quality

13.5.21. Surface water quality data were requested from the Environment Agency for all watercourses and ponds up to 2 km from the draft DCO site boundary, with a response received on 11th December 2018. A further data request has been submitted to the Environment Agency to take into consideration changes to the draft DCO site boundary since the Scoping Report. This data request is still pending; updated data will be reported in the Environmental Statement.

13.5.22. None of the potentially impacted watercourses are currently monitored. The data available for the local Main Rivers (i.e. Saredon Brook and River Penk), are considered unrepresentative of the watercourses impacted by the Scheme due to their different characteristics, including morphology, discharge and dimensions. However, the data from the nearest monitoring point on Saredon Brook at Wedges Mill is provided in Appendix 13.1, Table 13.1A.

13.5.23. The National Incident Reporting System contains information on pollution incidents. In the last five years for the South Staffordshire District, there is one Category 2 incident (Significant) within the study area. Incident Number 1253631, Category 2, took place on 8th July 2014, located approximately 350 m north-east of the A460 junction with the Junction M6 11 roundabout.

13.5.24. Data provided by the Environment Agency indicate that there are seven discharge consents in the vicinity of the proposed Scheme. They relate to discharges from mineral extraction works (Watercourse 5, labelled as D1 and D2 on Figure 13.1), sewage treatment (Watercourse 5 – labelled as D3 on Figure 13.1) and intermittent discharges from the public sewer network (Watercourse 2 – labelled as D5/D6 on Figure 13.1), and 'undefined or other (east of the M6 Junction 11, unknown watercourse, labelled as D4 on Figure 13.1) and waste management activities (labelled as D7 located approximately 2 km south of the centre of Junction 1 of the M54).

13.5.25. As part of the EIA quality monitoring will be undertaken at all the watercourses crossed by the proposed Scheme to better understand baseline conditions and provide input data to the quantitative assessment of road runoff impacts. This will include collecting water samples from each of the watercourses with seasonal timing. The precise locations of sampling are yet to be determined at the time of writing, and will be informed by the preliminary drainage strategy. Each sample will be tested for a range of physico-chemical parameters, metals and hydrocarbons that may typically be found in road runoff.

Surface Water Flow

13.5.26. Surface water flow data was requested from the Environment Agency for all watercourses and ponds within the study area. The nearest gauging station for which data has been provided is on Saredon Brook at Deepmore Farm (SJ 92780 08920), over 2 km north-west of the proposed Scheme and so is not considered relevant.

13.5.27. Highways England reported an average flow and discharge for Watercourses 1 to 6 as measured during a site investigation in August 2008 and reported in the 2015 Environmental Assessment Report (EAR) (Ref 13.2). The exact monitoring locations are not known, although they are reported to have been in the vicinity of the proposed Scheme. Watercourse 5 had the greatest discharge and flow, whilst Watercourse 4 had the least discharge, with Watercourse 6 measuring with the least flow. Watercourse 1 was not measured (refer to Table 13.1).

Table 13.1: Summary of surface water flow data reported in the 2015 EAR (Measured August 2008)

Test	Unit	Watercourse				
		2	3	4	5	6
Average Flow	m/s	0.3	0.13	0.04	0.36	0.024
Discharge	l/s	11.8	3.3	1.0	18.8	4.2

13.5.28. The Q95 flow (i.e. the flow that is exceeded for 95% of the time), has been calculated using Low Flow software for watercourses 2 to 5 as follows:

- Watercourse 2: Q95 0.003 m^3/s;
- Watercourse 3 : Q95 0.003 m^3/s;
- Watercourse 4: Q95 0.001 m^3/s; and
- Watercourse 5: Q95 0.004 m^3/s.

13.5.29. The Q95 flows to watercourses 6, 7 and 8 have not currently been estimated as no new flow is anticipated to be directed to these watercourses.

Groundwater

13.5.30. According to the HADDMS website (Ref 13.3), the bedrock underlying the study area consists of predominantly Kidderminster Formation – Sandstone and Conglomerate, Interbedded. There are some small areas of Clent Formation and Enville Formation (undifferentiated) – mudstone and sandstone to the east of the study area. Also, within the study area westwards towards M54 Junction 2, there is a slice of Wildmoor Sandstone Formation. There are also some superficial deposits within the study area which are predominantly Till, with some alluvial deposits. The geology is shown on Figure 9.2.

13.5.31. According to the HADDMS website, the bedrock beneath the majority of the study area is Principal aquifer (Kidderminster and Wildmoor Sandstone Formation), with the area of Clent Formation and Enville Formation being Secondary A aquifer). The Environment Agency describes Principal aquifer as 'layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer'. The Secondary A aquifer is described by the Environment Agency as 'permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers'.

13.5.32. For superficial deposits, the study area contains a strand of Secondary A aquifer (Alluvium) for superficial deposits around watercourses 5 and 8 west of M54 Junction 2, with a deposit of Secondary A in the area of Junction 2 and to the east of the junction. The remainder of the study area is a mix of secondary (undifferentiated) strata and unproductive strata. The Environment Agency assign secondary (undifferentiated) in cases where it has not been possible to attribute either category A or B to a rock type. In most cases, this means that the layer in question has previously been designated as both minor and non-aquifer in different locations due to the variable characteristics of the rock type. Unproductive strata are defined as rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow.

13.5.33. According to the Cranfield Soils and Agrifood Institute Soilscapes website (Ref 13.4), the soils to the north, west and south-west of the study area, including the area west to Junction 2, are slowly permeable, seasonally wet, slightly acid but base rich loamy and clayey. To the north-east, near Brookfield Farm, the soils are freely draining, slightly acid and loamy. At the centre of the study area, near to the Hilton Hall, the soils are slightly acid, loamy and clayey, with impeded drainage. To the south-east the soils are freely draining, very acid, sandy and loamy.

13.5.34. Most of the study area for the new link is not designated as a groundwater or source protection zone (SPZ). As the M54 goes west from Junction 1, approximately 1.3 km west, the area contain SPZ3 (total catchment – defined as the area around a source within which all groundwater recharge is presumed to be discharged at source). This abstraction is for a public water supply borehole at Slade Heath. The site is not within a Drinking Water Safeguard Zone or Protected Area.

13.5.35. The Environment Agency Catchment Data Explorer website indicates that a section of the southern half of the study area lies within the Staffordshire Trent Valley – Permo Triassic Sandstone Staffordshire WFD groundwater body (GB40401G300500). Under the 2016 Cycle 2 classification this has an overall Water Body Status of Poor. The quantitative and chemical classifications are both also Poor. The northern section of the study area is within the Staffordshire Trent Valley – Mercia Mudstone East & Coal Measures WFD groundwater body (GB40402G300300). This has an overall waterbody classification for 2016 of Good, including Good quantitative and chemical status. The boundary between the two groundwater bodies is in the area of Hilton Park Lakes.

13.5.36. Groundwater is considered to be a receptor of high importance due to the presence of the Principal Aquifer, which could be impacted should the proposed Scheme build go ahead.

Groundwater Abstraction

13.5.37. Data on groundwater abstractions was obtained from the Environment Agency and South Staffordshire District Council.

13.5.38. There are two abstractions relating to groundwater abstraction that are outside the 2 km study area, but which have been included here as they related to public water supply (A1, and A2). There are a further seven groundwater abstractions within the 2 km study area, four for spray irrigation (A3, A4, A5, A6) , one for industrial process water (A3) and two private water supplies (A8, A9) for further details refer to Figure 13.1 and Table 13.1B in Appendix 13.1. The two private water abstractions are a well (A8) at Latherford Farm, Shareshill located 1.7 km north-west of the A460 and a spring (A9) at Saredon Hall Farm located over 1.4 km north of the A460.

Flood Risk

13.5.39. The following flood risk baseline is based on information including the Environment Agency Interactive Flood Maps (Ref 13.5), requested Environment Agency data included within the EAR Addendum.

Tidal Flood Risk

13.5.40. Due to the distance from the coast and lack of tidal influence on the identified watercourses there is considered to be no risk of tidal flooding.

Fluvial Flood Risk

13.5.41. The proposed Scheme crosses seven ordinary watercourses as identified on Figure 13.1. Refer to paragraphs 13.5.5 to 13.5.16 for further details. The majority of the proposed Scheme is located in Flood Zone 1 and is therefore considered to have a low risk of flooding. Flood Zone 1 comprises land assessed as having a less than 1 in 1,000 year, or 0.1% Annual Exceedance Probability (AEP) of fluvial or tidal flooding in any given year. Given the use of the proposed Scheme (highway), development within these areas is considered acceptable from a fluvial flood risk perspective.

13.5.42. There are areas of Flood Zone 2 and 3 associated with Latherford Brook. Alternative floodplain compensation would be required for any land lost due to the proposed Scheme within the floodplain (Flood Zone 3) so as not to increase flood risks. There are areas of Flood Zone 2 and 3 associated with Watercourse 7, which are associated with Watercourse 8, a tributary of the River Penk. Alternative floodplain compensation would be required for any land lost due to the proposed Scheme within the floodplain (Flood Zone 3).

13.5.43. It is noted that modelled Flood Zones 2 and 3 within the Environment Agency's 'Flood Map for Planning' are not available for all ordinary watercourses, especially those with a catchment area <3 km^2. Detailed hydraulic modelling would be required to determine the extent of the Flood Zones for these watercourses where data is not currently available, to determine the risk posed by them.

Pluvial Flood Risk

13.5.44. Overland flow and surface water flooding typically arise following periods of intense rainfall, often of short duration, that is unable to soak into the ground or enter drainage systems. It can run quickly off land as overland flow and result in localised flooding.

13.5.45. One of the key issues with pluvial flooding is that even in areas with no history of surface water flooding, relatively small increases in impermeable hard surfacing and surface gradients can cause flooding (garden loss and reuse of brownfield sites for

example). As a result, continuing development could mean that pluvial flooding can become more frequent and although not on the same scale as fluvial flooding, it can still cause significant disruption locally.

13.5.46. At a national scale the Environment Agency has undertaken modelling of surface water flood risk and produced Risk of Flooding from Surface Water mapping. This mapping identifies those areas at risk of surface water flooding during the following three magnitude rainfall events:

- High Probability – 3.3% AEP (1 in 30 chance of flooding in any one year);
- Medium Probability – 1% AEP (1 in 100 chance of flooding in any one year); and
- Low Probability – 0.1% AEP (1 in 1000 chance of flooding in any one year).

13.5.47. The latest version of the mapping, published in 2013, is the updated Flood Map for Surface water (uFMfSW) and is available to view via the Environment Agency's online viewer (Ref 13.6). This data set now provides the Environment Agency, LLFAs and the public to access information on surface water flood risk that is consistent across England and Wales. As such, this data is considered the most appropriate dataset available to inform the assessment of surface water flood risk within the proposed Scheme study area.

13.5.48. The uFMfSW map indicates that the majority of the study area is at very low risk of surface water flooding. There are areas of medium risk of surface water flooding located at; a pond at Old Ride, Hilton Park and Brookfield Farm. There is an area within the Hilton Park grounds with a high risk of surface water flooding. Watercourses 4 and 5 have a very narrow band at a high risk of surface water flooding which corresponds to the line of the channel. There is a low risk of surface water flooding on the banks in the immediate vicinity of the watercourses.

Groundwater Flood Risk

13.5.49. The Environment Agency's Areas Susceptible to Groundwater Flooding (AStGWF) map (Ref 13.7) illustrates that the proposed Scheme lies within 1 km grid squares of which >25-<50% of their area is considered to be susceptible to groundwater emergence. The type of groundwater flooding the area is at risk from is due to permeable superficial deposits, which tend to have a relatively high water table.

