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20 October 2017

Dear Gareth Leigh

M42 Junction 6 Improvement ("the Development")
The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 – Regulation 10(1) Application for a Scoping Opinion

I write with reference to the above Development, for which we intend to apply for development consent under the Planning Act 2008.

With reference to Regulation 10(1) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 ("EIA Regulations 2017"), I write to apply for a scoping opinion from the Secretary of State in respect of the Development.

Please find enclosed the information required under Regulation 10(3) of the EIA Regulations 2017.

For the purpose of your duties under Regulation 11(1)(a) of the EIA Regulations 2017, the name and address of the Applicant (Highways England) for the Development are:

> Jonathan Pizzey
> M42 Junction 6 Improvement
> Highways England
> The Cube
> 199 Wharfside Street
> Birmingham
> B1 1RN

Yours sincerely

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M42 Junction 6 Improvement Scheme

Environmental Impact Assessment Scoping Report

Report Number: HE551485-ACM-EAC-M42_SW_ZZ_ZZ-RP-LE-0001-P02 S4
October 2017

M42 Junction 6 Improvement Scheme

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October 2017

Issue No	Current Status	Date	Prepared By	Reviewed By	Approved By
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1. INTRODUCTION

1.1. Overview

1.1.1. AECOM Infrastructure and Environment UK Ltd (AECOM) has been commissioned by Highways England to provide design services for the development of the M42 Junction 6 Improvement Scheme (referred to herein as the proposed scheme).

1.1.2. The M42 Junction 6 provides connections between the national motorway network, and A45 Coventry Road which provides strategic access to Birmingham to the west, and Coventry to the east. Junction 6 lies on the eastern edge of Birmingham, approximately nine miles from the city centre, with the nearest town being Solihull.

1.1.3. The proposed scheme includes the following five main elements:

- A new dumbbell junction approximately 1.8km south of the existing Junction 6 off the M42;
- The construction of a new, 2.4km dual carriageway link road between the new Junction and Clock Interchange (an existing junction on the A45);
- Modifications to the existing Clock Interchange junction;
- Upgrades to the existing Junction 6; in addition to,
- Realignments and improvements to local roads to the west of the existing M42 in proximity to the proposed bypass.

1.1.4. The 'Road Investment Strategy: for the 2015/16 – 2019/20 Road Period' (RIS1)[1], published 12/03/2015, indicated the project as a committed new scheme first announced in Autumn Statement 2014 (AS14), stating that the M42 Junction 6 scheme is a "*comprehensive upgrade of the M42 Junction 6 near Birmingham Airport, allowing better movement of traffic on and off the A45, supporting access to the airport and preparing capacity for the new HS2 station*."

1.1.5. The Highways England 'Delivery Plan 2015-2020' (published 26/03/2015) states that Highways England "*will be developing the options in more detail and preparing the scheme for public consultation in 2016, this will take into account planned station developments linked to High Speed 2.*" It also stated that Highways England "*anticipate being able to recommend a preferred route in early 2017. We are planning to start construction in 2020.*"

1.1.6. The proposed scheme forms part of a much larger Government / HS2 Growth Strategy being developed with local partners to maximise the economic benefits of HS2.

1.1.7. The proposed scheme would help facilitate significant economic growth in the area given that it would lie at the heart of an area of dynamic growth, surrounded by a unique mix of existing and proposed major assets serving both the local and wider economy. Junction 6 is the gateway to Birmingham Airport, Birmingham International Network Rail Station, the Birmingham National Exhibition Centre (NEC), the National Motorcycle Museum and National Conference Centre, Birmingham Business Park and Jaguar Land Rover (JLR).

1.1.8. In addition to the committed growth in the area, HS2's Birmingham Interchange station is anticipated to be operational by 2026, and Solihull Metropolitan Borough Council (SMBC) has ambitious plans to accommodate mixed use

[1] https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/408514/ris-for-2015-16-road-period-web-version.pdf

development at the UK Central Hub area (UKC)[2]. Collectively these developments will continue to add significant demand to the highway network and increase dependence on Junction 6.

1.1.9. Current congestion and journey reliability issues on the M42 and at Junction 6 present a significant constraint to future investment and economic growth. Without infrastructure investment to improve Junction 6, a major investment opportunity of national significance could be lost.

1.1.10. The proposed scheme constitutes a 'nationally significant infrastructure project' (NSIP) as defined in Section 14(1)(h) and 22(4) of the Planning Act 2008 (as amended).

1.1.11. The proposed scheme is being subject to formal Environmental Impact Assessment (EIA) procedures, as set out within The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (hereafter the 'EIA Regulations'), because it:

- is listed within Schedule 2 Regulation 3(1) Part 10 (f) Construction of roads; and
- has the potential to generate significant environmental effects by virtue of its nature, scale and location.

1.1.12. Highways England intends to make an application for a Development Consent Order (DCO) to the Planning Inspectorate (PINS). The Secretary of State will then make a decision on whether to grant or refuse development consent for the proposed scheme.

1.1.13. Highways England follows a Project Control Framework[3] (PCF) to deliver major infrastructure projects such as the proposed scheme. The PCF comprises: i) a standard project lifecycle; ii) standard project deliverables; iii) project control processes; iv) governance arrangements. All major road projects are progressed through the PCF which is split into seven discrete phases as illustrated in Table 1.1.

Table 1.1: Major Projects Lifecycle According to the Highways England PCF[2]

1.1.14. The Preferred Route Announcement (PRA) for the proposed scheme occurred on 7 August 2017 bringing an end to PCF Stage 2. The proposed scheme is now at PCF Stage 3 which, for NSIP highway schemes, entails the preparation of a draft Planning Act 2008 DCO and the preparation of an Environmental Statement reporting the outcomes of the EIA process.

[2] The Urban Growth Company (UGC) a new delivery vehicle formed by SMBC to oversee the investment into the UK Central Hub area (UKC), (previously known as the M42 Economic Gateway. The UGC role is to promote, lead and develop major infrastructure investment within the UKC to facilitate wider development within the Solihull / West Midlands geographic area.
[3] http://assets.highways.gov.uk/our-road-network/managing-our-roads/project-control-framework/The%20project%20control%20framework%20handbook%20v2%20April%202013.pdf

1.2. Project Location

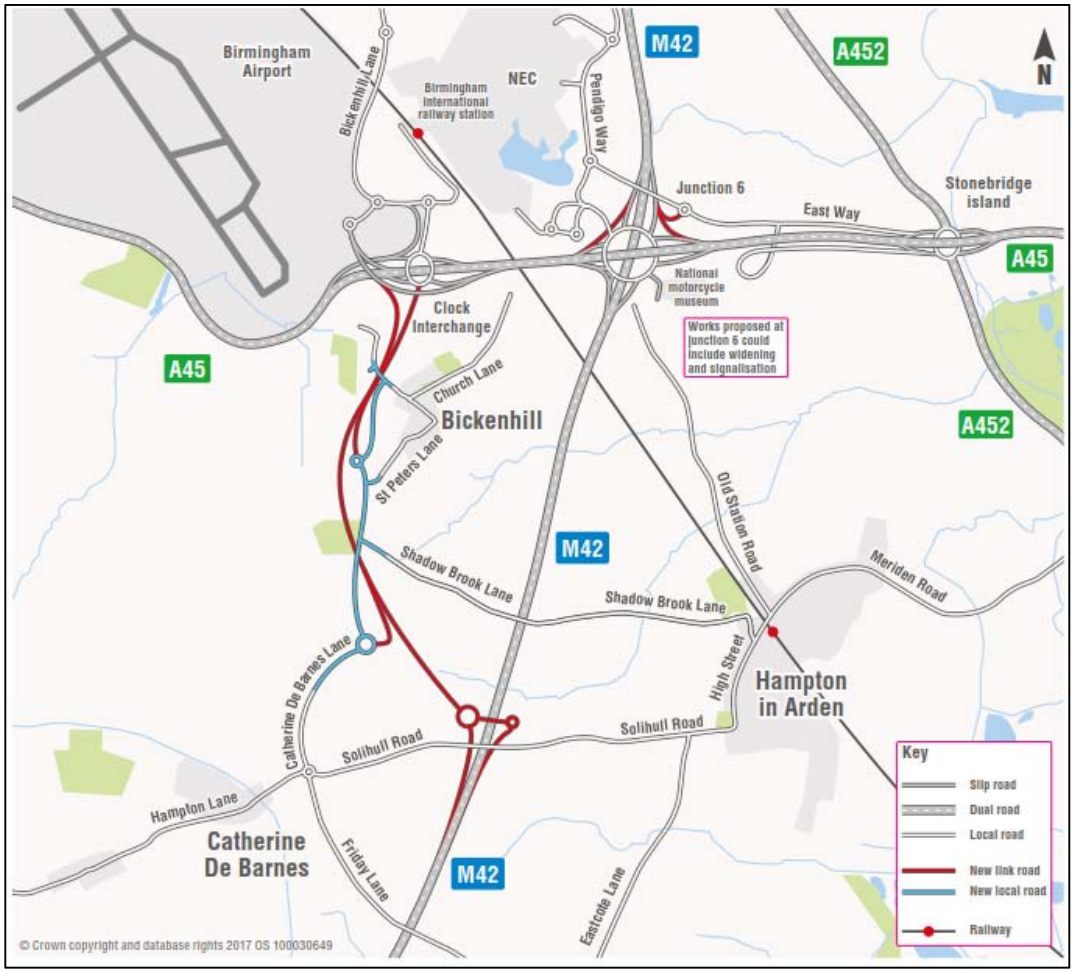
1.2.1. The proposed scheme would be located to the west of the existing M42 Junction 6 (refer to Plate 1) in the area of green belt between Junction 5 and Junction 6 and would involve tie-in points to the existing Strategic Road Network (SRN) at the following locations: M42 Clock Interchange (SP: 18778 82970) and a proposed junction (SP: 19307 81306); and junction enhancements at the existing M42 Junction 6 (SP: 19819 83061).

1.2.2. The M42 Junction 6 provides connections between the national motorway network, and A45 Coventry Road which provides strategic access to Birmingham to the west, and Coventry to the east. Junction 6 lies on the eastern edge of Birmingham, approximately nine miles from the city centre, with the nearest town being Solihull.

1.2.3. M42 Junction 6 lies at the heart of an area of dynamic growth and is surrounded by a unique mix of major assets that serve both the local and wider economy. It is located north of Solihull and provides the main access to Birmingham Airport, the NEC, Birmingham Business Park and JLR. As part of the wider economic development of the area, a planning application[4] for a proposed Motorway Service Area (MSA) has been submitted to SMBC by Extra Evergreen for determination. If the MSA is granted consent, this development would integrate into the proposed scheme works. However, if the MSA is refused consent, the proposed scheme would be constructed with minor alterations to the new southern junction roundabouts.

[4] https://publicaccess.solihull.gov.uk/online-applications/applicationDetails.do?activeTab=documents&keyVal=NQRLYUOEHYP00

Plate 1: M42 Junction 6 - Location Plan / Preferred Route



1.2.4. The proposed scheme is located within the administrative boundary of SMBC.

1.2.5. The location and provisional DCO red line boundary of the proposed scheme is illustrated on Figure 1.1 which shows both potential temporary and permanent land take requirements. In accordance with the guidance provided in PINS Advice Note 9 – Rochdale Envelope[5], the current DCO red line boundary has been drawn at this stage to allow design flexibility as the design process is ongoing. As such, it is not possible at this time to define the precise land take requirements of the proposed scheme. Figure 1.1 is intended to show the potential worst-case scenario, including candidate sites that may be required for site compounds, soil storage and provisions for materials, flood compensation areas and areas needed for ecological compensation, based on current knowledge and available information. As such, the red line boundary as included herein will be subject to review and revision, but will be finalised prior to making the DCO application.

1.2.6. The main characteristics of the proposed scheme are described in Chapter 2: Characteristics of the Development, which also provides details of local conditions associated with the proposed scheme.

[5] https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/05/Advice-note-9.-Rochdale-envelope-web.pdf

1.3. The Overseeing Organisation

1.3.1. The Overseeing Organisation is Highways England, The Cube, 199 Wharfside Street, Birmingham. Highways England has been consulted during all stages of the proposed scheme design process to ensure that both the approach and level of assessment as detailed herein are appropriate. As the Overseeing Organisation, Highways England defines the proposed scheme objectives as detailed in Section 2.3.

1.4. The Designer

1.4.1. The designer for the proposed scheme is AECOM, Royal Court, Basil Close, Chesterfield, Derbyshire, S41 7SL. The role of the designer includes preparation of the proposed scheme design, environmental assessment, stakeholder consultation and preparation of the DCO application.

1.4.2. The EIA Regulations state that in order to ensure the completeness and quality of an Environmental Statement:

a) the applicant must ensure that the Environmental Statement is prepared by competent experts; and
b) the Environmental Statement must be accompanied by a statement from the applicant outlining the relevant expertise or qualifications of such experts.

1.4.3. AECOM has a large multidisciplinary environmental team with appropriately qualified discipline leads across the subjects detailed within this Scoping Report. In addition, the Environment Lead is a full member of the Institute of Environmental Management and Assessment (IEMA) and a Chartered Environmentalist. Accordingly, it is considered that the requirements of the EIA Regulations will be complied with.

1.5. Purpose of the Scoping Report

1.5.1. The statutory EIA of the proposed scheme will be undertaken in accordance with the EIA Regulations and will be submitted with the DCO application in accordance with Regulation 5 (2)(a) of The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009 ('APFP Regulations').

1.5.2. Prior to submitting an application for a DCO, applicants have the opportunity to ask the Secretary of State for a formal written opinion on the information to be included in the Environmental Statement. This is known as a scoping opinion. Scoping is a key stage in the EIA process, the purpose of which is to set out the actions to be undertaken, and the methodologies to be applied, in order to identify the potential environmental effects of a development (to be reported in the Environmental Statement).

1.5.3. This EIA Scoping Report sets out the proposed level and scope of environmental assessment work to be undertaken to understand the existing environmental conditions associated with the proposed scheme location, and assess how the proposed scheme is likely to affect the environment. It documents the findings of an environmental scoping exercise, taking into account guidance presented in the Design Manual for Roads and Bridges (DMRB) Volume 11, Interim Advice Note (IAN) 125/15 and PINs Advice Note 7: Environmental Impact Assessment: Preliminary Environmental Information, Screening and Scoping[6].

1.5.4. Following receipt of a scoping request, the Secretary of State must adopt a scoping opinion within 42 days of receiving a scoping request. Before adopting a

[6] https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/03/Advice-note-7v4.pdf

scoping opinion, the Secretary of State must consult the prescribed consultation bodies, who have 28 days to respond[7]. The Secretary of State may also consult relevant non-prescribed consultation bodies identified in PINS Advice Note 3: EIA Notification and Consultation[8], who would also be given 28 days to respond. Responses received after the 28 day deadline will not be considered within the Secretary of State's scoping opinion, but will be forwarded to the applicant for their consideration.

1.5.5. As Highways England intend to submit an Environmental Statement within the DCO application, the submission of this EIA Scoping Report constitutes formal notification under Regulation 6(1) of the EIA Regulations that it proposes to provide an Environmental Statement in respect of the proposed scheme.

1.5.6. Following receipt of the scoping opinion from the Secretary of State, the EIA process will be reported in two stages, as follows:

- A Preliminary Environmental Information Report (PEIR) will be prepared to inform consultation with the community about the proposed scheme.
- Following consultation with the community, an Environmental Statement will be prepared to accompany the DCO application.

1.6. Structure and Content of the Scoping Report

1.6.1. This EIA Scoping Report has been prepared as part of a request to PINS for a formal scoping opinion on the information to be provided in the Environmental Statement, pursuant to Regulation 10 of the EIA Regulations.

1.6.2. Chapter 4: Environmental Impact Assessment Approach describes the approach that will be employed to undertake the EIA. It includes a description of the general assessment methodology that relevant topics will follow. It also describes the criteria by which the magnitude of potential impacts are to be quantified, and how the relative significance of effects will be categorised (and the thresholds at which an environmental effect is considered to be significant).

1.6.3. In accordance with IAN 125/15, and requirements of the EIA Regulations, this EIA Scoping Report considers the following technical issues:

- Air quality;
- Cultural heritage;
- Landscape and visual effects;
- Biodiversity;
- Geology and soils;
- Materials;
- Noise and vibration;
- People and communities;
- Road drainage and the water environment;
- Climate; and
- Combined and cumulative effects.

1.6.4. Chapters 5 through to 15 consider the technical environmental topics as detailed above, with each section structured as follows.

- Introduction;
- Summary of Relevant Policy;
- The Study Area;

[7] Regulation 8(11) of the EIA Regulations
[8] https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/07/advice_note_3_v5.pdf

- Baseline Conditions;
- Additional Survey Requirements;
- Value of Environmental and Resource Receptors;
- Potential Impacts and Effects;
- Proposed Scope of Assessment; and
- Proposed Assessment Methodology including Significance.

1.6.5. Table 1.2 presents a list of information to be included in an EIA Scoping Report, as prescribed by Regulation 10 of the EIA Regulations and the information that should be included to inform the scoping report as highlighted in PINS Advice Note 7 'Environmental Impact Assessment: Screening, Scoping and Preliminary Environmental Information'[9], and the location in this report where such information is presented.

Table 1.2: Information provided in the EIA Scoping Report (based on Advice Note 7)

Description of Information Required	Section in EIA Scoping Report where Information is Presented
A plan showing: • The DCO site boundary and associated development; • Permanent land take required for the NSIP; • Temporary land take required for construction, including construction compounds; • Existing infrastructure which would be retained or upgraded for use as part of the NSIP; • Existing infrastructure which would be removed; and • Features including planning constraints and designated areas on and around the site, such as national parks or historic landscapes.	Figure 1.1 provides a red line boundary for the proposed scheme, illustrating both temporary and permanent land take requirements. This figure depicts the potential worst-case scenario, including candidate sites that may be required for site compounds, soil storage and provisions for materials, flood compensation areas and areas needed for ecological compensation, as based on current knowledge. Also refer to Figure HE554185-ACM-GEN-M42_GEN_ZZ_ZZ-DR-CH-0001-0008 (proposed scheme drawings).
A description of: • The NSIP site; • The NSIP development; and • Its possible effects on the environment.	Chapter 2 (Characteristics of the Development) Chapter 4 (Environmental Impact Assessment Approach) – also refer to Chapters 5 to 15 for details of previous environmental assessment stages.
An outline of the main alternatives considered and the reasons for selecting a preferred option.	Chapter 3 (Scheme History and Alternatives).
Results of desktop and baseline studies where available.	Refer to Baseline section within Chapters 5 to 15.
Guidance and best practice to be relied upon, and whether this has been agreed with the relevant bodies.	Refer to Proposed Assessment Methodology including Significance section within Chapters 5 to 15.

[9] https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/

Description of Information Required	Section in EIA Scoping Report where Information is Presented
Methods used or proposed to be used to predict impacts and the significance criteria framework used.	Refer to Proposed Assessment Methodology including Significance section within Chapters 5 to 15.
Any mitigation proposed and predicted residual impacts.	Refer to Potential Impacts and Effects section within Chapters 5 to 15.
Where consequential or cumulative development has been identified, how the developer intends to assess these impacts in the Environmental Statement.	Chapter 15 (Consideration of Combined and Cumulative Effects).
An indication of any European designated nature conservation sites that are likely to be significantly affected by the proposed development and the nature of the likely significant impacts on these sites.	Chapter 8 (Biodiversity).
Where a developer seeks to scope out matters, a full justification for scoping out such matters.	See box below.
Transboundary effects	A screening matrix which details the consideration of potential transboundary effects is provided in Appendix 1.2 of this EIA Scoping Report. This is provided as information for PINS to confirm that no significant potential transboundary effects have currently been identified.
Key topics covered as part of the developer's scoping exercise.	Table 4.1 in Chapter 4: Environmental Impact Assessment Approach sets out the rationale for why certain environmental topics are included or excluded from the scoping exercise reported within this document, taking account of the characteristics of the development. Chapters 5 to 15 also provide specific details regarding aspects that have been scoped out of the assessment.
An outline of the structure of the proposed Environmental Statement	A proposed outline structure of the Environmental Statement is provided in Chapter 16 (Table 16.2).

1.7. Abbreviations and Acronyms

1.7.1. Efforts have been made to minimise the use of abbreviations, acronyms and technical language in this EIA Scoping Report. However, the use of some acronyms is unavoidable. Furthermore, some of the terminology used within this report may be unfamiliar with readers less accustomed to reading reports related to EIA and engineering design. Therefore, whilst terms are defined within the text itself, there is also an abbreviation list at the back of this report for convenience (see Chapter 18).

2. CHARACTERISTICS OF THE DEVELOPMENT

2.1. Background to the Proposed Scheme

2.1.1. The M42 Motorway is part of the SRN in the West Midlands. It provides links the M6, M6 Toll and M5 motorways. The M42 passes to the east and south of Birmingham, and forms the southern and eastern arms of the 'Birmingham Box'. This section of the SRN is seen as an essential interchange in an area identified for economic growth and substantial development opportunities.

2.1.2. Junction 6 serves a number of key strategic economic assets for both the local and wider community. These assets include Birmingham Airport, the NEC, Resorts World, JLR, Birmingham International Railway Station, the National Motorcycle Museum & Conference Centre (NMM) and Birmingham Business Park. In addition to these major assets, the area adjacent to M42 Junction 6 (immediately north-east of junction) is earmarked for development by SMBC as a proposed UK Central development which will also contain the Birmingham International HS2 railway station.

2.1.3. Given the immediate links to HS2, this region is expected to accommodate significant housing and employment growth. As a result, the traffic demands on the M42 and Junction 6 are forecast to grow quicker than the national average. Consequently, existing delays at the junction are anticipated to worsen due to increasing levels of traffic.

2.2. The Existing SRN and Junctions and their Associated Problems

M42 Junction 6 and Approach to the Junction

2.2.1. Junction 6 is a four-arm roundabout junction constructed within the topography of the surrounding environment. As such, the junction is above grade over the M42 motorway with the eastern extent of the junction being below grade beneath the Coventry Road (A45), and to the western extent above grave over the Coventry Road (A45).

2.2.2. In terms of access and egress points, the junction and motorway tie in through a number of on-slip and off-slip road junctions and include (clockwise around the junction):

- North bound on-slip and southbound off-slip on to the M42, with a dedicated off ramp from the south bound off slip onto Eastway for access to the NEC;
- Eastbound on-slip onto Coventry Road (A45) from the M42 and a westbound off-slip from Coventry Road (A45) onto the junction roundabout;
- A southbound on-slip onto the M42 from Junction 6, and a northbound off-slip from the M42 to Junction 6, in addition to a dedication off-slip link road from the M42 onto the westbound Coventry Road (A45); and
- A westbound on-slip from Junction 6 onto Coventry Road (A45) and an eastbound off-slip from the A45 onto junction. In addition, a local access road (South Way) is linked to Junction 6.

2.2.3. The junction is prone congestion at AM and PM peak times, primarily from the M42 off the northbound off-slip onto the A45. This congestion is compounded at times when the NEC is hosting events in addition to the regular landing schedules of long haul flights into Birmingham Airport.

2.2.4. This congestion inhibits the free flow of traffic safely off the M42 and can regularly lead to standing or slow moving traffic sitting on the on-slip and off-slips at Junction 6 waiting to gain access to the SRN.

Clock Interchange

2.2.5. Clock Interchange is considered a four-arm roundabout that links Coventry Road (A45) to Catherine De Barnes Lane (B4438) to the south and Bickenhill Lane to the north. In addition to those traffic movements, a sweeping two lane, west bound only off slip is provided from Coventry Road (A45) through to Airport Way.

2.2.6. The junction is prone to congestion, particularly when events are being held at the NEC and heavy traffic is leaving and entering the wider Birmingham Business Park. The congestion and subsequent delays at Clock Interchange noticeably increase when Junction 6 becomes congested, resulting in prolonged periods and lengths of the road network with stationary or slow moving traffic on it.

2.3. Scheme Objectives

2.3.1. In the scheme PRA, Highways England outlined a number of benefits associated with improving M42 Junction 6. These were:

- in a strategic sense, the proposed scheme comprises the construction of a bypass between the M42 Junction 5 and Junction 6 to increase capacity within the SRN immediately surrounding the southeast of Birmingham's urban fringes; and
- Highways England's high-level objectives for the proposed scheme include providing access to key assets through improving economic growth and quality of life by reducing congestion in the surrounding urban areas and the inter-regional roads.

2.3.2. In addition, it is considered that the proposed scheme would increase the capacity of the SRN and facilitate housing and employment growth within the southeast of Birmingham. The overarching objective is to deliver a proposed scheme that is affordable and delivers high value for money.

2.3.3. Scheme-specific objectives (as confirmed within the Highways England Client Scheme Requirements HE551485-MOU-GEN-M42_J6-RP-KK-0001 PCF Stage 2_Client Scheme Requirements, Mouchel/WSP, 2017) are as detailed in Table 2.1.

Table 2.1: Proposed Scheme-specific Objectives (Highways England, 2017)

Objective	How it aligns with strategic aims	Measures for success of objective
Objective 1: Increase capacity	Support and facilitates economic growth through providing adequate capacity on the network.	Improved journey time reliability and reduced congestion at J6 and on the M42 adjacent to it. Annual Monitoring Reports.
Objective 2: Provide access to key assets	Supports and facilitates economic growth. Balances the needs of individuals and businesses who rely on it.	Delivery of adjacent development site (UKC). Journey time reliability to Birmingham Airport, NEC and HS2 not compromised.
Objective 3: Promote reliable and safe operation of the wider corridor	Supports and facilitates economic growth. Balances the needs of individuals and businesses that rely on it.	Average speed and reliability of journey on the M42 adjacent to Junction 6. Smart Motorway monitoring.
Objective 4: Increase resilience and reliability of network	Supports and facilitates economic growth. Is maintained to a safe and serviceable condition.	Safety/Number of incidents. Assessment of how the network copes with incidents at the junction and on the surrounding network.
Objective 5: Unlock the potential for economic growth in the surrounding area	Supports the development and implementation of the long-term Midlands Transport Strategy.	Approval of new corporate, commercial and/or residential developments. Continued investment in the local economy by existing stakeholders.

2.4. Proposed Scheme Description

2.4.1. The proposed scheme, as outlined in the PRA and illustrated in Plate 1 in Section 1 would comprise, a new dual carriageway link between Clock Interchange and a new junction on the M42 north of Solihull Road allowing traffic travelling northbound to exit the M42 and traffic travelling southbound to join the M42.

2.4.2. The new dual carriageway would be to the west of Bickenhill and would generally be below ground level and pass beneath the B4438 (Catherine de Barnes Lane), both the north west and south west corners of Bickenhill.

2.4.3. Improvements would be made to the Clock Interchange and the A45 between the Clock Interchange and the M42.

2.4.4. Fee flow links would be provided around the north west and north east of the M42 junction 6. Improvements would also be included on the south east side of the M42 junction 6, the A45 westbound (east of the M42 junction 6) and the M42 junction 6 southbound slip roads to improve the performance around this quadrant of the junction.

2.4.5. A more detailed description of the proposed scheme is provided in Section 3.

2.5. Earthworks Design

2.5.1. Given the current status of the proposed scheme design, the total quantities of cut and fill material are being calculated and these volumes will be subject to review and change during PCF Stage 3. Whilst material generated is likely to be reused where possible (subject to its characteristics), it is apparent that a net excess of fill material would be produced during construction of the proposed

scheme. Further details are provided in Chapter 10: Materials which outlines Highways England's commitments to material management.

2.6. Integrated Design Elements

2.6.1. The following integrated design elements have informed the design process to date or can be implemented during the construction and / or operational phase of the proposed scheme to reduce the potential environmental impacts on known receptors as far practicable.

Drainage and Flood Risk Design

2.6.2. The proposed scheme would incorporate a suitable drainage design system that would consider solutions such as hybrid ponds (i.e. flow balancing and vegetative treatment for runoff, including spillage containment at the front end wherever necessary). Flow rates would be agreed in accordance with Environment Agency requirements and wider constraints such as Birmingham Airport's take-off and landing routes, and the implications of introducing standing water that may attract birds to the area.

2.6.3. The proposed scheme would cross an area that is not classified as being at risk of flooding with the exception of junction improvements proposed to the north of M42 Junction 6. Further details are presented in Chapter 13: Road Drainage and the Water Environment.

Landscape and Visual

2.6.4. The proposed scheme is currently being designed to be positioned in cutting and within the existing topography of the proposed location (as far as practicable) at key locations along the route alignment. This is particularly to the south, west and immediate north of Bickenhill as a result of ongoing environmental studies which have explored the potential to reduce visual impact on local receptors and perceived changes to the setting of historical assets.

Biodiversity

2.6.5. The proposed scheme is being designed to reduce the potential impacts on biodiversity as far as practicable by incorporating mitigation into the design, and through the careful routeing of the alignment away from wooded areas, water features and areas of habitat interconnectivity. This process has concentrated on the alignment of the route to avoid direct impacts to Bickenhill Site of Special Scientific Interest (SSSI) and minimise the impacts to Aspbury's Copse Ancient Woodland, Local Wildlife Sites (LWSs) within the study area, and established green corridors such as hedgerows and treelines.

3. SCHEME HISTORY AND ALTERNATIVES

3.1. Introduction

3.1.1. This chapter summarises the historical development of the proposed scheme from options identification, through to Highways England's preferred route (on which the content of this EIA Scoping Report is based) as formally announced on the 7th August 2017.

3.1.2. Further detailed technical information on the options described below is presented in the scheme Technical Appraisal Report and Scheme Assessment Report, both of which are available on the Highways England website at https://highwaysengland.citizenspace.com/he/m42-junction-6-improvement/.

3.2. Preliminary Options Identification

3.2.1. In 2016 Highways England explored a number of high level opportunities to alleviate traffic congestion in and around the M42 Junction 6 area in the section of the SRN most commonly referred to as the 'Birmingham Box'. As part of the high level exercise, approximately 40 individual solutions were appraised against a number of criteria, ranging from economic benefit, through to buildability and potential environmental impact. The 40 options were sifted down to three options, which formed the basis of the public consultation event that occurred in December 2016 to January 2017.

3.3. Scheme Options

3.3.1. The viable solutions taken forward for further development and through public consultation were all variants of the southern junction theme, with an additional option of one or more free-flow links. The three options that were taken to consultation were:

- **Option 1:** Southern Junction 2km south of Junction 6 with a link road to the west of Bickenhill village which connects to the A45 at Clock Interchange;
- **Option 2:** Southern Junction 2km south of Junction 6 with a link road to the east of Bickenhill village which connects to the A45 at Clock Interchange via an additional roundabout; and
- **Option 3:** Southern Junction 1km south of Junction 6 with northbound exit and southbound entry onto the M42 only and link road to the east of Bickenhill village which connects to the A45 at Clock Interchange via an additional roundabout.

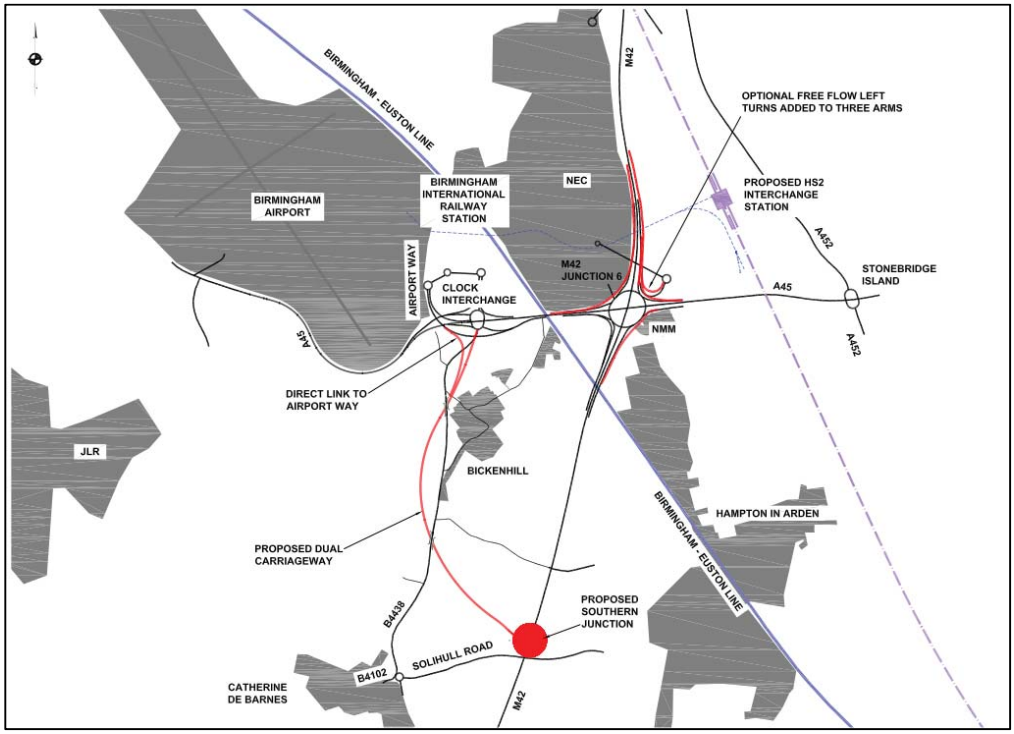
Option 1

3.3.2. Option 1 (see Plate 2) comprised a new 2.4km dual carriageway link between the Clock Interchange and an all movements junction allowing north and south access to the M42 north of Solihull Road. The Clock Interchange would be improved to accommodate additional flows of traffic, in addition to free flow links being provided to give improved access to Birmingham Airport and A45 west.

3.3.3. The new dual carriageway would be to the west of Bickenhill and would generally be below ground level crossing underneath the B4438 (Catherine de Barnes Lane), near Bickenhill and towards the M42. The alignment would tie closely into the existing local road corridor to minimise the effect on the green belt.

3.3.4. Connection onto the local roads could be designed to minimise long distance traffic use of locals while enabling access to the Clock Interchange.

Plate 2: M42 Junction 6 Public Consultation Option 1 - Link to the west of Bickenhill



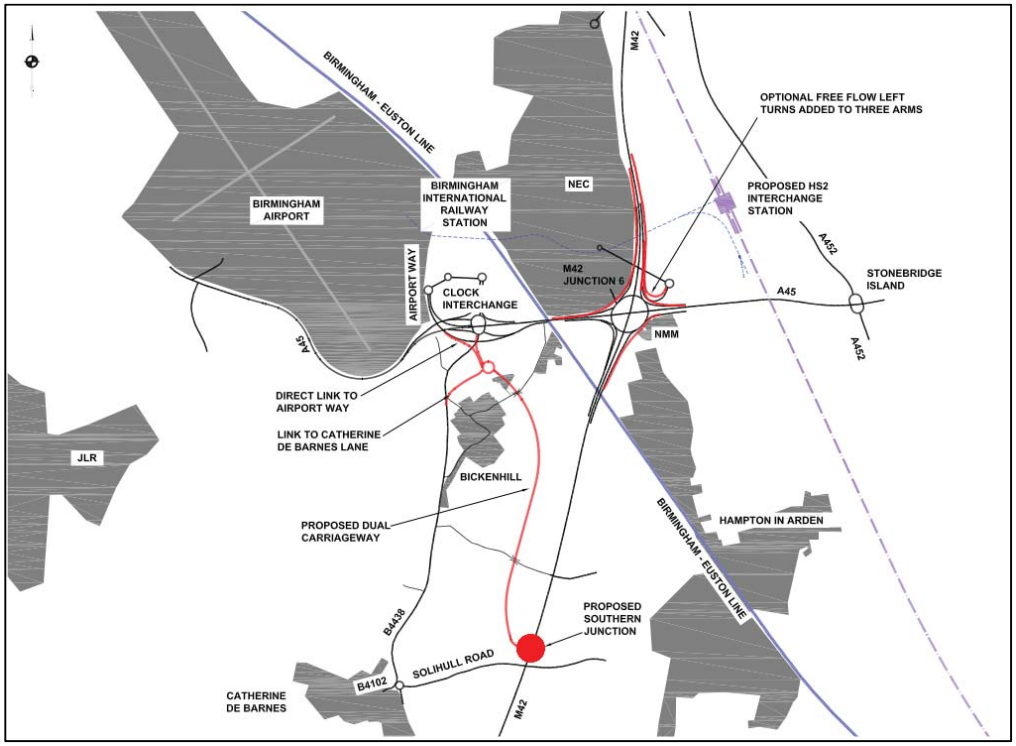
Option 2

3.3.5. Option 2 (see Plate 3) comprised a new 2.3km dual carriageway link between the Clock Interchange and an all movements junction allowing north and south access to the M42 north of Solihull Road. The Clock Interchange would be improved to accommodate the additional flows of traffic, in addition to a free flow link being provided to offer improved access to Birmingham Airport and the A45 west.

3.3.6. The new dual carriageway would be to the east of Bickenhill and pass beneath Church Lane before returning to existing levels north of Shadowbrook Lane. The alignment would minimise effects on the green belt as it would be closer to the existing M42 corridor through the area.

3.3.7. Connection onto the local roads would be via a new roundabout north of Bickenhill. This roundabout would be at existing ground level with link roads to the Clock Interchange, Catherine de Barnes Lane and Airport way.

Plate 3: M42 Junction 6 Public Consultation Option 2 - Link to the east of Bickenhill



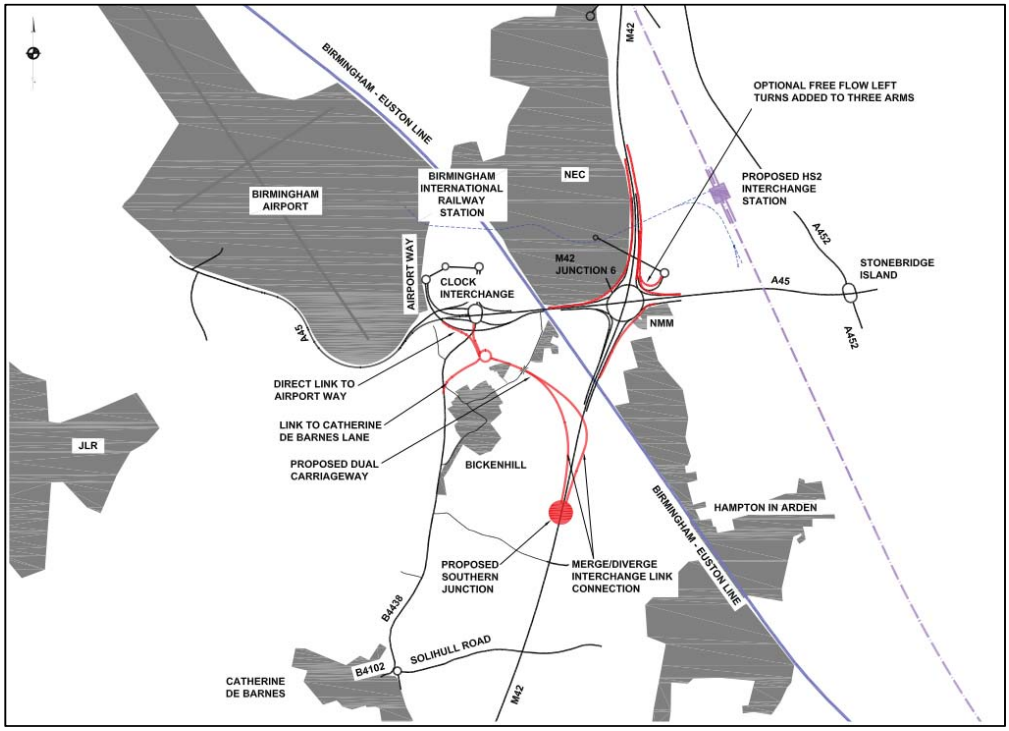
Option 3

3.3.8. Option 3 (see Plate 4) comprised a new 1.6km dual carriageway link between the Clock Interchange and a restricted movement junction with the M42 north of Shadowbrook Lane. This junction would only enable traffic to join the M42 southbound or exit from the M42 northbound using free flow links. The Clock Interchange would be improved to accommodate the additional flows of traffic and a free flow link would be provided to improve access to Birmingham Airport and A45 West.

3.3.9. The new dual carriageway would be to the east of Bickenhill and pass beneath Church Lane before rising on and embankment to cross the M42 on a large bridge. The alignment would minimise the effect on the green belt as it is closer to the existing M42 corridor through the area.

3.3.10. Connection onto local roads would be via a new roundabout north of Bickenhill. This roundabout would be at the existing ground level with link roads to the Clock Interchange, Catherine de Barnes Lane and Airport Way.

Plate 4: M42 Junction 6 Public Consultation Option 3 - Link to the east of Bickenhill



3.4. Public Consultation Results

3.4.1. In response to the question *'To what extent do you agree or disagree that M42 junction 6 needs improving?*' 71% of those who responded agreed there was a need to improve the junction and 64% of respondents expressed a preference for Option 1. 15% of respondents preferred Option 3, 10% preferred Option 2, while 11% of those who responded gave no preference.

3.4.2. Following the public consultation, Highways England continued to develop the presented options taking into account comments and issues raised during the consultation.

3.4.3. Assessments demonstrated that a slightly modified version of Option 1 would provide the best performing route overall by minimising the impact on local communities and a nearby Bickenhill Meadows SSSI while maximising the resilience and performance of the local road network to allow it to cope with future traffic increases.

3.5. Environmental Considerations of the Options

3.5.1. During PCF Stage 2 and based upon the findings and conclusions of the public consultation results, Mouchel / WSP undertook an early environmental options appraisal exercise based upon the environmental topics presented within the Department for Transport (DfT) WebTAG appraisal process.

3.5.2. The decision route on choice was based on the following criteria:

- DfT RIS brief;
- Highways England Imperatives;
- Scheme Economics;
- Public Consultation Results;

- Environmental Effects;
- Highways England Key Performance Indicators; and
- General (stakeholder issues, buildability, numbers of departures from standards).

3.5.3. The input into the route decision Environmental appraisal has been presented in Table 3.1.

Table 3.1: Environmental Appraisal of Options 1, 2 and 3 at PCF Stage 2

Environmental Discipline Considered	Options Appraised		
	Option 1	**Option 2**	**Option 3**
Noise	Option 1, 2 and 3 have the potential to increase noise levels to sensitive receptors on the altered roads, the introduction of the new junction, M42 slip roads and link to Airport Way. Within 1km of the corridor for options 1, 2 and 3 there are four Defra Noise Important Areas (NIAs): 1. on the A45 at Elmdon, (reference number 2830); 2. on the A45 West of Junction 6, (ref no 2831); 3. on the M42 South of Junction 6 (ref no 7481); and 4. on the West of the M42 further south between Junction 5 and Junction 6 (ref no 7482).		
	The new link has the potential to introduce a closer road traffic noise source to some noise sensitive receptors, particularly on the western side of Bickenhill and to a lesser extent to the northeast side of Catherine de Barnes. Potentially there are: • 207 dwellings; and • 10 other noise receptors - within 600m of the proposed alignment.	The new link has the potential to introduce a closer road traffic noise source to some noise sensitive dwellings and other receptors, particularly on the south and eastern side of Bickenhill. Potentially there are: • 147 dwellings; and • 9 other receptors - within 600m of the proposed alignment	The new link has the potential to introduce a closer road traffic noise source to some noise sensitive dwellings and other receptors, particularly on the eastern side of Bickenhill. Potentially there are: • 144 dwellings; and • 9 other noise sensitive receptors - within 600m of the proposed alignment.
Air Quality	Option 1, 2 and 3 may require signalling changes and therefore there is potential for changes to the average and peak speeds of road traffic, which could impact local air quality. No widening of the mainline will be required, other than the provision of merge / diverge from free flow links, and no additional off-line roads will be constructed at Junction 6. Birmingham and Coleshill Air Quality Management Areas (AQMAs) are situated approximately 2 km from all proposed options. One Pollutant Climate Mapping (PCM) model link (A45) is located within 200m of the proposed options.		

	Option 1 has the potential to impact local air quality at sensitive receptors in proximity to the Clock Interchange and Catherine De Barnes Lane (B4438), including residential dwellings adjacent to Clock Lane in proximity to the Clock Interchange. With the introduction of a new road source there is also the potential for the pathway distance of vehicular exhaust emissions between sensitive receptors, located along Catherine De Barnes Lane and Clock Lane, to decrease in comparison to the existing road configuration. Potential receptors within 200m of the proposed alignment: • 0m-50m = 14 receptors • 50m-100m = 13 receptors 100m-200m = 39 receptors *Total = 66 receptors*	Option 2 includes a new road source to the east of Bickenhill, creating a potential for the pathway distance of vehicular exhaust emissions between sensitive receptors located along Clock Lane, Pitt Lane, Shadowbrook Lane and 'The Meadows' to decrease, in comparison to the existing road configuration. Potential receptors within 200m of the proposed alignment: • 0m - 50m = 10 receptors • 50m - 100m = 13 receptors • 100m - 200m = 38 receptors *Total = 61 receptors*	Option 3 has the potential to impact local air quality at sensitive receptors in proximity to: Clock Interchange, Church Lane and Pitt Lane. This includes residential dwellings adjacent to Clock Lane in proximity to the Clock Interchange and the area known as 'The Meadows' along Church Lane Potential receptors within 200m of the proposed alignment: • 0m - 50m = 4 receptors • 50m -100m = 10 receptors • 100m - 200m = 41 receptors *Total = 55 receptors*
Greenhouse Gases	Alleviation of road traffic congestion as a result of the implementation of all options has the potential to reduce Greenhouse Gas emissions. However, any increase in road traffic flows might negate potential benefits. Confirmation of changes to traffic flows and speeds along the affected road links requires further quantitative assessment.		
Landscape	Overall, the elements of option 1 and 2 would combine to noticeably increase the footprint and presence of the M42 and the surrounding highways network in the local and wider landscape of the study area.		Overall, the new link road and junction with the A45 would noticeably increase the existing presence of the M42 and A45 corridors in an area already heavily influenced by transport corridor and would further urbanise the setting of Bickenhill

	Option 1 would result in the permanent loss of existing: 1. woodland, within and beyond the highways boundary (including Ancient Woodland); 2. fragmentation of field patterns around the new link road; 3. alterations to the existing landform; 4. increased traffic movements; and 5. lighting within the landscape.	Option 2 would result in the permanent loss of: 1. existing woodland within and beyond the highways boundary (including Ancient Woodland); 2. fragmentation of field patterns around the new link road; 3. alterations to the existing landform; 4. increased traffic movements; and 5. lighting within the landscape.	However, Option 3 would not result in significant changes to the perception of the landscape in the wider study area. Option 3 would result in the permanent loss of: 1. fragmentation of field patterns around the new link road; 2. alterations to the existing landform; 3. detractions to the setting of Bickenhill and loss of residential properties; 4. increased traffic movements; and 5. lighting within the landscape
	Qualitative Classification: **Moderate Adverse**	Qualitative Classification: **Moderate Adverse**	Qualitative Classification: **Slight Adverse**
Historic Environment	There is the potential for this option to be directly impacted upon; one Conservation Area and 20 non-designated heritage assets. The assets consist of a mixture of sites dating from the Bronze Age to the Medieval and Post Medieval periods. The setting of 1 scheduled monument; and 12 listed buildings will also be impacted upon. Number of known heritage assets affected is at least 33.	There is the potential for this option to be directly impacted upon one Conservation Area and 22 non-designated heritage assets The assets consist of a mixture of sites dating from the Medieval and Post Medieval periods. The setting of 1 scheduled monument; and 11 listed buildings will also be impacted upon. Number of known heritage assets affected is at least 34	***No qualitative supporting text provided.*** Number of known heritage assets affected is at least 20.
	Qualitative Classification: **Moderate Adverse**	Qualitative Classification: **Moderate Adverse**	Qualitative Classification: **Moderate Adverse**
Biodiversity	Option 1, 2 and 3 will result in the loss of UK and Local Biodiversity Action Plan (LBAP) habitats, resulting in a Neutral to Slight Adverse impact. Replacement hedgerows may provide an improvement in habitat quality and result in a Neutral to Slight Beneficial impact. Option 1, 2 and 3 will also likely impact on protected and notable fauna, if present. Impacts are currently unknown but are likely to be Neutral to Slight Adverse.		

	Major adverse impact on Bickenhill Meadows Site of SSS. Moderate adverse impact on Aspbury's Copse Ancient Woodland/Local Wildlife Site (LWS)/Ecosite (ES). Slight Adverse impact on Castle Hill Farm Meadows LWS, Clock Lane Meadows ES and Main Birmingham to London Railway Line ES due to direct land-take. Slight Adverse impacts to Hollywell Brook LWS due to in-stream works and culvert extension. This option will also likely impact: • Coleshill and Bannerly Pools SSSI • Bickenhill Meadows SSSI, • Castle Hill Farm Meadows LWS • Green Wards Piece LWS/ES • Bickenhill Churchyard ES • Clock Lane Meadows ES Meadows to the East of the Jungle ES; - due to increased nitrogen deposition, but the magnitude of this impact is currently unknown.	Moderate adverse impact on Aspbury's Copse Ancient Woodland/LWS/ES. Slight Adverse impact on Roadside Hedge LWS/ES and Main Birmingham to London Railway Line ES due to direct land-take. Slight Adverse impacts to Hollywell Brook LWS due to in-stream works and culvert extension. This option will also likely impact: • Coleshill and Bannerly Pools SSSI • Bickenhill Meadows SSSI • Castle Hill Farm Meadows LWS • Green Wards Piece LWS/ES • Wayside Cottage Meadows LWS/ES • Bickenhill Churchyard ES • Clock Lane Meadows ES and Meadows to the East of the Jungle ES - due to increased nitrogen deposition. The magnitude of this impact is currently unknown.	Slight Adverse impact on Main Birmingham to London Railway Line ES due to direct land-take. Slight Adverse impacts to Hollywell Brook LWS due to in-stream works and culvert extension. This option will also likely impact: • Coleshill and Bannerly Pools SSSI • Bickenhill Meadows SSSI • Castle Hill Farm Meadows LWS • Green Wards Piece LWS/ES • Wayside Cottage Meadows LWS/ES • Bickenhill Churchyard ES • Clock Lane Meadows ES and • Meadows to the East of the Jungle ES - due to increased nitrogen deposition. The magnitude of this impact is currently unknown.
	Qualitative Classification: **Major Adverse**	Qualitative Classification: **Moderate Adverse**	Qualitative Classification: **Slight Adverse**
Water Environment	Surface water features in the area comprise of the Hollywell Brook, unnamed tributary of Shadow Brook, Shadow Brook, Blythe from Temple Balsall Brook to Patrick Bridge, Blythe river from Patrick Bridge to River Tame, unnamed tributaries of the Low Brook. One groundwater body is assessed (Tame Anker Mease Secondary Combined). A number of standing waterbodies were assessed, including Pendingo Lake and other unnamed ponds. A number of surface and groundwater abstractions are located in the study area. Option 1, 2 and 3 are likely to have a Moderate Adverse impact upon the surrounding water environment, with the highest risk being increased flood risk.		

	Effects on surface watercourses from potential pollution from routine run-off/ accidental spillage with two new outfalls to surface watercourses are proposed with Slight Adverse impacts predicted. Option 1 features a larger impermeable surface area, five new culverts and changes to flow downstream as a result of cut-off drains on two ditches. In relation to groundwater, there is also a Slight Adverse impact on the potential indirect loss of Groundwater Dependent Terrestrial Ecosystems (located within 250m and a result of greater lengths of cutting with the potential to impact groundwater quality and flow). The construction and operation of the scheme could have a Moderate Adverse impact, due to impacts on flooding.	In addition to the surface water features mentioned above Option 2 will also affect 'other field drains'. Effects on surface watercourses include potential pollution from routine run-off / accidental spillage as three new outfalls to surface watercourses are proposed with Slight Adverse impacts predicted. Option 2 features a larger impermeable surface area, three new culverts, two existing culverts lengthened and changes to flow downstream as a result of cut-off on two ditches. In relation to groundwater, there is a Slight Adverse impact on the potential indirect loss of Groundwater Dependent Terrestrial Ecosystems (located within 250m and a result of greater lengths of cutting with the potential to impact groundwater quality and flow). The construction and operation of the scheme could have a Moderate Adverse impact, due to impacts on flooding.	Effects on surface watercourses include potential pollution from routine run-off / accidental spillage with three new outfalls to surface watercourses proposed with Slight Adverse impacts predicted. Option 3 features a relatively smaller impermeable surface area, two new culverts and three existing culverts lengthened. In relation to groundwater, there is a Slight Adverse impact as a result of cuttings with the potential to impact groundwater quality and flow, although the length of cutting is smaller than Options 1 and 2. The construction and operation of the scheme could have a Moderate Adverse impact, due to impacts on flooding.
	Qualitative Classification: **Moderate Adverse**	Qualitative Classification: **Moderate Adverse**	Qualitative Classification: **Moderate Adverse**

3.5.4. As a result, Option 1 (in conjunction with the output of all the criteria outlined in Section 3.6) was considered the most viable option to progress for the following factors:

- Option 1 received the largest support at public consultation, from both the local population and businesses (64%);
- Option 1 has the least impact on the 'openness of the green belt';
- Option 1 would have the best possibility of gaining planning approval
- Option 1 would need the fewest departures from standards;
- Option 1 has a medium Value for Money score and provides the most
- opportunity for improvement of benefits;
- Although Option 1 requires the most landtake, it would mainly be in cutting and provide more scope for mitigation to minimise the effect on the landscape and environment;

- Option 3 would require embankments that impact the 'openness of the green belt',
- Option 2 and 3 would bisect Bickenhill, passing beneath Church Lane;
- Option 1 (and 2) would not preclude future potential junction improvement
- works required if some of the 'aspirational' developments gain planning approval;
- Option 1 (and 2) would not preclude the planning application for a new Motorway Service Area, proposed by Extra;
- Option 1 would have less impact on private properties than Options 2 and 3; and
- Option 1 has less impact on the statutory utilities in the area than Options 2 and 3.

3.5.5. As such, Option 1 was further refined, into Option 1A, 1B and 1C, where the following minor alignment changes were applied:

- **Option 1A:** the proposed route alignment would deviate to the west of Option 1 to avoid direct impact on the Warwickshire Gaelic Athletic Association (GAA) sports fields;
- **Option 1B:** this variation would be aligned to impact on one of the GAA sport fields; and
- **Option 1C:** this variation would deviate to the east of the GAA and thus not directly impacting the sports fields.

3.5.6. From this refinement process, Option 1B was considered the most suitable option to progress as the preferred Option due to deciding factor of minimising the impact on the GAA sports fields.

3.6. Highways England Preferred Option

3.6.1. The proposed modification to Option 1 was incorporated into the PRA published on 7th August 2017. The modification moves the proposed link between Clock Interchange and the proposed southern junction approximately 50m closer to Bickenhill as it passes south west corner of the village in order to minimise the impact on a local business and the SSSI.

3.6.2. The options appraisal process also identified that there were issues in providing the southeast free-flow link at Junction 6 and the north facing slip roads from the new southern junction.

3.6.3. The southeast free flow link element was removed from the proposed scheme due to challenges with the horizontal and vertical alignment of link, impact on current access arrangements to adjacent businesses and prohibitively high construction costs compared to potential benefits.

3.6.4. The north facing slip roads from the new southern junction were also removed from the proposed scheme. Traffic analysis showed that relatively few vehicles would use the north facing slip roads and there inclusion would require departures from standard for reduced weaving length between the new junction and M46 junction 6. Although the slip roads would add resilience to the network, the capital cost and operational safety impact were assessed as outweighing the resilience benefit.

Detailed Description

3.6.5. The proposed scheme, as announced in the PRA, is shown in Plate 1. It comprises a new dumbbell roundabout junction (southern junction) with the M42, north of Solihull Road bridge and a new 120kph (70mph) dual carriageway link

towards Birmingham Airport and Clock Interchange on the A45 aligned to the west of Bickenhill.

3.6.6. Access to Catherine de Barnes Lane and Bickenhill village is accommodated via two staggered slip roads onto the new link road. The new dumbbell junction incorporates a western roundabout which is increased in size compared with the eastern roundabout to accommodate the higher level of traffic, and provide access for the potential MSA. South facing slip roads are designed as a ghost island merge / diverge layout.

3.6.7. The new southern junction is located approximately 2km south of the existing M42 Junction 6. Its position does not preclude the development of the MSA proposed by Extra Evergreen.

3.6.8. The position of the south facing slip road layouts have been designed to reduce the impact to the ancient woodland (Aspbury's Copse). For example, the earthworks were steepened to a 1 in 1 slope gradient, and consideration has been given to accommodating a Departure from Standards (DfS) to reduce visibility to further minimise the impact. The new south facing slip roads also required extensions to Solihull Road bridge, in order to allow them to be placed under the structure, with the appropriate forward visibility.

Link Road to Clock Interchange

3.6.9. The link road between the new southern junction and Clock Interchange would be a dual 2 lane all-purpose road with a design speed of 120kph. The horizontal alignment of the link has been designed to avoid the local village of Bickenhill with a horizontal curvature to the west of the village.

3.6.10. The link is predominately positioned a cutting to minimise potential visual and environmental impacts to Bickenhill and the surrounding countryside, and passes underneath the existing Catherine de Barnes Lane in two locations. The design of the vertical alignment would result in drainage having positive outfalls to Shadow Brook and Hollywell Brook.

Alignment - Slip Road from the New Link to Airport Way

3.6.11. A dedicated northbound slip road would connect the new link road directly to Airport Way. This slip road would be designed with a 70kph (40mph) design speed, and would require a minor DfS.

Alignment - Connections to the Local Road Network

3.6.12. Local road connections occur via staggered slip roads, resulting in two new roundabouts on the B4438 to allow connection to the new dual carriageway link and Clock Interchange. The northern roundabout (near Braceys Nursery) would accommodate southbound traffic and the southern roundabout (near Birmingham Dogs Home) would provide a northbound connection. This was developed to discourage the use of the link for rat-running on the local road network to Solihull, which is a local concern.

Free-Flow Links

3.6.13. The PRA incorporates free-flow left turn lanes for A45 eastbound traffic to the M42 northbound and for M42 southbound traffic to the A45 eastbound. The existing free-flow left turn between M42 northbound and A45 westbound would also be retained. Free flow left turn lanes benefit junction operations by reducing the number of vehicles having to use the circulatory carriageway, thereby reducing vehicle conflicts and allowing signal timings at the junction to be improved.

4. ENVIRONMENTAL IMPACT ASSESSMENT APPROACH

4.1. Introduction

4.1.1. This EIA Scoping Report identifies the topics that will be covered in the EIA and provides details on how they will be assessed and reported in the Environmental Statement, to ensure that:

- features of environmental importance that could be affected by the proposed scheme are identified and evaluated;
- analysis of the impacts and potential effects during construction and operation of the proposed scheme are undertaken to the necessary level of detail;
- appropriate mitigation measures are identified;
- the significance of effects are assessed; and
- cumulative effects are considered.

4.1.2. The EIA process is designed to be capable of, and sensitive to, changes that occur as a result of changes to the design, including any mitigation measures that are incorporated during the EIA. This will be particularly important for the proposed scheme as the design and layout is still being refined. Minor changes are likely to be made following submission of this EIA Scoping Report, which may result in amendments to the extents of the DCO red line boundary.

4.2. Relevant Legislation and Guidance

Environmental Impact Assessment Directive (2011/92/EU) & Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

4.2.1. European Directive 2014/52/EU amended Directive 2011/92/EU 'on the assessment of the effects of certain public and private projects on the environment' (known as the EIA Directive). The 2014 EIA Directive forms part of European law and was transposed into UK legislation by the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 on 16 May 2017. The EIA Regulations include details regarding EIA screening, scoping and the information that should be included in an Environmental Statement.

National Policy Statement for National Networks

4.2.2. As the proposed scheme constitutes and NSIP, there is a requirement to assess whether the proposed scheme accords with relevant national policy – namely the National Policy Statement for National Networks (NPSNN) as presented to Parliament pursuant to Section 9(8) and Section 5(4) of the Planning Act 2008 (as amended) (December 2015).[10]

4.2.3. The NPSNN sets out the need for, and Government's policies, to deliver NSIPs on the national road (and rail) network in England. It provides planning guidance for promoters of NSIPs on the road network, and the basis for the examination by the Examining Authority and decisions by the Secretary of State. The Secretary of State will use the NPSNN as the primary basis for making decisions on development consent applications for national networks NSIPs in England. Given the importance of the NPSNN, the EIA approach adopted for the proposed scheme takes account of this key policy document.

[10] https://www.gov.uk/government/publications/national-policy-statement-for-national-networks

National Planning Policy Framework

4.2.4. The overall strategic aims of the National Planning Policy Framework (NPPF) and the NPS are consistent; however, the two have differing but equally important roles to play.

4.2.5. The NPPF provides a framework upon which local authorities can construct local plans to bring forward developments, and the NPPF would be a material consideration in planning decisions for such developments under the Town and Country Planning Act 1990.

4.2.6. An important function of the NPPF is to embed the principles of sustainable development within local plans prepared under it. The NPPF is also likely to be an important and relevant consideration in decisions on nationally significant infrastructure projects, but only to the extent relevant to that project, which has been identified within chapters 5 to 15 where relevant.

4.2.7. However, the NPPF does not contain specific policies for NSIPs where quite particular considerations can apply. The NPSNN will assume that function and provide transport policy which will guide individual development brought under it.

4.2.8. In addition, the NPS provides guidance and imposes requirements on matters such as good scheme design, as well as the treatment of environmental impacts. As such, both documents seek to achieve sustainable development and recognise that different approaches and measures will be necessary to achieve this.

Design Manual for Roads and Bridges (DMRB)

4.2.9. The EIA will follow the established principles and guidance for the assessment of highways developments presented within the DMRB Volume 11 and Interim Advice Note (IAN) 126/15. The approach to the assessment will be consistent with current DMRB guidance, as modified by IANs as applicable.

4.2.10. As detailed in DMRB Volume 11, Section 2, Part 1 HA201/08 “General Principles and Guidance of Environmental Impact Assessment” the level of assessment required is dependent on the potential environmental effects. A simple level assessment would be sufficient if it established confidently that the forecast environmental effect would not be a fundamental issue in the decision-making process. A more detailed assessment would need to be applied where there is the potential to cause significant effects on environmental resources and receptors. Herein we define whether the applicable environmental topic requires a simple or detailed level of assessment.

4.2.11. Some of the DMRB methodologies are undergoing a process of review and update. Any such updates that arise during the course of the assignment will be taken into account as applicable. Should this occur, we will seek Highways England guidance on which methods are to be used.

4.2.12. Detailed methodologies to be employed within each of the specialist subject areas are defined in the relevant specialist chapters as reported herein.

PINS Guidance

4.2.13. PINS has published a number of guidance documents and advice notes for developers of NSIPs that are progressing through the DCO application process –

these documents have been consulted and will be used to inform the EIA as applicable[11]. These include:

- **Advice Note One:** Local Impact Report;
- **Advice Note Two:** The role of local authorities in the development consent process;
- **Advice Note Three:** EIA Consultation and Notification;
- **Advice Note Four:** Section 52
- **Advice Note Five:** Section 53 – Rights of Entry
- **Advice Note Six:** Preparation and Submission of application documents;
- **Advice Note Seven:** Environmental Impact Assessment: Preliminary Environmental Information, Screening and Scoping;
- **Advice Note Eight:** Overview of the nationally significant infrastructure planning process for members of the public and others;
- **Advice Note Nine:** Rochdale Envelope;
- **Advice Note Ten:** Habitat Regulations Assessment relevant to nationally significant infrastructure projects;
- **Advice Note Eleven:** Working with public bodies in the infrastructure planning process;
- **Advice Note Twelve:** Transboundary Impacts;
- **Advice Note Thirteen:** Preparation of a draft order granting development consent and explanatory memorandum;
- **Advice Note Fourteen:** Compiling the consultation report;
- **Advice Note Fifteen:** Drafting Development Consent Orders;
- **Advice Note Sixteen:** How to request a change which may be material;
- **Advice Note Seventeen:** Cumulative Effects Assessment; and
- **Advice Note Eighteen:** The Water Framework Directive.

4.3. Potential Impacts and Effects

4.3.1. Impacts are changes that are predicted to result from the proposed scheme. Impacts could occur during the construction or operational phases of the proposed scheme and these phases will be considered separately during the environmental assessment. Wherever possible, impacts will be quantified as part of their description. An impact and the way it is described are the same for every specialist topic considered. The character of the impact, its magnitude or scale, the probability that it will occur; its duration, frequency and reversibility are all elements of its description. An impact is not adverse or beneficial in its own right; rather impacts are the changes that are subsequently assessed from the perspective of a relevant receptor.

4.3.2. The consequence of an impact on a receptor is called an effect. Effects can be beneficial or adverse. It is quite possible for different receptors (even within the same specialist environmental topic) to consider the same impact in different ways, depending on the ways they are affected by that impact. Effects can be permanent, even if the impact is temporary or reversible, and vice versa.

4.3.3. Impacts and/or their resulting effects may arise as a direct result of the proposed scheme, or may be produced from or as a result of a more complex pathway or interaction (when they are referred to as secondary or indirect impacts/effects).

4.3.4. For an effect to occur there has to be an impact, a receptor, and a pathway by which the impact can influence the receptor. Specialist topics therefore need to

[11] Refer to: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/; https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/guidance/

identify and evaluate receptors that have the potential to be affected by identified construction or operation phase impacts.

4.3.5. In carrying-out the assessment, the category (or relative significance) of the effect is a product of the importance and/or sensitivity of the receptor and the magnitude of the impact (taking into account factors such as the receptor's sensitivity or resilience). The degree of confidence in the results also needs to be reported.

4.3.6. Wherever possible, the ongoing assessment has been used to influence the proposed scheme design such that impacts and / or effects can be designed-out or avoided, or otherwise limited in their magnitude, duration etc. Such measures will be reported in the Environmental Statement.

4.3.7. 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.

4.3.8. 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. Compensation measures may then be described if deemed to be necessary.

4.3.9. Residual effects of moderate, large or very large significance are deemed to constitute a significant environmental effect in the context of the EIA Regulations. Accordingly, these effects represent key factors in the decision-making process.

4.3.10. Potential activities during construction of the proposed scheme that may give rise to impacts and effects include:

- The formation and use of temporary offices, construction compounds, material storage areas and worksites;
- The formation and use of temporary accesses and haul routes;
- Demolition of structures, including removal of existing infrastructure (e.g. footbridges, signs, safety barriers etc.);
- Vegetation clearance, soil removal;
- Ground and excavation works;
- Routing of services and utilities;
- Noise, vibration, lighting, dust and disturbance resulting from construction works; and
- Pollution spill risk during construction.

4.3.11. Activities during operation of the proposed scheme that might give rise to impacts and effects include:

- Changes in traffic flow and composition with the potential for consequential impact upon noise and air quality:
- Any additional street lighting and signs; and
- Management practices, including landscape and vegetation management.

4.3.12. As detailed in Chapter 2, some areas of land required for the proposed scheme are yet to be fully confirmed (e.g. areas required for construction and potential ecological compensation areas) – the DCO red line boundary as included herein (see Figure 1.1) aims to capture candidates site associated with these requirements. Land take requirements will be confirmed as part of the EIA process, the effects of which will be reported in the Environmental Statement.

4.4. Topics Scoped into the EIA and EIA Directive Changes

4.4.1. Taking into account the proposed scheme characteristics as detailed in Chapter 2, and the prevailing environmental conditions in the vicinity of the proposed scheme (refer to Chapter 5 through to 15 herein), it is proposed that all topics detailed in IAN 125/15 will be scoped into the EIA.

4.4.2. In addition to the above, Schedule 5 of the EIA Regulations sets out the environmental factors that must be considered as part of an EIA where they are likely to be significantly affected by the project, namely:

- Population and human health;
- biodiversity, with particular attention to species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;
- Land, soil, water, air and climate;
- material assets, cultural heritage and the landscape; and
- the interaction between the factors referred to in the points above.

4.4.3. Schedule 5 includes a requirement to consider any significant effects arising from the vulnerability of a development proposal to major accidents or disasters that are relevant to the project, including those caused by climate change.

4.4.4. Table 4.1 sets out reasons as to whether, and how, these factors and other environmental guidance applied in the EIA process have been considered within this EIA Scoping Report.

Table 4.1: Consideration of Topics in the EIA Scoping Exercise

Aspect or Topic	Inclusion within (or exclusion from) the EIA Scoping Report
Factors identified in 2014 EIA Directive and EIA Regulations 2017	
Population	Effects upon community and livelihoods are considered in Chapter 12: People and Communities; whilst Chapter 5: Air Quality, Chapter 11: Noise and Vibration, and Chapter 7: Landscape and Visual Effects collectively consider how the proposed scheme could affect the local population.
Human health	Human health is a consideration in Chapter 6: Air Quality; Chapter 11: Noise and Vibration; Chapter 12 People and Communities; and Chapter 13: Road Drainage and Water Environment. Based on the fact that the guidance relating to these topics provides a means of considering and reporting health-related effects, the process of scoping concluded that a separate Health Impact Assessment (HIA) would not be required for the proposed scheme.
Biodiversity (species and habitats)	Biodiversity (including species and habitats) is considered in Chapter 8: Biodiversity.
Land	Effects on existing land use are considered in Chapter 12: People and Communities.
Soil	Soil is considered in Chapter 9: Geology and Soils and Chapter 12: People and Communities (in terms of effects upon agricultural practices).
Water	Various aspects of the water environment are considered in Chapter 13: Road Drainage and Water Environment, whilst Chapter 9: Geology and Soils also considers hydrogeology (groundwater) and potential pollution pathways.
Air	Chapter 5: Air Quality covers air quality.
Climate and vulnerability of project	Greenhouse gases are considered in Chapter 5: Air Quality and Chapter 10: Materials. Climate change is considered within topic

Aspect or Topic	Inclusion within (or exclusion from) the EIA Scoping Report
to climate change	chapters where relevant to the understanding of the baseline environment and potential impact interactions, including within Chapter 13: Road Drainage and Water Environment. Given the importance of this topic, Chapter 14: Climate Change details of the proposed scope of works to be undertaken as related to this topic.
Material assets	The consumption of material resources is considered in Chapter 10: Materials. Community and private assets are considered in Chapter 12: People and Communities.
Cultural heritage	Chapter 6: Cultural Heritage considers cultural heritage.
Landscape	Chapter 7: Landscape and Visual Effects considers effects upon landscape.
Interaction between the factors referred to above	Chapter 15: Consideration of Combined and Cumulative Effects describes how the interrelationships between environmental factors will be assessed as well as cumulative effects.
Heat and radiation	The EIA Regulations require consideration of the topics of heat and radiation. Based on a review of the characteristics of the proposed scheme, the process of scoping has concluded that neither heat nor radiation are of relevance to the proposed scheme. Accordingly, these aspects will be scoped out of the EIA.
Major accidents and disasters	The EIA Regulations require potential major accidents and disasters of relevance to the proposed scheme to be considered, and to define applicable mitigation and management measures. The process of scoping has concluded that environmental effects associated with potential major accidents and disasters can be appropriately assessed and reported in the Environmental Statement under applicable environmental topics.
Monitoring	Monitoring requirements associated with the proposed scheme will be detailed in the Environmental Statement where relevant and within an outline Environmental Management Plan (EMP).
Flood risk	Flood risk is considered in Chapter 13: Road Drainage and Water Environment.
Waste	Waste is considered in Chapter 10: Materials.
Socio-economic impacts	Socio-economic impacts have been considered as part of Chapter 12: People and Communities, and contribute to the proposed scheme objectives as detailed in Section 2.4.

4.5. Study Areas

4.5.1. Study areas are defined herein for each environmental topic, according to guidance and the potential geographic scope of identified impacts / effects.

4.6. Data Gathering

4.6.1. Data collated by AECOM and other Highways England approved suppliers as part of the proposed scheme design-development process has been used as a starting point for this EIA Scoping Report. It is recognised that up-to-date data are important for a robust assessment; therefore, updated data will be gathered for each scoped-in environmental topic where relevant, including the capture of data for the candidate sites identified for potential flood compensation, construction compounds, soil storage areas and / or potential areas for ecological compensation.

4.6.2. The scope of data collection, including the further surveys to be carried out, is defined in each specialist chapter. In most cases, this work will involve four elements:

- Consultation of third-party organisations to obtain factual information;
- Consultation of third-party organisations (including statutory consultees) for comment on the scope of the work required, on the prediction and assessment of impacts, and to define and agree appropriate mitigation requirements;
- Desk-based surveys; and
- Field surveys.

4.7. Assessment Years

4.7.1. The approach to the environmental assessment will be to assess the potential environmental impacts of the proposed scheme at key stages in its construction and operation. These will be compared to the current baseline situation (without the proposed scheme). For the purposes of the environmental assessment, the current baseline conditions are reported for 2017 and, where seasonally required, 2018.

4.7.2. Future baselines have been defined against which the predicted conditions during proposed scheme construction and operation can be compared. It is proposed that the EIA addresses the following timescales (all of which are subject to potential review):

- **Current Baseline Conditions (2017 - 2018):** this scenario describes the existing conditions associated with the proposed scheme.
- **Future Baseline Conditions (2020):** this scenario considers the future conditions immediately prior to the start of proposed scheme construction. Other future baseline scenario years can be used if appropriate, and where specified as they are predicted to be in the period immediately prior to the start of construction.
- **Construction (2020 - 2023):** this scenario describes the conditions during the construction phase (the construction phase duration is subject to review).
- **Operation (2024)**: this scenario describes the conditions predicted to be associated with the full operation of the proposed scheme within its year of opening.
- **Future Baseline Conditions (2039):** this scenario considers the future conditions with and without the proposed scheme 15 years after opening, and facilitates a comparison between the two. Year 15 is typically adopted on highway developments to account for the establishment of landscape mitigation measures over time.

4.7.3. Other future baseline scenario years may be defined and considered, as appropriate, to facilitate undertaking the individual assessments within the EIA.

4.8. Impact Avoidance Design Measures and Management Activities

4.8.1. The assessments to be undertaken and reported in the Environmental Statement will take into account any measures that have been incorporated into the proposed scheme design to avoid / reduce (or 'design-out') environmental impacts, and hence minimise or avoid environmental effects that might otherwise result from these impacts.

4.8.2. These measures may derive from the outset of the design-development process, or can result iteratively from the preliminary outcomes of the EIA process at key design stages, and must be both well established and proven. Novel or non-

standard measures that have not yet been demonstrated to be reliably effective, are at an experimental stage, or which cannot otherwise be confidently assumed to work, are not taken account of in the EIA as incorporated mitigation.

4.8.3. The assessments undertaken and reported in the Environmental Statement will also take account of any standard management activities that would be implemented as part of the proposed scheme. This includes measures that aim to limit environmental impacts and effects through adherence to good site practices and measures required for legal compliance during the construction phase.

4.8.4. The key tests which need to be 'passed' to enable these types of measures to be taken into account are:

- The management measures must be fairly standard and not new / untested;
- There must be commitment by Highways England to implement them; and
- There must be confidence that the measure's deliverability is foreseeable e.g. it can be delivered through applicable construction contractual obligations.

4.8.5. As detailed in IAN 183/14 Environmental Management Plans, the preparation and implementation of an Environmental Management Plan (EMP) is widely considered to constitute best practice in the management of the environmental effects of projects and to demonstrate compliance with environmental legislation. An outline EMP will be developed as part of the EIA process and will form part of the DCO application documentation.

4.8.6. Subject to the granting of consent, the outline EMP would then be developed into a Construction Environmental Management Plan (CEMP) by the appointed contractor and implemented during construction. Towards the end of the construction period, information in the CEMP would be used by the contractor to develop a Handover Environmental Management Plan (HEMP). The HEMP would contain essential environmental information needed by the body responsible for the future maintenance and operation of the proposed scheme.

4.9. Mitigation

4.9.1. Following the consideration of incorporated design and best practice management measures, wherever a significant effect is assessed to remain, mitigation measures will be developed to reduce adverse effects to an acceptable, residual level wherever feasible.

4.9.2. Environmental mitigation measures aimed at reducing or remedying potentially significant adverse environmental effects will be reported in the Environmental Statement.

4.10. Enhancement Measures

4.10.1. Enhancements are measures that are not critical to implementation of mitigation to reduce identified environmental impacts or the subsequent effects, but constitute additional measures that complement the overall objectives of the scheme and/or provide opportunities for any proposed mitigation to further reduce impacts.