13.5.50. Figure GW-SS of the South Staffordshire District Council Level 1 Strategic Flood Risk Assessment (SFRA) (Ref 13.8) identifies that the study area is located in an area classified as having a 'A' (i.e. limited potential for groundwater flooding to occur: based on rock type and estimated groundwater level during periods of extended intense rainfall) susceptibility to groundwater flooding.

Flooding from artificial sources

Reservoirs

13.5.51. The Environment Agency Long Term Flood Risk indicates that there is no flood risk from reservoirs.

Ponds and Lakes

13.5.52. As defined in paragraph 13.5.16, there are several ponds identified within the proposed Scheme area that may be impacted should the proposed Scheme go ahead. The flood risk from these sources may be impacted, however any potential change to risk is considered to be low.

13.5.53. No lakes or other waterbodies have been identified within 1 km of the draft DCO site boundary.

Staffordshire and Worcestershire Canal

13.5.54. The nearest canal to the proposed Scheme is the Staffordshire and Worcestershire Canal, which is located approximately 1.6 km to the north of the proposed Scheme site. The risk of flooding from artificial sources is therefore considered to be very low.

Flooding from Drains and Sewers

13.5.55. Data provided by Severn Trent Water shows that there are few sewers and drains in the vicinity of the proposed Scheme. There is a foul combined sewer along Hilton Lane, which crosses the proposed Scheme footprint. This sewer will need to be diverted, however given the rural nature of the area surrounding the proposed Scheme, the current flood risk from sewers and drains is considered to be low.

13.5.56. Figure SF-CC of the South Staffordshire District Council Level 1 SFRA identifies recorded incidents of sewer flooding within the local vicinity of the proposed Scheme from STW's DG5 register (covering the 20 year period prior to 2014).

Relevant Ecological Designated Sites

13.5.57. As detailed in Chapter 8: Biodiversity, there are a number of statutory designated sites of ecological importance within the vicinity of the proposed Scheme which include aquatic habitat that may be hydrologically linked to the proposed Scheme. Statutory designated sites within 2 km of the draft DCO site boundary include:

- Wryley and Essington Canal Local Nature reserve (LNR) and Local Wildlife Site (LWS), great crested newt records are available for this site, located 1.4 km east of the draft DCO site boundary; and
- Stowe Pool and Walk Mill Clay Pit Site of Special Scientific Interest (SSSI) - A flooded disused claypit designated for its populations of white-clawed crayfish. The site is isolated from the river systems, with no appreciable inflow or outflow of water, located 1.5 km north-east of the proposed Scheme.

13.5.58. Non-statutory designated sites within 1 km of the draft DCO site boundary include:

- Lower Pool Site of Biological Importance (SBI) and Local Wildlife Site (LWS) – a large ornamental pool with both emergent and floating vegetation, located within the draft DCO site boundary;
- Brookfield Farm (north-east of) Shareshill SBI and LWS – wet woodland and marshy grassland, located within the draft DCO site boundary;
- Saredon Hall Farm Biodiversity Action Site (BAS) - an area of oak (*Quercus sp.*) woodland with a small pond, located 270 m north of the draft DCO site boundary;
- The Hag BAS - woodland with a steep-sided pond without emergent vegetation, location 405 m east of the draft DCO site boundary; and
- Moseley Hall SINC – a mature semi-natural and amenity woodland along course of Waterhead Brook and large former mill pond, located 630 m south-west of the draft DCO site boundary;
- Keepers Wood, Hilton Park SBI and LWS – woodland including several small ponds, located 715 m east of the draft DCO site boundary; and
- There is a small patch of 'Priority Habitat – Reedbeds' to the east of Brookfield Farm. This is located outside of the draft DCO site boundary, to the south of

Latherford Brook. This habitat is upstream of where the proposed Scheme would cross Latherford Brook.

Importance of Receptors

13.5.59. Based on the baseline data as presented above, the initial importance of water bodies within the study area are as follows:

- **Watercourse 1 and 2** are tributaries of the River Penk and flowing into the river approximately 5 km downstream of the proposed Scheme. The River Penk is a WFD designated Main River (Classified as overall poor in Cycle 2, 2016) therefore these tributaries are considered to be receptors of medium importance.
- **Watercourse 3** appears to flow towards the Staffordshire and Worcestershire Canal (classified as a moderate WFD waterbody in Cycle 2 2016), but this is not verified at the time of writing, therefore, it is assumed this is also high importance due to it being a controlled waterbody.
- **Watercourse 5** (Latherford Brook) (classified as a moderate WFD waterbody in cycle 2 2016), considered to be a receptor of high importance.
- **Watercourse 4** is a tributary of Watercourse 5 and is therefore considered to be a receptor of high importance.
- **Watercourse 6** is a tributary of Watercourse 5, but of smaller scale than watercourse 4, and therefore considered to be a receptor of medium importance;
- **Watercourse 7** is a tributary of Watercourse 1, but of smaller scale and therefore considered to be a receptor of low importance;
- **Watercourse 8** (Waterhead Brook) is a tributary of the River Penk, and is therefore considered to be a receptor of high importance;
- **Staffordshire and Worcestershire Canal** is considered to be a receptor of high importance as it is a controlled waterbody;
- **Ponds and Lakes**: There are several ponds and lakes within the study area. These are considered in separate groups. The known commercial fishery ponds, Kings Pool Fishery, Brookfield Farm Fishery, and Millride Country Sports are considered to be receptors of high importance. The remaining ponds in the area, including the fishing ponds west of Hilton Hall, are considered to be of medium importance at this stage.
- **Hydromorphology**: Watercourses 1, 2, 3, 4, 6, 7 and 8 are considered to be of low importance, as each appears to be a heavily modified agricultural ditch. Watercourse 5 (Latherford Brook) is considered to be of medium importance, as shows signs of alteration but retains some natural features.
- **Groundwater**: considered to be a receptor of high importance due to the presence of Principal Aquifer (Triassic Sandstone Group).
- **Flood Risk**: fluvial flood risk for the area of Latherford Brook (Watercourses 4 and 5) and Watercourse 8 (Waterhead Brook) are receptors of high importance (floodplain potentially protecting more than 100 residential properties from flooding). Surface water and groundwater flood risk is considered to be a receptor of low importance in all of the areas.

13.5.60. The importance of water resource receptors will be reviewed and confirmed in the Environmental Statement (ES).

13.6. Potential Impacts

13.6.1. Mitigation measures are being incorporated in the design and construction of the proposed Scheme; these are described in Section 13.7. Prior to implementation of mitigation a summary of the potential water environment impacts (both beneficial and adverse) associated with the construction and operation of the proposed Scheme is outlined below.

Construction

13.6.2. During construction the following water environment impacts may occur if appropriate mitigation is not applied:

- Reduction in water quality, both surface and groundwater, due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals or through uncontrolled site run-off.
- Alteration in fluvial and overland flow paths, and potential increase in flood risk, as a result of storing construction materials in floodplains.
- Increased risk of blockage of drains as a result of increased material (sands, gravels etc.) transported in runoff from the site.
- Increased discharge to local watercourses due to a temporary increase in impermeable area and removal of vegetation during construction.
- The potential total or partial loss of ponds and impacts on water quality of residual pond areas (e.g. the loss of a pond to the east of Brookfield Farm, the partial loss of Lower Pool and the loss of a pond west of Tower House Farm).

Operation

13.6.3. During proposed scheme operation the following water environment impacts may occur if appropriate mitigation is not applied:

- Impacts on surface water or groundwater quality from highway run-off (including the use of de-icants) or as a result of accidental spillages.
- Impacts on hydrogeology from contaminant release during accidental spillages or via unlined sustainable drainage systems.
- Changes in the natural form of the landscape, which may have a subsequent impact on surface water drainage patterns, including adverse impacts on local nature conservation sites.
- Increased risk of fluvial flooding to the proposed scheme and surrounding area due to loss of floodplain storage.
- Increase in flood risk (fluvial, surface water, sewer and drainage infrastructure) due to an increase in surface water runoff from the proposed scheme, and increased risk of fluvial flooding over the lifetime of the proposed scheme from climate change effects (increased peak river flows).
- Increased risk of groundwater flooding (particularly to any below ground development) as a result of high water table and/or groundwater recharge.
- Impacts on hydraulic processes and sediment dynamics in watercourses and their floodplains.

13.6.4. It is possible that any improvements to the existing drainage network for the M6 Junction 11 or M54 Junction 1 could result in beneficial effects on the water

environment. However, until more information is available regarding the existing drainage systems, it is not currently possible to evaluate these potential benefits.

13.7. Design, Mitigation and Enhancement Measures

13.7.1. Environmental considerations have been taken into account during the development of the proposed Scheme design, in order to reduce and/or avoid potential water resource impacts. This iterative approach has led to a range of mitigation measures capable of reducing the magnitude of water environment impacts being embedded within the design of the proposed Scheme or captured within construction practices. Further development of the proposed Scheme design will take into account further mitigation measures highlighted as being necessary.

Construction Phase

Surface Water and Groundwater

13.7.2. The risk of pollution to surface water and groundwater is greatest during the proposed scheme construction. Pollution may arise directly from spillages of oil or other polluting substances, or indirectly from runoff from hard standing and other sealed surfaces or from construction machinery that may contain high levels of suspended solids. However, potential impacts to the water environment would tend to be temporary and short term.

13.7.3. In order to avoid, prevent, minimise and reduce such adverse impacts, the proposed works would be undertaken by the appointed contractor in line with measures as set out in their CEMP. The CEMP would include mitigation measures that follow current good construction practices, such as those included within the following Guidance for Pollution Prevention (GPP) documents prepared jointly by the various UK environment agencies (that supersede previous Pollution Prevention Guidance) and Construction Industry Research and Information Association (CIRIA) documents:

- GPP 2: Above ground oil storage (Ref 13.9);
- GPP 5: Works and maintenance in or near water for construction or maintenance works near, in, or over water (Ref 13.10);
- GPP 8: Safe storage and disposal of used oils (Ref 13.11);
- GPP 13: Vehicle washing and cleaning (Ref 13.12);
- GPP 21: Pollution Incident Response Plans (Ref 13.13);
- C522 (2001) Sustainable Urban Drainage Systems - Design Manual for England and Wales (Ref 13.14);
- C523 (2001) Sustainable Urban Drainage Systems - Best practice manual for England, Scotland, Wales and Northern Ireland (Ref 13.15);
- C532 (2001) Control of water pollution from construction sites - Guidance for consultants and contractors (Ref 13.16);
- C609 (2004) Sustainable Drainage Systems, hydraulic, structural and water quality advice (Ref 13.17);
- C624 (2004) Development and flood risk - Guidance for the construction industry (Ref 13.18);
- C648 (2006) Control of Water Pollution from Linear Construction Sites - Technical Guidance (Ref 13.19); and

- C741 (2015, 4th Edition) Environmental good practice on site guide (Ref 13.20).

13.7.4. During construction, any discharges to surface water of 'unclean runoff' would require a Water Activity Permit from the Environment Agency. The conditions attached to any such consent, and to limits on oils, suspended solids and other pollutants, would need to be adhered to. Similarly, permissions may be required from the Environment Agency and LLFA for Development affecting Main Rivers or potentially obstructing the flow in ordinary watercourses.

Flood Risk

13.7.5. All construction materials and temporary construction compounds associated with proposed Scheme construction should be located in Flood Zone 1. If water is encountered during below ground construction, suitable de-watering methods should be used.