4.10.2. The potential for enhancement measures to be implemented and delivered by the proposed scheme (as part of a wider commitment to the environment made by Highways England) will be considered as part of the EIA process, where possible. Given the nature of the proposed scheme, enhancements (if considered appropriate) are likely to include measures such as:

- improving the interconnectivity of mitigation areas to facilitate the development of green corridors;

- the inclusion of mammal bridges and tunnels to encourage free movement; and
- the reuse of material derived from earthworks as part of the overall landscaping strategy.

4.11. Cumulative and Combined Impacts and Effects

4.11.1. Cumulative effects are those that consider other developments that might reasonably be expected to take place at the same time, and considers whether these need to be taken into account when considering the overall effect experienced by that receptor.

4.11.2. Combined effects are defined as the result of different sorts of impact acting on the same receptor to cause an effect that is predicted to be different to that predicted if they were experienced in isolation.

4.11.3. The predicted effects of the proposed scheme will be considered alongside the effects of other proposed developments that may have their own impacts and effects within the relevant study area. DMRB requires the cumulative impacts of those road schemes that are committed or have progressed through the statutory process. A check on which schemes are in the roads programme, and therefore need to be assessed in terms of cumulative impacts, will be undertaken. Non-road schemes will also be taken into account, where relevant. Consultation will therefore be undertaken with relevant organisations to establish the geographic location, form and status of development projects that have genuine potential to interact with the proposed scheme.

4.11.4. Where possible the data collected for the other schemes and development projects in terms of environmental assessment will be acquired and used in the EIA of the proposed scheme, where relevant, to assist with baseline data collection. Further details of the proposed cumulative and combined impact assessment are provided in Chapter 15.

4.12. Decommissioning

4.12.1. The proposed improvements would be expected to operate adequately for a 15 years i.e. until 2038. Typically highway schemes are designed to have a material life-span of between 20 and 40 years before major maintenance and upgrading is required, which is dependent on material properties, maintenance and usage. Elements including structural concrete and steelwork have extended design lives of up to 120 years.

4.12.2. It is considered highly unlikely that the junction and link road elements of the proposed scheme would be decommissioned as the road is likely to form an integral part of the local transportation infrastructure. Accordingly, effects associated with any decommissioning phase will not be considered in the EIA.

4.13. Major Events

4.13.1. In May 2017 Highways England issued instructions setting out how changes brought about by the EIA Regulations would be considered in EIA terms. These instructions set out the proposed scope of assessments in relation to major events (‘events’ being the collective term used in the instructions for both accidents and disasters). This scope should cover:

- vulnerability of the project to risks of major accidents and/or disasters; and
- any consequential changes in the predicted effects of that project on environmental topics.

4.13.2. To achieve this, the instructions identify that projects should:

- apply professional judgement in consultation with the Overseeing Organisation to develop project specific definitions of major events;
- identify any major events that are relevant to and can affect a project;
- where major events are identified, describe the potential for any change in the assessed significance of the project on relevant environmental topics in qualitative terms;
- report the conclusions of this assessment within the individual environmental topics; and
- clearly describe any assumed mitigation measures, to provide an evidence base to support the conclusions and demonstrate that likely effects have been mitigated / managed to an acceptable level.

4.13.3. The Highways England instruction confirms that a separate chapter is not required. The potential receptors of effects resulting from major events will be reported in relevant topic chapters, and as such major events will not form a topic in itself.

4.13.4. In order to identify any major events that could be relevant to the proposed scheme, a long list of all possible major events will be developed. At that point an initial screening exercise will be carried out to identify if any of the identified major events have any potential to interact with the proposed scheme.

4.13.5. Major events (as they relate to the proposed scheme) will be categorised as:

- events that could not realistically occur, due to the proposed scheme type or its location;
- events that could realistically occur, but for which the proposed scheme, and associated receptors, are no more vulnerable than any other development; and
- events that could occur, and to which the proposed scheme is particularly vulnerable, or which the proposed scheme has a particular capacity to exacerbate.

4.13.6. Where events identified above are not already being considered within the individual assessment chapters, they will continue to be reviewed with the design team to ensure the risks are understood and addressed through the design-development process, as necessary. However, it is considered highly likely that major event types will be able to be removed from the scope of the assessment prior to publication of the Environmental Statement as the design will ensure there is no genuine risk or serious possibility of the event interacting with the proposed scheme. All such scoping out will be reported in the Environmental Statement.

4.14. Environmental Statement Structure

4.14.1. The proposed structure of the Environmental Statement is detailed in Section 16.5 (Table 16.2).

4.15. Publication Strategy and Timings

4.15.1. This EIA Scoping Report has been prepared as part of a formal request for a scoping opinion, submitted to PINS in October 2017.

4.15.2. The proposed scheme programme includes the following key dates:

- Submission of the PEIR: November 2017.
- Statutory consultation: January 2018.
- Submission of the Environmental Statement to accompany the DCO application: July 2018.

4.15.3. The above programme is subject to ongoing review and may change in response to evolving proposed scheme requirements.

4.16. Consultation

4.16.1. The process of consultation is critical to the development of a comprehensive and balanced Environmental Statement. The views of statutory and non-statutory consultees serve to focus the environmental studies and to identify specific issues that require further investigation. Consultation is an ongoing process, which enables mitigation measures to be incorporated into the proposed scheme design thereby limiting adverse effects and enhancing environmental benefits.

4.16.2. The following consultees have been contacted during PCF Stage 2 and / or during preparation of this EIA Scoping Report:

- Highway England;
- Environment Agency;
- Natural England;
- The GAA;
- SMBC;
- Solihull Historic Environment Record;
- Warwickshire Historic Environment Record; and
- Warwickshire Biological Records Centre.

4.16.3. Whilst informal consultation activities are ongoing with these bodies, as detailed in para. 4.16.2, no formal agreements have been reached regarding the scope of the EIA. A summary of consultation activities undertaken is detailed in Table 4.2.

Table 4.2: Consultation Activities Undertaken as Related to the EIA

Aspect or Topic	Consultation (Completed, On-going, Planned)
Air quality	Scope of the technical assessment and supporting air quality monitoring database has been discussed with Highways England air quality specialists.
Cultural heritage	No formal consultation has been undertaken with Historic England during PCF Stage 2 regarding assessment methodologies for the three cultural heritage elements (i.e. archaeological remains, historic buildings and historic landscape), potential scheme impacts on heritage resources, and archaeological survey requirements. Formal consultation is planned during PCF Stage 3.
Landscape and visual effects	Landscape officers at SMBC were consulted regarding the scope of the PCF Stage 2 assessment and the choice of viewpoint locations for the PCF Stage 3 Landscape and Visual Impacts Assessment (LVIA). Further consultation on assessment methods and selection of receptors is planned for PCF Stage 3.
Biodiversity	Ecological stakeholders were consulted during the PCF Stage 2 ecological impact assessment to provide baseline information on the existing ecology of the study area - these included Warwickshire Biological Records Centre and Highways England through EnvIS. Early consultation during PCF Stage 3 includes Natural England to discuss and determine further survey requirements, assessment methods and if required, mitigation measures and enhancement opportunities.
Geology and soils	No formal consultation has been undertaken with Natural England during PCF Stage 2 regarding assessment methodologies. Early consultation with Natural England has occurred during PCF Stage 3.

Aspect or Topic	Consultation (Completed, On-going, Planned)
Materials	The environmental team are consulting with the proposed scheme highway design team in order to gain an understanding of the types and quantities of materials that would likely be used during construction and the potential types and volumes of waste that would be generated. A construction contractor will also be available for providing advice during PCF Stage 3.
Noise and vibration	The Environmental Health Departments at SMBC have yet to be consulted formally on the noise and vibration assessment and monitoring for the proposed scheme. Relevant bodies will be consulted during PCF Stage 3.
People and communities	No formal consultation with organisations that have an interest in the facilities that are commonly accepted to constitute the people and communities assets have been undertaken during PCF Stage 2. During PCF Stage 3 a range of organisations will be consulted with regarding the proposed scheme, such as non-motorised user (NMU) facilities – this includes the SMBC public rights of way officer, Solihull Cycling Club, SUSTRANS Midlands Area, Ramblers Association, Highways England.
Road drainage and the water environment	No formal consultation has been undertaken at PCF Stage 2 with regards to road drainage and the water environment. Early consultation in PCF Stage 3 has occurred with the Environment Agency, Natural England and Highways England, whilst further consultation will be undertaken during the detailed assessment process regarding mitigation and compensation provisions where considered necessary.
Combined and cumulative effects	No formal consultation has been undertaken at PCF Stage 2 with regards to combined and cumulative effects. During PCF Stage 3 the planning department of SMBC will consulted with in order to identify potential major land developments in the vicinity of the proposed scheme with the potential to generate cumulative effects in association with the proposed scheme.

4.16.4. Highways England will prepare a Statement of Community Consultation (SoCC) for publication prior to the commencement of formal consultation in early 2018. The SoCC will outline how Highways England intends to formally consult with the local community about the proposed scheme.

4.16.5. Highways England proposes to undertake a programme of statutory consultation, following publication of the PEIR using a range of methods including public exhibitions and a project website. The website will be maintained throughout the proposed scheme programme to provide up-to-date information.

4.16.6. All responses received during consultation will be carefully considered and taken into account in the development of the proposed scheme design and the EIA process. Details of any responses received during consultation, and the account taken of those responses, will be included in a Consultation Report to demonstrate how Highways England has complied with the consultation requirements of the Planning Act 2008 (as amended).

5. AIR QUALITY

5.1. Introduction

5.1.1. The following section presents the proposed approach to assessing the potential air quality impacts and effects of the proposed scheme.

5.1.2. The assessment will consider potential impacts at sensitive receptors for human health and ecosystems within the study area. The assessment will consider potential impacts on dust and particulates (PM_{10}) during the construction phase. The proposed scheme operational phase assessment will focus on the pollutants: oxides of nitrogen (NOx), nitrogen dioxide (NO_2) and particulates (PM_{10}). These are the pollutants where vehicle emissions are the most likely to give rise to pollutant levels near to or above air quality objective values.

5.1.3. The following subsections outline relevant air quality planning policies, describe baseline air quality conditions of the local area and how air quality could be potentially impacted by the proposed scheme, and the air quality assessment methodology to be followed.

5.2. Summary of Relevant Policy

European Air Quality Legislation

5.2.1. The Clean Air for Europe (CAFE) programme revisited the management of Air Quality within the EU and replaced the EU Framework Directive 96/62/EC (Council of European Communities, 1996) its associated Daughter Directives 1999/30/EC (Council of European Communities, 1999, Council of European Communities, 2000 and Council of European Communities, 2002) and the Council Decision 97/101/EC (Council of European Communities,1997) with a single legal act, the Ambient Air Quality and Cleaner Air for Europe Directive 2008/50/EC (Council of European Communities, 2008).

5.2.2. Directive 2008/50/EC is currently transcribed into UK legislation by the Air Quality Standards Regulations 2010 (H.M. Government, 2010), which came into force on the 11th of June 2010. These limit values are legally binding on the UK and have been set with the aim of avoiding, preventing or reducing harmful effects on human health and on the environment as a whole.

National Air Quality Strategy

5.2.3. The UK National Air Quality Strategy (Department for Environment, Food and Rural Affairs, 2000) was initially published in 2000, under the requirements of the Environment Act 1995 (H.M. Government, 1995). The most recent revision of the Strategy (Department for Environment, Food and Rural Affairs, 2007) sets objective values for key pollutants as a tool to help Local Authorities manage local air quality improvements in accordance with the EU Air Quality Framework Directive. Some of these objective values have been laid out within the Air Quality (England) Regulations 2000 (H.M. Government, 2000) and later amendments (H.M. Government, 2002).

5.2.4. The air quality objective values have been set down in regulation solely for the purposes of local air quality management. Under the local air quality management regime, local authorities have a duty to carry out regular assessments of air quality against the objective values and if it is unlikely that the objective values will be met in the given timescale, they must designate an Air Quality Management Area (AQMA) and prepare an Air Quality Action Plan (AQAP) with the aim of achieving the objective values. The boundary of an AQMA is set by the governing local authority to define the geographical area that is to be subject to the management measures to be set out in a subsequent action plan. Consequently it is not unusual for the boundary of an AQMA to include within it, relevant locations where air quality is not at risk of exceeding an air quality objective.

5.2.5. The UK's national air quality objective values for the pollutants of relevance to this assessment are displayed in Table 5.1. These objectives for NO_2 and PM_{10} are for the protection of human health and the NOx objective is for the protection of vegetation and ecosystems.

Table 5.1: Air Quality Objective Values

Pollutant	Averaging Period	Objective	Date for Achievement
Nitrogen dioxide (NO_2)	Annual Average	40 µg/m^3	UK 11 June 2010
			EU 1 January 2010
	1-hour Average	200 µg/m^3 (not to be exceeded more than 19 times a year)	UK 11 June 2010
			EU 1 January 2010
Particulate matter (PM_{10})	Annual Average	40 µg/m^3	UK 11 June 2010
			EU 1 January 2005
	24-hour Average	50 µg/m^3 (not to be exceeded more than 35 times a year)	UK 11 June 2010
			EU 1 January 2005
Nitrogen oxides (NOx)*	Annual Average	30 µg/m^3	UK 31 December 2000
			EU 19 July 2001

* applies to ecosystems

National Policy Statement for National Networks

5.2.6. Statements 5.3 – 5.15 of the NPSNN (Department for Transport, 2013) specifically relate to air quality assessment and states that the Secretary of State should refuse consent where, after taking into account mitigation, the air quality impacts of a scheme will:

"*result in a zone/agglomeration which is currently reported as being compliant with the Air Quality Directive becoming non-compliant; or*

affect the ability of a non-compliant area to achieve compliance within the most recent timescales reported to the European Commission at the time of the decision."

5.2.7. The NPSNN also states that "*any increase in carbon emissions is not a reason to refuse development consent, unless the increase in carbon emissions resulting from the proposed scheme are so significant that it would have a material impact on the ability of Government to meet its carbon reduction targets*."

National Planning Policy Framework (NPPF)

5.2.8. The National Planning Policy Framework (NPPF) was published in March 2012 (Department for Communities and Local Government, 2012). Paragraph 109 of the NPPF states that:

"*The planning system should contribute to and enhance the natural and local environment by: preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability*…"

5.2.9. Annex 2 of NPPF defines 'pollution' as:

"*Anything that affects the quality of land, air, water or soils, which might lead to an adverse impact on human health, the natural environment or general amenity. Pollution can arise from a range of emissions, including smoke, fumes, gases, dust, steam, odour, noise and light*."

5.2.10. There are national, regional and local policies for the control of air pollution and local action plans for the management of local air quality across the proposed scheme. The effect of the proposed scheme on the achievement of such policies and plans are matters that may be a material consideration by planning authorities, when making decisions for individual planning applications. Paragraph 124 of the NPPF states that:

"*Planning policies should sustain compliance with and contribute towards EU limit values or national objectives for pollutants, taking into account the presence of Air Quality Management Areas and the cumulative impacts on air quality from individual sites in local areas. Planning decisions should ensure that any new development in Air Quality Management Areas is consistent with the local air quality action plan*."

Planning Policy and Guidance

5.2.11. The national Planning Practice Guidance (PPG) was first published on 6th March 2014 (Department for Communities and Local Government, 2014) and provides a web-based resource in support of the NPPF.

5.2.12. Following its publication a number of previously published planning guidance documents have been cancelled and these are detailed within the Written Ministerial Statement titled "*Making the planning system work more efficiently and effectively*", also dated 6th March 2014.

5.2.13. The PPG provides a summary of the air quality issues set out in the NPPF and goes on to note that assessments of the impact of proposed developments on air quality should include the following information:

- The existing air quality in the study area (existing baseline);
- The future air quality without the development in place (future baseline); and
- The future air quality with the development in place (with mitigation).

5.2.14. The guidance then advises that a planning application should proceed to decision with appropriate planning conditions or planning obligation, if the proposed development (including mitigation) would not lead to an unacceptable risk from air pollution, prevent sustained compliance with EU limit values or fail to comply with the requirements of the Conservation of Habitats and Species Regulations.

Local Policy and Guidance

5.2.15. The SMBC Local plan 2013 (SMBC, 2013), sets out how and where Solihull will develop in the future outlining the challenges facing Solihull and how they will be addressed, the vision for the future of Solihull, the strategy for achieving the vision, and policies and proposals to enable the borough to grow and develop.

5.2.16. The Protecting and Enhancing our Environment section of the Local Plan, policy P14 Amenity states that the Council will, "*Encourage better air quality in and around the Borough through the adoption of low emission zone initiatives such as those involving the use of electric vehicles for freight and public transport. Development that would contribute to air pollution, either directly or indirectly will be permitted only if it would not hinder or significantly harm the achievement of air quality objectives or any relevant Air Quality Management Plan, and it incorporates appropriate attenuation, mitigation or compensatory measures*."

5.2.17. SMBC is a partner in the Low Emissions Towns and Cities Programme and the Local Plan states that SMBC will support proposals aimed at securing better air quality across the metropolitan area, such as the provision of infrastructure to encourage the use of electric vehicles for freight and public transport journeys within and beyond the borough. Best Practice Planning Guidance will be produced to provide further guidance for local authorities and developers. Developers should have regard to air quality objectives in considering the location and design of new development.

5.2.18. The Solihull's Future Solihull's Local Plan Review (SMBC, 2016a) document sets out the programme for reviewing the Solihull Local Plan, which is currently the principal statutory development plan document for the Borough. The allied strategy Solihull Connected sets out the vision for transport in Solihull for the next 20 years along with a short, medium and long term investment plan to create a balanced transport investment programme that recognises the need to cater for cars, but places an increasing emphasis on walking, cycling and public transport. This approach aims to accommodate the increasing demand for travel as a result of growth, whilst ensuring the quality of Solihull is protected and that transport effectively supports the delivery of wider agendas such as those around climate change and health. The M42, Junction 6 is identified as a high level investment priority for the borough.

5.3. The Study Area

5.3.1. The air quality study area will be the 200m boundary of the roads that are determined to be affected by the Proposed scheme (i.e. the Affected Road Network) in accordance with guidance given in Highway England's DMRB HA207/07 (Highways Agency, 2007).

5.3.2. Detailed local air quality modelling will consider the impacts on human health sensitive receptors and ecological designated sites within this boundary. The approach to the determination of an Affected Road Network for air quality is defined further in Section 5.6. For the purpose of this Scoping Report only, an initial study area around the proposed scheme options has been reviewed, determined by the extent of the VISSIM model network. The final extent of the study area will be determined once detailed traffic modelling has been completed, and traffic data are made available.

Receptors

5.3.3. Potential sensitive receptors that may be affected by the proposed scheme include residential properties located close to the roadside of affected roads. The village of Bickenhill is located immediately to the east of the route of the proposed scheme – air quality impacts at the village will be a key focus of the assessment. Receptors that are located near to affected links are located in Kingshurst, Chelmund's Cross, Chelmsley Wood, Coleshill, Elmdon, Lode Heath, Catherine-de-Barnes, Hampton in Arden, Solihull and Copt Heath. Individual receptors near to affected links have also been considered.

5.3.4. There are a number of SSSIs within 5km of the proposed scheme, with one site being located within 200m, namely Bickenhill Meadows SSSI. This SSSI is split into two units on either side of the proposed scheme alignment. Coleshill and Bannerly Pools SSSI and the River Blythe SSSI are both located adjacent to roads included within the VISSIM model network. Whitacre Heath SSSI is located approximately 3.7km to the north and Berkswell Marsh SSSI is located approximately 500m to the east. Air quality at these sites may be affected if routes within 200m of the sites are affected. The ecological sites located within 2km of the proposed scheme are detailed in Chapter 8: Biodiversity.

5.4. Baseline Conditions

5.4.1. There is an AQMA in the vicinity of the proposed scheme. Birmingham City Council (BCC) (located approximately 2 km to the west of the existing M42 corridor) has declared a city wide AQMA, covering the entirety of their administrative area due to the exceedance of the NO_2 annual mean limit value, and the exceedance of the 24 hour mean limit value (BCC, 2016). North Warwickshire Borough Council (NWBC) had declared an AQMA around a section of the M42 and M6 to the south of Coleshill. This AQMA was revoked in 2013 (NMBC, 2015).

5.4.2. A review of the available modelled background concentrations along the proposed scheme has been carried out for annual mean background concentrations of NO_2, PM_{10} and $PM_{2.5}$ provided in 1km x 1km grid squares (Defra, 2016). Background concentrations for 2016 are well below the relevant objective values in this area for all pollutants.

5.4.3. Both SMBC (SMBC, 2016b) and NWBC (NWBC, 2015) have undertaken air quality monitoring at locations near to the proposed study area. BCC 2016 have undertaken monitoring across their administrative area (2016), however, none of their monitoring locations are within the proposed study area.

5.4.4. Monitoring undertaken by SMBC was decommissioned in 2012 and so the most recent air quality monitoring data relate to 2011. Monitoring results near to main roads, such as along Coventry Road (A45), indicate that concentrations of NO_2 were in the region of approximately 31µg/m^3, while concentrations further away from the main roads were in range 15.2µg/m^3 to 28.6µg/m^3. One monitoring location on Old Station Road near Junction 6 on the M42 had a reported NO_2 concentration of 39.7µg/m^3. This monitoring location was located within 5m of the Junction 6 roundabout and indicates that receptors located close to the M6 are at risk of exceeding the NO_2 annual mean limit value.

5.4.5. Monitoring undertaken by NWBC in Coleshill near to the interchange between the M6, M6 Toll and M42, record NO_2 concentrations at relevant receptors of 31µg/m^3, dropping to approximately 22 - 24 µg/m^3 at locations further from the motorways.

5.4.6. Monitoring of NO_2 has conducted by Highways England at six locations using diffusion tubes in 2016. Table 5.2 presents the results of the 2016 monitoring programme.

Table 5.2: Highways England NO_2 Diffusion Tube Monitoring in proximity to the Proposed Scheme

Site ID	Site Type	Grid Reference		2016 Annual Mean NO_2 Concentration ($\mu g/^3$)
		X	Y	
BBP4_001_0116 Chester Road	Roadside*	420024	284970	29.6
BBP4_002_0116 East Way	Roadside*	420281	283176	26.5
BBP4_003_0116 Church Lane	Roadside*	419283	282932	24.7
BBP4_004_0116 Old Station Road	Roadside*	419854	282851	32.2
BBP4_005_0116 St Peters Lane	Roadside*	418892	282217	17.5
BBP4_006_0116 Shadowbrook Lane	Roadside*	419564	281289	20.8
*Classification for sites within 1 m and 5 m from the kerb, as defined in Defra Technical Guidance (TG16)				

Trends in Pollution Concentration

5.4.7. Measured NO_2 concentrations have generally shown a small decline over the last five years in and close to the study area, although concentrations vary from year to year depending on meteorological conditions. Detailed results at selected sites over the last five years in the nearby local authorities are provided in Table 5.3.

Table 5.3: Trends in NO_2 concentrations

				Annual Mean NO_2 concentrations (µg/m3)				
Site ID	Site Name	Site Type	Distance to Proposed Scheme (km)	2010	2011	2012	2013	2014
Solihull Metropolitan Borough Council								
19	Partridge Close	Roadside	4.5	n/a	28.6	-	-	-
20	Blackfirs	Suburban	2.5	n/a	22.5	-	-	-
21	Old Station Road	Roadside	1	n/a	39.7	-	-	-
North Warwickshire Borough Council								

				Annual Mean NO_2 concentrations (µg/m3)				
6	Coventry Road, Coleshill	Roadside	4.5	33	28	34	31	31
7	Coleshill School	Roadside	5	29	23	28	25	24
8	Packington Lane, Coleshill	Roadside	5	28	22	27	24	22
11	AQMA Farmhouse (Gate)	Roadside	4	39	33	38	38	35
n/a = not available								

5.5. Additional Survey Requirements

5.5.1. Baseline diffusion tube monitoring is being collected for a six month period from September 2017 to February 2018. No additional surveys are required to support the air quality assessment to be reported in the Environmental Statement.

5.6. Value of the Environmental and Resource Receptors

5.6.1. The main types of receptors for local air quality are:

- Nationally and internationally designated ecological sites such as SSSIs, Special Areas of Conservation (SAC), Special Protection Areas (SPA) and sites listed under the Convention on Wetlands and Wildfowl (Ramsar).
- Public Exposure Receptors – sensitive locations where relevant exposure for the air quality criteria being assessed could occur e.g. residential properties or schools (as defined in Defra's Local Air Quality Management technical guidance; LAQM.TG16 (Department of Environment, Food and Rural Affairs, 2016)).
- Additional receptors that may be sensitive to deposition of dust and dust soiling (e.g. parks, gardens and allotments) during the construction phase.

5.6.2. All human receptors within the study area are exposed to the risk of adverse impacts from the inhalation of construction dust and vehicle exhaust emissions, and are therefore, potential receptors during proposed scheme construction and operation. Risks during the construction phase are primarily from construction dust – exposure can occur through particles suspended in the air, and through deposition of particles on receptor surfaces. Construction dust can include particles that contribute to ambient PM_{10} concentrations, and also far coarser particles. There are no limit values for deposition, however, dust from wet or dry deposition on receptor surfaces can result in a loss of amenity, and as such is considered a statutory nuisance under the Environmental Protection Act 1990.

5.6.3. Construction dust can also affect ecosystems through deposition that acts as a barrier physical to photosynthesising plants, and through the effects of its chemical constituents on sensitive ecological receptors.

5.6.4. Designated ecosystem sites can also be affected by increases in oxides of nitrogen (NOx) concentrations and associated increases in nitrogen deposition rates with higher NOx emissions from vehicles.

5.6.5. Permanent risks to local air quality can result through changes in the alignment of road centrelines and road edges to a position closer to sensitive human and ecological receptors, and also through changes to traffic, such as volume, composition, speed and flow. Whilst realignment of a road may reduce the distance between pollutant source and receptors, this may be countered by improvements in flow that reduce stationary or stop-start traffic and the amount of time that engines are operating at sub-optimal levels. Changes in vehicle composition can also affect ambient air quality, such as an increase in diesel powered Heavy Duty Vehicles (HDV) and Light Duty Vehicles (LDV) traffic that could result in an increase to PM_{10} and NO_2 concentrations.

5.6.6. All relevant receptors that have been selected to represent locations where people are likely to be present are based on impacts to human health. The air quality objective values have been set at concentrations that provide protection to all members of society, including more vulnerable groups such as the very young, elderly or unwell. As such, the sensitivity of receptors was considered in the definition of the air quality objective values and therefore no additional subdivision of human health receptors on the basis of building or location type is necessary.

5.7. Potential Impact and Effects

Construction Effects

5.7.1. Construction activities have the potential to give rise to adverse impacts from fugitive emissions of dust due to activities such as demolition of bridges, construction of new junctions and road re-surfacing. These are likely to be temporary in nature and localised. There may also be increases in PM_{10} and NO_2 concentrations at sensitive receptors due to emissions from traffic and plant (non-road mobile machinery). However, construction vehicle and plant emissions are unlikely to be significant, particularly in comparison to levels of similar emissions from vehicle movements on the road network.

5.7.2. Sensitive receptors within 200m of construction activities will be identified once the construction programme has been confirmed.

Operational Effects

5.7.3. The proposed scheme aims to provide improvements to traffic congestion along this section of the M42 and surrounding SRN. As the alignment moves away from the existing route of the M42, there may be improvements in air quality at sensitive receptors along the existing M42 and near to Junction 6. There is potential for changes in pollutant concentrations at sensitive receptors located along routes intersecting with the proposed scheme and in the wider area, such as within Bickenhill and along Old Station Road to the north of Hampton in Arden, due to changes in traffic movements in the wider area due to the proposed scheme. There is potential for increases in air pollution at sensitive receptors located within 200m of the proposed scheme or an affected road.

Summary of PCF Stage 2 Assessment

5.7.4. As part of the PCF Stage 2 assessment, no traffic modelling data were available. Therefore, a qualitative air quality assessment was conducted for a large number of different options. The PCF Stage 2 Environmental Assessment Report (EAR) (WSP, May 2017a) concluded that there was the potential for significant air quality effects during construction and operation for all options and that further assessment was recommended when traffic modelling results became available (Highways England, 2017).

5.8. Proposed Scope of Assessment

5.8.1. The scope of the air quality assessment for the proposed scheme will include:

- Identification of baseline air quality conditions and nearby sensitive receptors.
- Consideration of construction phase dust and PM_{10} impacts in terms of dust soiling and health impacts at sensitive receptors.
- Local air quality assessment of operational impacts of road traffic emissions (annual mean NOx for designated ecological sites and annual mean NO_2 and PM_{10} for public exposure sensitive receptors) for the proposed scheme opening year Do-Minimum and Do-Something.
- Assessment of significance of the local assessment for the Do-Something modelling scenarios compared to the Do-Minimum scenario in the proposed scheme opening year.
- Regional air quality assessment of NO_2, PM_{10} and CO_2 for the current baseline, proposed scheme opening year Do-Minimum and Do-Something and Design Year Do-Minimum and Do-Something.
- Assessment of the risk of adverse effects on compliance with Air Quality Limit Values.
- WebTAG appraisal of air quality in the proposed scheme opening and design year for Do-Minimum and Do-Something.

5.9. Proposed Assessment Methodology

Guidance

5.9.1. The air quality assessment methodology follows the air quality guidance given in the DMRB, HA207/07 (Highways Agency, 2007). This sets out the methodology to determine the impact that road projects may have on local and regional air quality for human health and ecological receptors. The guidance includes a calculation method to estimate local pollutant concentrations and regional emissions for air including those for carbon.

5.9.2. In addition to the main DMRB guidance document, a number of air quality IANs have been issued, namely:

- IAN 170/12 v3 Updated air quality advice on the assessment of future NOx and NO2 projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality (Highways Agency, 2012a).
- IAN 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (Highways Agency, 2012b).
- IAN 175/13 Updated advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for users of DMRB Volume 11, Section 3, Part 1 Air Quality (Highways Agency 2013).
- IAN 185/15 Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into ‘speed-bands’ for users of DMRB Volume 11, Section 3, Part 1 ‘Air Quality and Volume 11, Section 3 Part A Air Quality (Highways Agency 2015).

5.9.3. There are no DMRB criteria to define the significance in terms of construction dust effects. The Environmental Statement will specify a range of measures that can be implemented that have the aim of avoiding significant dust effects.

5.9.4. Where necessary, the modelling assessment and tools used will refer to Defra’s Local Air Quality Management (LAQM) Technical Guidance LAQM.TG16 (Defra, 2016).

5.9.5. The WebTAG appraisal will follow the latest Transport Analysis Guidance (TAG) as provided by the Department for Transport (currently Department for Transport, 2015).

Construction

5.9.6. The identification of the potential impacts due to construction dust emissions will be based on the DMRB guidance i.e. to consider sensitive receptors within 200m of construction activity. The locations of any sensitive receptors such as housing, schools, hospitals or special ecological sites within 200m of a construction site will be identified such that mitigation measures to reduce dust emissions can be identified and applied.

5.9.7. Demolition and construction plant emissions will not be explicitly modelled, as these are considered to be a small emission source relative to ambient local conditions in the vicinity of the proposed scheme. As such, the assessment will be considered in a qualitative manner.

5.9.8. Assessment of construction phase heavy goods vehicle (HGV) emissions will also follow DMRB guidance to consider the additional HGV movements due to construction of the proposed scheme. If the traffic data shows that there are unlikely to be more than 200 HGVs per day during the proposed construction phase, then these impacts will be screened out, as below this level of HGV movements, air quality effects would not be significant. Otherwise limited detailed dispersion modelling will be conducted.

5.9.9. It is proposed that defined mitigation measures would be recorded in a CEMP to ensure avoidance of any significant effects. These mitigation measures would be based on best practice guidance on the assessment of dust from demolition and construction sites.

Operation - Local Air Quality Assessment

5.9.10. The local air quality impact assessment during proposed scheme operation will focus on emissions of the key pollutants NO_2 and particulate matter (PM_{10}) as these are the principal pollutants of concern with regards to emissions from road traffic, as set out in the DMRB.

5.9.11. Information on current air quality in the vicinity of the proposed scheme will be taken from available monitoring data as identified in Section 5.4. In addition, it is proposed that a six month baseline NO_2 diffusion tube monitoring survey is conducted along the proposed scheme route and surrounding road network where no monitoring data are available.

5.9.12. DMRB air quality guidance screening criteria will be applied to define the affected road network, although this is anticipated to be restricted to the extent of the detailed VISSIM model. The Affected Road Network applies to those roads within the traffic reliability area (TRA) (i.e. the area within which traffic data is considered to be suitable for use in environmental assessments by the traffic team) which meet any of the following criteria:

- Road alignment changed by 5m or more.
- Daily traffic flows will change by 1,000 annual average daily traffic (AADT) or more.
- Heavy duty vehicle (HDV) flows will change by 200 AADT or more.
- Peak hour speed will change by 20km/hr or more.
- Daily average speed will change by 10km/hr or more.

5.9.13. Note that the changes are applied to roads (not links), and so where relevant changes are determined under two-way traffic conditions. The screening criteria are change based, where change is based on the difference in opening year traffic data between the Do-Minimum and Do-Something.

5.9.14. The final local air quality Affected Road Network will take account of the extent of reliable coverage of the traffic model (TRA), but will exclude road sections where there are no receptors within 200m of the road.

5.9.15. Detailed air quality modelling of the likely effects during the proposed scheme operational phase will be undertaken in accordance with relevant guidance outlined in DMRB and associated IAN. Defra's LAQM Technical Guidance (LAQM.TG(16)) will also be taken into account.

5.9.16. Representative sensitive receptors will be selected for assessment within the local air quality affected road network. These will generally include those sensitive receptors placed closest to the affected road network. Receptors include: residential premises, community facilities (schools and hospitals etc.) and ecological sites with international or national statutory designation (SSSI, SAC, SPA and Ramsar) that include designated features sensitive to local air pollution.

5.9.17. Sensitive receptors will be identified from Ordnance Survey MasterMap® and AddressBase®, aerial photography and Natural England's website. The selection of designated ecological receptors would be undertaken in conjunction with the proposed scheme ecologists.

5.9.18. The local air quality assessment of air quality will use the most up to date version of ADMS (Atmospheric Dispersion Modelling System) Roads dispersion model to predict road pollutant annual mean concentrations of NO_2 and PM_{10} at the identified sensitive receptors and annual mean NOx concentrations for designated ecological sites.

5.9.19. Model predictions will be made for the base traffic year for verification purposes. Base year results will be compared with the results of representative monitoring and, if appropriate, a model adjustment factor will be determined and applied.

5.9.20. Model predictions will also be made for without (Do-Minimum) and with (Do-Something) the proposed scheme for the opening year. On the basis of these predictions, the change in NO_2 and PM_{10} as a result of the proposed scheme will be established.

5.9.21. LAQM guidance and tools, for example NOx to NO_2 conversion approach and background maps, will also be used as required. Hourly sequential meteorological data for 2016 will be taken from a representative meteorological station (Birmingham Airport) and will be used within the dispersion modelling.

5.9.22. A key element of the local air quality impact assessment is the rate of improvement in air quality over time as cleaner vehicles enter the national vehicle fleet. The methodology outlined within IAN 170/12 v3 on the assessment of future NOx and NO_2 projections will be used in this assessment. The method considers Defra's advice on long term trends related to roadside NO_2 concentrations, which suggests that there is a gap between current projected vehicle emission reductions and projections on the annual rate of improvements in ambient air quality as previously published in Defra's technical guidance and observed trends.

5.9.23. The methodology, known as 'Gap Analysis', involves the completion of air quality modelling and verification, to correct verified modelled total NO_2 concentrations. Following verification of the modelled results, they are then adjusted to represent the observed long term trend (LTTE6) profile described in IAN 170/12 v3. The adjusted results from this Gap Analysis will be presented in the Environmental Statement. These results are considered to present a realistic worst-case scenario, as only a portion of the full anticipated improvements in air quality by Defra guidance are assumed to occur in the Gap Analysis results by the future opening year.

5.9.24. The speed data used in the air quality impact assessment will be derived following the methodology set out in IAN 185/15. This IAN sets out the methodology by which the speed of a given section of road is assigned to one of 3 or 4 speed "bands", which have an average pollutant emission rate assigned to them.

5.9.25. Variations in traffic flow during the day will be reflected in varying period flows between the AM period (3 hours), Inter-peak (6 hours), PM Peak (3 hours) and Off-Peak (12 hours).

5.9.26. For sensitive designated ecological sites, the effect of the proposed scheme on annual mean NO_x concentrations and total annual nitrogen deposition will be considered in accordance with DMRB methodology. Comparison of results will be made with the Critical Levels for NOx and the Critical Loads for nitrogen deposition (the latter varies according to designation). The implications for designated sites will be considered separately to the air quality assessment as part of the 'Biodiversity' topic (see Chapter 8: Biodiversity).

5.9.27. Results will be presented in tabular format showing concentrations at discrete representative sensitive receptors, together with interpretative text. Concentration values will be reported to no more than one decimal place.

5.9.28. Air quality will be evaluated for compliance with the EU Directive on Ambient Air Quality (2008/50/EC) in accordance with IAN 175/13. The assessment will use the results of the local air quality modelling overlaid on the Defra compliance network provided to establish whether one of the following conditions as a result of the proposed scheme is met:

- A compliant zone becoming non-compliant; and/or
- Delay Defra's date for achieving compliance for the zone i.e. the change on a road link would result in concentration higher than the existing maximum value in the zone; and/or
- An increase in the length of roads in exceedance in the zone which would be greater than 1% when compared to the previous road length.

5.9.29. This assessment enables proposed scheme assessors to undertake and report on the risk of a scheme being non-compliant with the EU Directive. The evaluation of significance will also include information on compliance risks in relation to the EU Directive.

Operation - Regional Assessment

5.9.30. The DMRB regional scoping criteria will be applied to opening year traffic data and the design year to define the regional affected road network (different to that for local air quality). Roads that meet the following criteria may be included within the regional affected road network:

- Daily traffic flows will change by 10% AADT or more.
- Heavy duty vehicle (HDV) flows will change by 10% AADT or more.

- Daily average speed will change by 20 km/hr or more.

5.9.31. The scenarios to be modelled are: the existing base case (the traffic model base case); and future Do-Minimum and Do-Something in the opening year and design year (15 years after proposed scheme opening).

5.9.32. The results of the regional assessment (annual emissions, change in emissions with the proposed scheme and distance travelled) will be presented in tabular format, together with interpretive text.