13.7.6. During the construction phase the contractor would need to monitor weather forecasts on a monthly, weekly and daily basis and plan works accordingly. For example, works in the channel of any watercourse would be avoided or halted were there to be a risk of high flows or flooding. In addition, the contractor would be required to sign up to Environment Agency flood warning alerts and describe in the Emergency Response Plan (part of the contractors CEMP) the actions it would take in the event of a possible flood event. These actions would be hierarchal meaning that as the risk increases the contractor would implement more stringent protection measures. This is important to ensure all workers, the construction site and third party land, property and people are adequately protected from flooding during the construction phase.

Operation Phase

13.7.7. A number of mitigation features would be incorporated into the proposed scheme design in order to minimise water resource impacts, including:

13.7.8. The channel designs for watercourse crossings would be developed and informed by hydromorphological, flood risk and ecological assessment. The design would need to ensure that existing flow conditions within the channels are maintained and not substantially impacted by constrictions. The morphological and ecological function of these channels would also be taken into account during the design of new or modified structures, and where possible, opportunities for enhancement explored.

13.7.9. New structures to cross watercourses should be of a clear span design where possible with no new structures positioned in the channel and set back as far as possible from the top of the banks, with soffits above the design flood level.

13.7.10. The number of new surface water outfalls should be minimised to avoid construction of unnecessary structures along the river bank.

13.7.11. The proposed Scheme would be provided with an appropriate surface water management system, developed and constructed in compliance with DMRB standards. The proposed drainage strategy will be defined in consultation with the Environment Agency, Staffordshire County Council (as LLFA), South Staffordshire District Council and other statutory agencies, taking into account the findings of the FRA and water risk assessment (to be prepared). The proposed drainage system would include the use of sustainable drainage systems (SuDS), where possible, to enable attenuation of surface water flows due to increases in the impermeable area as a result of the proposed Scheme. SuDS would also provide treatment of runoff to ensure potential adverse effects on water quality are avoided.

13.7.12. With regard to drainage into the watercourses, the extent of mitigation measures required to remove suspended solids, particulate and dissolved metals, and hydrocarbons etc. from road run-off will be determined through quantitative assessment of outfalls.

13.7.13. Operation of the proposed Scheme may alter the existing risk of road traffic accidents leading to a significant pollution incident. To mitigate the impacts on controlled waters, the highway drainage system would incorporate appropriate measures to minimise impacts associated with accidents and spillages by containing them upstream of receiving watercourses. Floodplain compensation would be required for any land lost in Flood Zone 3 due to the proposed Scheme so as not to adversely increase flood risk elsewhere. The requirements for such floodplain compensation are in the process of being investigated as part of the FRA.

13.8. Assessment of Effects

Surface Water Quality

Construction

13.8.1. Where construction works are undertaken in close proximity to watercourses 1 to 8 (including all branch tributaries or existing land drains connected to surface watercourses) and ponds, there is the potential for adverse effects from a reduction in water quality. A reduction in water quality may result from deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals. Such materials may be deposited or spilled directly into the watercourse, or enter the watercourse via uncontrolled surface runoff, or enter indirectly via drains.

13.8.2. The proposed Scheme requires the crossing of a number of watercourses and the preliminary drainage design indicates there are to be four new outfalls to watercourses 2, 3, 4 and 5 (Latherford Brook). The construction of the proposed Scheme and the new outfalls would require construction in the immediate proximity to the watercourses. There is the potential for conveyance of spills and fine sediment to result in indirect impacts on downstream receptors such as the River Penk and / or Watercourse 5 (Latherford Brook), WFD waterbodies, although such impacts would be more greatly diluted and dispersed by the flow in the initial watercourse.

13.8.3. The adoption of the mitigation measures described in the Section 13.7 would help to avoid and minimise any potential for adverse surface water quality impacts. Therefore, it is anticipated that construction of the proposed Scheme would not have a significant effect on surface water quality.

13.8.4. There are a number of ponds in the study area that could be impacted by the proposed Scheme. Where these ponds are isolated features barrier measures should provide effective mitigation to prevent pollution. However, some of these ponds may be lost during construction or would suffer direct adverse impacts (e.g. partial backfilling) or may be located in a flood compensation area. Those most likely to be impacted are Lower Pool, south-west of Hilton Hall, and a pond to the east of Brookfield Farm, which is thought to be part of a commercial fishery. The potential adverse impacts to any water features with ecological value will be further evaluated and considered in conjunction with the biodiversity assessment within the ES.

Operation

13.8.5. The proposed Scheme would result in a significant increase in impermeable area of carriageway where pollutants (including hydrocarbons, heavy metals and sediments) can accumulate and be washed into receiving watercourses as routine road runoff. The preliminary drainage designs propose to drain surface water from the

operational road to new outfalls into Watercourses 2, 3, 4 and 5 (Latherford Brook). In the absence of mitigation there could be significant adverse effects on receiving watercourses. However, through appropriate risk assessment (i.e. using the DMRBs HAWRAT Method A assessment) options for treatment (i.e. SuDS) can be identified and evaluated to ensure no adverse effects. Where existing outfalls are to be modified as part of the proposed Scheme, where treatment is provided and none currently exists, there is the potential for beneficial effects on surface water quality.

13.8.6. De-icing salt is a potential pollution source from routine highway maintenance. No practical form of treatment can remove salt from carriageway runoff after road salting. The road surface of the proposed Scheme may require 10 to 20 g/m^2 of salt in a precautionary salting, and prior to snowfall or rain followed by freezing the target would be 20 - 40 g/m^2. De-icing salt would potentially have an adverse impact on the receiving aquatic ecosystem, which could result in a greater effect where the receiving watercourse is small, due to limited dilution. However, generally, the effect from de-icants in runoff would be localised, seasonal and of short duration. As de-icing generally occurs in winter, fauna and flora tend to be less active and sensitive to the potential changes in water quality.

13.8.7. There is the potential for road traffic accidents to occur on the proposed Scheme which could lead to a serious pollution incident. An assessment of pollution impacts from accidental spillages is currently ongoing and the results will be reported in the ES. With appropriate mitigation measures in place, the potential effect on water quality resulting from accidental spillage is not likely to be significant. Where new spillage containment measures are provided on existing roads that currently do not have any, there is the potential for beneficial effects on surface water quality.

13.8.8. It is considered there would be limited potential for adverse impacts to surface water ponds resulting from receiving unclean water from routine highway runoff or accidental spillages during operation. This is based on all routine highway runoff during proposed Scheme operation being directed to watercourses, and not the surface water ponds in the area.

Surface Water Flow

13.8.9. Proposed Scheme construction has the potential to temporarily change the flow regime of Watercourse 5 (Latherford Brook) and Watercourses 1, 2, 3, 4 and 6. This could be due to blockages or the receipt of additional discharges and could result in a temporary increase in flood risk. These watercourses would all be potentially at risk as they would accept surface water runoff from the area of construction works. Works would be taking place up to, and in some cases, over, all of the identified watercourses. The construction of the proposed Scheme would increase the impermeable area discharging to narrow watercourses with potential for blockages. Assuming that appropriate mitigation measures would be put in place, it is considered that it is not likely that the proposed Scheme would result in a significant adverse effect on surface water flows.

River Morphology

13.8.10. The main morphological impacts are linked to the construction of four new watercourse crossings, with one being part of a reportable reach of a WFD waterbody (i.e. Watercourse 5 is part of the Saredon Brook WFD water body). At this stage the proposed crossing designs are yet to be determined, and could involve clear span bridges or culverts, with the later potentially requiring the straightening and widening of channels to create a suitable alignment through the structures. There is therefore the potential for adverse impacts associated with the

construction of new crossings and also from construction of new outfalls to watercourses.

13.8.11. Depending in the importance of the watercourse and the magnitude of impact, there is the potential for significant adverse effects on river morphology. However, with appropriate mitigation measures in place it is likely that the effect on river morphology could be reduced to slight adverse.

Pond Morphology

13.8.12. A number of ponds are likely to be directly impacted by the proposed Scheme. At this stage limited baseline data is known about the ponds within the study area. Where a pond is lost or partially infilled there is the potential for significant adverse effects on river morphology.

13.8.13. From south to north the current design of the proposed Scheme would directly impact the following ponds:

- the loss of a pond west of Tower House Farm , close to M54 Junction 1;
- impingement of part of 'Lower Pool', south-west of Hilton Hall requiring partial backfilling; and
- the loss of a pond to the east of Brookfield Farm.

13.8.14. Compensatory habitat creation will be considered within the Biodiversity chapter of the ES.

Groundwater

13.8.15. Any interaction with groundwater during construction has the potential to temporarily change the hydraulic gradient in the area of the excavation. The majority of the proposed Scheme is currently anticipated to be constructed at existing ground level or on embankment. There are small sections of the proposed Scheme in cutting within catchment 4, close to Brookfield Farm and where the proposed Scheme crosses under the Hilton Lane overbridge. The short distances of shallow cutting have a small potential to intercept groundwater flows, although the residual effect is unlikely to be significant. The Private Water Supply Abstractions are located over 1 km from the proposed Scheme and are therefore unlikely to be affected by the proposed Scheme. However, this would need to be confirmed after further investigation.

13.8.16. A ground investigation along the route of the proposed Scheme will be undertaken. This will enable determination of existing groundwater levels, and the likely extent of interference resulting from cuttings and other excavations that could potentially draw out groundwater. This will be explored in further detail and reported in the Environment Statement.

13.8.17. During construction there is the potential for accidental spillage or leakage of oil, fuel or other liquid chemicals to contaminate the ground, and subsequently leach into underlying groundwater. The most vulnerable areas would be along the proposed sections of cutting with the potential to create new pathways for pollutant migration. The risk to groundwater will be informed by the ground investigation. With the application of best practice construction phase mitigation it is considered unlikely that there would be significant adverse effects on groundwater quality.

13.8.18. There are no planned discharges to groundwater from the highway in the preliminary drainage designs. There could be a minor risk from infiltration from any unlined

ponds or other drainage measures. This risk will be considered as part of the EIA and reported in the ES.

Flood Risk

13.8.19. The proposed Scheme has the potential to have an adverse impact on flood risk from fluvial, surface water and groundwater sources. These impacts could occur during construction and operation of the proposed Scheme if these risks are not appropriately managed and controlled effectively. Mitigation will be defined within a proposed Scheme specific FRA provided as an Appendix to the ES. The FRA will address the risk of flooding to and from the proposed Scheme from these sources, including future flood risk considering climate change in accordance with requirements by LLFA. Based on current understanding and with appropriate mitigation in place, the potential flood risk effect is considered to be negligible and not significant.

13.8.20. As part of the ongoing assessment process to be reported in the ES, further quantitative assessment of flood risk will be undertaken, including hydrological and hydraulic modelling.

14. CLIMATE

14.1. Introduction

14.1.1. This chapter presents the findings of a preliminary assessment of temporary and permanent impacts on climate as a result of greenhouse gas emissions arising during construction and operation of the proposed Scheme. In addition future climate change, leading to an increase in extreme weather events, has the potential to affect the resilience of the proposed Scheme and receptors in the surrounding environment.

14.1.2. To align with the requirements of the National Policy Statement for National Networks (NPSNN) (Ref. 14.1) and the Environmental Impact Assessment (EIA) Directive (Ref.14.2) this preliminary assessment will address the following aspects:

- Greenhouse gas (GHG) impact assessment: the effects on the climate of GHG emissions arising from the proposed Scheme, including how the Scheme would affect the ability of government to meet its carbon reduction plan targets.
- Climate resilience assessment: the resilience of the proposed Scheme to climate change, including how the proposed Scheme design would be adapted to take account for the projected impacts of climate change.
- In-combination climate impacts assessment: the combined effects of the impacts of the proposed Scheme and potential climate change impacts on the receiving environment.