Operation - WebTAG

5.9.33. TAG assessments for the local air quality (known as plan level), regional air quality, the economics of air quality effects, social and distributional effects and greenhouse gases sub objectives will be reported separately in a TAG appraisal report.

5.9.34. Only the local plan level air quality appraisal from TAG will be reported as required by the DMRB guidance.

5.9.35. The local plan level methodology within the TAG guidance aims to quantify the change in exposure at receptors in the opening year as a result of schemes, through the quantification of exposure for all DMRB local affected roads. The methodology follows a number of steps comprising:

- Identification of the affected road network, which is the same as the DMRB local air quality affected road network.
- Quantification of the number of properties within 0m-50m, 50m-100m, 100m-150m and 150m – 200m bands, from the affected roads.
- The calculation of concentrations within each band at 20m, 70m, 115m and 175m from the road centreline using the DMRB spreadsheet model.
- Calculation of property-weighted NO_2 and PM_{10} concentrations.
- Calculation of the total numbers of properties where air quality improves, worsens or stays the same for each pollutant.
- A calculation of an overall assessment score for NO_2 and PM_{10}.

5.9.36. An overall positive score indicates an overall worsening in air quality and an overall negative score indicates an overall improvement in air quality.

Criteria for Significance of Effect

5.9.37. There are no DMRB criteria to define the significance in terms of construction dust effects. The Environmental Statement will specify a range of measures that can be implemented that have the aim of avoiding significant dust effects.

5.9.38. Evaluation of the significance of the local air quality assessment findings at sensitive receptors for health and designated ecological sites will be undertaken in accordance with IAN 174/13. This guidance evaluates the significance of air quality effects using the total estimated pollutant concentrations at sensitive receptors and the magnitude of change estimated to occur as a result of a scheme and recommends that the following key criteria for air quality are considered.

- Is there a risk that environmental standards will be breached?
- Is there a high probability of the effect occurring?
- Will there be a large change in environmental conditions?
- Will the effect continue for a long time?
- Will many people be affected?
- Is there a risk that protected sites, areas or features will be affected?

- Will it be difficult to avoid, or reduce or repair or compensate for the effect?

5.9.39. Following the collation of information to address these questions, an informed professional judgement on the significance of local air quality effects for public exposure and designated ecological sites will be established. Of the above questions, *'will many people be affected?*' will be addressed in terms of the number of receptors predicted to have small, medium and large changes in air quality. The change focuses only on those receptors that exceed the air quality objective value and in cases where the numbers of affected properties are above the upper thresholds listed in Table 5.4 (taken from IAN 174/13) this may suggest likely significant air quality effects.

Table 5.4: Guideline for Number of Properties Constituting a Significant Effect (in accordance with IAN 174/13)

Magnitude of Change in NO_2 or PM_{10} ($\mu g/m^3$)	Guideline for Number of Properties Constituting a Significant Effect	
	Worsening of air quality objective already above objective or creation of a new exceedance	Improvement of an air quality objective or the removal of an existing exceedance
Large (>4)	1 to 10	1 to 10
Medium (>2 to 4)	10 to 30	10 to 30
Small (>0.4 to 2)	30 to 60	30 to 60

5.10. Assumptions and Limitations

5.10.1. There are no significant assumptions or limitations affecting this assessment.

6. CULTURAL HERITAGE

6.1. Introduction

6.1.1. This chapter sets out the proposed approach to the assessment of the proposed scheme's impacts on cultural heritage (comprising historic buildings, archaeological remains and the historic landscape). The purpose of the assessment will be to identify and characterise any relevant cultural heritage resources, to consider the nature and scale of potential impacts due to the proposed scheme, and to assess the significance of any likely effects.

6.2. Summary of Relevant Policy

6.2.1. National policy of relevance to the cultural heritage assessment comprises:

- Ancient Monuments and Archaeological Areas Act 1979 (amended by the National Heritage Act 1983 and 2002).
- Planning (Listed Buildings and Conservation Areas) Act 1990.
- Hedgerows Regulations 1997, amended 2003, (while Hedgerow Regulations do not apply to Highways England works, their requirements would be applied to the assessment of significance of hedgerows within the study area);
- National Planning Policy Framework 2012 – with particular reference to Section 12 Conserving and Enhancing the Historic Environment.
- National Policy Statement for National Networks (NPSNN) – with particular reference to statements 5.120 – 5.142 which specifically apply to cultural heritage. When considering the impact of a proposed development, the NPSNN states: "*Substantial harm to or loss of a grade II Listed Building or a grade II Registered Park or Garden should be exceptional. Substantial harm to or loss of designated assets of the highest significance, including World Heritage Sites, Scheduled Monuments, grade I and II* Listed Buildings, Registered Battlefields, and grade I and II* Registered Parks and Gardens should be wholly exceptional*". Where a proposed development will lead to substantial harm to or total loss of significance of a designated heritage asset, the Secretary of State should refuse consent unless it can be demonstrated that the substantial harm or loss of significance is necessary in order to deliver substantial public benefits.

6.2.2. Key local policies relating to cultural heritage are:

- Solihull Local Plan (2013): Policy P16 – Conservation of Heritage Assets and Local Distinctiveness sets out the approach to the Historic Environment.
- Solihull Unitary Development Plan; saved Policies (2006): ENV5 (Conservation Areas), ENV6 (Listed Buildings), ENV7 (Locally Listed Buildings) & ENV 8 (Ancient Monuments and Archaeological Sites).
- Solihull Metropolitan Borough Council Supplementary Planning Guidance No 1 – The Historic Environment (2001).
- Hampton-in-Arden Conservation Area Appraisal (2015).
- North Warwickshire Local Plan Core Strategy (2014).

6.3. The Study Area

6.3.1. The study area for cultural heritage features extends to incorporate a Zone of Visual Influence (ZVI) from the proposed scheme[12], up to a maximum of 1km from the proposed scheme boundary, in order to assess the potential effects of the proposed scheme on designated heritage assets. For non-designated heritage assets, the study area will extend up to 500m from the proposed scheme boundary.

6.3.2. The final extent of the study area will be agreed in consultation with the applicable statutory consultees and subsequently confirmed as the assessment is undertaken and refined. The study area implemented to inform the assessment will be presented within the Environmental Statement for the proposed scheme

6.3.3. Designated assets in the vicinity of the proposed scheme are shown on Figures 6.1 and 6.2.

6.4. Baseline Conditions

Archaeological Remains

6.4.1. There are three scheduled monuments within the study area, including a moated site, a Moat House (1017243) and the Moated Site at Eastcote Hall (1017529), both of which are medieval in date. The Moat House includes the buried earthwork and standing remains of the moated and walled manorial complex. The site at Eastcote Hall also consists of buried and earthwork remains and is smaller in size. A scheduled cross (1017815) is located within the churchyard of St Mary and St Bartholomew's Church and is principally medieval in date. This is also a Grade II listed building (1076764).

6.4.2. The proposed scheme study area contains archaeological remains dating from the Mesolithic (10,000 – 3500 BC) period through to the modern (1901 – present) period. Cropmarks of potential field boundaries, trackways and enclosures, as well as individual small finds (such as a flint blades and a copper palstave axe), indicate activity in the area in the prehistoric periods. Evidence of Roman (AD 43 – AD 450) activity within the study area is limited to individual finds of mainly pottery. However, some of the cropmarks recorded in the area may potentially represent Romano-British activity. The early medieval (450 – 1066 AD) period is associated with the woodland clearances and expansion of land cultivation activity. The medieval (1066 – 1500 AD) period was one of great expansion for the area. A number of settlements were established, including Bickenhill and Hampton-in-Arden, and there is evidence for a further three Deserted Medieval Villages within the study area. Alongside these are three moated sites, including the two scheduled examples mentioned above. Throughout the medieval period and into the post-medieval (1500 – 1900 AD) the area remained largely rural in nature, despite the rapid industrial growth of Birmingham during the 19th century. The most significant change to the area came in the modern period when Birmingham Airport was opened in the early 20th century.

Historic Buildings

6.4.3. The route corridor extends through an area of open countryside known as the Meriden Gap, situated between the conurbations of Birmingham and Coventry. The M42 runs north-south through this landscape, connecting to the A45 to the north. The proposed scheme runs to the west of this, crossing through the Bickenhill Conservation Area and closer to its associated listed buildings

[12] Refer to Chapter 7: Landscape and Visual Effects

(including the Grade I listed Church of St Peter (1343224)). In addition, the proposed junction with the M42 is located to the west of Hampton-in-Arden, a designated Conservation Area focused on the Grade II listed Hampton Manor (1055754). The village contains a number of listed buildings, including the Grade I listed Church of St Mary and St Bartholomew (1055777) containing a Grade II listed Church Cross which is also a scheduled monument. Other designated assets close to the proposed scheme include a concentration of historic structures at Eastcote, including the Grade II* listed Eastcote Hall (1075961).

Historic Landscapes

6.4.4. The area has remained rural in character, despite the encroachment of Birmingham Airport to the north and the M42 running to the east. The Grade II* registered park and garden, Packington Hall, is located approximately 1.5km to the north-east of the proposed scheme. There are 110 entries on the record of Historic Land use Characterisation within the 500m study area. Many of these character areas relate to the land around the NEC and Birmingham International Airport. The areas along the route corridor are largely agricultural in nature.

6.5. Additional Survey Requirements

6.5.1. The methodology contained within DMRB Volume 11 Environmental Assessment Section 3 Part 2 Cultural Heritage (HA 208/07) for the detailed level of assessment will form the basis for further assessment. The methodology outlined in Chapter 5 and annexes 5 (Sub-Topic Guidance: Archaeological Remains), 6 (Sub-Topic Guidance: Historic Buildings) and 7 (Sub-Topic Guidance: Historic Landscape) of DMRB will be used to assess the value, impact and significance of the effect on the known cultural heritage assets.

6.5.2. It is also anticipated that further archaeological evaluation and mitigation will be required as part of the development process. As part of the detailed assessment, the archaeological fieldwork previously undertaken within the study area will be reviewed. The results of these former phases of evaluation will be used to inform an appropriate level of evaluation and mitigation to be undertaken as part of the proposed development. It is proposed that a geophysical survey will be undertaken as part of the detailed assessment, the results of which will also inform further phases of work. Details of archaeological surveys undertaken will be reported in the Environmental Statement.

6.6. Value of the Environmental and Resource Receptors

6.6.1. The value of a structure, area, site or landscape reflects its significance as a historic asset and, therefore, its sensitivity to change.

6.6.2. DMRB Volume 11.3.2 Annex 5 Archaeological Remains, Annex 6 Historic Buildings and Annex 7 Historic Landscape set out guidance on the criteria used for establishing the value of heritage assets comprising historic buildings, archaeological remains and historic landscape features. The criteria have been combined and each heritage asset has been assigned a value as indicated in Table 6.1.

Table 6.1: Guide for Assessing the Value of Historic Building Assets, Archaeology and Historic Landscape (HA 208/2007)

Asset Value	Description
Very High	• Assets inscribed as being of universal international importance, such as World Heritage Sites • Assets that contribute significantly to acknowledged international research objectives • Buildings of recognised international importance • Historic landscapes of international value, whether designated or not • Extremely well preserved historic landscapes with exceptional coherence, time-depth or other critical factor(s)
High	• Scheduled Monuments with extant remains, or sites and remains of comparable quality • Assets that contribute significantly to acknowledged national research objectives • Grade I and Grade II* Listed Buildings • Other listed buildings that can be shown to have exceptional qualities in their fabric or historical association not adequately reflected in their listing grade, including non-designated structures of clear national importance • Conservation areas containing very important buildings • Designated and non-designated historic landscapes of outstanding interest of high quality and importance, and of demonstrable national value
Medium	• Designated or undesignated assets that contribute to regional research objectives • Grade II Listed Buildings • Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historic association • Conservation areas containing important buildings • Historic Townscape or built-up areas with historic integrity in their buildings, or built settings (e.g. including street furniture and other structures) • Designated special historic landscapes and non-designated landscapes that would justify special historic landscape designation, landscapes of regional value
Low	• Sites of low importance • Assets compromised by poor preservation and / or poor survival of contextual associations • Locally listed buildings • Historic (unlisted) buildings of modest quality in their fabric or historical association • Historic Townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures) • Undesignated historic landscapes • Historic landscapes with importance to local interest group
Negligible	• Assets with very little or no surviving archaeological interest • Buildings of no architectural or historical note; buildings of an intrusive character • Landscapes with little or no significant historical interest
Unknown	• Assets the importance of which has not been ascertained

6.6.3. The designated cultural heritage resources present within the study area are included in Appendix 6.1 and shown on Figures 6.1 and 6.2.

6.6.4. There are 13 assets of high value in the study area comprising three Scheduled Monuments, two Grade I listed buildings and eight Grade II* listed buildings. A total of 22 assets in the study area have been assessed to be of medium value. These are predominantly Grade II listed buildings, but include the conservation areas of Bickenhill and Hampton-in-Arden.

6.6.5. There are a number of assets within the study area that have been identified from the Historic Environment Record (HER) and SMBC's local list. Further analysis will confirm whether these are of low or negligible value. In exceptional circumstances, these may be ascribed a higher value.

6.6.6. The historic landscape has been characterised as rural agriculture eroded by modern industry to the north. The landscape has historic time depth due to the lack of change and is enhanced by the historic settlements at Bickenhill and Hampton-in-Arden; however, it is common to the area. It is, therefore, considered to be of low value.

6.7. Potential Impacts and Effects

Summary of Mitigation Proposals

6.7.1. The results of the cultural heritage detailed level assessment will be used during the PCF Stage 3 environmental assessment to support the DCO application, and to inform an appropriate mitigation strategy.

6.7.2. The mitigation strategy may comprise preservation *in situ* (where appropriate and feasible), geophysical survey, detailed excavation, archaeological trial trenching, test pitting, detailed geoarchaeological investigation, archaeological topographic survey, and historic building recording (photography) to Historic England standard (English Heritage, revised 2016). Such archaeological mitigation and recording works will form a phased process which will be agreed with the Warwickshire Planning Archaeologist.

6.7.3. Impacts on cultural heritage will be carefully considered throughout the design process. The proposed landscape design will be further developed during PCF Stage 3 to take particular account of key heritage assets in the vicinity of the proposed scheme – namely Bickenhill Conservation Area and associated listed buildings.

Summary of PCF Stage 2 Assessment

Construction Effects

6.7.4. Construction of the proposed scheme has the potential to affect heritage assets. This could include:

- Partial or total removal of heritage assets.
- Compaction of archaeological deposits by construction traffic and structures.
- Changes in groundwater levels leading to the desiccation of waterlogged archaeological deposits.
- Effects on the setting of heritage assets including visual and noise intrusion, severance and adverse impacts on amenity as a result of construction works.

6.7.5. The proposed scheme would be constructed on new land take through undeveloped agricultural land. As a result, there is the potential for recorded and previously unrecorded archaeological assets to be impacted upon during construction. The lack of previous disturbance suggests that the archaeological

remains could be well preserved, although some damage may have been caused by agricultural practices.

6.7.6. The proposed scheme would truncate the Bickenhill Conservation Area to the west and would likely have an urbanising effect on the historic buildings within it. The proposed scheme would also bring the road in closer proximity to Hampton-in-Arden Conservation Area and associated historic buildings.

Operation Effects

6.7.7. Operation of the proposed scheme has the potential to result in impacts on the setting of heritage assets. In the majority of cases, these would potentially be long-term or permanent in nature. These could include:

- Changes to the surroundings of heritage assets or the general character of their setting.
- Changes to the viability of heritage assets.
- Cumulative impacts on historic landscape elements as a result of operational maintenance through alteration of historic landscape elements.

6.7.8. The proposed scheme has the potential to impact on the setting of a number of isolated assets such as Walford Hall Farmhouse and Castle Hills Farmhouse. However, any impacts should be seen in the context of existing infrastructure, including the M42, A45 and Birmingham Airport.

6.7.9. With regard to the historic landscape, the proposed scheme would introduce new earthworks and structures within a rural area which has undergone little change since the 18th Century.

6.8. Proposed Scope of Assessment

6.8.1. It is the responsibility of the local planning authority to ensure the protection, preservation and enhancement sites of historic value. As such, SMBC and Historic England will be consulted prior to undertaking a detailed assessment which will be reported in the Environmental Statement.

6.8.2. Sources of information that will be consulted include:

- Solihull HER.
- Warwickshire Records Centre.
- The National Heritage List.
- Heritage web resources.

6.8.3. All assets identified by these searches, within the confines of the proposed study areas, will be compiled into an inventory / database and accurately located in relation to the proposed scheme on a map at an appropriate scale. Key viewpoints will also be considered and will be agreed between the landscape and visual team (refer to Chapter 7: Landscape and Visual Effects) and where required SMBC and Historic England.

6.8.4. A DMRB detailed assessment baseline will be prepared which will identify all designated or non-designated heritage assets within the defined study area. This will involve the collation of information from the data gathering exercise, alongside a map regression and walkover survey.

6.8.5. The potentially affected known heritage assets will be visited to record their survival, extent, condition, setting and significance and to confirm their location and relationships to other sites, alongside the identification of any previously unrecorded heritage assets. The ground conditions and evidence for previous disturbance will also be assessed utilising available geotechnical investigation

reports and information. The results of the geotechnical review, and any archaeological monitoring of preliminary geotechnical investigations for the proposed scheme, and results from archaeological reconnaissance and evaluation work (archaeological geophysical survey, geoarchaeological borehole assessment, trial trenching and archaeological topographic survey), along the alignment, will be incorporated within the historic environment baseline and an assessment of the likely survival of archaeological remains will be made.

6.8.6. Consultation will be undertaken with the relevant Local Planning Authority Conservation Officers (LPACOs), the planning archaeologist for Warwickshire and Historic England as necessary, with regards to the results of the detailed assessment baseline.

6.9. Proposed Assessment Methodology including Significance

6.9.1. The DMRB detailed assessment baseline will be undertaken in accordance with national legislation as detailed in Section 6.2.

6.9.2. The assessment will be carried out in accordance with the published 'Standards and Guidance' and 'Code of Conduct' of the Chartered Institute for Archaeologists and in accordance with policy and guidance with specific reference to:

- Historic England: Seeing the History in the View: A Method for Assessing Heritage Significance within Views (2011).
- Historic England: Historic Environment Best Practice Advice in Planning Note 3. The Setting of Heritage Assets (2015).
- The Chartered Institute for Archaeologists: Code of Conduct (2014).
- The Chartered Institute for Archaeologist: Standard and Guidance for Historic Environment Desk-based Assessment.

6.9.3. Consultation will be undertaken with the relevant LPACOs, the SMBC and Historic England as necessary, with regards to the likely impacts on heritage assets from the construction of the proposed scheme. Mitigation measures will be agreed as necessary and appropriate.

6.9.4. The assessment methodology will follow guidance set out in DMRB, Volume 11, Section 3, Part 2, HA 208/7 Cultural Heritage (Highways Agency 2007). The value and magnitude of impacts on heritage assets will be judged in accordance with the factors described in DMRB (2007).

6.9.5. NPPF defines significance of heritage assets as "*The value of a heritage asset to this and future generations because of its heritage interest."* (NPPF 2012, Annex 2 Glossary). In addition, the NPPF sets out criteria which should be considered when assessing the significance of cultural heritage assets, which include archaeological, architectural, artistic and historic values (NPPF 2012). These criteria will, therefore been used in the assessment of significance for each affected asset. This information, in conjunction with professional judgement, will be used to assess the significance of heritage assets.

6.9.6. The assessment of residual effects will be undertaken in two stages. The magnitude of impact is first assessed without reference to the value of the feature, but taking into account any appropriate mitigation. The findings of this assessment will then be cross-referenced with the value rating of the feature to establish the significance of residual effect that is likely to result due to the proposed scheme. This is calculated by the use of a matrix (refer to Table 6.2 as taken from DMRB, Volume II, Section 3, Part 2, 2007) that balances the

importance of a feature against the magnitude of impact, taking into account any mitigation measures proposed).

6.10. Assumptions and Limitations

6.10.1. The methodology as detailed above assumes permission will be granted by landowners to undertake both intrusive and non-intrusive archaeological surveys, plus potential access to private properties to undertake the setting assessment.

6.10.2. The PCF Stage 2 heritage assessment did not consider the candidate sites identified for potential flood compensation, construction compounds and / or ecological compensation. As such the heritage assessment to be reported in the Environmental Statement will consider the heritage assets in such areas and the associated impacts and effects.

6.10.3. The assessment has been based on data contained within the PCF Stage 2 report. This is based on data received from databases held and maintained by third parties. It is assumed that this data is appropriate for use. Available online sources were also used.

7. LANDSCAPE AND VISUAL EFFECTS

7.1. Introduction

7.1.1. IAN 135/10[13], Landscape and Visual Impacts Assessment (LVIA) (November 2010) provides Highways England guidance on LVIA. It states that the main objectives of the scoping exercise are to determine whether or not the project is likely to give rise to any landscape or visual effects, and to define the level of detail required for any further study.

7.1.2. For the purposes of the LVIA, a clear distinction is 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' views of the landscape or townscape (e.g. local residents or passing motorists).

7.1.3. The LVIA will be undertaken using standard methodologies in accordance with good practice procedures. In addition to conforming to Highways England guidance IAN 135/10, the methodology will draw upon the Guidelines for Landscape and Visual Impact Assessment (GLVIA3[14]) jointly published by the Landscape Institute and Institute of Environmental Management and Assessment (IEMA) in 2013. In particular the assessment of sensitivity and magnitude will rely on the more recent terminology of GLVIA3 to determine nature of receptor and nature of effect.

7.1.4. It is proposed to carry out a detailed assessment as defined in IAN135/10, on the basis that although the proposed scheme is a modification of an existing highway which currently generates effects, there is potential for new or different significant effects.

7.2. Summary of Relevant Planning Policy

7.2.1. The following NPPF policies are broadly relevant to the LVIA:

- Policy 7 Requiring good design.
- Policy 9 Protecting Green Belt land.
- Policy 11 Conserving and Enhancing the Natural Environment.

7.2.2. Within the NPSNN there is a section on landscape and visual impacts of proposed projects which covers an applicant's assessment, decision making and mitigation requirements. When an EIA is required, the applicant's submission needs to contain *'an assessment of any likely significant landscape and visual impacts'*. This assessment needs to refer to any relevant landscape character assessments or related studies, as well as taking account of any relevant policies from local development documents. The NPSNN states that significant effects on landscape and visual amenity need to be considered during construction and operation of projects, and needs to include an appreciation of historic landscape character as well as noise and light pollution and its effects on local amenity, tranquillity and nature conservation. The aim of any project should be to 'avoid or minimise harm to the landscape, providing reasonable mitigation where possible and appropriate'.

[13]Highway England (2010) DMRB Interim Advice Note 135/10 Landscape and Visual Effects Assessment.
[14] Landscape Institute and IEMA (2013) Guidelines for Landscape and Visual Assessment (GLVIA 3)

7.2.3. The local policies as detailed in Table 7.1 are considered to be relevant to the LVIA.

Table 7.1: Planning Policy Context Relevant to the LVIA

Local Policies – Solihull Local Plan (2013)	
Policy P10: Natural Environment	*"The Council will seek to protect, enhance and restore the diverse landscape features of the Borough…. Joint working with neighbouring authorities will be supported, recognising the need for a landscape scale approach to the natural environment and conservation biodiversity."* *"Where development is permitted, appropriate mitigation of the impacts and compensation where relevant will be required to deliver… landscape character and local distinctiveness."*
Policy P14: Part x. Amenity	*"Protect the tranquil and locally distinctive areas in the Borough by guiding new development, particularly those that will create significant noise, either directly or through associated transport, to locations that will avoid or minimise adverse impacts."*
Policy P17: Countryside and Greenbelt	*"The council will not permit inappropriate development in the Green Belt, expect in very special circumstances."*
Local Policies – North Warwickshire Local Plan 2006	
Policy ENV1: Protection and Enhancement of Natural Landscape	*"Development that would neither protect nor enhance the intrinsic qualities of the existing landscape, as defined by Landscape Character Assessment, will not be permitted. Only where protection or enhancement is incompatible with proposed development might mitigation be considered as an alternative to protection or enhancement."*
Policy ENV4: Trees and Hedgerows	*"Development will not be permitted if it would result in the loss of trees, woodlands or hedgerows that in terms of their historical, ecological, townscape or landscape significance make a positive contribution to the quality of the local environment. The planting of new trees, woodlands and/or hedgerows will be sought in the landscaping of new development."*
Local Policies – North Warwickshire Core Strategy Adopted 2014	
Policy NW13: Natural Environment	*"The quality, character, diversity and local distinctiveness of the natural environment will be protected and enhanced. In particular within identified landscape character areas development will conserve, enhance and where appropriate, restore landscape character as well as promote a resilient, functional landscape able to adapt to climate change. Specific landscape, geo-diversity, wildlife and historic features which contribute to local character will be protected and enhanced."*

7.3. The Study Area

7.3.1. Guidance given in DMRB Volume 11 Section 3 Part 5 (Annex III), although superseded by IAN 135/10, suggests a 1km study area corridor, broadening to capture areas within the Zone of Theoretical Visibility (ZTV) sitting outside of the 1km with capacity to experience significant effects as a result of the proposed scheme. This approach is commonly adopted for highways projects and will be adopted in this LVIA.

7.3.2. The ZTV would be generated by placing points along the proposed scheme at intervals not exceeding 50m and assigning levels of 1.5m, 4.5m and 12.5m high to represent visibility of cars, HGVs and lighting columns within a digital terrain model (DTM) based on the OS Terrain 5 dataset. Built form and vegetation from the National Woodland dataset will be incorporated into the terrain model at heights of 7.5m and 12.5m respectively.

7.3.3. The study area for the purpose of scoping has been defined using a combination of IAN 135/10 guidance, the ZTV, professional judgement, and field survey verification.

7.3.4. The final extent of the study area will be agreed in consultation with the applicable statutory consultees and subsequently confirmed as the assessment is undertaken and refined. The study area implemented to inform the assessment will be presented within the Environmental Statement for the proposed scheme.

7.4. Baseline Conditions

Baseline Visual Context

7.4.1. The study area for the assessment of landscape and visual effects encompasses a section of the M42 that falls within the administrative boundary of SMBC.

Landscape Character

7.4.2. In the broader scale the landscape of the region falls within Natural England's National Character Area (NCA) 97: Arden[15]. The key characteristics of which are:

- Well-wooded farmland landscape with rolling landform,
- Mature oaks, mostly found within hedgerows, together with ancient woodlands, and plantation woodlands that often date from the time of enclosure. Woodlands include historic coppice bounded by woodbanks,
- Narrow, meandering clay river valleys with long river meadows; the River Blythe SSSI lying between the cities of Coventry and Birmingham is a good example of this,
- Numerous areas of former wood-pasture with large, old, oak trees often associated with isolated remnants of more extensive heathlands. Village greens/commons have a strong association with remnant lowland heath. Fragmented heathland persists on poorer soils in central and northern areas,
- Diverse field patterns, ranging from well hedged, irregular fields and small woodlands that contrast with larger semi regular fields on former deer park estates, such as, Packington Hall and Stoneleigh Park,
- Complex and contrasting settlement pattern with some densely populated where traditional settlements have amalgamated to form the major West Midlands conurbation while some settlements remain distinct and relatively well dispersed,
- Transport infrastructure, the M42, M40, M6 and M5 are major transport corridors that sit within the landscape of this NCA.

7.4.3. Landscape character assessments undertaken by Warwickshire County Council[16], SMBC[17] and North Warwickshire Borough Council[18] have been

[15] National Character Area Profile: 97. Arden. www.naturalengland.org.uk
[16] Warwickshire Landscape Guidelines: Arden, Warwickshire County Council, 1987.
[17] Solihull's Countryside Strategy 2010-2020 First Review 1.0, Solihull Metropolitan Borough Council, 2010.
[18] North Warwickshire Landscape Character Assessment, North Warwickshire Borough Council, 2010.

referenced during PCF Stage 2 to describe the existing landscape and develop the Local Character Areas (LCA)[19] within the study area.

7.4.4. At the regional scale the study area is part of the Arden Parkland character area of the Warwickshire Landscape Guidelines. This regional landscape consists of an enclosed, gently rolling landscape defined by woodland edges, parkland and belts of trees. The landscape is characterised by the gently rolling countryside with medium to large scale defined woodland edges, belts of trees and wooded streamlines. The impression of enclosure is enhanced by the almost flat topography, which emphasises woodland edges. The enclosed landscape is created by ancient woodlands, hedgerow trees and belts of trees although this is not a common feature with the most significant instances found alongside transportation corridors.

7.4.5. At local level the study area falls within the North Warwickshire Borough Council[20] Landscape Character Assessment with the following LCAs:

- LCA 1 Arden Farmland;
- LCA 2 Blythe Valley Parkland Farmland; and
- LCA 3 Transport Interchange, NEC and Business Park.

LCA 1 Arden Farmland

7.4.6. This LCA is formed of the rural landscape extending from the edges of the Solihull and the Birmingham conurbation in the west towards the broader Arden landscape and Coventry in the east.

7.4.7. The LCA is formed of former historic parkland which has largely been replaced by agricultural production. Field patterns reflect this transition with pockets of treed grassland and smaller fields with strong mature boundaries still existing around the fringes of the village settlements and woodlands, with the more prevalent larger arable fields occupying the intervening farmland. These larger fields have been expanded which together with the gappy hedges, have meant much of their definition has been lost. The major transport corridors, including rail and highways, also heavily influence the area as they cut through the landscape and create barriers within it, whilst overhead power lines interrupt the broader skyline. The major developments around the Birmingham Airport and the NEC are also prominent visual indicators of the nearby conurbation.

7.4.8. Land cover ranges from woodland to small settlements to transport corridors, but the landscape primarily consists of the arable farmland. Vegetative cover includes the ancient woodlands of Aspbury's Copse, Hampton Coppice and Barber's Coppice in the south and west, as well as the numerous smaller stands scattered within the study area. The mature trees concentrated within and around the small villages and lining the wider local road network create a cohesive and widespread vegetative element. The topography of the LCA broadly falls gently from approximately 130m above ordnance datum (AOD) in the west to the east towards the River Blythe at approximately 85m AOD, and is comprised of a series of local rises which contributes to the rolling landscape and forms a series of brooks.

7.4.9. This LCA is a settled rural landscape surrounded and dissected by major development and transport corridors. However, despite these pressures it remains functional and intact with relatively limited areas where the components

[19] Natural England, (2014). An approach to Landscape Character Assessment. Natural England.

[20] North Warwickshire Landscape Character Assessment, North Warwickshire Borough Council, 2010.

of this landscape breakdown or shift towards more diverse and discordant land uses typical of urban fringe landscapes.

7.4.10. Overall this LCA is comprised of a good quality rural landscape which continues to resist, but remains vulnerable to, the pressures of the urban fringe and would be of a medium sensitivity to change to the type of development proposed.

LCA 2 Blythe Valley Parkland Farmland

7.4.11. This LCA is formed around the River Blythe as it meanders northwards around the A452 towards Coleshill and the confluence of the Rivers Tame, Cole and the Blythe and the landscapes beyond, that form their associated floodplains.

7.4.12. The river is set within a broad, gently sloping valley with highpoints along the valley sides of approximately 100m AOD. The landfill site at Little Packington creates a distinct artificial landform in the area. Field patterns are varied and include the small irregular pastoral fields close to the river, semi-regular arable fields associated with former estates and deer parks and larger fields on the more steeply sloping valley sides to the south. Land cover includes extensive areas of parkland associated with Packington Hall where woods that contributed to the former deer parks, treed parklands and golf courses provide a strong vegetation framework within the LCA. Combined with the riparian vegetation along the River Blythe and the infilling farmland defined by low trimmed hedges and frequent hedgerow trees a diverse and cohesive rural character results.

7.4.13. This LCA is generally a sparsely settled landscape with only a few scattered hamlets and farmsteads, set along a broad network of connecting lanes. There is little influence from the nearby urban expanses and transport corridors within the LCA, with the exception of the southern and western extents near to the M42 and A45 corridors where extensive road layouts, lighting and electricity pylons disrupt the rural character.

7.4.14. Despite the proximity of this LCA to a major city and the associated infrastructure this LCA is an intimate rural landscape with strong links to the historic land uses and settlement patterns, evidenced through the estate and parkland landscapes. Overall this LCA is comprised of a good quality remnant parkland landscape with relatively limited influences from modern day development and would be of a high sensitivity to change to the type of development proposed.

LCA 3 Transport Interchange, NEC and Business Park

7.4.15. This LCA is formed around the urban fringe transport and business areas, bounded by the A45, M42 and residential areas at Sheldon, Marston Green and Chelmsley Wood.

7.4.16. The Birmingham Airport, NEC and Birmingham Business Park dominate this area as large scale urban features which continue to be expanded and developed. The railway line, airport boundary and traffic flow systems including winding access roads with frequent roundabouts restrict movement through the area and discourages pedestrian access.

7.4.17. Woodland, particularly around Pendigo Lake and at Bickenhill Plantations to some extent breaks up the expanse of large buildings and car parks. The layers of buildings and woodland reduce awareness of the surrounding rural and residential areas and the A45 and M42 road corridors. The well wooded, narrow strip of fields in the north of the LCA provides a buffer between some of the commercial units and the residential areas.

7.4.18. Overall this LCA is a developed urban fringe area and despite the presence of woodland and a narrow strip of fields, it is dominated by large scale transport and

commercial features and is of Low Sensitivity to the type of development proposed.

Visual Context

7.4.19. The visual context of the study area is largely defined by the surrounding settled rural character of the landscape. The combination of the gentle topography, broad network of lanes and strong vegetation framework results in a sense of enclosure from within the lower lying areas, or from along the local road network which is frequently lined by roadside vegetation. Views from Public Rights of Way (PRoW) that traverse the open fields or higher ground, however, are afforded a wider aspect due to the areas of field expansion and degraded field boundaries. From these areas the presence of the nearby airport and NEC are evident as well as other elements of the Birmingham conurbation.

7.4.20. Settlement within the study area includes the edges of the Birmingham conurbation to the north and west and the villages of Bickenhill, Hampton-in-Arden and Catherine-de-Barnes within the study area itself. In addition, there are smaller hamlets and isolated properties scattered throughout the rural farmland.

7.4.21. An assessment of the visual sensitivity of the identified receptors has previously been recorded, as defined in IAN 135/10, Annex 2, Table 1 and categorised in respect of the existing inherent level of visual sensitivity for receptors. These have formed the basis for the selection of a number of key viewpoints, agreed with the relevant consultees, which are representative of the groups of receptors where potential views have previously been identified.

7.4.22. A total of 23 viewpoints within the extents of the preliminary ZTVs have been identified and agreed at PCF Stage 2. These viewpoints cover a range of views across the study area from residential and commercial properties, PRoW and local roads (refer to Figure 7.1 and Figure 7.2).

- VIEWPOINT A – A452 / Garden Centre
- VIEWPOINT B – NEC / Hotel Car Park
- VIEWPOINT C – East Way Overbridge
- VIEWPOINT D – Coventry Road A45 westbound
- VIEWPOINT E – National Motorcycle Museum / National Conference Centre (NMM/NCC)
- VIEWPOINT F – Old Station Road
- VIEWPOINT G – Right of way on railway over bridge south
- VIEWPOINT H – Right of way on railway over bridge north
- VIEWPOINT I – Bickenhill North
- VIEWPOINT J – St Peters Lane
- VIEWPOINT K – Right of Way west of Bickenhill 1
- VIEWPOINT L – Right of Way west of Bickenhill 2
- VIEWPOINT M – Right of Way near Castle Hills Farm
- VIEWPOINT N – Right of Way at Hazel Farm
- VIEWPOINT O – Right of Way West of M42 Crossing
- VIEWPOINT P – Right of Way East of M42 Crossing
- VIEWPOINT Q – Gaelic Football Grounds
- VIEWPOINT R – B4438 Catherine de Barnes Lane
- VIEWPOINT S – Shadowbrook Lane
- VIEWPOINT T – Rights of Way south of Shadowbrook Lane
- VIEWPOINT U – Friday Lane
- VIEWPOINT V – Solihull Road (B4102)
- VIEWPOINT V – Eastcote Lane

7.5. Additional Survey Requirements

7.5.1. To support and inform the LVIA assessment an arboricultural assessment will be undertaken during detailed design to assess the variety and quality of the trees within the potential to be impacted upon by the proposed scheme.

7.5.2. No survey requirements have been identified at this stage other than site visits to define ZTV viewpoints (summer and winter) for the production of scheme photomontages for the purpose of illustrative assessment and consultation requirements.

7.6. Value of the Environmental and Resource Receptors

7.6.1. Under GLVIA3, the 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; and
- Associations.

7.6.2. The LVIA will assess 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

7.6.3. There are no statutory landscape designations of National Parks or Areas of Outstanding Natural Beauty associated with the study area. There are no non-statutory landscape designations associated with the study area. The absence of a formal designation does not, however, determine that a landscape is necessarily of low value; factors such as accessibility and local scarcity can render areas of unremarkable quality highly valuable as a local resource.

7.6.4. The proposed scheme sits within Solihull Metropolitan Green Belt known as the Meriden Gap. Bickenhill and Hampton-in-Arden are designated as Conservation Areas. These conservation areas are relatively well screened by existing woodland and vegetation from the surrounding built form.

7.6.5. Assessment of value of views will form a component of the LVIA required to establish sensitivity. Value of views is typically more subjective and may vary from viewer to viewer, however, factors to be considered will include views of or from heritage assets, designated landscapes / views, or named or promoted views found in guidebooks or tourist literature.

7.7. Potential Impacts and Effects

Summary of Mitigation Proposals

7.7.1. Environmental considerations will be taken into account during the further development of the proposed scheme design, including consideration of minimising land take, screening where the proposed route alignment is not in cutting, explore opportunities to construct more of the route alignment in deeper cutting, and use the existing topography of the land to its fullest potential.

7.7.2. A CEMP would be prepared and implemented by the selected construction contractor – this 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.

7.7.3. The proposed scheme design will include an appropriate landscape design which will incorporate tree and shrub planting. During PCF Stage 3 a landscape design will be prepared. In particular the future development of the landscape design will take account of ecological mitigation requirements and heritage features as well as the opinions of applicable local resident groups, in particular Birmingham Airport due to the requirement for safe arrival and departure routes.