14.1.3. The legislative framework and assessment methodology for the full Environmental Impact Assessment is provided in Chapter 1: Climate, Sections 15.3 and 15.8 of the PCF Stage 3 EIA Scoping Report (Ref 14.3).

14.2. Stakeholder Engagement

14.2.1. Following receipt of the EIA Scoping Opinion in February 2019, the scope of the climate assessment has been be reviewed and modified (as necessary) to take account of any additional requirements stipulated by the Planning Inspectorate. In summary these include:

- Demolition of the proposed Scheme is scoped out of further assessment.

14.2.2. No specific consultation will be undertaken to inform the climate assessment however, consultation carried out for other specialist topics such as air quality and road drainage and the water environment will be taken into consideration for the assessment of effects on climate as cross referred to in the Environmental Statement (ES).

14.3. Assessment Assumptions and Limitations

14.3.1. The information presented in this chapter is based on the information available at the time of writing the report and based on an emerging design. The findings reported in this PEI Report may be subject to change as the design of the proposed Scheme is developed and refined through the EIA and consultation processes.

14.3.2. The GHG assessment methodology for the final ES assumes that the following information is available:

- design details (construction materials quantities/volumes and processes);
- operational energy use; and

- projected maintenance and replacement schedule for the life of the proposed Scheme.

14.3.3. Where this data is not available assumptions will be made where possible or a qualitative assessment undertaken.

14.3.4. All assumptions and limitations, including any exclusions, together with assumptions for choices and criteria leading to exclusion of input and output data are being documented as part of the assessment. Where relevant data is not available, and suitable approximations or assumptions cannot be applied, qualitative analysis will be undertaken.

14.3.5. Climate change, by its very nature, is associated with a range of assumptions and limitations. To overcome these issues, current climate change data and science is being incorporated into the assessment, and proven effective approaches undertaken for similar project types are being replicated. All limitations and assumptions will be made clear in the full ES chapter.

14.3.6. Limitations associated with the approach to be taken for the climate resilience assessment relate to uncertainties inherent within UK Climate Projections (UKCP18 data) (Ref 14.4). By its very nature, climate change is associated with a range of assumptions and limitations. UKCP18 are currently the leading climate change projections for the UK.

14.3.7. Assessments being made in relation to climate change risk and impact likelihood and severity are relying on professional judgement and evidence gathered through other EIA discipline assessments.

14.4. Study Area

Greenhouse Gas Impact Assessment

14.4.1. The study area covers all direct GHG emissions arising from activities undertaken within the proposed Scheme boundary during the construction and operation of the proposed Scheme. It will also include indirect emissions embedded within the construction materials arising as a result of the energy used for their production as well as emissions arising from the transportation of materials and waste to and from the site.

14.4.2. For construction carbon the study area principally takes account of emissions associated with project activities and their associated transport. The spatial coverage of the assessment is therefore the area of construction works falling within the draft DCO site boundary.

14.4.3. The study area for the assessment of GHG emissions arising during the operation of the proposed Scheme will include both direct emissions arising from energy use within the draft DCO site boundary as well as emissions from road users.

Climate Resilience Assessment

14.4.4. The study area for the climate change resilience assessment is the proposed Scheme i.e. it covers all assets and infrastructure which constitute the proposed Scheme.

In-combination Climate Impacts Assessment

14.4.5. The study area for the in-combination climate impacts assessment is receptors in the surrounding environment. These will be identified by other disciplines within the EIA and will be specified in the climate chapter in the ES.

14.5. Baseline Conditions

Greenhouse Gas Impact Assessment

14.5.1. The current and future baseline for the GHG impact assessment is a "Do-Minimum" (DM) scenario where the proposed Scheme does not go ahead. Under this scenario GHG emissions associated with the future use and maintenance of the existing road network will be considered.

Climate Resilience Assessment

14.5.2. A review of all available and relevant information sources has been undertaken to establish existing and future baseline data and current understanding with regards to climate change and extreme weather risks.

Existing Baseline

14.5.3. Historic climate data obtained from the Met Office website (Ref 14.5) recorded by the closest meteorological station to the proposed Scheme (Moseley Old Hall Weather Station) for the period 1981-2010 indicates the following:

- average annual maximum daily temperature was 13.7°C;
- warmest month on average was July (mean maximum daily temperature of 21.5°C);
- coldest month on average was February (mean daily minimum temperature of 1.2°C);
- mean annual rainfall levels were 681.2 mm;
- wettest month on average was October (67.4 mm of rainfall on average for the month); and
- driest month on average was February (39.7 mm of rainfall on average for the month).

14.5.4. The Met Office baseline climate averages for the Midlands region identify gradual warming (although not uniformly so) with increased rainfall between 1968 and 2017. Information on mean maximum annual temperatures (°C) and mean annual rainfall (mm) is summarised in Table 14.1.

Table 14.1: Climate variations from 1968 to 2017 in the Midlands region

Climate Period	Climate Variables	
	Mean maximum annual temperatures (°C)	Mean annual rainfall (mm)
1968-1977	12.805	739.51
1978-1987	12.552	794.73
1988-1997	13.453	732.83
1998-2007	13.973	838.05
2008-2017	13.749	804.91

Future Baseline

14.5.5. The future baseline is expected to differ from the present day baseline. UK Climate Projections published in 2018 (UKCP18) have been developed by the UK Climate Impacts Programme (UKCIP) (Ref. 14.4) to provide projections for future climate

scenarios and trends. The UKCP18 data is the most robust source of information on the UK's future climate.

14.5.6. UKCP18 provides climate change projections for pre-defined 30-year time slices (for example 2010-2039, 2040-2069, and 2070-2099), at annual and seasonal levels for changes to mean climatic conditions over land areas. For the purpose of the proposed Scheme, UKCP18 projections for the following average climate variables have been obtained and analysed:

- change in mean summer temperature (°C);
- change in mean winter temperature (°C);
- precipitation rate anomaly in summer (%); and
- precipitation rate anomaly in winter (%).

14.5.7. A range of possible Representative Concentration Pathway (RCPs), selected from the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (Ref 14.6), have been used by UKCP18 to inform differing future emission trends. The four scenarios are RCP2.6 RCP4.5 RCP6.0 and RCP8.5. RCP8.5 is the closest to the UKCP09 high emissions scenario previously used for climate assessment.

Table 14.2: RCP pathways

RCP	Description
RCP2.6	Represents a pathway where GHG emissions are strongly reduced, resulting in a best estimate global average temperature rise of 1.6°C by 2100 compared to the pre-industrial period.
RCP4.5	Medium stabilisation pathway, with some level of mitigation, resulting in a best estimate global average temperature rise of 2.4°C by 2100 compared to the pre-industrial period.
RCP6.0	Medium stabilisation pathway, with some level of mitigation, resulting in a best estimate global average temperature rise of 2.8°C by 2100 compared to the pre-industrial period.
RCP8.5	A pathway where GHG emissions continue to grow unmitigated, leading to a best estimate global average temperature rise of 4.3°C by 2100 compared to the pre-industrial period.

14.5.8. IPCC provides evidence to suggest that current global population and urbanisation trends, slow uptake of renewable energy sources, delay in nuclear power growth, and slow development of international climate change policy means that it is most likely that global emissions will follow the predicted RCP8.5 pathway.

14.5.9. UKCP18 also allows for future climate projections across a range of probability levels to be assessed, ranging from 10% probability to 90% probability:

- 10% probability level – this demonstrates what the future change is unlikely to be less than. There is a 90% chance the projected change will be more than this.
- 50% probability level – this is known as the central estimate, with an even chance of it occurring and not occurring.
- 90% probability level – this demonstrates what the future change is unlikely to be more than. There is a 10% chance the projected change will be more than this.

14.5.10. Taking into account the expected design life of the proposed Scheme, the UKCP18 for the RCP8.5 pathway were applied to the location of the closest weather station to the proposed Scheme (Moseley Old Hall Weather Station). Table 14.3 summarises climate projections for the 2050s and 2080s time slices.

Table 14.3: Summary of climate projection for the 2050s and 2080s time slices

Climate Variable		2050s	2080s
Change in mean winter temperature (°C)	50% probability (central estimate)	+1.6°C	+3°C
	Range	+0.4 to + 2.9°C	+1.1 to +5°C
Change in mean summer temperature (°C)	50% probability (central estimate)	+2.3°C	+4.7°C
	Range	+0.7 to +3.9°C	+1.9 to +7.6°C
Precipitation rate anomaly in winter (%)	50% probability (central estimate)	+9%	+20%
	Range	-4 to +26%	+2 to +41%
Precipitation rate anomaly in summer (%)	50% probability (central estimate)	-21%	-35%
	Range	-43 to +1%	-51 to -6%

14.5.11. Staffordshire's Local Transport Plan (Ref. 14.7) refers to the likelihood of severe weather events such as flooding becoming more frequent in the future and outlines a number of associated issues relating to road networks.

In-combination Climate Impacts Assessment

14.5.12. The baseline conditions for the in-combination climate impacts assessment is the same as the baseline conditions defined for the climate resilience assessment, paragraphs 14.5.2 to 14.5.11.

14.6. Potential Impacts

14.6.1. Mitigation measures are being incorporated in the design and construction of the proposed Scheme; these are set out in Section 14.7. Prior to implementation of mitigation a summary of the potential air quality impacts (both beneficial and adverse) associated with the construction and operation of the proposed Scheme is outlined below.

Greenhouse Gas Impact Assessment

14.6.2. To assess GHG emissions arising from the construction and operation of the proposed Scheme a lifecycle assessment approach will be undertaken using design, construction and transportation data. This approach is consistent with the principles set out in BS EN 15804 (Ref. 14.8), PAS 2080 (Ref. 14.9) and IEMA guidance (Ref. 14.10). The key GHG emission sources considered in the GHG assessment are set out in Table 14.4 and Table 14.5 for the construction and operation stages, respectively.

Construction

14.6.3. Potential impacts during the construction phase of the proposed Scheme are presented in Table 14.4.

Table 14.4: Key anticipated construction GHG emissions sources - construction

Lifecycle stage	Activity	Primary emissions impacts
Pre-construction stage	Enabling works	GHG emissions from vehicles and fuel use for generators on site GHG emission from workers travelling to and from the site
Product stage	Raw material extraction and manufacturing of products required to build the proposed Scheme	Embodied GHG emissions i.e. GHG emissions from the extraction and manufacture of construction materials and products.
Construction process stage	On-site construction activity Transport of construction materials Transport of construction workers Disposal of any waste generated by construction processes	GHG emissions from vehicle use GHG emissions from disposal of waste

Operation

14.6.4. Potential impacts during the operation phase of the proposed Scheme are set out in Table 14.5.

Table 14.5: Key anticipated construction GHG emissions sources - operation

Lifecycle stage	Activity	Primary emissions impacts
Operation stage	Operation of associated road and signalling Maintenance including re-surfacing	GHG emissions from energy and fuel use Embodied emissions associated with re-surfacing materials
Use stage	Vehicle journeys	GHG emissions per vehicle km Energy consumption

Climate Resilience Assessment

14.6.5. The proposed Scheme has the potential to be impacted upon by a changing climate, including an increased frequency and severity of prolonged and heavy precipitation events, prolonged droughts and heatwaves, a greater frequency of very hot days, and an increased risk of storms. Warmer temperatures may also mean that the risks associated with ice and snow will decrease over time, but retaining the ability to respond to these events will remain important in the medium to longer-term (2050s and 2080s time slices). Potential impacts on the proposed Scheme during the construction and operational phases are set out in Table 14.6.

Table 14.6: Potential impacts of projected climate change and extreme weather impacts upon the resilience of the proposed Scheme

Climate variable projections	Impacts
Projected increase in mean summer and winter	• Heat damage, deformation, cracking and thermal expansion

Climate variable projections	Impacts
temperatures	• Overheating of electrical equipment • Corrosion of structures • Increased frequency of fog episodes • Changing travel patterns of network users • Longer vegetation growing season/ reduced soil moisture/ increased leaf coverage/ increased likelihood of tree fall • Increasing snow/ice melt leading to flooding
Projected increase in winter rainfall	• Damage to roads and drainage systems due to flooding • Surface water flooding and standing waters • Deterioration of structures due to soil moisture levels • Slope instability and landslides • Reduced visibility • Increased debris and mud on roads • Increased scour of roads and supporting structures
Projected decrease in winter snowfall	• Reduced ice loading on structures and requirement for snow clearance • Altered soil stability • Freeze-thaw causing increased pavement deterioration
Projected decrease in mean summer precipitation	• Drying out of road pavement/ structures
Projected increase in frequency and magnitude of storms/ wind	• Increased debris on the network • Damage to utilities • Increased road user disruption/ operational constraints • Increased wind gusts affecting tall structures

14.6.6. The risk assessment being undertaken considers the likelihood of a hazard occurring that could result in an impact on the infrastructure and assets associated with the proposed Scheme. The assessment of likelihood and consequence of impact considers existing or embedded resilience measures already in place or in development for infrastructure and assets. The risk assessment will identify the need for any additional resilience measures to protect against the effects of climate change where more significant risks are identified.

14.6.7. A flood risk assessment (FRA) is being undertaken to model the potential impacts faced by the proposed Scheme. These assessments consider the worst case scenario according to the latest Environment Agency guidelines utilising the upper end allowance category for the 2080s time period (2070-2115).

In-combination Climate Impact Assessment

14.6.8. The in-combination climate impact assessment will identify the impacts from climate change on receptors in the surrounding environment identified by other disciplines within the EIA. These will be specified in the ES.

14.7. Design, Mitigation and Enhancement Measures

Greenhouse Gas Impact Assessment

14.7.1. Environmental considerations will be taken into account during further development of the proposed Scheme design, including consideration of:

- A CEMP, to be prepared and implemented by the selected construction contractor, which would need to include a range of best practice construction measures outlining an environmental management framework, operational control procedures (for example development of a site waste management plan) as well as a pollution control contingency plan.
- Specification of materials with lower embodied GHG emissions such as locally sourced products and materials with a higher recycled content.
- Low carbon design specifications such as energy-efficient lighting and durable construction materials to reduce energy consumption and maintenance and decrease replacement cycles.

14.7.2. Further options to mitigate GHG emissions will be identified and considered as the design of the proposed Scheme emerges and will be confirmed in the ES.

Climate Resilience Assessment

14.7.3. A number of general mitigation and adaptation measures to address resilience risks are being considered, many of which will be addressed by other topic assessments and through the design of the proposed Scheme. This assessment assumes that the proposed Scheme will be designed to be resilient to impacts arising from current weather events and climatic conditions and in accordance with current planning, design and engineering practice and codes. Mitigation measures incorporated at this stage of design include Sustainable Urban Drainage Systems (SUDS) and a drainage design which could accommodate +40% runoff to account for climate change.

14.7.4. Further options to adapt the proposed Scheme for the potential impacts of climate change will be identified and considered as the design of the proposed Scheme is developed.

In-combination Climate Impacts Assessment

14.7.5. As in the climate resilience assessment, a number of general mitigation and adaptation measures will be considered, many of which will have been identified by other parts of the EIA and the proposed Scheme design.

14.8. Assessment of Effects

14.8.1. The NPSNN (Ref 14.1) states that it is unlikely that the impact of a single road development, such as the proposed Scheme, will affect the UK's ability to meet its overarching binding GHG reduction targets. However, as the UK's trajectory to this overall target is defined by a series of five year carbon budgets, it is also important to assess the GHG impact of the proposed Scheme against these budgets.

14.8.2. While the NPSNN does not specify significance criteria for GHG emissions, it does highlight the document 'Investing in Britain's Future' (Ref 14.11) which states that the programme of investment planned for the UK Strategic Road Network (SRN) would equate to below 0.1% of average annual carbon emissions allowed in the fourth carbon budget. This needs to be considered in the context of other policy around an increase in the use of electric vehicles and the decarbonisation of the national electricity grid.

14.8.3. The GHG impacts of the proposed Scheme should also be put into the wider context of the UK SRN. The length of the proposed Scheme (approximately 1.6 miles) represents less than 0.1% of the 4,400 mile UK SRN (Ref 14.12). Therefore, although it is important that the relative GHG impacts of the proposed Scheme designs are considered so that mitigation measures can be integrated into the

proposed Scheme, the overall increase is expected to be minimal when considered in the national context.

14.8.4. Of all the lifecycle stages scoped in to the assessment and shown in Table 14.4 and Table 14.5, the embodied carbon associated with materials use is likely to be the biggest contributor to the carbon footprint of the proposed Scheme. Materials such as steel, concrete and bitumen can have high embodied carbon contents depending on the specifications used. The assessment for the ES will identify the materials used and calculate the associated carbon emissions from their production as well as transport to site.

14.8.5. The ES will provide a comparison of the total emissions from the construction and maintenance of the proposed Scheme against national level carbon budgets and the associated five year reduction targets.

14.8.6. To put the impact of the proposed Scheme into context, total emissions will also be compared against other new road schemes within the SRN to benchmark GHG performance.

14.8.7. The five year carbon budgets and associated carbon reduction targets will already account for a proportion of carbon emissions resulting from the existing road network. The purpose of the GHG assessment is therefore to understand what additional emissions will arise as a result of the proposed Scheme in addition to those already predicted. GHG impacts from 'additional' road use will therefore be assessed by comparing a business as usual baseline (i.e. where the proposed Scheme is not built) against road use for the proposed Scheme. It should be noted however that not all journeys made on the new road would result in additional emissions to the associated carbon budget as it is likely that a proportion of these journeys would have been made anyway via different routes. In order to overcome this and provide a comparison a number of scenarios will be used, with the assessment conducted on this basis.

Climate Resilience Assessment

14.8.8. The proposed Scheme itself has been identified as being vulnerable to a range of climate risks during its use and its resilience to these impacts will be assessed on an ongoing basis as the design develops and further data becomes available. The ES will provide the outputs of the ongoing climate resilience assessment identifying the key impacts on the proposed Scheme and appropriate measures that will be implemented to mitigate these.

14.8.9. The proposed Scheme will be inherently designed to minimise the impacts of climate change on future use as far as is reasonably feasible. Potential impacts as a result of more extreme temperature fluctuations, an increase in the frequency of storms and the risk of more flash flooding would be mitigated through the design of the proposed Scheme and the selection of materials used for its construction and operational procedures. Scheme drainage for example will most likely be designed to be resilient to the increase in predicted levels of precipitation and to accommodate +40 percent runoff.

In-combination Climate Impacts Assessment

14.8.10. The combined effects of different environmental impacts from the proposed Scheme on a single receptor are determined when the environmental assessments for the separate environmental topics have been completed, and as such this data is not available at this stage. The likelihood of in-combination significant effects will be

reported in the ES, following completion of the individual environmental topic assessments.

15. ASSESSMENT OF CUMULATIVE EFFECTS

15.1. Introduction

15.1.1. The proposed Scheme has the potential to bring about combined and cumulative effects as a result of multiple impacts affecting a single receptor due to the proposed Scheme or in combination with affects from other developments. Potential effects from the proposed Scheme may not be significant in isolation, but when combined with another impact or multiple impacts on a single resource or receptor, the combined or cumulative effect could become significant.

15.1.2. The cumulative impact assessment is ongoing and will consider the following:

- **Combined effects**: the effect resulting from several different impacts from a single scheme (in this case the proposed Scheme) on a single receptor e.g. a single receptor being subject to noise, air quality and visual impacts associated with the proposed Scheme.
- **Cumulative effects**: the effect resulting from impacts of the proposed Scheme acting together with an impact or impacts associated with other proposed development schemes on a single receptor. This can be two similar impacts acting on a single receptor (such as increases in air quality emissions as a result of the proposed Scheme and another development), or two different impacts acting on a single receptor (such as an increase in air quality emissions from the proposed Scheme and an increase in noise levels from another development).

15.2. Assessment of Combined Effects

15.2.1. The main source of data for the intra-project combined effects assessment will be the outcomes and information obtained from the individual environmental topic assessments, which are currently ongoing as reported within the individual topic chapters of this PEI Report. It is currently anticipated that there would be combined dust, noise and visual impacts upon receptors in close proximity to the construction areas.

15.2.2. Mitigation and avoidance measures are currently being considered with the aim of reducing such impacts and the overall potential for combined effects. The potential for combined effects will be reported in the Environmental Statement (ES), following completion of the individual environmental topic assessments.

15.3. Assessment of Cumulative Effects

15.3.1. The Planning Inspectorate's Advice Note 17 on the assessment of cumulative effects identifies a four stage approach to the assessment of cumulative effects, as follows:

- Stage 1: establish the project's zone of influence (ZOI) and identify a long-list of 'other development';
- Stage 2: identify a shortlist of 'other development' for the cumulative impact assessment;
- Stage 3: information gathering; and
- Stage 4: assessment.

15.3.2. Further details regarding the proposed methods being used to identify potentially significant combined and cumulative effects are set out in Chapter 16 of the PCF Stage 3 EIA Scoping Report (Ref 15.1).

Proposed Zone of Influence (ZOI) for Environmental Topics Areas (Stage 1)

15.3.3. In accordance with the Planning Inspectorate's Advice Note 17, the study areas as identified within Chapters 5 to 14 will form the ZOIs for the assessment of cumulative effects.

15.3.4. The assessment of cumulative effects arising from the proposed Scheme in combination with other developments is based upon a review of current planning applications and local policy documents. The assessment is currently focussed on the identification of relevant developments and land allocations within the defined ZOIs which have the potential to generate potentially significant cumulative effects. Details of developments are currently being collated and placed on an initial long-list which identifies the size, type and location of each development. These long-list developments are being reviewed to assess their potential temporal and spatial interactions with the proposed Scheme in order to identify whether they should be scoped into the cumulative assessment – initial results from the short-listing exercise are detailed below.

15.3.5. Relevant developments, based on their likelihood and potential traffic contributions, are being included within the proposed Scheme traffic model. The traffic model will be used to inform the individual topic chapters which take account of proposed Scheme changes to traffic flow (e.g. air quality, noise and vibration and population and health). Thus the operational phase air, noise and vehicle severance impact assessment which will be reported in the ES will be an inherently cumulative assessment. Consideration is also being given to the inclusion of other Highways England schemes as part of the cumulative impacts assessment.

Short-listed Developments – Initial Stage 2 Findings

15.3.6. Based on a preliminary review of the current long-list of potential developments within defined ZOIs, the following are considered to have the potential to generate cumulative effects with the proposed Scheme (based on their temporal scope and/or scale and nature):

- West Midlands Interchange;
- Hilton Cross;
- i54 Site;
- four ashes development; and
- residential development, Hobnock Road, Essington.

15.3.7. It should be noted, however, that the long-list is still being reviewed and continually updated, hence further developments may be scoped into the assessment.

15.4. Next Steps

15.4.1. The initial long-list will be further collated and refined, aided by consultation with the relevant local planning authorities.