Summary of PCF Stage 2 Assessment

Landscape Character

7.7.4. Potential changes to landscape character associated with the preferred scheme would be contained within LCA 1 and would arise from:

- New sections of offline link road between the M42 corridor and the Clock Interchange on the A45;
- New grade separated junction on the M42 corridor;
- Alterations and additions to the existing local road network; and
- Alterations to the existing field patterns and surrounding vegetation framework and modifications to existing landform.

7.7.5. These works have the potential to change the perception of LCA 1 through the introduction of new traffic movements and associated highways infrastructure within the rural landscape, leading to the fragmentation and further urbanisation of this vulnerable landscape. There would be no physical alterations to LCA 2, however, potential remains for changes to the perception of the landscape in some areas due to the increased visual presence of the surrounding motorway network. There would be no direct physical effects to the components of LCA 3 as a result of the proposed scheme and any visual connections of the works are likely to be limited by woodland and building pattern.

Visual Effects

7.7.6. The offline sections of the new link road would inevitably extend the physical extent of the M42 and A45 corridors and lead to new or increased sense of scale associated with the surrounding network and associated traffic. In addition works along the existing M42 corridor at existing junctions, new grade separated junctions and fly overs would increase existing awareness of the M42 corridor where it already exerts an influence within the surrounding area, as a result visual effects are likely to occur to:

- Viewpoints associated with surrounding static visual receptors of variable sensitivity, some of which have existing views of both the M42 and A45 corridors and some that currently have limited or no awareness. These receptors will be subject to changes as a result of new roads, junctions or flyovers, slip roads and additional lighting some of which will be substantial; and
- Viewpoints associated with users of local roads and public rights of way which currently may have increased views or awareness of the surrounding highways infrastructure or will experience new views. These receptors would be subject to variable changes to their view as a result of changes to the existing layout.

7.7.7. The significant visual effects arising from the proposed scheme would primarily arise from:

- The new junction on the M42 in the south which would introduce a new dumbbell arrangement, associated slip roads and lighting outside the existing M42 corridor to users of the rights of way and local roads.
- The offline link road, although set in deep cutting and passing to the west of Bickenhill, is extensive and would be in close proximity to several rights of way as well as residential properties.
- Modifications to the local road network, including the addition of new roundabouts.

7.7.8. While set in deep cutting and minimising direct views of traffic, the proposed scheme alignment passes through areas relatively free from major highways infrastructure and would give rise to potential significant visual effects across its length (refer to Table 7.2).

Table 7.2: Potential Visual Effects of the Proposed Scheme as identified during PCF Stage 2

Viewpoint	Proposed Option	
	Year 0	Year 15
A	Neutral	Neutral
B	Slight Adverse	Neutral
C	Slight Adverse	Neutral
D	Neutral	Neutral
E	Slight Adverse	Neutral
F	Neutral	Neutral
G	Viewpoint not accessed in previous assessment	Viewpoint not accessed in previous assessment
H	Neutral	Neutral
I	Moderate Adverse	Slight Adverse
J	Moderate Adverse	Moderate Adverse
K	Slight Adverse	Slight Adverse
L	Large Adverse	Moderate Adverse
M	Slight Adverse	Slight Adverse
N	- Viewpoint not accessed in previous assessment	- Viewpoint not accessed in previous assessment
O	- Viewpoint not accessed in previous assessment	- Viewpoint not accessed in previous assessment
P	- Viewpoint not accessed in previous assessment	- Viewpoint not accessed in previous assessment
Q	Large Adverse	Moderate Adverse
R	Large Adverse	Large Adverse
S	Moderate Adverse	Slight Adverse
T	Large Adverse	Moderate Adverse
U	Neutral	Neutral
V	Slight Adverse	Neutral

W	Slight Adverse	Slight Adverse

7.8. Proposed Scope of Assessment

7.8.1. The ZTV will allow for the verification of representative viewpoint locations which will be visited and form the basis of the assessment of effects on visual amenity within the LVIA. The LVIA will also assess changes in visual amenity as a result of effects arising from any additional land areas associated with the proposed scheme.

7.8.2. The viewpoints are drawn from publically accessible locations chosen to cover the range of effects on visual amenity from receptors such as residential areas, PRoW, highways, commercial and leisure locations, although not all categories may be present. The viewpoints will represent grouped effects of multiple receptors from settlements, but will adopt the GLVIA3 approach of identifying representative viewpoints rather than listing all locations.

7.8.3. The LVIA will assess likely effects of the proposed scheme on each of these representative viewpoints and, by extension, the additional similar viewpoints which may also be similarly impacted by the proposed scheme.

7.8.4. The LVIA will assess likely effects of the proposed scheme on the landscape character of the LCTs and on the townscape character of each of the wards within the study area.

7.8.5. The landscape and visual effects of the proposed scheme will be assessed at the following stages of the development:

- During the proposed scheme construction period.
- At year 1 of proposed scheme opening.
- At 15 years after proposed scheme opening, allowing time for the contribution of planting or other landscape mitigation to take effect and taking into account future planned development.

7.8.6. The LVIA will comprise, but not limited to, the following:

- Desktop study of existing landscape character assessments both at national and local level. Reference will be made to Natural England National Character Area Profiles relevant to the area.
- Identification of the baseline character, value and quality of the site and surrounding landscape as well as its susceptibility to the specific change arising from the proposed scheme.
- Verification of the ZTV - this will help identify receptors and public viewpoints that should be assessed. Assessment locations are to be agreed with SMBC. Photographs will be taken at representative viewpoints along with a record of the key landscape and visual characteristics.
- The assessment of impacts from the agreed viewpoints, using photography and where appropriate, photomontages. The nature of existing views will be described for each viewpoint. An assessment of sensitivity of receptor, derived from susceptibility to the specific change and value of view combined with magnitude of effect derived from the scale/extent, duration and reversibility of change in the view, will be used to determine likely overall significance of effect.
- Assessment of impacts on the LCAs and townscape. An assessment of sensitivity of character, derived from susceptibility to the specific change and value character combined with magnitude of effect derived from the scale / extent, duration and reversibility of change in the character will be used to determine likely overall significance of effect.

- The results of the LVIA will be integrated with the cultural heritage, ecological and arboricultural assessments as far is necessary given the degree of overlap.
- Identification of appropriate mitigation and enhancement proposals to be illustrated on a landscape master plan to minimise or reduce impacts; and
- Draw upon the findings and conclusions of a detailed lighting assessment for both construction and operation of the proposed scheme.

7.9. Proposed Assessment Methodology including Effect Significance

7.9.1. The GLVIA3 and DMRB IAN 135/10 methodology will be used to determine the sensitivity and magnitude of effects which will then be combined using the terminology in Table 7.2, derived from IAN 135/10. In accordance with DMRB and GLVIA3 methodology, the matrix will be used as a guideline to define landscape and visual effect significance rather than a prescriptive or inflexible process.

Table 7.2: Matrix for the Definition of Landscape and Visual Significance of Effects (derived from IAN 135/10)

Landscape Sensitivity	Magnitude of Impact				
	No Change	**Negligible**	**Minor**	**Moderate**	**Major**
High	Neutral	Slight	Slight / Moderate	Moderate / Large	Large / Very Large
Moderate	Neutral	Neutral / Slight	Slight	Moderate	Moderate / Large
Low	Neutral	Neutral / Slight	Neutral / Slight	Slight	Slight / Moderate

7.9.2. Photography incorporated into the figures accompanying the LVIA will be undertaken in accordance with guidance given in Landscape Institute Advice Note 01/11 “Photography and photomontage in landscape and visual impact assessment” unless stated otherwise.

7.10. Assumptions and Limitations

7.10.1. The LVIA will be based on, and limited to, the baseline conditions observed at the time of the ZTV survey. Surveys will cover the summer and winter, but will not include other seasons.

7.10.2. The PCF Stage 2 LVIA did not consider the candidate sites identified for potential flood compensation, construction compounds and / or ecological compensation. As such the LVIA to be reported in the Environmental Statement will consider the landscape and visual assets in such areas and the associated impacts and effects.

8. BIODIVERSITY

8.1. Introduction

8.1.1. The biodiversity chapter in the Environmental Statement will identify and evaluate relevant ecological features (e.g. receptors including nature conservation designations, priority habitats and protected / notable species) associated with the proposed scheme, and consider the effects that the proposed scheme is likely to have on their conservation status, inter-relationships, and contribution to local and if appropriate, national biodiversity.

8.1.2. The chapter will identify impact avoidance / reduction / mitigation and compensation measures that may be required to enable the proposed scheme to proceed in compliance with relevant nature conservation legislation and planning policy, and will demonstrate that due consideration has been given to ecological features and that the works have been planned accordingly.

8.2. Summary of Relevant Policy

8.2.1. The key legislation and policy relevant for the assessment of the potential ecological, biodiversity and nature conservation implications of the proposed scheme includes:

- Wildlife and Countryside Act 1981 (as amended) (WCA).
- Countryside and Rights of Way Act 2000 (CRoW).
- The Conservation of Habitats and Species Regulations 2010 (as amended) (the Habitats Regulations).
- Natural Environment and Rural Communities Act 2006 (NERC).
- Protection of Badgers Act 1992.
- The Hedgerows Regulations 1997 (as amended).
- The Water Environment (Water Framework Directive (England and Wales) Regulations 2017 (WFD).
- National Planning Policy Framework (NPPF).
- National Planning Practice Guidance (NPPG).
- Natural England and Defra Standing Advice.
- National Policy Statement for National Networks (NPSNN).
- Arden National Character Area (NCA) Profile.
- Design Manual for Roads and Bridges (DMRB).
- Solihull Local Plan: Shaping a Sustainable future (adopted December 2013).
- Nature Conservation in Solihull (10 February 2010).
- Warwickshire, Coventry and Solihull Local Biodiversity Action Plan (LBAP).
- Highways England Biodiversity Plan 2015.

8.2.2. The assessment will make reference to the Highways England Biodiversity Plan as published on 29th June 2015 which provides a framework for identifying how Highways England intend to take biodiversity initiatives forward within the current RIS period. The Biodiversity Plan contains the following key biodiversity commitments:

- Contribute to the Government's National Pollinator Strategy by developing an additional 3,500 hectares of species rich grassland by 2021.
- Work with external partners to undertake habitat improvement works within the Government's 'Nature Improvement Areas'.
- Improve 50% of the SSSIs within the soft estate into favourable condition; and
- Development of landscape scale features (such as green bridges) that will reduce the fragmentation effects of the strategic road network.

8.3. The Study Area

8.3.1. The study area reflects standard best practice and the scoping distances that statutory consultees would typically expect to be considered for identification of features external to the proposed scheme boundary that could be affected. This is informed by published guidance and professional judgement.

8.3.2. The indicative extent of the proposed scheme footprint is presented in Figures 8.1 and 8.2. This includes the proposed scheme plus candidate sites identified for construction compounds and / or ecological compensation areas.

8.3.3. The desk study data collected during the PCF Stage 2 EAR (WSP, May 2017a) has been updated for the proposed scheme and includes a larger search area to meet all potential data needs for the assessment of potential ecological impacts and effects. The desk study included a search for:

- International nature conservation designations within 30km of the proposed scheme to identify sites where bats are a primary reason for designation.
- Other international statutory nature conservation designations and within 10km of the proposed scheme.
- National statutory and non-statutory nature conservation designations within 2km of the proposed scheme.
- Protected species within 1km of the proposed scheme.

8.3.4. The range of study areas and supporting findings for the ecological surveys undertaken by WSP can be made available upon request.

8.3.5. The final extent of the study area will be agreed in consultation with the applicable statutory consultees and subsequently confirmed as the assessment is undertaken and refined. The study area implemented to inform the assessment will be presented within the Environmental Statement for the proposed scheme.

8.4. Baseline Conditions

8.4.1. This section describes the existing baseline conditions as determined through desk study, extended Phase 1 Habitat survey, National Vegetation Classification (NVC) and protected species surveys undertaken by WSP throughout 2017. Some of these surveys are still ongoing, whilst additional studies have been commissioned based on initial survey findings and will be completed in 2017 and / or 2018. Information on existing conditions will be updated once these studies are complete and will be included in the Environmental Statement.

Nature Conservation Designations

8.4.2. Records of protected and notable species and habitats were obtained from:

- Warwickshire Biological Record Centre.
- Highways England EnvIS.
- Multi-Agency Geographic Information for the Countryside (MAGIC) website.

8.4.3. The available desk study data are included in Figures 8.1 and 8.2.

8.4.4. There are no statutory international nature conservation designations for bats within 30km of the proposed scheme. There are no other statutory international nature conservation designations within 10km of the proposed scheme.

8.4.5. There are six national and local statutory nature conservation designations within 2 km of the proposed route alignment, as summarised in Table 8.1 below and shown on Figure 8.1 and 8.2.

Table 8.1 Statutory Nature Conservation Designations within 2km of the proposed route

Designation	Reason(s) for Designation	Relationship to the Site
Bickenhill Meadows SSSI	7.2ha of lowland neutral grassland (MG4/MG5) – one of the richest grassland floras in the county.	Two separate units, located adjacent to and approximately 400m south-east of the proposed scheme.
River Blythe SSSI	39 km stretch of lowland river on clay substrate. Botanically, one of the richest rivers in lowland England with the most species-rich sections containing as many species as the very richest chalk streams. The habitats along the river are also important for invertebrate communities.	Closest location approximately 350m south of proposed works. Hydrological connectivity with the proposed scheme via Holywell Brook LWS.
Coleshill and Bannerly Pools SSSI	37.7ha designated for lowland fen, marsh and swamp and for lowland broadleaved, mixed and yew woodland. The two pools and land between form the only valley mire system in Warwickshire.	Location approximately 1.4km north of the proposed scheme.
Marston Green Millennium Wood Local Nature Reserve (LNR)	Not known. Designation does not does not necessarily imply notable nature conservation value. 3.85ha of plantation on sandy soils with open grassland areas.	Location approximately 1.3km north-west of the proposed scheme.
Elmdon Coppice LNR	Not known. Designation does not necessarily imply notable nature conservation value. 5.27ha of Ancient Semi-Natural Woodland with a pond and grassy areas.	Location approximately 1km to west of the proposed scheme.
Elmdon Manor LNR	Not known. Designation does not does not necessarily imply notable nature conservation value.	Location approximately 1.6km west of the proposed scheme.

8.4.6. The PCF Stage 2 EAR (WSP, May 2017a) assessed ten local designated sites (i.e. Ecosites/Local Wildlife Sites (LWS) within 250m of the proposed scheme) - information relevant to the proposed scheme is summarised in Table 8.2. Figure 8.2 shows LWS from publically available sources (labelled with the reference numbers in Table 8.2) – this information will be updated when the local record centre provides the locations and reasons for designation of LWS in the vicinity of the proposed scheme. If the updated data search identifies additional sites within 2km of the proposed scheme, they will be included in the ecological assessment as applicable.

Table 8.2: Non Statutory Nature Conservation Designations within 2km of the Proposed Scheme

Designation (Reference number)	Reason(s) for Designation	Relationship to the Site
Aspbury's Coppice Ancient Woodland /LWS/Ecosite (p1)	Ancient woodland replanted site.	The proposed scheme is located within the LWS.
Holywell Brook LWS/Ecosite (p13)	Brook stream flows into the River Blythe SSSI. Grassland and artificial ponds also present.	The proposed scheme requires widening the existing M42 which goes through the LWS.
Main Birmingham to London Railway line Ecosite	Botanical interest.	Site boundary not available.
Meadows to the east of the Jungle Ecosite	Not available.	The proposed scheme would go through the LWS. Site boundary not available.
Bickenhill Churchyard Ecosite	Little ecological information available, likely to be semi-improved or unimproved grassland.	Bickenhill Churchyard location 170m east of proposed scheme. Site boundary not available.
Clock Lane Meadows Ecosite (Part of Castle Hill Farm Meadows LWS) (2)	Part of the site is designated as part of Castle Hill Farm Meadows LWS. No ecological information available.	The proposed scheme would go through the LWS.

Habitats

8.4.7. The following LBAP habitats recorded in the extended Phase 1 habitat survey in 2017 coincide with the proposed scheme (refer to Table 8.3):

- Broad-leaved semi-natural and mixed semi-natural woodland.
- Hedgerows.
- Unimproved and semi-improved neutral grassland.
- Standing water.
- Running water.

8.4.8. Based on a conservation value of 'site' the following habitats will not be taken forward in the assessment as no significant effects are expected:

- Amenity grassland.
- Arable / improved grassland.
- Scattered and dense / continuous scrub.
- Bare ground.

Protected and Notable Species

8.4.9. The surveys and assessments undertaken to date have identified no evidence of water vole, reptiles, or white-clawed crayfish – therefore, these species will not be considered further in this report or by the ecological assessment.

8.4.10. The following protected and notable species have been recorded as being present or potentially present during field surveys conducted in 2017:

- **Badger (Meles meles)** – two incidental records comprising one north of Solihull Road within approximately 20m the proposed scheme and one west of Bickenhill within approximately 90m of the proposed scheme.
- **Bats** – foraging and commuting across the survey area.
- **Breeding birds** across the survey area.
- **Barn owl (Tyto alba)** – incidental record east of Catherine De Barnes Lane and approximately 100m from the proposed scheme.
- **Great crested newt** – west of Hampton in Arden and east of the M42 (approximately 300m and 460m east of the proposed scheme), west of the M42 (approximately 640m east of the proposed scheme and north of Bickenhill (approximately 330m east of the proposed scheme).

Invasive species

8.4.11. Four stands of Japanese knotweed (Fallopia japonica) are present within the survey area. One stand is located adjacent to pond 39 north of Solihull Road and within the proposed scheme footprint. Three stands are located southwest of Bickenhall with the closest of these located approximately 160m west of the proposed scheme. This species is listed on Schedule 9 of the WCA, which means it is illegal to cause it to spread onto third party lands or into the wild.

8.5. Additional Survey Requirements

8.5.1. The results of the following surveys are not currently available, but will be taken into account during the ecological survey to be reported in the Environmental Statement:

- Badger survey;
- Bats (building assessment for bat roost features, emergence/re-entry of trees and activity surveys);
- Common dormouse (Muscardinus avellanarius).
- Breeding birds;
- Wintering birds;
- Great crested newt surveys of ponds where access was denied in 2017;
- Terrestrial invertebrates; and
- Hedgerows.

8.5.2. The scope of the proposed badger survey will be confirmed when desk study and incidental survey records are available.

8.5.3. Further survey requirements for protected / notable species of fish will be assessed when survey information is received from WSP.

8.5.4. Consultation is currently taking place with statutory consultees to agree the scope of bat and wintering bird surveys to be completed during 2017 and 2018.

8.6. Value of the Environmental and Resource Receptors

8.6.1. The data collected from the baseline surveys and desk studies completed to-date has been used to identify a list of relevant ecological features with potential to be affected by the proposed scheme (refer to Table 8.3). A precautionary approach has been taken at this stage, as not all of the necessary survey work has been completed.

8.6.2. A hierarchical geographical approach has been used to determine the relative nature conservation importance (value) of the identified relevant ecological features. The approach taken accords with Highways England IAN 130/10, the Guidelines for Ecological Impact Assessment in the UK and Ireland (Chartered Institute of Ecology and Environmental Management, 2016) (hereafter referred to as the CIEEM guidelines), and professional judgement.

8.6.3. The following geographic hierarchy has been used to qualify the relative importance of ecological features:

- International or European;
- National (UK or England);
- Regional (West Midlands);
- County (Warwickshire);
- Unitary Authority (Solihull);
- Local; and
- Site level.

8.6.4. The importance assigned to ecological features reflects their distribution within the study area as currently understood. Worst case assumptions are made of potential value where data are lacking or incomplete. This preliminary evaluation may be subject to change as further surveys are completed in 2017 and 2018, or as a consequence of consultation with relevant statutory and non-statutory consultees.

8.6.5. As well as assigning importance, there is also a need to identify potential conflicts with legislation and planning policy. For example, the legal protections afforded to certain species will likely still apply, and constrain the design and implementation of the proposed scheme, regardless of the geographic importance assigned to the ecological features concerned.

Table 8.3: Preliminary Evaluation of the Importance (or Value) of Ecological Features

Type of Ecological Feature	Name/Description of Ecological Feature	Relative Importance (provisional)	Reasoning	Legal and Policy Implications	Likely/Potential Impact
Statutory nature conservation designation	Bickenhill Meadows SSSI	National	A designated SSSI	Strict legal protection afforded through WCA. Presumption against development likely to impact SSSIs via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential indirect impact from: • emission to air during construction and operation • interception of ground or surface water as a consequence of construction Further work is required to determine the significance of effects on this site.
	River Blythe SSSI	National	A designated SSSI	Strict legal protection afforded through the WCA. Presumption against development likely to impact SSSIs via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Hydrological connectivity with proposed scheme via Holywell Brook LWS. Potential indirect impact from: • interception of ground or surface water as a consequence of construction Further work is required to determine the significance of effects on this site.
	Coleshill and Bannerly Pools SSSI	National	A designated SSSI	Strict legal protection afforded through the WCA. Presumption against development likely to impact SSSIs via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential indirect impact from: • emission to air during construction and operation Further work is required to determine the significance of effects on air quality on this site.
	Marston Green Millennium Wood LNR	Local	Local Nature Reserve designated by SMBC. To qualify for LNR status, a site must be of importance for wildlife, geology, education or public enjoyment. Higher value unlikely given it is not a LWS.	Presumption against development likely to impact LNRs via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	The LNR is approximately 1,350m from the proposed scheme and separated from it by a main road (Bickenhall Parkway) and the National Exhibition Centre. It is therefore unlikely that there would be any impacts from the proposed scheme on the LNR.
	Elmdon Coppice LNR	Local	Local Nature Reserve designated by SMBC. Higher value unlikely given it is not a LWS.	Presumption against development likely to impact LNRs via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	The LNR has connectivity to the proposed scheme via woodland and hedgerows however it is unlikely to be impacted due its distance (approximately 1,000m) from the proposed scheme.
	Elmdon Manor LNR	Local	Local Nature Reserve designated by SMBC. Higher	Presumption against development likely to impact LNRs via Solihull Local Plan Policy P10.	The LNR has connectivity to the proposed scheme via woodland and hedgerows

Type of Ecological Feature	Name/Description of Ecological Feature	Relative Importance (provisional)	Reasoning	Legal and Policy Implications	Likely/Potential Impact
			value unlikely given it is not a LWS.	Highways England BAP target to achieve no net loss of biodiversity.	however there is a main road (Damson Parkway) in between and it is located approximately 1,600m from the proposed scheme. It is therefore unlikely to be impacted by the proposed scheme.
Non-statutory nature conservation designation	Aspbury's Coppice Ancient Woodland /LWS/Ecosite,	County	LWS designated by SMBC. LBAP habitat and habitat of principal importance	Presumption against development likely to impact LWSs via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity. The NPPF outlines that planning permission should be refused for development resulting in the loss or the deterioration of irreplaceable habitats, including ancient woodland…. unless the need for, and benefits of, the development in the location outweigh the loss'	Potential impacts from: • substantive land take • severance of habitats • impedance of effective management • emissions to air • hydrological changes • littering and noise
	Holywell Brook LWS/Ecosite	County	LWS designated by SMBC.	Presumption against development likely to impact LWSs via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential direct impact from: • substantial land take Potential indirect impacts from: • interception of surface or ground water as a consequence of construction • shading • severance/barrier effect Replacement habitat would be required.
	Clock Lane Meadows Ecosite (Part of Castle Hill Farm LWS)	County	LWS designated by SMBC.	Presumption against development likely to impact LWSs via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential direct impact from: • land take Potential indirect impact from: • emissions to air Further work is required to determine the significance of effects on air quality on these habitats.
	Meadows to the east of the Jungle Ecosite	County	LWS designated by SMBC.	Presumption against development likely to impact LWSs via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential direct impact from: • land take Potential indirect impact from: • emissions to air Further work is required to determine the significance of effects on air quality on these habitats.

Type of Ecological Feature	Name/Description of Ecological Feature	Relative Importance (provisional)	Reasoning	Legal and Policy Implications	Likely/Potential Impact
	Castle Hill Farm Meadows LWS	County	LWS designated by SMBC. Castle Hill Farm Meadows was accorded Regional value in the Stage 2 Scoping Report (WSP, May 2017b). Value will be reviewed when updated data is received from local record centres.	Presumption against development likely to impact LWSs via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential direct impact from: • land take Potential indirect impact from: • emissions to air Further work is required to determine the significance of effects on air quality on these habitats.
	Main Birmingham to London Railway Line Ecosite	County	LWS designated by SMBC and may include LBAP features.	Presumption against development likely to impact LWSs via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential indirect impact from: • emissions to air Further work is required to determine the significance of effects on air quality on these habitats.
	Bickenhill Churchyard Ecosite	County	LWS designated by SMBC and may include LBAP features. Value of LWS will be reviewed when updated data is received from local record centres.	Presumption against development likely to impact LWSs via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential indirect impact from: • emissions to air Further work is required to determine the significance of effects on air quality on these habitats.
Habitats	Broad-leaved semi-natural and mixed semi-natural woodland	Local	LBAP habitats and habitats of principal importance; Arden National Character Area profile.	Presumption against development likely to impact LBAP habitats via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential direct impact from: • land take
	Unimproved and Semi-improved neutral grassland	Local	LBAP habitats and habitats of principal importance; Arden National Character Area profile.	Presumption against development likely to impact LBAP habitats via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential direct impact from: • land take
	Standing water	Local	LBAP habitats and habitats of principal importance	Presumption against development likely to impact LBAP habitats via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Twelve ponds are located within the current redline boundary and would potentially be lost to the proposed scheme. There is a potential indirect impact to another five ponds located adjacent to the proposed scheme from: • interception of surface or ground water during construction
	Running water	Local	LBAP habitats and habitats of principal importance	Presumption against development likely to impact LBAP habitats via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential indirect impact from: • interception of surface or ground water during construction

Type of Ecological Feature	Name/Description of Ecological Feature	Relative Importance (provisional)	Reasoning	Legal and Policy Implications	Likely/Potential Impact
Habitat	Hedgerows	County (precautionary)	LBAP habitat and habitats of principal importance. Hedgerows to be lost require further survey. Value will be confirmed following surveys.	Protected by the Hedgerows Regulations 1997. Highways England BAP target to achieve no net loss of biodiversity.	Potential impact from: • land take • severance of habitats Impacts will be assessed when survey results are available.
Species	Bats	County (precautionary)	Trees, woodlands and structures with features suitable for roosting bats are present within the survey area. Woodlands, grassland, arable fields, water bodies and hedgerows are suitable for foraging and commuting bats. Bats are LBAP species. Surveys have recorded common pipistrelle Pipistrellus pipistrellus and soprano pipistrelle Pipistrellus pygmaeus (common species) and Myotis species and noctule Nyctalus noctula (rarer species) Soprano pipistrelle and Noctule are species of principal importance). Value will be confirmed following further surveys.	Protected by European and UK Law (Habitat Regulations and WCA). Presumption against development likely to impact protected species via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential impact from: • loss of roosting sites • loss of foraging and commuting habitat • mortality crossing the new road Impacts will be assessed when survey results are available.
Species	Common dormouse	Regional (precautionary)	LBAP species and a species of principal importance. Suitable habitat for this species exists in patches of woodland linked by an extensive network of hedgerows. Value will be confirmed following further surveys.	Protected by European and UK Law (Conservation of Habitats and Species Regulations 2010 as amended and WCA 1981 as amended). Presumption against development likely to impact protected species via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential impact from: • loss of breeding site or resting place • habitat severance Impacts will be assessed when survey results are available.
Species	Badger	Local.	Legally protected. Two active badger setts are present within the construction area. Woodland, scrub, grassland and arable fields provide sett-building and	Protected by UK Law (Protection of Badgers Act 1992). Presumption against development likely to impact protected species via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential impact from: • loss of sett • loss of foraging habitat • severance of territories • mortality crossing the new road

Type of Ecological Feature	Name/Description of Ecological Feature	Relative Importance (provisional)	Reasoning	Legal and Policy Implications	Likely/Potential Impact
			foraging habitat.		Impacts will be assessed when survey results are available.
Species	Hedgehog Erinaceus europaeus	Local	LBAP species and a species of principal importance. Woodland, hedgerows, grassland and scrub provide good potential foraging habitat.	None, but is a species of principal importance under NERC Act 2006. Presumption against development likely to impact LBAP species via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential impact from: • loss of foraging habitat • mortality on the new road
	Otter (Lutra lutra)	County	Otter uses River Blythe and is likely to use Holywell Brook	Protected by European and UK Law (Conservation of Habitats and Species Regulations 2010 as amended and WCA 1981 as amended). Presumption against development likely to impact protected species via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential impact from: • loss of resting places and commuting/foraging habitat
Species	Great crested newt	County (precautionary)	LBAP species and a species of principal importance. Hedgerows, dense scrub, woodland and grassland are suitable for foraging and sheltering amphibians. Small populations of great crested newts were recorded in four pond clusters within 500m of the proposed scheme during surveys in 2017. Due to survey limitations, the size of one of the populations may have been underestimated and probable absence of newts in pond 37 cannot be relied upon. Due to access restrictions, 16 ponds were not surveyed. These ponds are to be subject to further survey and assessment in 2018. Four of these ponds coincide with the proposed scheme. Value will be confirmed following further surveys.	Protected by European and UK Law (Conservation of Habitats and Species Regulations 2010 as amended and WCA 1981 as amended). Presumption against development likely to impact protected species via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential impact from: • killing and injury during construction

Type of Ecological Feature	Name/Description of Ecological Feature	Relative Importance (provisional)	Reasoning	Legal and Policy Implications	Likely/Potential Impact
Species	Toad Bufo bufo	Local	LBAP species and a species of principal importance.	None, but is a species of principal importance under NERC Act 2006. Presumption against development likely to impact LBAP species via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential impact from: • killing and injury during construction
Species	Birds	County (precautionary)	Trees, woodland and hedgerows provide suitable habitat for breeding birds. Grassland, arable fields and waterbodies provide suitable habitat for wintering birds. Incidental record of barn owl a WCA Schedule 1 species. Value will be confirmed following surveys.	Protected by UK Law (WCA 1981 as amended). Presumption against development likely to impact protected species via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity. Highways England BAP target to achieve no net loss of biodiversity.	Potential impacts from: • killing and injury during construction • loss of nesting and foraging habitat Impacts will be assessed when survey results are available.
Species	Terrestrial Invertebrates	Local (precautionary)	Unimproved grassland, woodland and marshy grassland may support locally important invertebrate assemblages. May include species of principal importance and LBAP species. Value will be confirmed following surveys.	None, but may contain species of principal importance under NERC Act 2006. Presumption against development likely to impact protected species via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential impacts from: • loss of foraging habitat • Killing and injury during construction Impacts will be assessed when survey results are available.
	Fish	Local (precautionary)	Component watercourses of the River Blythe SSSI such as Holywell Brook and Shadow Brook may provide suitable habitat for LBAP species	None, but may be species of principal importance under NERC Act 2006. Presumption against development likely to impact notable species via Solihull Local Plan Policy P10. Highways England BAP target to achieve no net loss of biodiversity.	Potential impact from: • obstructions to the passage of fish in watercourses

8.7. Potential Impacts and Effects

Construction

8.7.1. The following construction impacts may result in potentially significant effects on important ecological features as associated with the proposed scheme:

- **Habitat loss:** direct loss and severance of wildlife habitats through land take in various locations with potential to affect various species including bats, badgers, breeding and wintering birds and terrestrial invertebrates; and
- **Indirect impacts:** noise; watercourse pollution / sedimentation; dust; lighting; increased human disturbance; potential for invasive non-native species introductions from site works.

8.7.2. The proposed scheme has the potential to generate significant negative effects upon the following ecological features during construction (based upon existing baseline information) in the absence of mitigation:

- **Statutory designated sites:** Bickenhill SSSI due to potential changes in air quality baseline conditions, dust deposition and changes to water quality and groundwater resources;
- **Non-statutory designated sites:** Aspbury's Copse Ancient Woodland (due to partial loss of woodland area) and Castle Hill Farm Meadows LWS (due to habitat loss);
- **Habitats:** Species-rich semi-improved grassland, poor semi-improved grassland, Semi-natural broadleaved, mixed plantation, broadleaved plantation and coniferous plantation woodland, running water, arable and hedgerows, (due to habitat loss); and
- **Species:** badger, bats, birds and terrestrial invertebrates (due to habitat loss and/or killing/injury/disturbance from construction).

Operation

8.7.3. The following operational impacts may result in significant effects on important ecological features as associated with the proposed scheme:

- Mortality of wildlife due to collision with traffic;
- Noise disturbance to wildlife from traffic;
- Lighting impacts on nocturnal species;
- Polluted surface water run-off; and
- Disturbance from salt spray/changes in air quality (emissions).

8.7.4. The proposed scheme has the potential to generate significant negative effects upon the following ecological features during operation (based upon existing baseline information) in the absence of mitigation:

- **Statutory designated sites:** Bickenhill SSSI due to possible changes in the water and air quality environment;
- **Non-statutory designated sites:** Aspbury's Copse Ancient Woodland (due to partial loss of woodland area, Castle Hill Farm Meadows LWS, Green Ward Piece LWS, (due to surface water run-off and damage / disturbance from salt spray / emissions on retained habitats adjacent to the proposed scheme boundary); and
- **Species:** Badgers (due to killing/injury through collision with motor vehicles); bats (due to killing / injury through collision with motor vehicles and light impacts on foraging and commuting corridors); and birds (due to killing / injury

through collision with motor vehicles and reduced population size and breeding success due to traffic noise and visual disturbance).

Summary of Mitigation Proposals

8.7.5. Additional proposed scheme specific mitigation and enhancement measures will be proposed where potential significant ecological effects are identified. Based upon existing baseline information, the following mitigation and enhancement measures are likely to be implemented in relation to designated and non-designated sites, habitats and species to reduce the effect of potentially significant construction impacts:

- Retention of habitats and on-site soft-landscaping to contribute to the replacement of those habitats lost to construction.
- Off-site mitigation and enhancement areas to aim to deliver no net loss in biodiversity.
- Translocation of habitats.
- Habitat creation and enhancement of watercourses to maximise gains to the water environment (and aim to meet objectives of the WFD).
- Planting of field margins and species-rich hedgerows.
- Enhancing the wildlife corridor and ecosystem function of the proposed scheme.
- Incorporation of mammal ledges into culvert designs and underpasses to enhance and facilitate otter movement.
- Pre-construction checks of potential nesting sites with appropriate mitigation measures implements (where applicable).
- Compensatory planting to minimise impact on notable farmland birds.
- Alternative nesting sites and habitat for wintering birds to mitigate for the habitat lost.
- Bird screening and monitoring surveys during construction to minimise disturbance.
- Bird foraging and nesting habitat to compensate for the loss of habitat.
- A mixture of habitats (including bat boxes) incorporated into the landscape design to benefit foraging, commuting and roosting bats.
- Terrestrial invertebrate habitat mitigation through suitable habitat creation (e.g. blocks of grassland habitat, varied topography (such as slopes, banks and ditches and log piles).
- A means of escape from trenches left open overnight provided for badger and other mammals.
- Appropriate habitat creation for foraging and commuting badger to mitigate for that lost.

8.7.6. Based upon existing baseline information, the following additional mitigation and enhancement measures could be implemented to reduce the effect of potentially significant operational impacts:

- Shelterbelt to protect birds (farmland).
- Appropriate lighting design to minimise effects on bats.
- Planting of linear features to replace/reinstate navigational cues for bats and minimise risk of killing and injury of bats through collision with motor vehicles.
- Appropriate fencing, tunnels and underpasses installed / maintained for badger.
- Opportunities for the inclusion of wildlife tunnels and underpasses would be considered at appropriate locations to enhance connectivity and improve the wildlife corridor function of the proposed scheme.

8.7.7. In addition to the above, the following general scheme-wide measures are also proposed:

- On-going monitoring throughout construction and operation to allow for positive intervention where mitigation measures are not meeting objectives.
- Invasive plant species management to avoid spread of invasive plant species during construction and operation.

Design implications

8.7.8. The following ecological issues need to be considered as part of the ongoing proposed scheme iterative design process:

- Procurement of land for replacement ponds and terrestrial habitat for GCN.
- Procurement of land for replacement badger sett(s).
- Procurement of land for provision of mammal crossing points (wildlife tunnels or underpasses) for badger, dormouse and hedgehog.
- Incorporation of mammal ledges into culvert designs and underpasses to facilitate otter movement.
- Procurement of land for translocation of semi-natural ancient woodland.
- Procurement of land for replacement broad-leaved semi-natural and mixed semi-natural woodland.
- Procurement of land for planting of linear features to replace/reinstate navigational cues for bats; and
- The procurement of land for offsite planting agreements

8.8. Summary of PCF Stage 2 Assessment

8.8.1. The PCF Stage 2 EAR (WSP, May 2017a) indicated that the proposed scheme has the potential to generate a range of potentially significant effects upon statutory and non-statutory site designations, habitats and protected species. Following a review of the available data to inform this Scoping Report, there remains the potential for significant ecological effects, however, uncertainty remains relating to likely significant effects on the following ecological receptors:

- Coleshill and Bannerly Pools SSSI.
- Bickenhill Meadows SSSI.
- River Blythe SSSI.
- Aspbury's Coppice Ancient Woodland/LWS/Ecosite
- Hollywell Brook LWS/Ecosite.
- Bickenhill Churchyard Ecosite.
- Castle Hill Farm Meadows LWS.
- Clock Lane Meadows Ecosite.
- Meadows to the east of the Jungle Ecosite.
- Main Birmingham to London Railway Line Ecosite.
- Bats.
- Badgers.
- Common dormouse.
- GCN.
- Birds.
- Terrestrial invertebrates.

8.9. Proposed Scope of Assessment

8.9.1. Impacts on potential important ecological features (i.e. habitats, species or ecosystems) within the zone of influence of the proposed scheme will be considered within the Environmental Statement. The assessment will also determine the importance (i.e. value) of, and impacts upon, each ecological feature with regard to the associated geographical scale of reference.

8.9.2. A Habitat Regulations Assessment for PCF Stage 2 options was prepared by WSP in April 2017 (WSP, April 2017) which reported there would be no significant effects on European site designations. This assessment will be reviewed during PCF Stage 3.