15.4.2. At Stage 2, any developments considered to have the potential to cause cumulative effects with the proposed scheme will be identified and placed on the short list. This process is ongoing and will be undertaken with input from the local planning authorities and the environmental topic specialists.

15.4.3. Stage 3 will involve the collation of information relating to the short-listed schemes, including their design and location, programme for construction/ operation and demolition, and any environmental assessments carried out.

15.4.4. Stage 4 involves the assessment and identification of potentially significant cumulative effects – this stage will be undertaken and reported in the ES.

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Ref 13.10 GPP 5: Works and maintenance in or near water for construction or maintenance works near, in, or over water

Ref 13.11 GPP 8: Safe storage and disposal of used oils

Ref 13.12 GPP 13: Vehicle washing and cleaning

Ref 13.13 GPP 21: Pollution Incident Response Plans

Ref 13.14 C522 (2001) Sustainable Urban Drainage Systems – Design manual for England and Wales

Ref 13.15 C523 (2001) Sustainable Urban Drainage Systems – Best practice manual for England, Scotland, Wales and Northern Ireland

Ref 13.16 C532 (2001) Control of water pollution from construction sites - Guidance for consultants and contractors, Scotland, Wales and Northern Ireland

Ref 13.17 C532 (2001) Control of water pollution from construction sites - Guidance for consultants and contractors, Scotland, Wales and Northern Ireland

Ref 13.18 C624 (2004) Development and flood risk – Guidance for the construction industry

Ref 13.19 C648 (2006) Control of Water Pollution from Linear Construction Sites – Technical Guidance

Ref 13.20 CIRIA (2015) C741 Environmental Good Practice on Site guide

Ref 14.1 Department for Transport (2014) National Policy Statement for National Networks

Ref 14.2 Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU

Ref 14.3 Highways England (2019) M54-M6/ M6 Toll Link Road: PCF Stage 3 EIA Scoping Report.

Ref 14.4 UK Climate Impacts programme (UKCIP) (2018) UK Climate Projections

Ref 14.5 The Met Office historic climate data. Weblink: https://www.metoffice.gov.uk/public/weather/climate/gcqe2n19b (Accessed 21/01/19).

Ref 14.6 IPCC (2014) Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp.

Ref 14.7 Staffordshire County Council (2011) Staffordshire Local Transport Plan 2011-2026

Ref 14.8 BS EN 15804:2012+A1:2013 – Sustainability of construction works, BSI

Ref 14.9 British Standards Institution (2011) PAS 2050:2011 Specification for the assessment of the life cycle greenhouse gas emissions of goods and services

Ref 14.10 Institute of Environmental Management and Assessment (2017) Environmental Impact Assessment Guide to: Assessing Greenhouse Gas Emissions and Evaluating their Significance

Ref 14.11 HM Treasury (2013) Investing in Britain's future

Ref 14.12 Department for Transport (2015) UK Strategic Road Network Statistics

ABBREVIATIONS

AADT	Annual Average Daily Traffic
ADMS	Atmospheric Dispersion Modelling System
AEP	Annual Exceedance Probability
AQMA	Air Quality Management Area
ALC	Agricultural Land Classification
AOD	Above Ordnance Datum
ARN	Affected Road Network
ASNW	Ancient Semi-Natural Woodland
AWVP	Ancient Woodland Vascular Plant
BAP	Biodiversity Action Plan
BAS	Biodiversity Action Site
bgl	Below ground level
BGS	British Geological Survey
BMV	Best and Most Versatile
CEMP	Construction Environmental Management Plan
CO_2	Carbon Dioxide
CIfA	Chartered Institute for Archaeologists
CL:AIRE	Contaminated land: Applications in Real Environments
dB	Decibel
DCO	Development Consent Order
Defra	Department for Environment Food and Rural Affairs
DfT	Department for Transport
DM	Do-Minimum
DMRB	Design Manual for Roads and Bridges
DS	Do-Something
EA	Environment Agency
EAR	Environmental Assessment Report
EC	European Commission
EIA	Environmental Impact Assessment
END	Environmental Noise Directive
ES	Environmental Statement
EU	European Union
FRA	Flood Risk Assessment
GHG	Greenhouse Gas
GIS	Geographical Information System
GLVIA	Guidelines for Landscape and Visual Impact Assessment

ha	hectares
HADDMS	Highways Agency Drainage Data Management System
HAPMS	Highways Agency Pavement Management System
HRA	Habitat Regulations Assessment
HDVs	Heavy Duty Vehicles
HECZ	Historic Environment Character Zone
HER	Historic Environment Record
HGVs	Heavy Goods Vehicles
HLA	Historic Landscape Area
IAQM	Institute of Air Quality Management
IAN	Interim Advice Note
IEMA	Institute of Environmental Management and Assessment
IP	Inter Peak
IPCC	Intergovernmental Panel on Climate Change
LAQM	Local Air Quality Management
LAQM.TG	Local Air Quality Management Technical Guidance
LCA	Landscape Character Area
LCT	Landscape Character Type
LGS	Local Geographical Sites
LLFA	Lead Local Flood Authority
LLT	Long Term Trend
LNR	Local Nature Reserve
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Site
NCA	National Character Area
NO_X	Nitrogen Oxides
NO_2	Nitrogen Dioxide
NPPF	National Planning Policy Framework
NPSNN	National Policy Statement for National Networks
NMU	Non-Motorised User
NRMM	Non-Road Mobile Machinery
NSIP	Nationally Significant Infrastructure Project
NTS	Non-Technical Summary
NVC	National Vegetation Classification
OEMP	Outline Environmental Management Plan
OP	Off Peak
PA 2008	Planning Act 2008
PAS	Publically Available Specification

PAWS	Plantation on Ancient Woodland Site
PCF	Project Control Framework
PCM	Pollution Climate Mapping
PEI	Preliminary Environmental Information
PM_{10}	Particle Matter 10 micrometers or less in diameter
PPG	Planning Practice Guidance
PRoW	Public Right of Way
RCP	Representative Concentration Pathway
SAC	Special Area of Conservation
SBI	Site of Biological Importance
SFRA	Strategic Flood Risk Assessment
SINC	Site of Importance for Nature Conservation
SNRHW	Selected Non-Reactive Hazardous Waste
SPA	Special Protection Area
SSSI	Site of Special Scientific Interest
STW	Severn Trent Water
SuDS	Sustainable Drainage Systems
SWMP	Site Waste Management Plan
TAG	Transport Analysis Guidance
UKCP09	UK Climate Projections published in 2009
UKCP18	UK Climate Projections published in 2018
UKCIP	UK Climate Impacts Programme
WebTAG	Web-based Transport Analysis Guidance
WFD	Water Framework Directive
ZOI	Zone of Influence
ZTV	Zone of Theoretical Visibility
$\mu g/m^3$	Microgram per cubic metre

GLOSSARY

Term	Definition
Above Ordnance Datum	Above the mean sea level at Newlyn in Cornwall calculated between 1915 and 1921, taken as a reference point for the height data on Ordnance Survey maps.
Accommodation Bridge	A bridge that replaces a pre-existing private road, path or right of access when a major transport route is built across it.
Affected Road Network	Parts of the road network which are identified as likely to be affected by changes in air quality as a result of a development project.
Agglomeration	An agglomeration is an urban area with a population in excess of 100,000 persons and a population density equal to or greater than 500 people per km^2.
Aggregate	Granular material (e.g. sand and gravel or crushed rock) that can be used for building and/or civil engineering purposes (e.g. for concrete production).
Agricultural Land Classification	The system devised and introduced by the Ministry of Agriculture, Fisheries and Food to classify agricultural land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. Land is graded between 1 (excellent quality) to 5 (very poor quality), with grade 3 subdivided into agricultural subgrades 3a and 3b.
Air quality exceedance	Where pollutant concentrations exceed an air quality standard.
Air quality limit value	A maximum pollutant concentration to be achieved in the atmosphere, either without exception or with a permitted number of exceedances. Limit values are defined in European Union Directives and implemented in United Kingdom legislation.
Air Quality Management Area	If a local authority identifies any locations within its boundaries where the air quality objectives are not likely to be achieved, it must declare the area as an air quality management area. The local authority is subsequently required to put together a local air quality action plan.
Air quality objective	Objectives are policy targets generally expressed as a maximum ambient pollutant concentration to be achieved. The objectives are set out in the UK Government's Air Quality Strategy for the key air pollutants.
Amenity	The benefits of enjoyment and well-being which are gained from a resource in line with its intended function. Amenity may be affected by a combination of factors such as: sound, noise and vibration; dust/air quality; traffic/congestion; and visual impacts.
Ancient Woodland	Land that has been continually wooded since at least the year 1600AD.
Annual Average	The total volume of vehicle traffic on a road flowing past a certain point

Term	Definition
Daily Traffic	over a year, divided by 365 days.
Annual Exceedance Probability	Flood frequency is expressed in terms of an annual exceedance probability, which is the inverse of the annual maximum return period. For example, the 100-year flood (a flood likely to occur once every 100 years) can be expressed as the 1% AEP flood, which has a 1% chance of being exceeded in any year.
Appropriate Assessment	An assessment of the effects of a plan or project on the Natura 2000 network of European sites of nature conservation significance. The assessment focuses on the plan or project's implications for the site and any potential adverse impacts on its integrity.
Aquifer	A geological formation that is sufficiently porous and permeable as to store and yield a significant quantity of water to a borehole, well or spring.
Area of Outstanding Natural Beauty	Land protected by the Countryside and Rights of Way Act 2000 (CROW Act). It protects the land to conserve and enhance its natural beauty.
Assemblage	A group of species found in the same location.
At-grade	On the same level. For example, when a road is on the current ground level.
Balancing pond	Part of a drainage system that is used for temporarily storing and attenuating flood waters. Also referred to as an Attenuation pond.
Baseline conditions	The environment as it appears (or would appear) immediately prior to the implementation of the project together with any known or foreseeable future changes that will take place before completion of the project.
Bedrock	Rock that underlies loose deposits such as soil or alluvium.
Best and most versatile land	Land defined as grades 1, 2 and 3a of the Agricultural Land Classification. This land is considered the most flexible, productive and efficient and is most capable of delivering crops for food and non-food uses.
Below ground level	Term used to differentiate below ground from above ground.
Biodiversity	The variety of life in the world or in a particular habitat or ecosystem.
Biodiversity Action Site	A non-statutory designation used by some local planning authorities to protect locally valued sites of biological diversity described as local wildlife sites by the UK Government.
Birmingham and the Black Country Ecological Record Centre	Database records for ecological species and sites in Birmingham and the Black Country.