8.10. Proposed Assessment Methodology including Effect Significance

8.10.1. The method used for the ecological impact assessment will be based upon the following guidance:

- DMRB Volume 11, Section 2 (General Principles and Guidance of Environmental Impact Assessment (HA 201/08)).
- DMRB Volume 11 Section 2 (Assessment and Management of Environmental Effects (HA 205/08).
- DMRB Volume 10 Section 4 Nature Conservation.
- DMRB Volume 11 Section 3 Part 4 Ecology and Nature Conservation.
- IAN 125/15 (Environmental Assessment Update).
- IAN 130/10 (Ecology and Nature Conservation: Criteria for Impact Assessment).
- Guidelines of Ecological Impact Assessment in the UK and Ireland (Chartered Institute of Ecology and Environmental Management, Second Edition 2016); and Professional judgement.

8.10.2. The scope of the ecological impact assessment will cover the following:

- Assigning / confirming nature conservation resource importance (or value) to nature conservation resources present within the applicable study area. The importance of the identified features will be assigned to their relevant geographic scale, namely: international or European; UK or national; regional; county or unitary authority area, or local.
- Characterisation of ecological impacts on specific features (i.e. receptors as confirmed during the baseline surveys in 2017) (taking into account impact avoidance design measures and standard management activities).
- Determination of the significance of effects by the importance of the ecological feature and the characterisation of the ecological impact on each specific feature.
- The ecological surveys to be conducted in 2017 and 2018 will confirm / identify the presence / probable absence of species and habitats.

8.10.3. The ecological surveys to be conducted in 2017 and 2018 will confirm/identify the presence/probable absence of species and habitats.

8.10.4. Options to avoid / reduce / mitigate / compensate for any identified significant potential effects will be considered in line with the Highways England 2015 Biodiversity Plan and to the point where any residual effects are not considered to be significant. In addition, opportunities will be sought for the enhancement of biodiversity at both on and off-site locations as associated with the proposed scheme (taking into account the sustainability objectives as set out in the Highways England 2015 Biodiversity Plan).

8.11. Assumptions and Limitations

8.11.1. The following assumptions and limitations have been noted during the scoping of the assessment:

- The PCF Stage 2 ecological assessment did not include the candidate sites identified for construction compounds and / or ecological compensation areas. As such the ecological assessment as reported in the Environmental Statement may be different to that reported during PCF Stage 2.
- Further baseline surveys are being undertaken. Additionally, selective updated surveys are being carried out across the proposed scheme in order to ensure data is in date to support the DCO submission (subject to agreement with consultees). These surveys may recommend further surveys (where applicable) depending on findings. Additionally, the surveys may highlight new important ecological features with potential to be significantly affected, which were not identified (or considered not to be significant) at PCF Stage 2.
- A precautionary approach is assumed that all habitats within the proposed scheme footprint are likely to be lost during construction.
- There are a number of candidate sites for potential ecological enhancement measures. For some of these sites, the potential ecological enhancement measures would be selective/localised/.targeted, and non-licensable.

9. GEOLOGY AND SOILS

9.1. Introduction

9.1.1. This section sets out the proposed approach to the assessment of the proposed scheme's potential impacts upon geology and soils. As detailed in the DMRB (Volume 11, Section 3, Part 11 – Geology and Soils), road schemes can have an impact on both geology and soils and on land use (DMRB Volume 11, Section 3, Part 6 – Land Use Amendment No 1) of an area. It is therefore important that the potential impacts of development on both the soil and the underlying rocks are considered. The converse also applies in that existing soil conditions of a site can impose constraints on a proposed development for example, where land which has been contaminated by previous industrial land uses.

9.2. Summary of Relevant Policy

9.2.1. The national and local planning policies of most relevance to the soils and geology assessment are summarised in Table 9.1.

Table 9.1: Summary of Planning Policy of Relevance to Soils and Geology Assessment

National Policy Statement for National Networks (NPSNN) (2014)	• NPSNN Paragraph 5.168
National Planning Policy Framework (NPPF) (2012) and associated Planning Practice Guidance (PPG) (2014)	• NPPF Paragraphs 109 -110, PPG ID34: Water Supply, Wastewater and Water Quality and NPPG ID33: Land affected by Contamination; • NPPF Paragraph 111 and PPG ID8: Natural Environment (Brownfield Land, Soils and Agricultural Land); • NPPF Paragraph 112 and PPG ID8: Natural Environment (Brownfield Land, Soils and Agricultural Land); • NPPF Paragraphs 120 – 121 and PPD ID33: Land affected by Contamination.
Planning Policy Statement 7 – Sustainable Development in Rural Areas (2004)	• Paragraph 28: Best and Most Versatile Agricultural Land

9.3. The Study Area

9.3.1. A desk based study of readily available sources has been undertaken in order to identify potential impacts of the proposed scheme on geology and geomorphology, soils and contaminated land, as required by DMRB (Volume 11, Section 3, Part 11 – Geology and Soils). The review of information has been confined to the following distances from the proposed scheme:

- Geography and topography: description of the route of the proposed scheme.
- Geology: along the route of the proposed scheme.
- Geological designated sites: within 250m of the proposed scheme boundary.
- Historical land uses and potential sources of contamination: within 250m of the proposed scheme boundary.
- Controlled waters: within 250m of the proposed scheme boundary.
- Agricultural land: immediately adjacent to the existing highway and within the proposed scheme boundary.

- Other land designations e.g. LNRs: immediately adjacent to the existing highway boundary.

9.3.2. The final extent of the study area will be agreed in consultation with the applicable statutory consultees and subsequently confirmed as the assessment is undertaken and refined. The study area implemented to inform the assessment will be presented within the Environmental Statement for the proposed scheme.

9.4. Baseline Conditions

Published Geology

9.4.1. The 1:50,000 scale Solid and Drift geological maps (Birmingham Sheet 168) and the BGS GeoIndex mapping provide information on the published geology in the area of the proposed scheme.

9.4.2. Made Ground is only present to the west of M42 Junction 6 and the north of A45 associated with Birmingham Airport and with some areas further north along the M42.

9.4.3. There are no superficial deposits shown on the geological maps for the majority of the proposed scheme. There are strips of Alluvium deposits (Clay, Silt, Sand and Gravel) to the west of B4438 and the north of A45. There are patches of Glacio-fluvial deposits present to the east of the proposed scheme and to the north of the M42 Junction 6. The southern part of the proposed scheme area (i.e. area between Friday Lane and Henwood Lane) comprises Alluvium, River Terrace and Glacio-fluvial deposits.

9.4.4. The proposed scheme area is entirely underlain by the Mercia Mudstone Group comprising Sidmouth Mudstone Formation (predominantly to the west of M42), Bransombe Mudstone Formation (predominantly to the north of M42 J6) and Arden Sandstone Formation. These are sedimentary bedrock formed in the Triassic Period.

9.4.5. There are no Local Geological Sites (formerly Regionally Important Geological Sites (RIGS)) within the defined study area.

Historical Land Uses and Potential Sources of Contamination

9.4.6. There are historical landfill sites in the vicinity of the proposed scheme as shown on the Environment Agency website (assessed on 18/09/2017). These are summarised in Table 9.2.

Table 9.2: Historical Landfill within 300m of the Proposed Scheme

Landfill Name	Site Operator	Site Address	Approximate Distance from the Route	Type of Waste Received	Operation Dates
Castle Hills Farm	Bulldog Demolition Limited	Catherine De Barnes Lane, Bickenhill, Solihull,	0m	Inert	1977 – 1978
Bickenhill Lane	Sheridan Contractors Limited	Bickenhill Lane, Bickenhill	80m	Inert	1977 - 1981
Glebe Farm	Mercon Construction Limited	Catherine De Barnes Lane, Bickenhill, Solihull	0m	Inert	1988 - 1989
Opposite Church	Birmingham - Welsh Rugby	Clock Lane, Bickenhill,	100m	Industrial, Commerci	1970 –

Landfill Name	Site Operator	Site Address	Approximate Distance from the Route	Type of Waste Received	Operation Dates
Farm	Football Club	Birmingham		al and Household	1972
Site Corner Clock Lane	Bickenhill, Birmingham	Not available	0m	Not available	1985
Windbridge Nurseries	West Midlands (Excavations) Limited	Coventry Road, Bickenhill, Solihull	50m	Inert	1979 - 1982
Middle Bickenhill Lane	Rawlins Brothers (Birmingham) Limited	Middle Bickenhill Lane, Bickenhill, Solihull	280m	Inert, Industrial, Commercial, Household and Special	1962 – 1985

Hydrological and Hydrogeological Information

9.4.7. The superficial (Alluvium and Glaciofluvial) deposits underlying the proposed scheme area are classified collectively by the Environment Agency as Secondary 'A' aquifer. The underlying bedrock including the Sidmouth Mudstone and Bransombe Mudstone Formations are classified collectively by the Environment Agency as Secondary 'B' aquifer. The areas underlain by the Arden Sandstone Formation bedrock are classed as Secondary 'A' aquifer. There are no groundwater source protection zones in the area. According to the Environmental Constraints Map inside the 1 km buffer zone there is a Groundwater source north of Junction 6. The groundwater vulnerability zone around the area is mainly minor aquifer high and minor aquifer low.

9.4.8. The footprint of the proposed scheme falls within the surface water nitrate vulnerable zone and surface water safeguard zones. The surface water bodies in the vicinity of the proposed scheme include Hollywell Brook, River Blythe and Shadow Brook all to the east of M42 eventually passing under the M42 and to the west of M42 and B4438 there is Low Brook.

Agricultural Land and Other Land Designations

9.4.9. As detailed in the Natural England Technical Information Note TIN049, the Agricultural Land Classifications (ALC) system classifies land into five soil grades, with Grade 3 soils being subdivided into Subgrades 3a (good) and 3b (moderate). The BMVL is defined as ALC Grades 1, 2 and 3a by policy guidance (e.g. Annex 2 of NPPF). This is the land that is most flexible, productive and efficient in response to inputs and which can best deliver future crops. Grade 4 soils are defined as being poor, and Grade 5 soils described as very poor. The ALC system is used by Natural England and others to provide advice to planning authorities if development is proposed on agricultural land that could potentially grow crops. NPPF (paragraph 112) states that *"Where significant development of agricultural land is demonstrated to be necessary, local planning authorities should seek to use areas of poorer quality land in preference to that of a higher quality*".

9.4.10. The Agricultural Land Classification map West Midlands Region (1:250,000) indicates that the whole footprint of the proposed scheme area falls under agricultural land classification Grade 3. The DEFRA magic website (accessed on

18/09/2017) further classifies some of the farmland in the west of the M42. This includes the Walford Hall Farm area adjacent to the M42 near Friday Lane classed mainly as Grade 3a and Grade 3b with a small area of Grade 2. Land adjacent to B4438 west side occupied by Bunts Wood, Woodhouse Farm, Hampton Coppice and Castle Hills is mainly Grade 3b but also has areas of Grade 2 and 3a land with a small area of Grade 4 land in the corner adjacent to Damson Parkway.

9.5. Additional Survey Requirements

Geological and Land Contamination Investigation

9.5.1. An intrusive ground investigation will be undertaken along the alignment of the proposed scheme in order to obtain details of prevailing ground conditions. As part of this investigation, soil and groundwater samples will be collected and analysed for a range potential contaminants taking into account previous historic land uses. No further ground investigations are currently planned.

Agricultural Soil Quality

9.5.2. The Natural England Technical Note defines best and most versatile land (BMVL) which needs to be protected as Grades 1, 2, and 3a. The majority of the land within the footprint of the proposed scheme is classed as Grade 3, with no distinction between Grade 3a and Grade 3b. As such, an agricultural land survey will be undertaken to confirm agricultural soil grades within the proposed scheme footprint in order to identify BMVL.

9.6. Value of the Environmental and Resource Receptors

9.6.1. No locally or nationally geological designated sites have been identified within the vicinity of the proposed scheme.

9.6.2. Section 9.4 indicates that some locations (such as landfills sites in Table 9.2) in the vicinity of the proposed scheme have the potential to be contaminated. The principal receptors which could be affected by either contamination on or off-site which is created or affected by construction and / or operation of the proposed scheme comprise:

- **Human health:** Construction and maintenance workers, offsite receptors and future site users;
- **Controlled waters:** Including Secondary 'A' (superficial deposits) and Secondary 'B' (bedrock) aquifers underlying the area; and
- **Construction materials:** Existing and new concrete and structures associated with the highway.

9.6.3. It is considered that the proposed scheme construction and maintenance phases would be undertaken in a manner that appropriately protects the health and safety of workers, whilst the proposed scheme would use materials that are appropriate for the identified ground conditions. As such, construction / maintenance workers and construction materials have been scoped out of the assessment and are not considered further herein.

9.6.4. As indicated in Section 9.4, there is agricultural land in the area has been predominantly classed as Grade 3. There is thus the potential for BMVL to be present within the proposed scheme footprint.

9.6.5. Table 9.3 presents the importance / sensitivity of potential receptors or soil / geological resources to ground conditions impacts according to the categories detailed in Table 9.4.

Table 9.3: Critical Receptors and their Importance / Sensitivity

Receptor	Phase		Importance/Sensitivity
	C	O	
Human Health – Off-site receptors	✓	✓	Medium
Human Health – Future site users	-	✓	Low
Controlled Waters – Groundwater	✓	✓	Medium
Controlled Waters – Surface Waters	✓	✓	Medium
Surrounding Land Uses – (Agricultural Land)	✓	*	Low to Medium
Soil Quality	✓	✓	Low to Medium

C – construction; O - operation

9.7. Potential Impacts and Effects

9.7.1. Road schemes have the potential to impact on both the geology and soils of an area. The following are the possible categories of environmental effect:

- Physical effects of the proposed scheme: For example, changes in topography, soil compaction, soil erosion, ground stability.
- Effects on geology as a valuable resource: For example, mineral resource sterilisation, loss or damage to regionally important geological sites, SSSIs.
- Effects associated with ground contamination that may already exist on site: For example, introducing or changing pathways of contamination migration, or changes to the characteristics and contamination receptors.
- Effects associated with the potential for polluting substances used during construction or operation to cause new ground contamination issues on site, such as the accidental loss/spillage of fuels and oils to ground.
- Impacts associated with re-use of soils and waste soils: Re-use of site-sourced materials on- or off-site, disposal of site-sourced materials off-site, and importation of materials to the site.
- Effects on soils as a valuable resource: For example, loss or damage to soils of good agricultural quality.

Summary of Mitigation Proposals

Construction Phase Mitigation Measures

9.7.2. A CEMP would be prepared and implemented by the construction contractor which would include a range of measures associated with mitigating potential impacts as 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/chemical storage facilities e.g. bunded tanks, hard standing and associated emergency response/spillage control procedures;
- Well maintained plant and associated emergency response / spillage control procedures.
- 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.

9.7.3. The prevention of pollution of controlled waters would be achieved via the mitigation measures as outlined in Chapter 13: Road Drainage and Water Environment. Mitigation measures to protect controlled waters would take into account the results of any ground investigation undertaken and would account for any necessary 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 with particular reference to the water environment that replenishes Bickenhill SSSI. 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.

Operational Phase Mitigation Measures

9.7.4. 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. However, there would be potential for environmental risks as associated with spillages due to road accidents or faulty vehicles. To mitigate such impacts during the proposed scheme operation stage, 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. In addition, any spillages following road incidents would be routinely managed by Highways England who is responsible for the maintenance of Highways England assets in the West Midlands Region.

Summary of PCF Stage 2 Assessment

9.7.5. A PCF Stage 2 assessment was undertaken by Mouchel / WSP in May 2017. The assessment concluded that there is low likelihood for the proposed scheme to result in significant adverse effects with respect to geology and soils. The assessment recommended a ground investigation due to the potential for contaminants to be mobilised or displaced during the construction and / or operation of the proposed scheme.

9.7.6. The PCF Stage 2 assessment also recommended that a simple level assessment be undertaken during the PCF Stage 3 and which should include further details regarding construction techniques and consideration of the results from any geotechnical investigation.

9.8. Proposed Scope of Assessment

9.8.1. The proposed scope of the assessment would focus upon those receptors as identified in Table 9.3, namely human health - off-site receptors, human health - future site users, controlled waters – groundwater, controlled waters - surface waters, surrounding land uses - agricultural land and soil quality.

9.8.2. The geology and soils assessment will be undertaken in accordance with the advice in DMRB Volume 11, Section 3, Part 11 Geology and Soils. The objective is to undertake sufficient assessment of the proposed scheme to identify any potentially significant effects on geology and soil and where appropriate any particular environmental issues associated with contaminated land. The assessment of agricultural soils will be undertaken in accordance with the guidance within DMRB Volume 11, Section 3, Part 6 – Land Use – Amendment No 1.

9.9. Proposed Assessment Methodology including Significance

Data Sources

9.9.1. Baseline information will be collated by reference to the following data sources:

- Information available in an 'Envirocheck' Report (Landmark Information Group).
- Data from British Geological Survey (BGS) Solid and Drift Geology Sheets.
- BGS borehole logs, where appropriate.
- Available site investigation factual and interpretative reports.
- Natural England.
- Environment Agency.
- DEFRA.
- Local authorities.

9.9.2. Factual and interpretative geotechnical and geo-environmental reports relating to site investigations, soil surveys and agricultural land classification surveys will be reviewed and reported as applicable in the Environmental Statement. This will include the results of any risk assessments undertaken if any land contamination is identified.

Assessment Criteria

9.9.3. The geology and soils assessment will be undertaken in accordance with the advice in DMRB Volume 11, Section 3, Part 11 Geology and Soils. This guidance defines the scope of the topic, but does not provide formal guidance on the assessment of impacts and effects. The impact assessment methodology applied will take account of technical guidance that has been produced in the UK for the assessment of ground conditions and water resources by the government (i.e. DEFRA and its predecessor and successor departments); agencies such as the Environment Agency and Contaminated land: Applications in Real Environments (CL:AIRE); and British Standards.

9.9.4. With regard to impacts upon agricultural soils, the assessment methodology will take into account the statutory consultation procedures in the Town and Country Planning (Development Management Procedure) Order 2010 in which Natural England has to consider proposals which individually or cumulatively involve the loss of more than 20ha of BMVL.

9.9.5. The importance/sensitivity of potential receptors or soil/geological resources to ground condition impacts will be described qualitatively according to the categories in Table 9.4. The criteria for assessing the magnitude of impact upon the receptors will be described according to categories in Table 9.5 and the criteria for assessing the significance of effect will be in accordance to the matrix presented in Table 9.6.

Table 9.4: Descriptive Scale for Importance / Sensitivity of Receptors (Geology and Soils)

Importance	Criteria	Receptors Susceptible to Land Contamination and Ground Hazard Impacts	Soil and Geological Resources	Agricultural Soil Resources
High	Attribute has a high quality and rarity on regional or national scale or high sensitivity	• Future Site users – residential development • Residential areas or schools within 50m of construction works • Water features deemed to be of high value • Ecological features deemed to be of high value • Allotments, arable farmland, livestock or market gardens on or adjacent to the site	• Internationally and nationally designated sites • Regionally important sites with limited potential for substitution • Soils of high nature conservation or landscape importance • Presence of significant mineral reserves and within a Mineral Consultation Area • Soil / materials disposal required following earthworks resulting in a significant increase in demand on waste management infrastructure	High quality agricultural soils (Grade 1)
Medium	Attribute has a high quality and rarity on local scale or high sensitivity	• Future site users - commercial development • Residential areas or schools within 50m to 250m of construction works • Commercial areas within 50m of construction works • Water features deemed to be of medium value • Ecological features deemed to be of medium value • The built environment including buildings and infrastructure	• Regionally important sites with potential for substitution • Locally designated sites with limited potential for substitution • Soils of medium conservation or landscape importance • Site within a Mineral Consultation Area • Soils / materials disposal required following earthworks resulting in a moderate increase in demand on waste management infrastructure	Good quality agricultural soils (Grade 2 and 3a)

Importance	Criteria	Receptors Susceptible to Land Contamination and Ground Hazard Impacts	Soil and Geological Resources	Agricultural Soil Resources
Low	Attribute has a medium quality and rarity on local scale or medium sensitivity	• Future site users - car park, highways and railway related development • Residential areas >250m from construction works • Commercial areas within 50m to 250m of construction works • Water features deemed to be of low value • Ecological features deemed to be of low value	• Undesignated sites of some local earth heritage interest • Soils of low nature conservation or landscape importance • Limited potential for mineral reserves and site not within a Mineral Consultation Area • Soil/materials disposal required following earthworks resulting in a limited increase in a minor increase in demand on waste management infrastructure	Moderate or poor quality agricultural soils (Grade 3b and 4)
Very Low	Attribute has a low quality and rarity on local scale or medium sensitivity	• Areas where there are no built structures, crops, or livestock • Commercial areas within >250m of construction works • Water features deemed to be of low value • Ecological features deemed to be of negligible value	• Other sites with little or no local earth heritage interest • Soils of negligible nature conservation or landscape importance. • Negligible potential for mineral reserves to exist	Very poor quality agricultural soils (Grade 5)

9.9.6. The magnitude of the geology and soils impact of the proposed scheme will be determined using the 4 point scale shown in Table 9.5.

Table 9.5: Criteria for Assessing the Magnitude of Impact upon Features / Attributes – Geology and Soils

Magnitude	Criteria	Receptors Susceptible to Land Contamination and Ground Hazard Impacts	Soil and Geological Resources	Agricultural Soil Resources
High	Results in loss of attribute and / or quality and integrity of the attribute	• Human Health: Acute risk to human health • Surface waters and/or groundwater: Substantial acute pollution or long term degradation of sensitive water resources (Principal Aquifer, groundwater source protection zone, surface waters of good or very good quality) • Ecology: Significant change to the number of one or more species or ecosystems • Built Environment: Catastrophic damage to buildings, structures or the environment • Landscaping / Agriculture: Loss in value of livestock or crops as a result of death, disease, or physical damage.	Loss of feature or attribute Earthworks resulting in high volume of surplus soil for off-site disposal Classification of surplus soil as Hazardous Waste where the intention is to discard	Loss of over 50 ha of 'best and most versatile agricultural land' Grades 1, 2 and 3a. Damage to / or loss of all topsoil resource. Soil sealing >75%.
Medium	Results in effect on integrity of attribute, or loss of part of attribute	• Human Health: Chronic risk to human health • Surface water and/or groundwater: Pollution of non-sensitive water resources or small scale pollution of sensitive water resources (Principal or Secondary Aquifers of water courses of fair quality or below) • Ecology: Change to population densities of non-sensitive species • Built Environment: Damage to buildings, structures or the environment • Landscaping/Agriculture: Non-permanent health effects to vegetation/crops from disease or physical damage, which results in a reduction in value.	Impact on integrity of or partial loss of feature or attribute Earthworks resulting in moderate volume of surplus soil for off-site disposal	Loss of between 20ha and 50ha of 'best and most versatile agricultural land' Grades 1, 2 and 3a. Damage to / or loss of half of topsoil resource Soil sealing >50%

Magnitude	Criteria	Receptors Susceptible to Land Contamination and Ground Hazard Impacts	Soil and Geological Resources	Agricultural Soil Resources
Low	Results in some measurable change in attributes quality or vulnerability	• Human Health: Slight reversible short-term effects to human health • Surface waters and/or groundwater: Slight pollution of non-sensitive water resources • Ecology: Some change to population densities of non-sensitive species with no negative effects on the function of the ecosystem • Built Environment: Easily reparable effects of damage to buildings or structures • Landscaping/Agriculture: Slight or short term health effects which result in slight reduction in value	Minor impact on feature or attribute Earthworks resulting in low volume of surplus soil for off-site disposal	Loss of less than 20ha of 'best and most versatile agricultural land' Grades 1, 2 and 3a or the loss of any quantity of land not considered 'best and most versatile agricultural land' Grades 3b, 4 or 5. Re-use of all topsoil resource within the development. Soil sealing <50%
Very Low	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	• Human Health: No measurable effects on humans • Surface waters and/or groundwater: Insubstantial pollution to non-sensitive water resource • Ecology: No significant changes to population densities in the environment or in any ecosystem • Built Environment: Very slight non-structural damage or cosmetic harm to buildings or structures • Landscaping/Agriculture: No significant reduction in landscape value.	Impact of insufficient magnitude to affect use or integrity of feature or attribute No off-site disposal of surplus soil required	No loss of agricultural land. Minor disturbance to soils. Soil sealing unlikely to occur.

9.9.7. For each of the potential impacts identified, an assessment will be made of the likely level of significance of the resulting effects. The definition of effect significance will be made by taking into account both the importance/sensitivity of the receptor (refer to Table 9.4) and the magnitude of the predicted impact (refer to Table 9.5), using the matrix as presented in Table 9.6, in conjunction with professional judgement of the site-specific factors that may be of relevance.

Table 9.6: Criteria for Assessing the Significance of Effects upon Geology and Soils

		Magnitude of Impact			
		High	Medium	Low	Very Low
Sensitivity of Resource / Receptor	High	Major	Major	Moderate	Minor
	Medium	Major	Moderate	Minor	Negligible
	Low	Moderate	Minor	Negligible	Negligible
	Very Low	Minor	Negligible	Negligible	Negligible

9.10. Assumptions and Limitations

9.10.1. An intrusive ground investigation will be undertaken to inform the PCF Stage 3 assessment. Data from the proposed ground investigation will be utilised to refine assessments of risks to human health, controlled waters, and off-site receptors. The results from the ground investigation will be reviewed to support the environmental assessment and will be taken into account to develop appropriate mitigation proposals.

9.10.2. The PCF Stage 2 soils and geology assessment did not include the candidate sites identified for potential construction compounds and/or ecological compensation areas. Further studies may identify new soils and geology features with the potential to be affected. As such the soils and geology assessment as reported in the Environmental Statement may be different to that reported during PCF Stage 2.

10. MATERIALS

10.1. Introduction

10.1.1. For the purposes of this scoping report, materials are defined as comprising:

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

10.1.2. The materials chapter of the Environmental Statement will consider the use of materials during the proposed scheme construction and operation. It will examine the environmental impacts associated with the use of material resources and the generation of waste. Material resources include both primary raw materials, such as aggregates and minerals, and secondary manufactured products.

10.1.3. Road schemes require significant quantities of both primary raw and secondary manufactured products. Many material resources originate off-site and some arise on-site, such as excavated soils or recycled road planings (old road surface materials removed from redundant carriageways or areas to be resurfaced). The production, sourcing, transport, handling, storage and use of these materials, as well as the disposal of any surplus, have the potential to affect the environment. At the same time, the beneficial reuse of materials arising on site in construction prevents these materials from becoming waste that would require transport off-site for disposal elsewhere, whilst also avoiding the need for the use of finite resources obtained from elsewhere.

10.2. Summary of Relevant Policy

Waste (England and Wales) Regulations 2011 (as amended)

10.2.1. These regulations transpose the Waste Framework Directive 2008/98/EC in England and Wales, and require the Secretary of State and Welsh Ministers to establish waste prevention programmes and waste management plans that apply the waste hierarchy. The regulations require businesses to apply the waste hierarchy when transferring waste, and introduce a system for waste carrier and broker registration. The regulations also amend the hazardous waste controls and excludes some categories of waste from waste controls. There is also a requirement that waste collection authorities and contractors are required to collect waste paper, metal, plastic and glass separately.

The Environmental Permitting (England and Wales) Regulations 2016

10.2.2. These regulations provide a system of environmental permitting for a wide range of potentially polluting activities. These include certain types of waste operations for recovering or disposing waste. The type of permit depends upon the nature of the waste activity. Landfills, hazardous waste plants and waste incinerators require Bespoke Permits. Standard permits can be issued for lower risk operations such as waste storage and transfer stations. Exemptions from permitting are issued for certain low risk activities depending upon the type of waste and how it is processed. Each exemption must be registered with the Environment Agency and applies a specific set of limits and conditions that must be observed to ensure the exempted operation remains outside of the scope of the permitting regime. Some exemptions do not need to be registered and these are called Non Waste Framework Directive (NWFD) exemptions. The most commonly used is NWFD2 which allows a waste producer to temporarily store any waste at the place of production pending collection.

Hazardous Waste (England and Wales) Regulations 2005 (as amended)

10.2.3. These regulations define, and regulate the safe management of, hazardous waste. They set out the requirement for cradle to grave documentation of movement of hazardous waste, and describe the requirements for record keeping and reporting.

Environmental Protection Act 1990 (as amended)

10.2.4. Section 34 of the Environmental Protection Act 1990 imposes a duty of care on anyone who produces, imports, keeps, stores, transports, treats or disposes of waste, who must take all reasonable steps to ensure that waste is managed properly. It also applies to anyone who acts as a broker and has control of waste.

Waste Management Plan for England

10.2.5. The Waste Management Plan for England is a high level document which is non-site specific. It draws on the Government Review of Waste Policy and provides an analysis of the current waste management situation in England, evaluating how it will support implementation of the objectives and provisions of the revised Waste Framework Directive (European Commission, 2008) (the Directive) as transposed in to UK legislation by way of the Waste (England and Wales) Regulations 2011 (as amended).

10.2.6. This Plan sets out an overview of waste management in England to fulfil the revised Waste Framework Directive Article 28 mandatory requirements, and other required content as set out in Schedule 1 to the 2011 Regulations. The Plan, in conjunction with the Government Review of Waste Policy, the National Planning Policy for Waste and the associated Policies meets the requirements of the Directive by providing:

- An analysis of the current waste management situation and the measures being taken to deliver the hierarchy of re-use, recycling, recovery and disposal of waste including an evaluation of how the plan will support the implementation of the objectives and provisions of the Directive.
- An analysis of the type, quantity and source of waste generated and the waste likely to be shipped from or to England along with an evaluation of the development of waste streams in the future.
- An overview of existing waste collection schemes and waste disposal and recovery installations, including any special arrangements for waste oils, hazardous waste or waste streams addressed by specific European Community legislation.
- An assessment of the need for new collection schemes, the closure of existing waste installations and the need for additional waste installation infrastructure in accordance with Article 16 (on the proximity principle) of the Directive, and, if necessary, the investments related thereto.
- Sufficient information on the location criteria for site identification and on the capacity of future disposal or major recovery installations, if necessary.
- General waste management policies, including planned waste management technologies and methods, or policies for waste posing specific management problems.

National Planning Policy for Waste

10.2.7. The National Planning Policy for Waste sets out the Government's ambition to work towards a more sustainable and efficient approach to resource use and management. Positive planning plays a pivotal role in delivering this country's waste ambitions through:

- Delivery of sustainable development and resource efficiency, including provision of modern infrastructure, local employment opportunities and wider climate change benefits, by driving waste management up the waste hierarchy.
- Ensuring that waste management is considered alongside other spatial planning concerns, such as housing and transport, recognising the positive contribution that waste management can make to the development of sustainable communities.
- Providing a framework in which communities and businesses are engaged with and take more responsibility for their own waste, including by enabling waste to be disposed of or, in the case of mixed municipal waste from households, recovered, in line with the proximity principle.
- Helping to secure the re-use, recovery or disposal of waste without endangering human health and without harming the environment.
- Ensuring the design and layout of new residential and commercial development and other infrastructure (such as safe and reliable transport links) complements sustainable waste management, including the provision of appropriate storage and segregation facilities to facilitate high quality collections of waste.

10.2.8. The National Planning Policy for Waste sets out detailed waste planning policies. It should be read in conjunction with the NPPF, the Waste Management Plan for England and National Policy Statements for Waste Water and Hazardous Waste, or any successor documents. All local planning authorities should have regard to its policies when discharging their responsibilities to the extent that they are appropriate to waste management.

10.3. Local Planning Policy

10.3.1. SMBC is a unitary authority and therefore is both Waste Collection Authority (WCA) and Waste Disposal Authority for the borough. SMBC's waste management policies are set out in Solihull Local Plan "Shaping a Sustainable Future" (December 2013). Policy P12 (Resource Management) states that:

10.3.2. "The Council will promote and control new development to prevent the production of waste within the Borough wherever possible, and will encourage prevention from existing buildings and uses. Where this is not feasible, waste shall be treated as a resource to be reused, recycled, or from which value will be recovered, with management to be as high up the waste hierarchy as possible. Disposal of waste shall be a last resort, to be considered only when all other options have been exhausted".

10.3.3. The Proposal Map of the Local Plan identifies existing strategic waste management facilities and an Area of Search for new facilities. The proposed scheme does not impact on any existing strategic waste management facilities. The proposed new slip road to the north-west of M42 Junction 6 is on the boundary of the Area of Search for new facilities.

10.4. The Study Area

10.4.1. The final extent of the study area will be agreed in consultation with the applicable statutory consultees and subsequently confirmed as the assessment is undertaken

and refined. The study area implemented to inform the assessment will be presented within the Environmental Statement for the proposed scheme

10.4.2. At present, it is anticipated the study area will comprise the proposed scheme footprint and the region within which waste management facilities are located and from where construction materials may be sourced.

10.5. Baseline Conditions

10.5.1. The baseline waste conditions in terms of the locations of facilities and the existing quantities of waste generated will be established based on information from the relevant waste local plan.

10.6. Additional Survey Requirements

10.6.1. No surveys with regard to materials are required

10.7. Value of the Environmental and Resource Receptors

10.7.1. For materials, the receptors that are likely to be impacted upon include relevant policies and high level policy and strategy targets (both internal Highways England policies and external ones) influencing materials resource use.

10.7.2. The impacts of the waste forecast to be generated will be assessed in the context of the impacts on the waste management infrastructure (the receptor with regards to waste) and the legislation, policy and strategy targets (both internal Highways England policies and external ones) influencing waste management.

10.7.3. The nature of the receptors means that it is not practicable to allocate sensitivities or values to individual receptors. The capacity of the relevant waste management infrastructure will be estimated where feasible, based on published information.

10.8. Potential Impacts and Effects

10.8.1. For surplus materials and waste, the potential environmental effects are associated with the production, movement, transport, processing, and disposal of arisings from sites. Assessment of the effects of waste will be based on identifying the quantities and type of waste firstly, and then establishing the impacts on sensitive receptors, which are likely to comprise existing waste policies and local/regional waste management infrastructure.

10.9. Proposed Scope of Assessment

10.9.1. The scope of the assessment will comprise an assessment of the potential impacts and effects of the materials required for the proposed scheme and the anticipated waste arisings.

10.9.2. The quantities of materials and waste generated during proposed scheme operation are expected to be very small and are therefore scoped out. The assessment will thus focus on the construction phase only.

10.9.3. An outline Site Waste Management Plan will be developed, for subsequent adoption and development by the contractor as a tool to manage and report waste effectively.

10.10. Proposed Assessment Methodology including Significance

10.10.1. Waste management impacts and effects will be assessed in accordance with the methodology set out in IAN 153/11 "Guidance on the Environmental Assessment of Material Resources". At this stage it is anticipated that a simple level of assessment will be required, and the need for a detailed level of assessment will be reviewed based on the findings of this initial simple assessment (as defined in IAN 153/11).

10.10.2. The simple assessment will consider:

- The materials required for the project and where information is available, the quantities.
- The anticipated waste arisings from the project, and where information is available, the quantities and type (e.g. hazardous).
- The impacts that will arise in relation to materials and waste.
- The results of any consultation.
- A conclusion about whether this level of assessment is sufficient to understand the effects of the project or whether detailed assessment is necessary.

10.10.3. The Environmental Statement will set out the methodology recognising the requirements of the National Policy Statement for National Network (2014), including how significance of effects are to be determined.

10.11. Assumptions and Limitations

10.11.1. It is outside the scope of this assessment to assess the environmental impacts associated with the extraction of raw materials and the manufacture of products. These stages of a product's or a material's life cycle are likely already to have been subject to environmental assessment. These impacts will occur off site and may possibly occur outside the UK. They include the depletion of non-renewable resources and the production of waste at the point of extraction and during manufacturing.

10.11.2. The materials assessment will be undertaken on the basis of information available at the time of the assessment. It is anticipated that some of the information required for a full detailed assessment may not be known during the EIA, such as the exact sources / origins of materials. As such, the assessment will be undertaken based on what information is available at the time of assessment (including any information from a construction contractor).

11. NOISE AND VIBRATION

11.1. Introduction

11.1.1. The noise and vibration chapter will identify the receptors in the surrounding area which could be affected by the proposed scheme, and will quantify the predicted noise and vibration impacts from the construction and operational phases of the proposed scheme. It will then assess the significance of any identified likely effects.

11.1.2. The assessment and mitigation of road traffic noise and vibration will be carried out according to established prediction and assessment methodologies that are guided by the following key documents: DMRB Volume 11 Section 3 Part 7 (HD213/11) Revision 1, November 2011[21], Noise and Vibration; and the Calculation of Road Traffic Noise 1988 (CRTN)[22].

11.1.3. The assessment of site based construction noise and vibration will also be carried out according to assessment methodologies detailed in BS 5228 Code of practice for noise and vibration control on construction on the public highway network and open sites 2014 Part 1 Noise[23] and Part 2 Vibration[24]. The potential effects of construction traffic will also be considered and reference will be made to DMRB Volume 11 Section 3 Part 7 (HD213/11) Revision 1 with respect to magnitude of traffic noise level change.

11.1.4. Information contained within the Stage 2 EAR (WSP, May 2017a) has been reviewed in order to inform this Scoping Report chapter.