Term	Definition
Borehole	A hole bored into the ground, usually as part of investigations, typically to test the depth and quality of soil, rock and groundwater. A borehole can also be used to dewater the ground.
British Geological Survey	A body which aims to advance geoscientific knowledge of the United Kingdom landmass and its continental shelf by means of systematic surveying, monitoring and research
British Standard	Standard produced by the British Standards Institution.
British Standards Institution	A group which produces British Standards across industry sectors and which is formally designated as the National Standards Body for the UK.
Built heritage	A structure or building of historic value. These structures are visible above ground level.
Bund	An embankment which acts as a visual or noise screen, or acts as a barrier to control the spillage of fluids.
Buried archaeology (or buried heritage)	An archaeological asset beneath ground level, which may include earthworks.
Calculation of Road Traffic Noise	A technical memorandum that describes the procedures for calculating noise from road traffic.
Carbon footprint	The total greenhouse gas emissions associated with a particular policy or development.
Carriageway	The width of a highway that can be used by motorised vehicles and non-motorised users.
Catchment	A drainage/basin area within which precipitation drains into a river system and eventually into the sea.
Circa	Meaning approximately, often used in a historic context in reference to a date.
Clay	An inorganic component of soil derived from the weathering of rock and comprising particles less than 0.002mm in equivalent diameter.
Climate	The climate can be described simply as the 'average weather', typically looked at over a period of 30 years. It can include temperature, rainfall, snow cover, or any other weather characteristic.
Climate change	This refers to a change in the state of the climate, which can be identified by changes in average climate characteristics which persist for an extended period, typically decades or longer.
Committed development	A development that has full or outline planning permission, or is allocated in an adopted development plan.
Conceptual Site Model	Method used to manage identification of the various types of risk relating to contaminated land. The conceptual site model includes: categorisation of sources of contamination; categorisation of potential

Term	Definition
	receptors; and identification of potential contamination pathways (i.e. linking sources to receptors).
Connectivity	A measure of the availability of the habitats needed for a particular species to move through a given area.
Conservation status	The state of a species or habitat including for example, extent, abundance, distribution and their trends.
Construction plant	Portable construction machinery and equipment.
Controlled waters	Rivers, streams, estuaries, lakes, canals, ditches, ponds and groundwater as far out as the UK territorial limit. The statutory definition is provided in section 104 (1) of the Water Resources Act 1991 and section 30A (d) of the Control of Pollution Act 1974.
Construction Environmental Management Plan	A plan prepared by a contractor which sets out how a construction project will avoid, minimise or mitigate effects on the environment and surrounding area and the protocols to be followed in implementing these measures, in accordance with environmental commitments.
Culvert	A tunnel (pipe or box shaped) that carries a stream or open drain under a road or railway.
Cumulative impact (or effect)	A cumulative impact (or effect) may arise as the result of: the combined impact of a number of different environmental topic-specific impacts from a single environmental impact assessment project on a single receptor/resource; and the combined impact of a number of different projects within the vicinity (in combination with the environmental impact assessment project) on a single receptor/resource.
Cutting (road)	Excavation of earth material to lower the ground level on which a road would be positioned, in order to help to reduce noise and/or visual impact.
Decibel	The scale used to measure noise is the decibel scale which extends from 0 to 140 decibels, corresponding to the intensity of the sound pressure level.
Decision-maker	The Secretary of State (in England).
Department for Environment, Foods & Rural Affairs	The Government department responsible for policy and regulations on environmental, food and rural issues. The department's priorities are to grow the rural economy, improve the environment and safeguard animal and plant health.
Deposition (dust)	The vertical passage of a substance (e.g. dust) to a surface or the ground.
Deposition (sediment)	The laying down of part, or all, of the sediment load of a stream on the bed, banks or floodplain which forms various sediment features such as bars, berms and floodplain deposits.

Term	Definition
Design-development	The process in which technical specialists (engineers and environmentalists) refine the design for the various elements of the proposed scheme.
Design Manual for Roads and Bridges	A set of documents that provide a comprehensive manual system which accommodates all current standards, advice notes and other published documents relating to the design, assessment and operation of trunk roads (including motorways).
Detailed assessment	Method applied to gain an in-depth appreciation of the beneficial and adverse consequences of the project and to inform project decisions. Detailed Assessments are likely to require detailed field surveys and/or quantified modelling techniques.
Development Consent Order	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Diffusion tube	Passive devices used in air quality monitoring to measure weekly or monthly average pollutant concentrations.
Directive	Legal obligations imposed on European member states by the European Union.
Do-Minimum	The conditions that would persist in the absence of the implementation of a construction or improvement project, but given that maintenance is ongoing.
Do-Something	The conditions that would occur as a consequence the implementation of a construction or improvement project.
Drift geology	Materials of glacial origin including sediments and large rocks derived from erosion, transportation and deposition by glaciers.
Driver stress	The adverse mental and physiological effects experienced by a driver traversing a road network. Factors influencing the level of stress include road layout and geometry, surface riding characteristics, junction frequency, and speed and flow.
Dust	All airborne particulate matter.
Earthworks	The removal or placement of soils and rocks such as in cuttings, embankments and environmental mitigation, including the in-situ improvement of soils/rocks to achieve the desired properties.
Ecological potential	Surface waters identified as Heavily Modified Water Bodies or Artificial Water Bodies must achieve 'good ecological potential' (good potential is a recognition that changes to morphology could make Good Ecological Status very difficult to achieve).
Ecological status	The state of a water body, derived from a number of factors, including: the abundance of aquatic flora and fauna, nutrient availability, salinity, temperature and chemical pollution levels.

Term	Definition
Ecosystem	Biological community of interacting organisms (e.g. plants and animals) and their environment.
Effect	Term used to express the consequence of an impact (expressed as the 'significance of effect'), which is determined by correlating the magnitude of the impact to the importance, or sensitivity, of the receptor or resource in accordance with defined significance criteria.
EIA Directive	Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment
EIA Regulations	The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
Embankment	Artificially raised ground, commonly made of earth material, such as stone, on which the carriageway is laid.
Enhancement	A measure that is over and above what is required to mitigate the adverse effects of a project.
Envirocheck	A provider of environmental data, reports and risk solutions for use in site-based assessments.
Environment Agency	Government agency established to protect and improve the environment and contribute to sustainable development in England. Responsibilities include: water quality and resources, flooding and coastal risk management and contaminated land.
Environmental Impact Assessment	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.
Environmental Statement	A document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
Erosion	The removal of sediment or bedrock from the bed or banks of a channel by flowing water occurring mostly during high flows and flood events. Forms various river features such as scour holes and steep outer banks.
International designated site	The generic term used to describe the following designated sites: Special Areas of Conservation (SACs) and Special Protection Areas (SPAs); Sites that are in the process of designation as SACs and SPAs -these are known as proposed SACs (pSACs), candidate SACs (cSACs), potential SPAs (pSPAs) and Sites of Community Importance (SCIs), depending on the type of designation and point of progression through the designation process; and Ramsar Sites.
Fill	Material used to artificially raise the existing ground levels.
Find spot	A term used to describe the location at which an archaeological find was

Term	Definition
	discovered.
Flood Zones 1, 2 and 3	A flood zone area classification system devised by the Environment Agency: Flood Zone 1: land outside the floodplain. There is little or no risk of flooding in this zone; Flood Zone 2: the area of the floodplain where there is a low to medium flood risk; and Flood Zone 3: the area of the floodplain where there is a high risk of flooding.
Floodplain	Land adjacent to a watercourse over which water flows or would flow in times of flood, but for defences in place.
Fluvial	A term that relates to rivers and streams and the processes that occur within them.
Formation (geological)	A group of related rock strata with some common properties.
Fragmentation (ecological)	The breaking up of a habitat, ecosystem or land use types into smaller parcels.
Future baseline	The situation that would prevail should a proposed development not proceed. Predicted impacts are compared against this theoretical scenario.
Geomorphology	The study of landforms and the processes which create them.
Geophysical survey	A process involving ground-based physical sensing techniques to determine the presence or absence of anomalies likely to be caused by archaeological features, structures or deposits.
Grade-separated junction	A type of junction where the major route (or routes) through the junction do not stop and do not cross any other road on the level. Movements to other roads are made using sliproads and bridges.
Green Belt	A designation for land around certain cities and large built-up areas, which aims to keep this land permanently open or largely undeveloped.
Greenhouse gases	Atmospheric gases such as carbon dioxide, methane, chlorofluorocarbons, nitrous oxide, ozone, and water vapour that absorb and emit infrared radiation emitted by the Earth's surface, the atmosphere and clouds.
Ground-borne vibration	Vibration generated by an event such as the pass-by vehicles in a tunnel, propagated through the ground or structure (i.e. not the air) into a receiving building.
Ground investigation	An intrusive investigation undertaken to collect information relating to the ground conditions, normally for geotechnical or land contamination purposes.

Term	Definition
Groundwater	All water which is below the surface of the ground and within the permanently saturated zone.
Groundwater source protection zone	Areas defined by the Environment Agency which show the risk from contamination/pollution to groundwater that is extracted for drinking water.
Habitat	The natural home or environment of an animal, plant, or other organism.
Haul road	A temporary road provided within a contractor's site area to allow for the movement of construction material, construction machinery and/or construction labour around the site.
Highways Agency Water Risk Assessment Tool	A spreadsheet based application used to determine whether highway runoff is likely to have an ecological impact on surface watercourses.
Heavy Duty Vehicle	See Heavy Goods Vehicle.
Heavy Goods Vehicle	A commercial carrier vehicle with a gross vehicle weight of more than 3.5 tonnes.
Hectare	A metric unit of measurement, equal to 2.471 acres or 10,000 square metres.
Heritage asset	A building, monument, site, place, area or landscape of historic value.
Highways England	The government agency responsible for the operation, maintenance and improvement of England's trunk roads and motorways.
Historic England	Executive non-departmental public body created under section 32 of the National Heritage Act 1983 to: secure the preservation of ancient monuments and historic buildings situated in England; promote the preservation and enhancement of the character and appearance of conservation areas situated in England; and promote the public's enjoyment of, and advance their knowledge of, ancient monuments and historic buildings situated in England and their preservation.
Historic Environmental Record	A record of all known archaeological finds and features and historic buildings and historic /landscape features, relating to all periods from the earliest human activity to the present day; maintained by each County and Unitary Authority in the United Kingdom.
Hoarding	A temporary fence erected around a construction site.
Hydrogeology	The nature, distribution and movement of groundwater in soils and rocks, including in aquifers.
Impact	Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).

Term	Definition
In-combination effects	In-combination effects arise where community or business establishments are affected by a combination of a number of environmental effects (for example, from sound, noise and vibration; dust and air quality).
Inert waste	Defined in Article 2(e) of EU Landfill Directive (1999/31/EC) as waste that does not undergo any significant physical, chemical or biological transformations: inert waste does not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health; and the total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and, in particular, do not endanger the quality of any surface water and/or groundwater.
Interim Advice Note	Guidance notes issued by Highways England which incorporate amendments or additions to the Design Manual for Roads and Bridges.
Invasive species	Non-native UK plants that are invasive, for example Japanese Knotweed.
Key characteristics (landscape)	The combination of elements that are particularly important to the current character of the landscape and help to give an area its particularly distinctive sense of place.
Landscape character area	Areas of landscape that have a broadly consistent pattern of topography, land use and vegetation cover.
Land use	What land is used for, based on broad categories of functional land cover, such as urban and industrial use and the different types of agriculture and forestry.
Landform	The shape and form of the land surface which has resulted from combinations of geology, geomorphology, slope, elevation and physical processes.
Laydown area	An area used for the temporary storage of construction equipment and supplies.
Link road	A section of road between two junctions.
Listed building	A building of special architectural or historic interest. Listed buildings are graded I, II* or II, with Grade I being the highest. Listing includes the interior as well as the exterior of the building.
Local Biodiversity Action Plan	A plan that identifies threatened species and habitats and seeks to protect and restore biological systems.
Local planning authority	The local authority or council that is empowered by law to exercise planning functions.
Local Geological	Non-statutory geological sites considered worthy of protection for their