11.2. Summary of Relevant Policy

11.2.1. Policy of relevance to the noise and vibration assessment is summarised in Table 11.1.

Table 11.1: Relevant Noise and Vibration Policy Summary

Policy	Summary
National Policy Statement for National Networks (NPSNN)[25]	The NPSNN states that both construction and operational noise and vibration, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance. The NPSNN also states that the applicant should consult Natural England with regard to the assessment of noise on designated nature conservation sites, protected landscapes, protected species or other wildlife. With respect to decision making, the NPSNN states that developments must be undertaken in accordance with statutory requirements for noise and that due regard must have been given to the relevant sections of the Noise Policy Statement for England (NPSE), the NPPF and the Government's associated planning guidance on noise. It states that the Secretary of State should not grant development consent unless satisfied that the proposals will meet the following aims, within the context of Government policy on sustainable development:

[21] Department of Transport/Welsh Office (1998), Calculation of Road Traffic Noise (CRTN)
[22] Highways Agency (2011), Design Manual for Road and Bridges Volume 11 Section 3 Part 7 HD213/11 (Revision 1) Traffic Noise and Vibration
[23] British Standards Institute (2014), BS 5228-1:2009+A1:2014 – Code of practice for noise and vibration control on construction and open sites. Part 1: Noise
[24] British Standards Institute (2014), BS 5228-2:2009+A1:2014 – 'Code of practice for Noise and Vibration control on construction and open sites. Part 2:Vibration'
[25] Department for Transport (2014), National Policy Statement for National Networks

Policy	Summary
	• Avoid significant adverse impacts on health and quality of life from noise as a result of the new development. • Minimise and mitigate other adverse impacts on health and quality of life from noise from the new development. • Contribute to improvements to health and quality of life through the effective management and control of noise, where possible.
The National Planning Policy Framework 2012 (NPPF)[26]	The NPPF states that planning policies and decisions should aim to: • Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development. • Mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions. • Recognise that development will often create some noise, and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established subject to the provisions of the Environmental Protection Act 1990 and other relevant law. • Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.
Noise Policy Statement for England 2010 (NPSE)[27]	The NPSE statement sets out the long-term vision of the government's noise policy, which is to "promote good health and a good quality of life through the effective management of noise within the context of policy on sustainable development". This long-term vision is supported by three aims: • Avoid significant adverse impacts on health and quality of life. • Mitigate and minimise adverse impacts on health and quality of life. • Where possible, contribute to the improvements of health and quality of life. The long-term policy vision and aims are designed to enable decisions to be made regarding what is an acceptable noise burden to place on society. It uses the following concepts: • No Observed Effect Level (NOEL): the level below which no effect can be detected. Below this level no detectable effect on health and quality of life due to noise can be established. • Lowest Observable Adverse Effect Level (LOAEL): the level above which adverse effects on health and quality of life can be detected. • Significant Observed Adverse Effect Level (SOAEL): the level above which significant adverse effects on health and quality of life occur. The NPSE recognises that "it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations". The levels are likely to be different for different noise sources, for different receptors and at

[26] Communities and Local Government (2012), National Planning Policy Framework
[27] Department for Environment, Food & Rural Affairs (2010), Noise Policy Statement for England (NPSE)

Policy	Summary
	different times of the day.
Planning Practice Guidance 2014 (PPG)[28]	The guidance advises that local planning authorities should consider: • Whether or not a significant adverse effect is occurring or likely to occur. • Whether or not an adverse effect is occurring or likely to occur. • Whether or not a good standard of amenity can be achieved.
The Environmental Noise (England) Regulations 2006 (as amended 2008, 2009, 2010)[29]	The regulations implement the Assessment and Management of Noise Directive 2002/49/EC (known as the Environmental Noise Directive - END). Under the END, strategic noise mapping of major roads, railways, airports and agglomerations has been completed across the UK, including the M42 Junction 6. The results of Round 2 of the noise mapping process were released to Highways England in 2014. A number of 'Important Areas' (those areas most exposed to noise) were identified in Round 2 in the vicinity of the M42 Junction 6. Highways England is responsible for assessing the potential for cost effective noise mitigation measures to be implemented in the Noise Important Areas (NIA) around M42 Junction 6. Important Areas on other major roads in the vicinity of the proposed scheme, such as the A45, are the responsibility of the local highways authority (i.e. Solihull Metropolitan Borough Council).
Control of Pollution Act 1974[30]	Sections 60 and 61 of Control of Pollution Act 1974 (CoPA) provide the main legislation regarding demolition and construction site noise and vibration. If noise complaints are received, a Section 60 notice may be issued by the local planning authority with instructions to cease work until specific conditions to reduce noise have been adopted. Section 61 of the Control of Pollution Act 1974 provides a means for applying for prior consent to carry out noise generating activities during construction. Once prior consent has been agreed under Section 61, a Section 60 notice cannot be served provided the agreed conditions are maintained on-site. The CoPA requires that 'Best Practicable Means' (as defined in Section 72 of CoPA) be adopted for construction noise on any given site. CoPA makes reference to BS5228 as Best Practicable Means.
Solihull Metropolitan Borough Council (SMBC) Draft Local Plan 2016[31]	"*335. The Council recognises the existence of significant sources of noise or potential noise within the Borough, such as Birmingham Airport, major roads and railways, mineral workings and some industrial processes, and the need to protect noise sensitive uses, including housing, education and health institutions. The policy seeks to ensure that noise and vibration are contained by appropriate design and operational measures*." "*378. The main elements identified as having significant impacts on health are: […]* • *Transport: It is suggested that transport is a significant challenge to public health in terms of road traffic injuries, physical inactivity, community severance and noise and air*

[28] Department for Communities and Local Government (DCLG) (2014), Planning Practice Guidance
[29] Secretary of State (SoS) (2006), The Environmental Noise (England) Regulations
[30] Parliament, (1974), Control of Pollution Act 1974, HMSO
[31] Solihull Metropolitan District Council (2016), Local Plan (Draft)

Policy	Summary
	pollution. However, it also allows access to work, education, social networks and services that can improve people's opportunities"

11.3. The Study Area

11.3.1. The study area for the assessment of construction phase noise impacts comprises the closest identified potentially sensitive receptors to the proposed scheme and any other areas affected by construction, such as construction compounds, soil storage areas, haulage routes etc.

11.3.2. For the operational phase, Paragraph A1.11 of DMRB HD 213/11 Revision 1 sets out the process for defining the 'study area' and 'calculation area'. For the purpose of the Scoping level assessment, the main study area for operational noise extends 1km from existing routes that are being improved or bypassed, and any proposed new routes, between the start and end points of the physical works associated with the road project. Within this 1km boundary, a 600m calculation area will be subject to traffic noise modelling. Outside this 1km boundary, a 50m boundary around identified 'affected routes' will be considered. This is explained further below:

11.3.3. The study area comprises the proposed scheme and all surrounding existing roads that are predicted to be subject to a change in traffic noise level as a result of the proposed scheme of:

- 1dB(A) or more in the short-term (Do-minimum (without scheme) vs Do-something (with scheme) in the Baseline (opening) Year); or
- 3dB or more in the long-term (Do-minimum in the Baseline (opening) Year vs Do-something in the Future Year), subject to a minimum change of 1dB between the Do-minimum vs Do-something in the Future Year. The Future Year is taken as the worst affected year within 15 years after opening.

11.3.4. Roads predicted to be subject to these changes are defined as' affected routes' and are identified by analysis of the provided traffic data. The identification of affected routes considers all roads with flows above the 1,000 lower cut off of the CRTN prediction methodology.

11.3.5. The calculation area for the modelling of noise impacts comprises a corridor 600m either side of the proposed scheme, 600m either side of the extent of the local road network to be replaced by the proposed scheme (i.e. the B4438 Catherine De Barnes Lane), and a set of corridors 600m either side of all affected routes within 1km of the proposed scheme.

11.3.6. For dwellings and other sensitive receptors that are within the 1km boundary, but more than 600m from an affected route or the proposed scheme, a qualitative assessment of the traffic noise impacts will be carried out.

11.3.7. For affected routes which are outside the 1km boundary, an assessment will be undertaken by estimating the CRTN Basic Noise Level for these routes with and without the proposed scheme. A count of the number of dwellings and other sensitive receptors within 50m of these routes is undertaken.

11.3.8. Figure 11 shows the extent of roads that are being considered as newly proposed and bypassed links, together with the 1km boundary.

11.3.9. The operational traffic vibration annoyance study area is defined as 40m from the edge of the proposed scheme carriageway.

11.3.10. The final extent of the study area will be agreed in consultation with the applicable statutory consultees and subsequently confirmed as the assessment is undertaken and refined. The study area and monitoring locations implemented to inform the assessment will be presented within the Environmental Statement for the proposed scheme.

11.4. Baseline Conditions

11.4.1. The baseline (existing) noise environment is likely to be dominated by a mix of road and aircraft traffic, with some localised commercial and industrial sources. Currently no baseline noise measurement data have been obtained for the proposed scheme area. Discussions will be held with the Environmental Health Officer (EHO) at SMBC in order to determine the requirements for baseline noise monitoring during the assessment.

11.4.2. Traffic noise levels will be predicted at all receptors within the 600m calculation area for the existing year (2017/2018), the Do-minimum in the Baseline (opening) Year and the Do-minimum in the Future baseline, using noise modelling.

11.4.3. Baseline traffic vibration predictions and surveys are not proposed.

11.5. Additional Survey Requirements

11.5.1. As above, discussions will be held with the EHO at SMBC regarding the scope of any baseline noise monitoring required.

11.6. Value of the Environmental and Resource Receptors

11.6.1. Table 11.2 details the currently identified Noise Sensitive Receptors (NSRs) within the 1km boundary of the proposed scheme identified from an initial desk-based review of the area using aerial photography. The sensitivity of each NSR is based upon the classifications given in Table 11.12.

11.6.2. NSRs have currently been identified from Ordnance Survey MasterMap® and AddressBase®, aerial photography, and Natural England's website (http://www.naturalengland.org.uk/).

Table 11.2: Description of Local NSRs

Road / NSR Name	Additional Information	Approximate Location	Sensitivity
Brickenhill	A village with residential buildings, a church, a caravan park and guest houses	Adjacent to the new bypass	High
Shadowbrook Lane	Residential	To the east within 100 m of the new bypass	High
Catherine De Barnes Lane (B4438)	Residential	50 m west of the new bypass	High
Four Winds	Residential	30 m west of the new bypass	High
Walford Hall Farm	Residential	250 m south-west of the new bypass	High
Woodhouse Farm	Residential, contains Solihull Music School	900 m west of the new bypass	High

Road / NSR Name	Additional Information	Approximate Location	Sensitivity
Hampton Lane Farm		300 m south-west of the new bypass	High
Catherine-de-Barnes	A village with residential buildings on Bickenhill Lane and Hampton Lane	400-1000 m south-west of the new bypass	High
Residential on Solihull Road (B4102)	Residential	80 m east of the M42 junction with the new bypass	High
Residential and B&B on Shadowbrook Lane	Residential	200-400 m east of M42	High
Hampton in Arden	A village with residential properties	900-1000 m east of M42	High
Residential on Old Station Road	Residential	20-1000 m east of M42	High
Residential on Middle Bickenhill Lane	Residential	300-400 m north-east of new slip roads of M42 J6	High
Airport hotels	Airport Hotels, Hilton, Crowne Plaza, Novotel, Ibis and Arden	50-900 m north of A45	High
The National Motorcycle Museum		Adjacent to M42 Junction 6	Medium
National Exhibition Centre	Multi-purpose conference centre	Approximately 250m west of M42	Medium

11.6.3. Ecological receptors are specifically referenced in the NPSNN, which states that noise from a proposed development can have adverse impacts on wildlife and biodiversity and that noise effects of a proposed development on ecological receptors should be assessed in accordance with the Biodiversity and Geological Conservation section of the NPS. Although there are no nationally designated ecological sites (related to fauna) within the 1km study areas, there are a number of ecologically sensitive areas in the vicinity of the proposed scheme (refer to Chapter 8: Biodiversity). The selection of ecological receptors will be undertaken in conjunction with the proposed scheme ecologists. Traffic noise level changes from the operational noise assessment will be fed into the ecological impact assessment.

11.6.4. It is also noted that there are several road Noise Important Areas (NIAs) within 1km boundary of the proposed scheme - these are detailed in Table 11.3.

Table 11.3: Description of NIAs

NIA code	Location	Responsible Authority
7482	Adjacent to M42	Highways England
7481	Adjacent to M42 Junction 6	Highways England
2831	Adjacent to A45	SMBC

11.6.5. SMBC is the relevant local highway authority for the Noise Important Area which is not on the M42. At the time of writing, a response from SMBC is awaited confirming if there are any current proposals for noise mitigation at these Important Areas. However, further assessment taking into account the potential impact of the scheme on these NIAs (including those under the control of SMBC) will be undertaken where necessary.

11.6.6. The NSRs identified in Table 11.2 will be subject to a variety of noise sources. Table 11.4 details the existing and potential dominant noise sources likely to affect the selected NSRs.

Table 11.4: Description of Noise Sources

Name of Noise Source	Additional Information	Approximate Location in relation to the Proposed Scheme
M42 (road traffic noise)	Part of proposed scheme	Located centrally
A45 (road traffic noise)	Part of proposed scheme	Located centrally
New bypass* (road traffic noise)	Part of proposed scheme	Located centrally
Birmingham Airport (Aircraft noise)		800m northwest of the new link
Existing Rail line (rail noise)	Birmingham International – Hampton-in-Arden link	Crosses M42 and A45
Planned HS2 line*(rail noise)	Station planned within the 1km boundary	600 - 800 m northeast of the new slip roads of M42 J6

* Potential future noise sources which are not currently constructed, but could have a significant contribution to the local sound climate once they are in operation.

11.7. Potential Impacts and Effects

Summary of Mitigation Proposals

Construction

11.7.1. A CEMP would be prepared and implemented by the selected construction contractor, which would include a range of best practice measures associated with mitigating potential noise and vibration impacts, including example measures described below:

- Selection of low noise and 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.

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 (e.g. web-based, newsletters, newspapers, radio announcements etc.) – an appropriate communication strategy will be developed during the DCO application stage. An information web-page would be provided and kept up-to-date on the Highways England website to reflect construction and community liaison requirements. It is envisaged that the web-page would provide up-to-date information on the progress of the construction works, areas affected by construction, mitigation in place to reduce adverse effects, information regarding planned construction works (including any proposed works outside normal hours) and works recently completed. The communication strategy is envisaged to minimise the likelihood of complaints. Residents would be provided with a point of contact for any queries or complaints.

11.7.3. The construction noise assessment will be updated during PCF Stage 3 and reported in the Environmental Statement, identifying any further mitigation measures as applicable. The assessment will consider changes in road traffic noise during construction, including roads proposed for closure or diversion.

Operation

11.7.4. It is assumed that noise mitigation will be incorporated into the proposed scheme design in the form of low-noise surfacing across the extent of proposed scheme. Current guidance in DMRB advises that an additional benefit from low noise surfacing should only be assumed in the noise predictions where speeds are 75kph or above.

11.7.5. Areas where additional noise mitigation (e.g. noise barriers or earth bunds) is required will be identified during once the operational noise assessment has been undertaken and refined during PCF Stage 3 as necessary.

Summary of PCF Stage 2 Environmental Assessment Report

11.7.6. Key findings of the PCF Stage 2 noise and vibration impact assessment are summarised below.

Construction

- No specific construction noise assessment was presented. Rather the focus was on setting out potential construction mitigation and best practice measures.

Operation

- Assessment was presented for three options. It included presenting the number of NSRs within distance bands up to 600m from each route option.
- Assessment concluded that there is uncertainty regarding likely significant and adverse noise effects and that further assessment (including baseline noise surveys) will be required at a later stage.

11.8. Proposed Scope of Assessment

11.8.1. The assessment of noise and vibration for the proposed scheme will be completed in accordance with the relevant guidance in the DMRB Volume 11, Section 3, Part 7 (HD213/11) Revision 1 guidance. Based upon the alignment of the proposed scheme, the proximity of NSRs and the potential for the noise change thresholds to be exceeded, a detailed level assessment is proposed. The aim of the DMRB detailed level assessment is to determine traffic noise levels with and without the proposed scheme in place, and the significance of changes in traffic noise at affected receptors. The potential for traffic vibration effects will also be considered at receptors within 40m of the proposed scheme. Temporary construction noise and vibration effects will be included in the scope of the assessment. The level of assessment will depend on the information available at the time of the assessment regarding the proposed construction works.

11.9. Proposed Assessment Methodology Including Significance

Assessment of Construction Noise Effects

11.9.1. As stated above, before the appointment of a construction contractor, site specific details on the construction activities, programme and number or type of construction plant are unlikely to be available. Therefore, detailed construction noise predictions at specific NSRs cannot be undertaken. Nevertheless, indicative construction noise predictions of key activities will be undertaken using the calculation methods set out in BS 5228:2009+A1:2014 'Code of practice for noise and vibration control on construction and open sites', based upon construction information from other major road scheme projects and data provided by the design team, as available.

11.9.2. The calculation method provided in BS 5228 takes account of factors including the number and types of equipment operating, their associated Sound Power Levels (SWLs), their modes of operation (% on-times within the working period), the distance to NSRs, and the effects of any intervening ground cover or barrier/ topographical screening. This allows prediction of the magnitude of impact.

11.9.3. The noise levels generated by construction activities and experienced by nearby sensitive receptors, such as the occupants of residential properties, schools etc., depend upon a number of variables, the most significant of which are:

- The noise generated by plant or equipment used on site, generally expressed as a sound power level.
- The periods of operation of the plant on the site, known as its 'on-time'.
- The distance between the noise source and the receptor.
- The attenuation due to ground absorption and barrier effects.

11.9.4. BS 5228 provides a methodology for the estimation of likely construction noise levels as an equivalent continuous noise level averaged over a suitable assessment period, for example a one-hour period ($L_{Aeq,1h}$). BS 5228 contains a database of the noise emission from individual items of equipment and routines, which can be used to predict noise from construction activities at identified NSRs. The prediction method gives guidance on the effects of different types of ground, barrier attenuation and how to assess the impact of fixed and mobile plant.

11.9.5. BS 5228 contains a number of example methodologies for identifying significant construction noise effects based on fixed thresholds or noise level changes. Taking into account this guidance, the threshold values detailed in

11.9.6. Table have been adopted for this assessment to define the SOAEL (the 'significant observed adverse effect level', as defined in Table 11.1) and the LOAEL (the 'lowest observable adverse effect level') for residential receptors.

Table 11.5: Construction Noise SOAEL and LOAEL for Residential Receptors

Time of Day	SOAEL $L_{Aeq,T}$ dB (façade)	LOAEL $L_{Aeq,T}$ dB (façade)
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	75	65
Evenings (19:00 – 23:00 weekdays) and Weekends (13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays)	65	55
Night-time (23:00 – 07:00)	55	45

11.9.7. The criterion for the SOAEL at residential receptors corresponds to the threshold values for Category C in the BS 5228 example ABC method. Similarly, the criterion for the LOAEL corresponds to the threshold values for Category A in the BS 5228 example ABC method. In accordance with the NPPF and NPSE, it is important to consider receptors that exceed the LOAEL and ensure adverse effects are mitigated and minimised.

11.9.8. When considering exceedances of the SOAEL and LOAEL, other project-specific factors have been taken into account, such as the existing ambient noise levels, number of receptors affected and the frequency and duration of the impact.

11.9.9. Based upon the above, the magnitude of the impact of construction noise on residential NSRs has been classified in accordance with the descriptors in Table 11.6.

Table 11.6: Construction Noise Magnitude of Impact Criteria for Residential Receptors

Magnitude of Impact	Daytime $L_{Aeq,T}$ dB (façade)	Evening / Weekend $L_{Aeq,T}$ dB (façade)	Night-time $L_{Aeq,T}$ dB (façade)
High	>80	>70	>60
Medium	>75 - 80	>65 - 70	>55 - 60
Low	>65 - 75	>55 - 65	>45 - 55
Very Low	≤65	≤55	≤45

11.9.10. Information on the likely timing and volume of HGV traffic movements (on the public highway network) required for material haulage during the construction programme will be considered during the EIA, where available. These will be considered in the context of existing traffic flows to enable an indication to be provided of the potential magnitude of impact on existing traffic noise levels due to the addition of construction traffic. The magnitude of impact of construction traffic uses the same scale and descriptors as for short-term changes in operational traffic noise, as detailed in Table 11.11.

Construction Vibration

11.9.11. A number of proposed scheme construction activities which could be potentially significant sources of vibration, include:

- Piling of structure foundations (e.g. retaining walls). Bored piling or continuous flight auger piling.
- Piling of temporary works, including sheet piling.
- Ground improvement works at areas of earthworks at the junctions. For example, the use of vibratory rollers or vibro stone columns. The need for ground improvement works, and the proposed method, depends on ground type and conditions.

11.9.12. The passage of vibration through the ground is highly dependent on site-specific ground conditions. However, BS 5228-2: 2009+A1: 2014 'Code of practice for noise and vibration control on construction and open sites – Part 2 Vibration' provides a range of measured historical data for a variety of different piling methods and ground improvement works.

11.9.13. Guidance on the effects of construction vibration in terms of building damage is provided in BS 7385: 1993 'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration'[32]. It provides guidance on vibration levels likely to result in cosmetic damage, and is referenced in BS 5228-2. Limits for transient vibration, above which cosmetic building damage could occur, are given in Table 11.7.

Table 11.7: Transient Vibration Guide Values for Cosmetic Damage

Building Type	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
	4Hz to 15Hz	15Hz and above
Reinforced or framed structures Industrial and heavy commercial buildings	50mms^{-1} at 4Hz and above	50mms^{-1} at 4Hz and above
Unreinforced or light framed structure Residential or light commercial buildings	15mms^{-1} at 4Hz increasing to 20mms^{-1} at 15Hz	20mms^{-1} at 15Hz increasing to 50mms^{-1} at 40Hz and above
Note 1: Values referred to are at the base of the building. Note 2: For unreinforced or light framed structures and residential or light commercial buildings, a maximum displacement of 0.6mm (zero to peak) is not to be exceeded.		

11.9.14. BS 7385-2 states that the probability of building damage tends to be zero for transient vibration levels less than 12.5mms^{-1} ppv. For continuous vibration the threshold is around half this value. It is also noted that these values refer to the likelihood of cosmetic damage. ISO 4866:2010[33] defines three different categories of building damage:

- **Cosmetic:** formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick / concrete block constructions.

[32] British Standards Institute (1993), BS 7385-2 – Evaluation and measurement for vibration in buildings. Guide to damage levels from groundborne vibration.
[33] International Standards Organization (ISO) 4866 (2010), Mechanical vibration and shock -Vibration of fixed structures - Guidelines for the measurement of vibrations and evaluation of their effects on structures.

- **Minor:** formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick/block.
- **Major:** damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.

11.9.15. BS 7385-2 indicates that minor damage occurs at a vibration level twice that of cosmetic damage, and that major damage occurs at a vibration level twice that of minor damage. This guidance can be used to define the magnitude of vibration damage impact as shown in Table 11.8.

Table 11.8: Magnitude of Impact for Vibration Damage

Magnitude of Impact	Damage Risk	Continuous Vibration Level ppv mms^{-1}
Major	Major	30
Moderate	Minor	15
Minor	Cosmetic	7.5
Negligible	Negligible	6

11.9.16. BS 5228-2 provides guidance on the impact of construction vibration in terms of annoyance, focussing on residential properties. The vibration levels and associated effects stated in BS 5228-2 are provided in Table 11.9.

Table 11.9: Magnitude of Impact for Vibration Annoyance

Magnitude of Impact	Annoyance	Continuous Vibration Level ppv mms^{-1}
Major	Vibration is likely to be intolerable for any more than a very brief exposure to this level.	10
Moderate	It is likely that vibration of this level in residential environments will cause complaints, but can be tolerated if prior warning and explanation has been given to residents.	1.0
Minor	Vibration might be just perceptible in residential environments.	0.3
Negligible	Vibration might be just perceptible in the most sensitive situations for most vibration frequencies associated with construction. At lower frequencies, people are less sensitive to vibration.	0.14

11.9.17. For construction vibration annoyance, the LOAEL is set at $0.14mms^{-1}$ and the SOAEL at $1.0mms^{-1}$.

11.9.18. In order to quantify the likely vibration impact from construction works in accordance with the methods and guidance in BS 5228-2, it is necessary to define the various activities to be undertaken and the equipment to be used, based upon the anticipated construction works programme. It is anticipated that at PCF Stage 3 details regarding construction activities and plant requirements will not be available, therefore, an initial assessment of potential construction vibration is proposed based on experience of typical road construction methods.

Operational Traffic Noise

11.9.19. The general principle of DMRB HD213/11 is to allocate an assessment method according to risk - this process uses three levels of assessment:

- Scoping.
- Simple.
- Detailed.

11.9.20. The proposed assessment presented here follows the most comprehensive detailed assessment approach.

11.9.21. Noise from a flow of road traffic is generated by both the vehicle engines and the interaction of tyres with the road surface. The traffic noise level at a receptor, such as an observer at the roadside or residents within a property, is influenced by a number of factors including traffic flow, speed, composition (percentage of HGVs), road gradient, type of road surface, distance from the road and the presence of any obstructions between the road and the receptor.

11.9.22. Noise from a stream of traffic is not constant, but to assess the noise impact a single figure estimate of the overall noise level is necessary. The index adopted by the Government in 'The Calculation of Road Traffic Noise' (CRTN) to assess traffic noise is $L_{A10,18h}$. This value is determined by taking the highest 10% of noise readings in each of the 18 one-hour periods between 06:00 and 00:00, and then calculating the arithmetic mean. As recorded in DMRB, a reasonably good correlation has been shown to exist between this index and the perception of traffic noise by residents over a wide range of noise exposures.

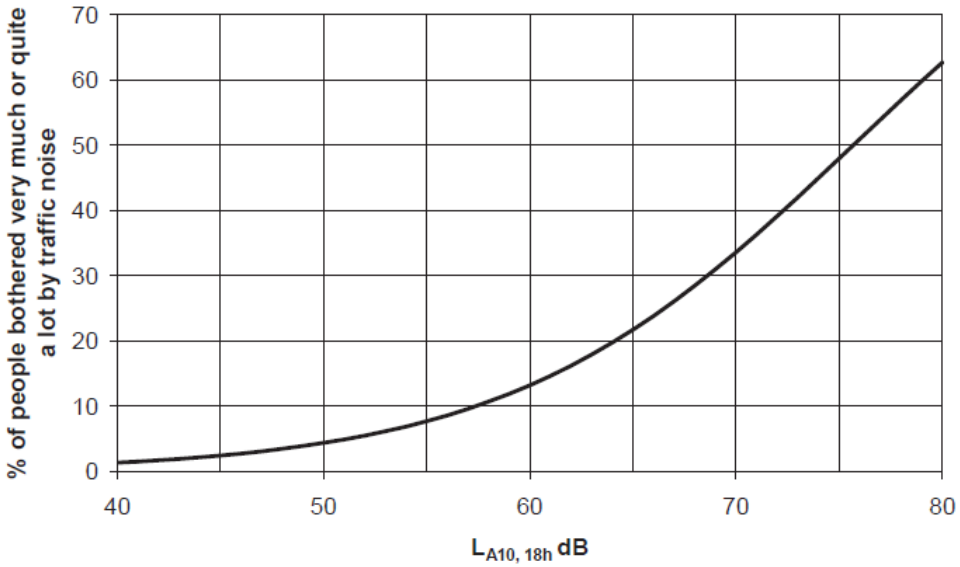
11.9.23. CRTN provides the standard methodology for predicting the $L_{A10,18h}$ road traffic noise level. Noise levels are predicted at a point measured 1 m horizontally from the external façade of buildings.

11.9.24. DMRB also requires an assessment of night-time (i.e. between 23:00 and 07:00) traffic noise levels ($L_{night,outside)}$. However, this parameter is not predicted by the standard CRTN methodology. DMRB refers to three methods for calculating night-time traffic noise levels developed by the Transport Research Laboratory (2002). The most widely used is 'Method 3' which simply factors the L_{night} from the $L_{A10,18h,}$ based on the typical diurnal pattern of traffic flows in the UK.

11.9.25. The traffic noise predictions generated by modelling will be based on traffic data provided by a traffic model of the proposed scheme and surrounding area. The traffic flow and % HGV data are taken directly from the model. However, the traffic speeds can be subject to a process called 'speed banding', which assigns one of four speeds to all non-motorway roads. The use of speed banded data will be confirmed during the assessment.

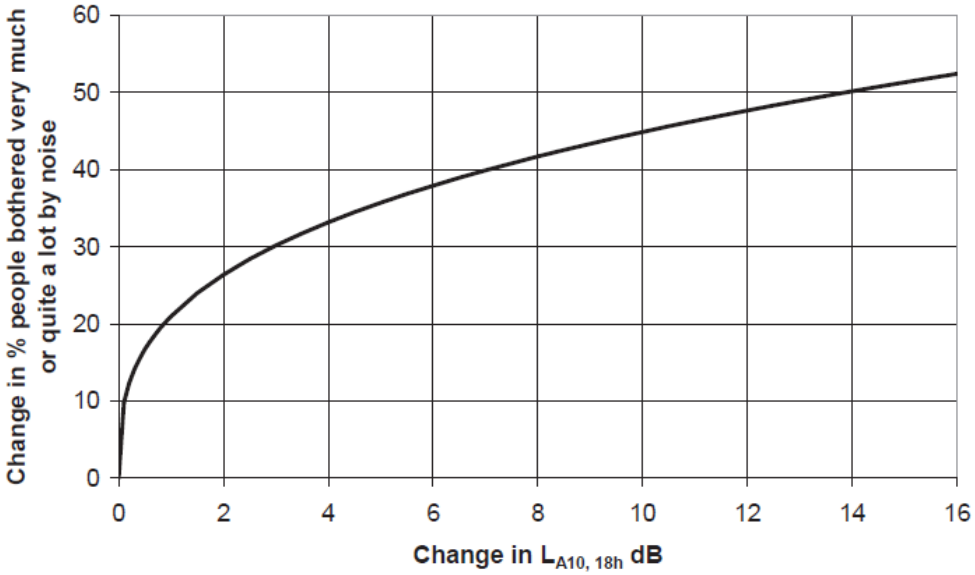
11.9.26. Once the traffic noise levels have been predicted, they can be used to provide an indication of the likely annoyance to residents caused by traffic noise. Individuals vary widely in their response to the same level of traffic noise. However, the average or community response from a large number of people to the same level of traffic noise is fairly stable and, therefore, a community average degree of annoyance caused by traffic noise can be related to the long-term steady state noise level. The relationship between the steady-state traffic noise level and the estimated annoyance experienced, expressed as the percentage of people 'bothered very much or quite a lot', is illustrated in Plate 11.1 (taken from DMRB). This shows, for example, that approximately 13% of all residents would be 'bothered very much or quite a lot' at a façade road traffic noise level of 60 dB $L_{A10,18h}$.

Plate 11.1: Estimation of Traffic Noise Annoyance – Steady State (taken from DMRB Volume 11, Section 3, Part 7, HD 213/11 Revision 1)



11.9.27. In addition, research recorded in DMRB has shown that people are more sensitive to abrupt changes in traffic noise, for example, following the opening of a new road, than would be predicted from the steady state relationship between traffic noise and annoyance (as described above). These effects last for a number of years. However, in the longer term, the perceived noise annoyance tends towards the steady-state level due to familiarisation. The percentage change in the traffic noise annoyance due to an abrupt change in traffic noise is illustrated in Plate 11.2 (as taken from DMRB).

Plate 11.2: Estimation of Traffic Noise Annoyance – Immediate Change (taken from DMRB Volume 11, Section 3, Part 7, HD 213/11 Revision 1)



11.9.28. Plate 11.2 shows, for example, that with an abrupt (and permanent) increase of 10 dB(A) there would be a net change of 45% residents 'bothered very much or quite a lot' by road traffic noise. If the initial noise level was 60dB $L_{A10,18h}$ (with 13% people already bothered – refer to Plate 11.1), then there would be a total of 58% bothered immediately after an increase to 70dB $L_{A10,18h}$. This would eventually diminish in the long term because of familiarisation to become approximately 34% subject to annoyance (see Plate 11.2).

11.9.29. The objective of the assessment, as set out in DMRB, is to gain an overall appreciation of the noise and vibration climate, both with (Do-something) and without (Do-minimum) the proposed scheme, to identify where noise impacts occur and to determine where mitigation to reduce these impacts is required. These conditions are assessed for the baseline year (the year of proposed scheme opening) and the future assessment year (the worst affected year within 15 years after proposed scheme opening). DMRB outlines the steps to be carried out at the detailed assessment stage:

- Identify the study area and predict 18-hour (06:00 - 00:00) and night-time (23:00 - 07:00) traffic noise levels at all residential properties within 600m of the proposed scheme, the existing routes bypassed/improved by the scheme, and affected routes within the defined 1 km boundary. The computer noise modelling software SoundPLAN or CadnaA, which implement the CRTN methodology to predicted $L_{A10,18h}$ noise levels.
- Carry out the following comparisons for each property in order to identify the number of properties where residents may experience an increase or decrease in traffic noise levels and annoyance:
- The Do-minimum scenario in the baseline year against the Do-minimum scenario in the future assessment year (long-term);
- The Do-Minimum scenario in the baseline year against the Do-Something scenario in the baseline year (short-term); and
- The Do-Minimum scenario in the baseline year against the Do-Something scenario in the future assessment year (long-term).
- For night-time traffic noise levels, comparisons are only required for the two long-term scenarios and for properties where the $L_{night,outside}$ level is 55dB(A) or more in the relevant scenarios;
- Assess the impact on sensitive receptors, other than residential properties, within the 600 m calculation area. This is based on 18 hour (06:00 - 00:00) traffic noise levels and considers the same three comparisons as outlined above for residential properties. Other sensitive receptors include hospitals, schools, community facilities (such as places of worship, educational buildings and hospitals), designated ecological areas such as Areas of Outstanding Natural Beauty (AONB), National Parks, Special Areas of Conservation (SAC), Special Protection Areas (SPA) and Sites of Special Scientific Interest (SSSI), public open spaces, designated scheduled monuments and public rights of way (PRoW);
- Complete a qualitative assessment of sensitive receptors which are within the 1 km boundary, but outside the 600m calculation area; and
- For affected routes which are outside the 1km boundary, complete an assessment by estimating the CRTN Basic Noise Level (BNL) on these roads (the traffic noise level at 10m) with and without the proposed scheme. Count the number of dwellings and other sensitive receptors within 50m of these routes.

11.9.30. Different façades of the same property can experience different changes in traffic noise level depending on their orientation to the noise source. DMRB requires that each of the above comparisons of traffic noise levels is based on the façade which experiences the worst-case change i.e. the largest increase, or, if all façades undergo a decrease, the smallest decrease. Additionally, DMRB requires that the above comparisons of annoyance use the highest levels of annoyance in the first 15 years. For properties which experience an increase in noise due to the proposed scheme, the greatest annoyance is likely to be immediately after proposed scheme opening (see Plate 11.2). For properties which experience a decrease in noise (and also in the Do-minimum comparison), the greatest annoyance is the steady-state level of annoyance in the long term (see Plate 11.1).

11.9.31. DMRB provides two classifications for the magnitude of the noise impact of a proposed road scheme, as shown in Tables 11.11 and 11.12 (taken from DMRB). These relate to short-term changes in noise levels and long-term changes in noise levels. Paragraph 3.36 of DMRB HD 213/11 states HA 205/08 "*provides a method for the classification of the magnitude of impact and the significance of an effect, in order to arrive at an overall level of significance. In terms of road traffic noise, a methodology has not yet been developed to assign significance according to both the value of the resource and the magnitude of an impact. However, the magnitude of traffic noise impact from a road project should be classified into levels of impact in order to assist with the interpretation of the road project. Therefore for the assessment of traffic noise that is covered by [DMRB] a classification is provided for the magnitude of impact*."

11.9.32. In light of the advice in DMRB set out above, Tables 11.10 and 11.11 will be used to assess the magnitude of changes in operational traffic noise.

Table 11.10: Classification of Magnitude of Noise Impacts – Short-term

Noise change $L_{A10,18h}$ dB	Magnitude of Impact
0	No change
0.1 - 0.9	Negligible
1.0 - 2.9	Minor
3.0 - 4.9	Moderate
≥5.0	Major

Table 11.11: Classification of Magnitude of Noise Impacts – Long-term

Noise change $L_{A10,18h}$ dB	Magnitude of Impact
0	No change
0.1 - 2.9	Negligible
3.0 - 4.9	Minor
5.0 - 9.9	Moderate
≥10.0	Major

11.9.33. The significance of effect of the magnitude of change is assessed by considering the sensitivity of receptor as set out in 11.9.43. However, the introduction of the NPPF, NPSNN and NPSE has increased the focus on consideration of absolute noise levels as well as the change in noise levels due to a road scheme. The current version of DMRB HD213/11 only considers the change in noise level when determining the magnitude of impact of a road scheme. In light of the introduction of the NPPF, NPSNN and NPSE a greater consideration of absolute noise levels is considered appropriate, including an acknowledgement that where existing traffic noise levels are high (above the SOAEL as defined below), even small changes in traffic noise in the short term, on road scheme opening (1dB or more), may be significant.

11.9.34. For daytime, the SOAEL is set at 63dB $L_{Aeq,16h}$ (free-field) for residential properties based on advice from Highways England. This is broadly equivalent to 68dB $L_{A10,18h}$ (façade) as predicted by CRTN, which is consistent with the daytime trigger level in the Noise Insulation (Amendment) Regulations 1988 (NIR). The LOAEL is set at 50 dB $L_{Aeq,16h}$ (free field), based on the information provided in the Guidelines for Community Noise. This is broadly equivalent to 55dB $L_{A10,18h}$ (façade) as predicted by CRTN.

11.9.35. For night-time, the SOAEL is set at 55dB $L_{Aeq,8h}$ (free-field) for residential properties. This aligns with the interim night-time outdoor target level provided in the Night Noise Guidelines for Europe. The LOAEL is set at 40dB $L_{Aeq,8h}$ (free-field), which is explicitly defined as the LOAEL in the Night Noise Guidelines for Europe.

11.9.36. The number of residential properties above the SOAEL will be reported for each assessment scenario, based on the façade with the highest noise level in each scenario. In addition, the discussion of the changes in traffic noise levels between scenarios will take into account the absolute traffic noise levels relative to the SOAEL.

11.9.37. The predicted noise levels at each façade of each residential property will also be used to carry out an initial assessment of the likelihood of any properties qualifying under the NIR for noise mitigation. A complete assessment under the NIR is beyond the scope of the assessment at PCF Stage 3, however, the results presented will provide a useful initial indication of the number of potentially qualifying buildings.

Operational Traffic Vibration

11.9.38. Vibration from traffic can be transmitted through the air or through the ground. Airborne vibration is produced by the engines and exhausts of road vehicles, with dominant frequencies typically in the range of 50 - 100 Hz. Ground borne vibration is produced by the interaction of the vehicle tyres and the road surface with dominant frequencies typically in the range of 8 - 20 Hz. The passage of vehicles over irregularities in the road surface can also be a source of ground borne vibration.

11.9.39. Traffic vibration can potentially affect buildings and disturb occupiers. DMRB reports that extensive research on a wide range of buildings has found no evidence of traffic induced ground borne vibration being a source of significant damage to buildings and no evidence that exposure to airborne vibration has caused even minor damage.

11.9.40. Airborne vibration is noticed by occupiers more often than ground borne vibration, as it may result in detectable vibrations in building elements such as windows and doors.