Term	Definition
Site	earth science or landscape importance. Formerly known as Regionally Important Geological Sites.
Local Nature Reserve	A statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949 by principal local authorities. They are places with wildlife or geological features that are of special interest locally.
Local Wildlife Site	Non-statutory sites of nature conservation value that have been designated 'locally'. These sites are referred to differently between counties with common terms including site of importance for nature conservation, county wildlife site, site of biological importance, site of local importance and sites of metropolitan importance.
Made ground	Land where natural and undisturbed soils have largely been replaced by man-made or artificial materials. It may be composed of a variety of materials including imported natural soils and rocks with or without residues of industrial processes (such as ash) or demolition material (such as crushed brick or concrete).
Multi-Agency Geographic Information Service	A UK government website which provides geographic information about the natural environment.
Main River	A river maintained directly by the Environment Agency. They are generally larger arterial watercourses.
Metapopulation	A group of spatially separated populations of the same species which interact at some level.
Mitigation	Measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects.
Micron	One millionth of a metre.
Microgram	One millionth of a gram.
Monitoring	A continuing assessment of the performance of the project, including mitigation measures. This determines if effects occur as predicted or if operations remain within acceptable limits, and if mitigation measures are as effective as predicted.
Mineral safeguarding areas	Areas defined by mineral planning authorities with known mineral resources that are of identified economic or conservation value.
National Character Area	Areas of England defined by their unique combination of landscape, biodiversity, geodiversity, history and cultural an economic activity.
National Cycle Network	A national cycling route network of the United Kingdom, which was established to encourage cycling throughout Britain, as well as for the purposes of bicycle touring.
National Policy Statement	Statements prepared and designated by the Secretary of State under the Planning Act 2008, which establish national policy for Nationally

Term	Definition
	Significant Infrastructure Projects, including energy, transport and water, waste water and waste and against which applications for Development Consent Orders are assessed.
National Policy Statement for National Networks	A statement setting out the need for, and Government's policies to deliver, the development of nationally significant infrastructure projects on the national road and rail networks in England.
National Vegetation Classification	A comprehensive classification and description of the plant communities of Britain, administered by the Joint Nature Conservation Committee.
Nationally Significant Infrastructure Project	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
Natural England	Executive non-departmental public body constituted under the Natural Environment and Rural Communities Act 2006 (section 2(1)) to ensure that the natural environment is conserved, enhanced and managed for the benefit of present and future generations, thereby contributing to sustainable development.
Nitrogen dioxide	A gas produced when fuels are burned and is often present in motor vehicle and boiler exhaust fumes. It is an irritant to the respiratory system.
Nitrogen oxides	A group of chemical compounds consisting only of nitrogen and oxygen which may be interconverted in the atmosphere. The principal oxides of nitrogen are nitric oxide and nitrogen dioxide.
Noise barrier (or attenuation barrier)	A solid construction that reduces unwanted sound. It may take many forms including: engineering cutting; retaining wall; noise fence barrier; landscape earthworks; a 'low level' barrier on a viaduct; a parapet barrier on a viaduct; or any combination of these measures.
Noise Important Area	Are identified with respect to noise from major roads and from roads within agglomerations where 'the 1% of the population that are affected by the highest noise levels from major roads' are located according to the results of the strategic noise mapping.
Noise Sensitive Receptor	These comprise mainly residential buildings, but also include educational buildings, hospitals and places of worship.
Non-hazardous waste	Any waste not defined as 'hazardous' under Directive 91/689/EEC. Examples include soils from ground/site clearance and demolition wastes.
Non-motorised users	A collective term used to describe pedestrians, cyclists and equestrians (horse riders).
Non-Technical Summary	Information for the non-specialist reader to enable them to understand the main predicted environmental effects of the proposal without reference to the main Environmental Statement.

Term	Definition
Notable species	Notable species are taken as principal species for the conservation of biodiversity listed under Section 41 of the Natural Environment and Rural Communities Act 2006; any species listed in an IUCN Red Data Book; and any other species listed under the Staffordshire Biodiversity Action Plan.
Operational	The functioning of a project on completion of construction.
Ordnance Survey	The national mapping agency for the UK.
Outline Construction Environmental Management Plan	A framework document which sets out the matters that the contractor will need to include in their Construction Environmental Management Plan.
Overbridge	A bridge crossing over a transport corridor (e.g. a highway).
Particulate matter	Discrete particles in ambient air, with diameters ranging between nanometres (billionths of a metre) to micrometres (millionths of a metre).
Pathways	The routes by which pollutants are transmitted through air, water, soils, plants and organisms to their receptors.
Phase 1 habitat survey	A habitat classification and field survey technique to record semi-natural vegetation and other wildlife habitats.
Photomontage	Inserting an image of a proposed development onto a photograph for the purposes of creating an illustrative representation of potential changes to existing views.
Planning Act 2008	An Act of Parliament in the UK intended to accelerate the process of approving major new infrastructure projects.
Pollution prevention guidance	A series of guidance notes produced by the Environment Agency to advise industry and the public on legal responsibilities and good environmental practice.
Potential Local Wildlife Site	An area being considered against defined nature conservation value criteria. This criteria takes into account the most important, distinctive and threatened species and habitats. If considered suitable pLWS are confirmed as LWS. See LWS.
Preliminary Environmental Information	The information referred to in Part 1 of Schedule 4 of the EIA Regulations that has been reasonably compiled by the applicant, and is reasonably required to assess the environmental effects of a development project.
Preferred route	The chosen design option that most successfully achieves the project objectives and becomes subject to further design and assessment.
Preferred Route Announcement	An announcement made by Highways England following the selection of a preferred option or solution for a given road project.
Priority habitat	Priority habitats are taken as principal habitats for the conservation of

Term	Definition
	biodiversity listed under Section 41 of the Natural Environment and Rural Communities Act 2006.
Project Control Framework	A joint Department for Transport and Highways England approach to developing, delivering and managing major road projects.
proposed Scheme	The M54 to M6 Link Road
Public right of way	A highway where the public has the right to walk. It can be a footpath (used for walking), a bridleway (used for walking, riding a horse and cycling), or a byway that is open to all traffic (include motor vehicles).
Ramsar (site)	Wetland sites that are of international importance, as designated under Article 2(1) of the Convention on Wetlands of International Importance especially as Waterfowl Habitat. Ramsar (Iran), 2 February 1971. UN Treaty Series No. 14583.
Receptor	A defined individual environmental feature usually associated with population, fauna and flora that has potential to be affected by a project.
Regionally Important Geological Sites	Locally designated sites of importance for geodiversity.
Remediation	The process of removing a pollution linkage (i.e. by removing one or more of the elements in a source-pathway-receptor linkage) in contaminated land in order to render an acceptable risk. Usually this involves a degree of removal of contaminants and/ or blockage of pathways.
Resource	A defined but generally collective environmental feature usually associated with soil, water, air, climatic factors, landscape, material assets, including the architectural and archaeological heritage that has potential to be affected by a project.
Restoration (ecological)	The re-establishment of a damaged or degraded system or habitat to a level similar to its original condition.
Road Investment Strategy	A document which sets out a long-term vision for England's motorways and major roads, outlining how smooth, smart and sustainable roads will be achieved through investment over a five year period (2015 – 2020).
Risk assessment	An assessment of the probability of a hazard occurring that could result in an impact.
Runoff	The flow of water over the ground surface.
Sand	Soil particles from 0.06mm-2.0mm in equivalent diameter. Fine sand particles are from 0.06mm-0.2mm; medium sand from 0.2mm-0.6mm; and coarse sand from 0.6mm-2.0mm.
Scheduled Monument	Nationally significant heritage assets protected by the 1979 Ancient Monuments and Archaeological Areas Act.

Term	Definition
Scoping	The process of identifying the issues to be addressed by the Environmental Impact Assessment process. It is a method of ensuring that an assessment focuses on the important issues and avoids those that are considered to be not significant.
Scoping Opinion	A written opinion of the relevant authority, following a request from the applicant for planning permission, as to the information to be provided in an Environmental Statement.
Secondary aquifer	There are two types of secondary aquifer designations: Secondary A: permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers; and Secondary B: predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Secretary of State	The cabinet minister who (among other things) ultimately determines applications for Development Consent Orders.
Sediment	Organic and inorganic material that has precipitated from water to accumulate on the floor of a water body, watercourse or trap.
Setting (cultural heritage)	The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive, negative or neutral contribution to the significance of an asset and may affect the ability to appreciate it.
Severance (non-motorised users)	The perceived separation of residents from facilities and services they use within their community caused by new or improved roads, or by changes in traffic flows.
Severance (land)	The splitting of a land holding into more than one part, for example through the introduction of a new section of road.
Significance (of effect)	A measure of the importance or gravity of the environmental effect, defined by significance criteria specific to the environmental topic.
Silt	Soil particles from 0.002mm to less than 0.06mm in equivalent diameter.
Site of Biological Importance	A non-statutory designation used by some local planning authorities to protect locally valued sites of biological diversity described as local wildlife sites by the UK Government.
Site of Importance for Nature Conservation	A designation used by local planning authorities in the UK to protect sites of substantive local nature conservation.
Site of Special	Area of land notified by Natural England under section 28 of the Wildlife and Countryside Act 1981 as being of special interest due to its flora,

Term	Definition
Scientific Interest	fauna or geological or physiological features.
Site Waste Management Plan	A plan that is used to outline how a construction project will avoid, minimise or mitigate effects on waste production and handling on the environment and surrounding area.
Soil	The upper layer of the earth's crust, in which plants grow. It consists of weathered rock, organic matter, air spaces and water. Descriptions usually identify the relevant characteristics of its (usually) horizontal layers in terms of their significance for soil characteristics and crop growth, usually to a depth of 1.2m.
Soil erosion	The detachment and movement of soil by the action of water and/or wind.
South Staffordshire District Council	The local authority within whose jurisdiction the proposed scheme would be implemented.
Staffordshire County Council	The local authority within whose jurisdiction the proposed scheme would be implemented.
Stakeholder	An organisation or individual with a particular interest in a development project.
Statutory consultee	Organisations that the relevant determining authority is required to consult by virtue of the EIA Regulations
Strategic Road Network	Motorways and major trunk roads in England.
Study area	The spatial area within which environmental effects are assessed (i.e. extending a distance from the project footprint in which significant environmental effects are anticipated to occur).
Subsoil	Weathered soil layer extending between the natural topsoil and the unweathered basal layer (geological parent material) below, or similar material on which topsoil can be spread. Subsoil has lower organic matter and plant nutrient content than topsoil. In most cases topsoils require a subsoil to perform one or a number of natural soil functions.
Superficial deposit	A geological deposit that was laid down during the Quaternary period. Such deposits were largely formed by river, marine or glacial processes but can also include wind-blown deposits known as loess.
Surface water	Waters including rivers, lakes, loughs, reservoirs, canals, streams, ditches, coastal waters and estuaries.
Sustainable drainage systems	Measures designed to control surface runoff close to its source, including management practices and control measures such as storage tanks, basins, swales, ponds and lakes. Sustainable drainage systems allow a gradual release of water and thereby reduce the potential for downstream flooding.

Term	Definition
Till	Unsorted glacial sediment deposited directly by a glacier.
Topsoil	Upper layer of a soil profile, usually darker in colour (because of its higher organic matter content) and more fertile than subsoil, and which is a product of natural biological and environmental processes.
Translocation	Transporting and release of species or habitats from one location to another. For example, if an area of land is required permanently for a new development; species can be moved from that site to a suitable alternative location.
Vehicle movement	A journey made by a vehicle. This can either be a one way or two way trip.
Viewpoint	A place from which something can be viewed.
Visual amenity	The overall pleasantness of the views people enjoy of their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of the people living, working, recreating, visiting or travelling through an area.
Visual receptor	People who may have a view of a proposed development during construction or operation.
Zone of Influence	The temporal and spatial influence of a development project.
Zone of theoretical visibility	The likely (or theoretical) extent of visibility of a development, usually shown on a map.