11.9.41. It is a requirement of new highway constructions that the highway surface be smooth and free from any discontinuities. Paragraph A5.26 of DMRB HD213/11 states, in relation to ground borne vibration: "*Such vibrations are unlikely to be important when considering disturbance from new roads and an assessment will only be necessary in exceptional circumstances*". Hence, no impacts or effects from traffic induced ground borne vibration due to the passage of vehicles over irregularities in the road are anticipated as associated with the proposed scheme.

11.9.42. To assess the magnitude of the impact of traffic induced airborne vibration on residents, a parameter is needed which reflects a person's subjective rating of vibration disturbance. DMRB recommends the use of the $L_{A10,18h}$. The relationship between the $L_{A10,18h}$ and annoyance due to vibration is similar to that for annoyance due to steady state traffic noise, as shown in Plate 11.1, except that the percentage of people bothered by vibration is lower. For a given level of noise exposure, the percentage of people bothered very much or quite a lot by vibration is 10% lower than the corresponding figure for annoyance due to traffic noise. Below 58dB(A) the percentage of people bothered by traffic induced vibration is assumed to be zero.

11.9.43. The potential for vibration impacts is limited to the immediate vicinity of a road, and the relationship between annoyance due to vibration and traffic noise level is based on properties located within 40m of a road. Therefore, at each property within 40m of the proposed scheme, and at which traffic noise levels are predicted to be 58dB, $L_{A10,18h}$ or more, the percentage of people likely to be bothered very much or quite a lot by vibration will be calculated, based on the annoyance levels in Plate 11.1, with a reduction of 10%.

Significance of Effect

11.9.44. The significance of effect is a function of the value or sensitivity of the receptor and the magnitude of the impact. Table 11.12 details the sensitivity of receptors, whilst Table 11.13 presents the significance of effect, based on the magnitude of impact (as detailed in the sections above) and the sensitivity of receptors (as per Table 11.12).

Table 11.12: Sensitivity of Receptors

Sensitivity/Value of Receptor	Description
Very High	Concert halls / theatres, specialist vibration sensitive equipment
High	Residential properties, educational buildings, medical facilities
Medium	Places of worship, public open spaces, public rights of way
Low	Commercial and industrial premises

Table 11.13: Significance of Effect

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

11.10. Assumptions and Limitations

11.10.1. The following assumptions and/or limitations are anticipated with regard to the noise and vibration impact assessment:

- Information on existing road surfacing and barriers is dependent on the accuracy of the data in the Highways England HAPMS and EnvIS databases or available from the project team. Information on future resurfacing plans in the area will be based on the current maintenance proposals. Changes to the re-surfacing plans or inaccuracies within the databases would affect the outcome of the noise assessment.
- In order to quantify the likely vibration impact from construction works in accordance with the methods and guidance in BS 5228-2, it is necessary to define the various activities to be undertaken and the equipment to be used, based upon the anticipated construction works programme. It is anticipated that at PCF Stage 3 full details regarding construction activities and plant requirements will be not available. Therefore, an initial assessment of potential construction vibration is proposed based on key construction activities and knowledge on other major road schemes.
- Road surfacing corrections as follows will be assumed during the assessment:
- Standard Hot Rolled Asphalt (HRA) with speed <75kph = -1dB; with speed ≥75kph = -0.5dB, assuming a 1.5mm texture depth.
- Existing low noise thin surfacing speed <75kph -1dB, speed ≥75kph -2.5dB.
- New low noise thin surfacing speed <75kph -1dB, speed ≥75kph -3.5dB.
- Where low noise surfacing only exists on part of the carriageway, the low noise surface correction will be applied if the majority of the carriageway has a low noise surface i.e. 2 lanes out of 3, or if there are only 2 lanes if the low noise surface is on the inside lane where a higher volume of traffic is concentrated.
- In the absence of detailed information, all other roads included in the detailed quantitative noise modelling will be assumed to be HRA in all scenarios. The road surface correction for standard HRA surfacing is -1 dB at speeds < 75kph and -0.5dB at speeds ≥ 75kph, assuming a 1.5mm texture depth.
- Consideration of the inclusion within the assessment of roads with a flow below the CRTN low flow cut of 1,000 vehicles (18hr Annual Average Weekday Traffic) will be made during the noise modelling at the EIA stage.
- 10m x 10m grid to be used to produce noise change contour plots at height of 4m above ground.
- The noise levels will be predicted at receivers at the highest floors of each property assessed (for example 4m for the first floor of a two story property).

12. PEOPLE AND COMMUNITIES

12.1. Introduction

12.1.1. In accordance with IAN 125/15, the Environmental Statement will consider proposed scheme impacts upon people and communities and will take into account guidance provided in the DMRB Volume 11 Volume 11 Section 3 Part 6: Land Use; Part 8: Pedestrians, Cyclists, Equestrians and Community Effects; and Part 9: Vehicle Travellers.

12.2. Summary of Relevant Policy

National Policies

National Planning Policy Framework (NPPF)

12.2.1. The NPPF sets out the Government's planning policies for England and Wales and how these are expected to be applied. It provides a framework within which local people and their relevant councils produce their own local and neighbourhood plans. The NPPF contains policies that are applicable to both travellers and community and private assets. Section 4 of the NPPF refers to the promotion of sustainable transport and the following sections of the NPPF set out objectives relevant to community and private assets (including land use):

- Building a strong and competitive economy (Chapter 1);
- Supporting a prosperous rural economy (Chapter 3);
- Promoting healthy communities (Chapter 8);
- Protecting Green Belt land (Chapter 9); and
- Conserving and enhancing the natural environment (Chapter 11).

National Practice Policy Guidance (NPPG)

12.2.2. In March 2014 the government published the NPPG which provides further guidance on health and well-being and open spaces, sports and recreational facilities, public rights of way and local green space relevant to this assessment.

National Policy Statement for National Networks (NPSNN)

12.2.3. The NPSNN sets out the need for and Government's policies to deliver development of NSIPs on the national road and rail networks in England. It provides planning guidance for promoters of nationally significant infrastructure projects on the road and rail networks, and the basis for the examination by the Examining Authority and decisions by the Secretary of State. Paragraphs 5.165, 5.166 and 5.168 of the NPSNN are relevant to this assessment.

Local Policies

12.2.4. The local policies and development planning documents listed in Table 12.1 are relevant to the people and communities assessment.

Table 12.1 Local Planning Policy and Development Plan Documents

Local Policies	Relevance
Solihull Local Plan 2013 Policy P18 iii.	Contribute to the development of a high quality, safe and convenient walking and cycling network
Solihull Local Plan 2013 Policy P18 iv.	"The protection and enhancement of physical access, including public rights of way to open space and green infrastructure will also be supported."

12.3. NMUs and Vehicle Travellers

Study Area

12.3.1. The study area includes all known NMU facilities within 500m of the proposed scheme.

12.3.2. For traveller's views, the study area extends to the Visual Envelope (VE) which represents the extent of views from, as well as to, the proposed scheme alignment from an approximate 2km wide buffer zone either side of the centreline of the proposed scheme alignment.

12.3.3. The VE is defined in DMRB Volume 11, Section 3, Part 5, Annex III as the area of land from which there is a view of any part of the proposed works, its structures or the traffic which will use it.

12.3.4. OS mapping and site visits have been used to identify PRoW and land in community use adjacent to the proposed scheme alignment.

12.4. Baseline Conditions

12.4.1. The applicable people and community assets identified within this chapter are presented on Figure 12.

Equestrians

12.4.2. There are two livery stables located within Bickenhill within 500m of the proposed scheme.

Pedestrians and Cyclists

Junction 6

12.4.3. There are two designated Public Rights of Way (PRoW) within 500m of the junction, namely:

- A PRoW that passes in a west to east direction approximately 30m at it closest from the southern extent of the junction (M42 / A45 westbound on-slip). The PRoW commences on Church Lane and eastwards through open fields and over the Birmingham to London Euston Midlands railway line on an overbridge. Beyond the railway line, the PRoW deviates northwards and runs in parallel to the wider M42 corridor for approximately 40m before stopping at Junction 6.
- A second PRoW is located to the southeast of junction 6 that commences off Old Station Road and passes behind the existing National Motorcycle museum and at its closest is approximately 180 m from the existing junction. The PRoW continues behind the museum for approximately 300 m before separating in a southerly and northerly direction and out of the study area.

Clock Interchange

- There is one designated PRoW within 500m of Clock Interchange which is located approximately 30 m south of the existing Catherine De Barnes Lane (B4438). The PRoW travels in a south to north direction, commencing from Church Street in Bickenhill for approximately 350m before stopping to the immediate east of Catherine De Barnes Lane B4438.

The Proposed Route Alignment

12.4.4. From a south to north direction there are a number of PRoWs within 500m of the proposed alignment, namely:

- A PRoW commences at Hampton Lane Farm and travels north for approximately 450 m before splitting into three paths, one to the east to the boundary of the M42 and turning north to end on Shadowbrook Lane, a westerly spur which passes south of Shadowbrook Meadows Nature Reserve and ends at Catherine De Barnes Lane, and a third spur which continues north through the field network before stopping to the immediate west of Heath Farm on Shadowbrook Lane;
- A PRoW commences immediately north of Four Winds Farm and travels in a north westerly direction away from Catherine De Barnes Lane through open fields for approximately 300 m. Upon reaching the GAA, the PRoW splits in two, one path travels east and ends at Catherine De Barnes Lane, the second in a roughly westerly direction towards Castle Hill and out of the study area;
- A PRoW passes in an east to west direction to the south of the village of Bickenhill, commencing on St Peter's Lane and through to Catherine De Barnes Lane, at which point the PRoW continues westwards through field networks and to the immediate north of a Radio Beacon and out of the study area;
- Further north a PRoW crosses the study area in a west to east direction, entering the study area to the west of the caravan site off Catherine De Barnes Lane, it follows the route of a path between field boundaries to Catherine De Barnes Lane. At this point, the PRoW continues to the east of the road to the north of Grange Farm and on Church Lane. The PRoW turn south at St Peter' Church, through fields and joins St Peter's Lane and continues southwards away Bickenhill for approximately 800m where it crosses the M42 on an pedestrian overbridge. Beyond the M42, the PRoW continues south, past Home Farm and out of the study area;
- A PRoW commences approximately 30m south of the existing Catherine De Barnes Lane (B4438). The PRoW travels in a south to north direction, commencing from Church Street in Bickenhill for approximately 350m before stopping to the immediate east of Catherine De Barnes Lane B4438;
- A PRoW commences on Church Lane and travels eastwards through open fields and over the Birmingham to London Euston Midlands railway line on an overbridge. Beyond the railway line, the PRoW deviates northwards and runs in parallel to the wider M42 corridor for approximately 40m before stopping at Junction 6; and
- A traffic free cycle route is located on the existing Catherine-de-Barnes Lane (B4438) which travels in the south to north direction through the study area from the village of Catherine-de-Barnes and through past Clock Interchange.

Motorised Vehicles and Views from the Road

12.4.5. Existing views from the M42 are restricted due to verge planting, existing mature trees (which become denser towards Junction 6) and existing motorway infrastructure. Verge planting in both southbound and northbound directions reduce the possibility of far reaching views for vehicle travellers.

12.4.6. Similar views from vehicles are experienced at Clock Interchange, noting that the majority of the junction is at-grade with established tree lines surrounding the junction and on slip and off slip locations. To the immediate south, the elevated Catherine De Barnes Lane (B4438) slip road to Airport Way inhibits longer views to the rural landscape around Bickenhill.

12.4.7. Views from the existing Catherine De Barnes Lane (B4438) that passes in the south to north direction through the study area from Catherine De Barnes, to the immediate west of Bickenhill and through onto Clock Interchange, are limited in the majority of places due to the thick tree lines that are on both sides of the road. As the B4438 passes north of Bickenhill views from the road open up and long views across the immediate field networks can be seen.

Driver Stress

12.4.8. Driver stress refers to the adverse mental and physiological effects that drivers may experience travelling along the M42 with particular reference to Junction 6 and Clock Interchange. The assessment of drivers' stress is based on four main factors: frustration; fear of accidents; uncertainty of route; and traveller care.

12.4.9. Long delays and congestion within the merge points of major junctions off the SRN raises driver stress due to increased journey times and the fear of accidents. Slow moving traffic especially on the approach to congested junctions means that drivers have to brake suddenly which could potentially cause accidents. These factors increase drivers stress levels. Drivers also fear accidents occurring as a result of the impatience displayed by other drivers.

12.5. Additional Survey Requirements

12.5.1. An NMU (pedestrian, cyclist, equestrian or disabled user) survey will be undertaken during PCF Stage 3 to understand the NMU movements and usage patterns of the PRoWs within the study area.

12.6. Value of the Environmental and Resource Receptors

12.6.1. Resources comprise the routes within the study area as used by travellers, whilst the receptors are the travellers who would potentially be impacted by the proposed scheme. There is no standard guidance on applying a value to resources and receptors for this topic.

12.6.2. Professional judgement has been used to define criteria to aid in applying a value to routes for pedestrians, cyclist and equestrians as set out in Table 12.2. Examples from with the study area have been provided and will be reviewed during PCF Stage 3, taking into account potential changes to the baseline conditions and to the design as a result of alignment iterations. No distinction in value will be applied to vehicle travellers due to the inherent variability among people's susceptibility to driver stress.

Table 12.2: Sensitivity of NMU Routes to Temporary Disruption or Permanent Change

Sensitivity	Description	Examples in Study Area, (Preliminary valuation)*
Very High	Key routes used by pedestrians, cyclists and other NMUs. Routes record very high numbers of NMU journeys and / or connect communities with employment land uses and other services with a direct and convenient NMU route. Routes are important since they offer opportunities to meet sustainable transport and public health objectives through active travel modes rather than private car use. Any interruption of these would inconvenience many people	None in study area

Sensitivity	Description	Examples in Study Area, (Preliminary valuation)*
	and could cause people to switch from active modes to private car use. Routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who may be disproportionately affected by small changes in the baseline due to potentially different needs.	
High	National or regional trails and routes likely to be used for recreation that record high use. The sensitivity of these routes is judged to be high because of the number of people affected and effects upon regional leisure. Crossing points on busy roads for NMU (roads with more than 8,000 vehicles per day) which may not currently record high use, but for which limited alternatives are available. These points are sensitive because disruption to these may affect the convenience or safety of journeys for NMU.	None in Study Area
Medium	Public rights of way and other routes close to communities which are used mainly for recreational purposes (for example dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys. It is likely that direct and efficient journeys are not the priority for the majority of people using these routes so they would be more tolerant of disruptions and diversions. However, people are likely to be sensitive to changes to the amenity and character of the overall route.	PRoW from Four Winds Farm to Castle Hills and into east Solihull.
Low	Routes which have fallen into disuse such as through past severance or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes. Whilst these routes would not be sensitive in terms of disruption from development proposals, they may present opportunities for enhancement if existing barriers or poor amenity can be overcome through development proposals.	Hampton Lane Farm PRoW

12.7. Potential Impacts and Effects

Summary of Mitigation Proposals

12.7.1. The proposed scheme design aims to include at least the level of NMU provision that exists at present with enhancement provisions where deemed appropriate and reasonable. NMUs provisions will be confirmed during PCF Stage 3 through consultation with appropriate stakeholders and will provide a better appreciation of

where the proposed scheme could meet a HE KPI of improving fitness levels of the public.

Summary of PCF Stage 2 Assessment

12.7.2. An appraisal of NMUs and vehicle travellers has been undertaken at PCF Stage 2 – a summary of the key findings is provided below.

NMU

- Without mitigation and with limited assessment conducted at PCF Stage 2, moderate adverse impacts are anticipated where the proposed scheme severs seven PRoW, including:
  - A footpath running approximately parallel to the south of Shadowbrook Lane, leading from the M42 to the BB4438.
  - A footpath north of Hampton Lane Farm which links to another PRoW and the wider footpath network.
  - Two separate footpaths which cross the Bickenhill sports fields and Birmingham Dogs Home.
  - A footpath west of the B4438 near to Hazel Farm which traverses around a radio beacon.
  - A foot path west of Grange Farm and the BB4438 running from Bickenhill westwards below the A45.
  - A footpath to the north-east of Bickenhill where the footpath acts to link the residential properties to the south of the A45. f
- It is likely that the amenity value of these footpaths would be substantially altered due to the introduction of new infrastructure into the landscape.
- A cycle route, which links Solihull and the airport, NEC and future HS2 terminal would not be directly impacted, although the introduction of traffic could lead to moderate adverse impacts on the amenity of this route.

View from the Road

- The proposed scheme heading west arcs around Bickenhill before connecting into the existing A45. Vehicle travellers would receive glimpses of largely flat agricultural landscape and associated farm buildings. Nearer to Bickenhill the view to the east would comprise of the village, farms and residential property interspersed in the agricultural landscape.

Vehicle Users

- Motorised users are anticipated to receive beneficial impacts from the proposed scheme as speeds would increase resulting in less frustrating driving conditions. Signage and street furniture would be installed to present standards resulting in improved conditions for driving and improved safety.

12.8. Proposed Scope of Assessment

12.8.1. A simple assessment of the proposed scheme on the effects on all travellers will be undertaken taking into consideration receptors within the proposed scheme extent that have the potential to be impacted.

12.8.2. There are numerous provisions for cyclists and pedestrian along the proposed scheme extent and these travellers may be impacted to a certain degree in terms of severance and an increase in journey lengths. As no adverse effects on equestrians are anticipated, it is proposed that these travellers are scoped out of the assessment. The assessment will also identify the factors and effects relating to vehicle travellers. Driver stress and views from the road of the proposed scheme

will be assessed taking into account the proposed scheme design and landscape mitigation provisions.

12.9. Proposed Assessment Methodology including Significance

12.9.1. The proposed methodology for the assessment of effects on all travellers has been prepared in accordance with guidance in HA/200/08 and IAN 125/09 which merges the former chapters for 'Pedestrians, Cyclists, Equestrians and Community Effects' (DMRB Volume 11, Section 3, Part 9) and 'Vehicle Travellers' (DMRB Volume 11, Section 3, Part 8) into a combined 'Effects on All Travellers' chapter.

12.9.2. The need for an assessment of Driver Stress will be confirmed within the Environmental Statement due to likely changes to the DMRB assessment criteria for road schemes. This will be confirmed and if not applicable will be scoped out of the assessment. In the event an assessment of driver stress is required for the proposed scheme, the methodology outlined herein will be adhered to.

Non-Motorised Users

12.9.3. The potential for effects on NMUs will be considered in accordance with the relevant sections of DMRB Volume 11 Section 3 Part 8. The assessment will concentrate on changes in amenity and journey length. Amenity is defined as the relative pleasantness of a journey. It is therefore concerned with changes in the degree and duration of people's exposure to traffic (safety, noise, dirt and air quality) and the impact of the proposed scheme plus any visual intrusion associated with the proposed scheme.

12.9.4. A judgement as to the overall significance of effect on pedestrians and cyclists will be made in accordance with Table 12.3.

Table 12.3 Significance Criteria for NMUs

Significance	Description
Large adverse	Direct impact on, or severance of, a route used by pedestrians, cyclists or equestrians, resulting in a substantial and permanent loss of amenity and use (NMU facilities of high to very high sensitivity). Increases of 30% or more in traffic flows along a route to increase volumes to over 16,000 vehicles per day which would be likely to deter use by most NMU, particularly road cyclists.
Moderate adverse	Introduction of new need to cross a highway for a previously uninterrupted route, or the introduction of new highway in close proximity to a route which was previously tranquil in character. The changes would not cause a significant extension of journey (<500 m), but would cause loss of amenity/convenience or substantially alter the character of the route. Increases of 30% or more in traffic flow along route to increase volumes to over 8,000 vehicles per day such that would be likely to deter use by some NMU, particularly road cyclists, or cause noticeably more intimidating conditions. Temporary severance to routes that are used by high numbers of pedestrians, cyclists or equestrians (during construction activities).
Minor adverse	No direct permanent impact, but some loss of amenity. Temporary disruption to routes or short-term loss of amenity (e.g. short-term disruption and diversions to NMU routes during construction activities).
No change	No significant change to route used by pedestrians, cyclists and / or equestrians.

Significance	Description
Minor beneficial	An improved at-grade crossing facility or other provision on an existing route that improves the amenity or convenience for NMU, for example the introduction of a traffic island or pelican crossing.
Moderate beneficial	Introduction of a new crossing or other facility on an existing NMU route that is likely to encourage more use due to improved amenity / convenience or perception of safety, for example a new cycle lane, grade separated crossing or replacement of grass verge with pavement. Reductions in traffic to below 8,000 vehicles per day or by more than 30% such that conditions for NMU such as road cyclists are less intimidating.
Large beneficial	Provision of a permanent new route useful for NMU where previously there was no route or access was very hazardous or perceived to be hazardous such that NMU did not regularly use the route. Reductions in traffic to below the threshold of 8,000 vehicles per day or by more than 60% such that NMU are more encouraged to take the route, particularly road cyclists.

12.10. Vehicle Travellers

12.10.1. A simple level assessment of vehicle travellers will be undertaken based on guidance in DMRB Volume 11, Part 9 Vehicle Travellers. The proposed assessment methodology considers the following:

- Views from the road: In assessing the views of travellers it is essential to understand their sensitivity to changes in the landscape and views from the road. This relates both to the speed at which the landscape is viewed and also the ability of the drivers to concentrate on the road while travelling, particularly during the construction period. There are no established criteria to define the level of impact that a proposed road scheme has on travellers views, as such the significance of effects will be define using professional judgement;
- Driver Stress: Driver stress can be defined as the adverse mental and physiological effects experienced by a driver while travelling along a road network. Driver stress has main components that are considered in the assessment:
- Frustration;
- Fear of potential accidents;
- Uncertainty relating to the route;
- Traveller care.

12.10.2. The level of driver stress is dependent upon the driver's experience and driving skills, knowledge of the route being taken, health and temperament. Factors to consider include:

- Lane flow.
- Travel speed.
- Junction frequency.
- Road surface characteristics.
- Road layout and geometry.

12.10.3. For the purposes of the assessment, relative levels of value (sensitivity) will not be assigned to the receptors (vehicle travellers). For the purposes of the assessment, all drivers will be considered to have the same sensitivity in relation to drivers' stress.

12.10.4. As an indicator of drivers' stress/frustration, DMRB tabulates the relationship between average peak hourly flow per lane and average journey speed, in order to describe the magnitude of drivers' stress on a three point scale: low; moderate and high (refer to Table 2 in DMRB Volume 11, Part 9 Vehicle Travellers).

12.10.5. In accordance with DMRB, an assessment of driver stress is made for the worst year in the first 15 years after proposed scheme opening (the design year). The fear of accidents can become particularly acute in adverse weather conditions when spray from vehicles reduces visibility. Adverse weather conditions coupled with the limited sight distances caused by the scale and mass of HGVs, makes driving and overtaking more stressful and risky, and therefore increases the fear of accidents.

12.10.6. Road uncertainty is caused primarily by signing that is inadequate for purpose.

12.10.7. The assessment of drivers' stress will also consider traveller care and whether sufficient traveller care facilities are available in close proximity to the proposed scheme.

12.10.8. A judgement as to the overall significance of effect for drivers' stress will then be made in accordance with Table 12.4.

Table 12.4: Drivers' Stress Significance of Effect

Significance of Effect	Description
Very large beneficial or adverse	Where there would be a very major increase/reduction in driver stress resulting from the proposed scheme compared to the Do-Minimum.
Large beneficial or adverse	Where there is a major increase/reduction in driver stress resulting from the proposed scheme compared to the Do-Minimum.
Moderate beneficial or adverse	Where there is a moderate increase / reduction in driver stress resulting from the proposed scheme compared to Do-Minimum
Slight beneficial or adverse	Where there is a minor increase / reduction in driver stress resulting from the proposed scheme compared to the base year and Do-Minimum.
Neutral	Where no effects on driver stress is anticipated from the proposed scheme, or where the beneficial and adverse effects are considered balanced.

12.11. Community and Private Assets

12.12. Introduction

12.12.1. This section of the Environmental Statement will consider potential effects on community and private assets resulting from the proposed scheme. The assessment will take into consideration the guidance as outlined in DMRB Volume 11 Section 3, Part 8: Pedestrians Cyclist and Community Effects (Community Effects only for this section) and Part 6: Land Use. The overall aim of the assessment will be to define existing land use patterns, and assess the effects of the proposed scheme on prevailing land use. Access to community facilities and services and other destinations also form part of the assessment.

12.13. Study Area

12.13.1. For land use, the study area will extend to 250m from the proposed scheme alignment.

12.13.2. A study area for community effects is not defined in DMRB. Therefore, a buffer zone of 250m from the proposed scheme is considered suitable. This will encompass potential community facilities in the vicinity of the proposed scheme alignment and any desire lines associated with them.

12.13.3. The final extent of the study area will be agreed in consultation with the applicable statutory consultees and subsequently confirmed as the assessment is undertaken and refined. The study area implemented to inform the assessment will be presented within the Environmental Statement for the proposed scheme.

Baseline Conditions

12.13.4. This section describes the agricultural and non-agricultural land uses of relevance to the proposed scheme.

12.13.5. There are no public open spaces within 250m of the proposed route alignment.

12.13.6. Land use on either side of the proposed alignment is predominantly arable field networks. Around Junction 6 and Clock Interchange the land use is more urbanised and is heavily influenced by the retail and events sector to the north of Coventry Road (A45), with the A45 forming the stop line for current expansion to the south.

12.13.7. There are a number of farmsteads within 250m of the proposed alignment including:

- Walford Hall Farm;
- Hampton Lane Farm;
- Four Winds Farm;
- Hazel Farm;
- Grange Farm;
- Health End House; and
- Glebe Farm.

12.13.8. In addition to these farmsteads, residential properties are located on Shadowbrook Lane, St Peter's Lane (north and south) and within the wider village of Bickenhill.

12.13.9. Commercial enterprises known at present include:

- The Birmingham Dogs Home located off Catherine De Barnes Lane (B4438) immediately south of Bickenhill Lane;
- Bracey's Nursery and Garden Centre is located immediately east of the existing Catherine de Barnes Lane (B4438), to the north of Shadowbrook Lane;
- Avon Caravan Park located to the immediate north west of Bickenhill off Catherine De Barnes Lane (B4438); and
- Páirc na hÉireann which is the principal Gaelic games sports facility in the West Midland. The three playing fields and associated facilities are located immediately off Catherine De Barnes Lane (B4438), to the south west of Bickenhill.

12.13.10. Other potentially sensitive land uses include a number of local wildlife sites include:

- Bickenhill Meadows SSSI;
- Aspbury's Coppice LWS;
- Castle Hill Farm Meadows LWS;

- Holywell Brook LWS;
- Main Birmingham to London Railway line Ecosite;
- Bickenhill Churchyard Ecosite; and
- Clock Lane Meadows (part of Castle Hill LWS).

12.13.11. The study area is located within green belt as is known as the Meriden Gap locally as is seen as an area that inhibits the urban sprawl south of the A45.

12.14. Additional Survey Requirements

12.14.1. There are a number of land owners in the vicinity of the proposed scheme who would experience land loss as a result of the proposed scheme. In order to assess the level of impact on these land owners, a land use and farm viability survey will be undertaken to capture the extent to which land owners may be affected.

12.14.2. No other specific land use surveys are proposed other than the on-going consultation with potentially affected land owners.

12.15. Value of the Environmental and Resource Receptors

12.15.1. For the purposes of this assessment and in the absence of guidance within DMRB, the sensitivity/value of resources and receptors will be based on professional judgement and in accordance with Table 12.5.

Table 12.5 Sensitivity Criteria - Community and Private Assets

Sensitivity	Description
High	Residential, commercial or industrial buildings Buildings used by the community e.g. schools, community halls Community land that attracts users nationally e.g. national parks Designated public open space Religious sites and cemeteries
Medium	Residential, commercial or industrial land e.g. gardens Land used by the community on a regional scale, e.g. country parks, forests and other land managed in such a way as to attract visitors from a regional catchment
Low	Derelict or unoccupied buildings Locally used community land e.g. local parks and playing fields

12.16. Potential Impacts and Effects

Summary of Mitigation Proposals

12.16.1. Environmental considerations have been taken into account during the development of the proposed scheme design, specifically aiming to minimise building demolition requirements along the proposed scheme alignment, and minimise land-take requirements outside of the existing highway boundary.

Summary of PCF Stage 2 Assessment

12.16.2. An assessment of community and private assets was undertaken at PCF Stage 2 in-line with guidance provided in DMRB Volume 11, Section 3, Part 6 and Volume 11, Section 3, Part 8 – this identified the following residual effects resulting from the proposed scheme:

- The Gaelic football and hurling fields and facilities located adjacent to Catherine-de-Barnes Lane would likely be subject to adverse impacts as a

result of the proposed scheme. Without mitigation the proposed option is likely to preclude continued operation of this recreational area for its existing and intended use due to land-take and loss of amenity. The pitches are considered to be of national importance to the sport.

- Adverse impacts to agricultural, residential and commercial land during construction and operation, due to land take and loss of amenity, are anticipated as a result of the proposed scheme.

12.17. Proposed Scope of Assessment

12.17.1. It is proposed that a detailed assessment is undertaken on the effects of the proposed scheme on community and private assets. This is due to the potential adverse effects resulting from the loss of private property and community land. In accordance with DMRB Volume 11, Section 3, Part 6 (HA, 2001b) and Volume 11, Section 3, Part 8 the assessment will consider the following aspects:

- Demolition of private property;
- Loss of land used by the community;
- Effects on development land;
- Community severance; and
- Effects on agricultural land and effects on individual farm units.

12.18. Proposed Assessment Methodology including Significance

Demolition of Private Property and Land Take

12.18.1. The assessment will be based on DMRB Volume 11 Section 3 Part 6 (Land Use) and identify residential, commercial, industrial and other properties at risk of demolition or land-take. There is no specific guidance within DMRB in terms of significance and so the significance of effects will be assessed using the criteria in Table 12.6, which has been developed using professional judgement.

Table 12.6: Significance of Direct Impacts on Private Property (Residential and Non-residential) and Associated Land Take

Effect Significance	Criteria
Large Adverse	Residential: Demolition of the whole of the property would affect the quality of life in the neighbourhood such that the loss of housing cannot be replaced in the locality. Non-Residential: Acquisition of the whole or a substantial portion of property and associated buildings, which may lead to closure of the business and a loss to the community which cannot be replaced in the locality.
Moderate Adverse	Residential: The land take / acquisition is sufficiently large so as to diminish the quality of life in the neighbourhood, although some replacement can be made in the locality. Non-Residential: Acquisition is sufficiently large so as to result in increased management/operational difficulties for the business, or replacement site is in the locality.
Slight Adverse	Residential: Part of the curtilage is acquired, resulting in a decreased enjoyment of the residence, which would diminish the quality of life in the neighbourhood, although replacement could be made in the locality. Non-Residential: A small portion of the property/land is acquired resulting in, at most, some slight management/operational difficulties

Effect Significance	Criteria
	for the business.

Community Land

12.18.2. DMRB Volume 11 Section 3 Part 6: Land Use sets out the methodology for assessing the loss of land used by the community. The assessment relates to direct impacts on common land, town or village green, allotments, and public open space. However, there is no specific guidance within DMRB in terms of significance and so the significance of effects will be assessed using the criteria in Table 12.7 which has been developed using professional judgement.

Table 12.7 Significance of Direct Impacts on Community Land and Associated Land Take

Effect Significance	Criteria
Large Adverse	Acquisition of the majority of land used by the community which cannot be replaced within the locality.
Moderate Adverse	Community land take is sufficiently large (although not representing the majority) so as to diminish the quality of life in the neighbourhood.
Slight Adverse	A small portion of community land take is required which would affect the enjoyment of land used by the community, which would therefore diminish the quality of life in the neighbourhood.
Negligible	Negligible community land take with little or no overall impact on the enjoyment of the land and therefore quality of life in the neighbourhood.

12.18.3. There is also a need to consider community severance – this is concerned with the role of roads as a 'barrier' between different parts of a community, and the resulting distortion of journey patterns. Guidance on severance assessment is contained within DMRB Volume 11 Section 3 Part 8 (pedestrians, cyclists, equestrians and community effects). DMRB defines community severance as ‘the separation of residents from facilities and services they use within their community caused by new or improved roads or by changes in traffic flows’.

12.18.4. Significance criteria for community severance has been developed based upon guidance contained in DMRB Volume 11 Section 3 Part 8, and is set out in Table 12.7. New severance caused by increases in traffic levels is described on a three point scale: slight, moderate or severe:

- Slight increases in severance are likely to be experienced where journey patterns are generally maintained, but there would be some hindrance to movement such as an increase in journey length by up to 250m.
- Moderate effects would be expected where some residents, particularly children and elderly people, are likely to be dissuaded from making trips. Other trips will be made longer or less attractive.
- For severe effects, people are likely to be deterred from making trips to an extent sufficient to induce a re-organisation of their habits. Alternatively, considerable hindrance will be caused to people trying to make their existing journeys.

12.18.5. Relief of severance as a result of reduction in traffic levels is also described using the terms slight, moderate or severe. A negligible impact is defined as less than 10% change in traffic levels.

Table 13.8: Significance of Community Severance Effects

Effect Significance	Criteria
Large Beneficial / Adverse	Crossing a road which has a change in traffic levels of >60%; or Length of walk journeys changed by over 500 m; or Change in walk experience - for example, increased severance if three or more new bridges or subways are traversed instead of three previous convenient at-grade crossings, or relief of severance if three or more at grade crossings are traversed instead of three or more previous bridges/subways.
Moderate Beneficial / Adverse	Crossing a road which has a change in traffic levels of 30 - 60%; or Length of journeys changed by 250 – 500 m; or Change in walk experience - for example, increased severance if two new bridges are traversed instead of two previous convenient at-grade crossings or relief of severance if two at grade crossings are traversed instead of two previous bridges.
Slight Beneficial / Adverse	Crossing a road which has a change in traffic levels of 10 - 30%; or Length of journeys changed by up to 250 m; or Change in journey experience - for example, increased severance if a new bridge is traversed instead of a previous convenient at-grade crossing, or relief of severance if an at grade crossing is traversed instead of a previous bridge.
Neutral	Crossing a road which has a change in traffic levels of <10%; or Length of journeys not materially changed.

Loss of Development Land

12.18.6. DMRB Volume 11 Section 3 Part 6 (Land Use) sets out the methodology for assessing the effects on development land. This relates to the impact of a proposed scheme on unimplemented planning permissions and development allocations in the Local Planning Authority development designations. There is no specific guidance within DMRB in terms of significance; therefore, this will be assessed qualitatively using professional judgement. Significant effects would include a permanent direct impact on a site allocated for development or a site with current planning permission.

Agricultural Land Use

12.18.7. The land use planning context for the consideration of agricultural land is provided primarily by national policies for development involving agricultural land set out in the NPPF. This policy advice is predicated upon principles of sustainable development and requires land use decision makers to take account of the need to protect, and make prudent use of natural resources. Consequently, it is necessary to have regard to the qualities of the agricultural land involved in development proposals.

12.18.8. Where it is demonstrated that significant development of agricultural land is necessary, and the options of utilising previously developed land or poorer quality land are not available or inappropriate, decision makers are required to have regard to the economic and other benefits of the best and most versatile agricultural land

(Grades 1, 2 and 3a). Impacts associated with the loss of BMVL will be assessed in accordance with Chapter 9: Geology and Soils, whilst the community and private assets assessment will only consider potential impacts upon farm holding viability.

12.18.9. With regard to farm holdings, impacts relate primarily to the loss of land and other key farm infrastructure (dwellings, buildings and other structures such as irrigation reservoirs and slurry pits), the fragmentation of land from the residually farmed area and disruption to existing farm operations from, for example, changes to access arrangements or conflicts of noise and dust from construction activities with sensitive land uses. The magnitude of potential impacts will be determined as detailed in Table 12.8.

Table 12.8: Magnitude of Impacts on Farm Holdings

Impact Magnitude	Land Take	Severance	Infrastructure	Disruption
High	20%+ of all land farmed	No access to severed land	Direct loss of farm dwelling, building or structure	Disruption discontinues land use or enterprise
Medium	10 - 20% of all land farmed	Access available to severed land via the public highway	Loss of or damage to infrastructure affecting land use	Disruption necessitates change to scale or nature of land use or enterprise
Low	5 - 10% of all land farmed	Access available to severed land via private way	Infrastructure loss/damage does not affect land use	Disruption does not affect land use or enterprise
Negligible	5% or less of all land farmed	No new severance	No impact on farm infrastructure	No disruption to land use or enterprise

12.18.10. Farm holding sensitivity is a reflection of the size of an affected holding, with larger holdings generally more able to accommodate change than smaller ones, and the nature of the particular agricultural activity. Complex activities, or ones dependent upon particular infrastructure or regular access to land, for example dairying, intensive livestock and horticulture, have a high degree of sensitivity to development impacts. General arable and grazing enterprises normally have a degree of operational flexibility which can adapt to changing circumstances. Non-commercial activities are deemed to have a low sensitivity. Given the complex nature of farm sensitivity, professional judgement has been applied. Thereafter, the significance of potential farm holding effects will be determined in accordance with Table 12.9.

Table 12.9: Farm Holding Significance Matrix

Magnitude Sensitivity	High	Medium	Low	Negligible
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Moderate / minor	Minor
Low	Moderate	Moderate / minor	Minor	Negligible
Negligible	Minor	Minor	Negligible	Negligible

12.19. Assumptions and Limitations

12.19.1. The PCF Stage 2 appraisal did not include the candidate sites identified for potential construction compounds and / or ecological compensation areas. Further studies and surveys are proposed in 2017 which may identify new features with potential to be significantly affected. As such the assessment as reported in the Environmental Statement may be different to that reported during PCF Stage 2.

13. ROAD DRAINAGE AND THE WATER ENVIRONMENT

13.1. Introduction

13.1.1. This chapter presents an overview of the water environment baseline and proposed scope of works for assessing the potential effects of the proposed scheme on the water environment. The water environment includes surface and ground water quality, the hydromorphology of water bodies, flood risk and drainage.

13.1.2. Baseline information has been reviewed in the context of the proposed scheme in order to identify potentially significant effects. Where potentially significant effects are identified, a method of assessment to determine the significance of those effects has been described.

13.2. Summary of Relevant Policy

13.2.1. EU directives and National and Regional Policies relevant to the assessment of road drainage and the water environment are listed below.

- Water Framework Directive (WFD) 2000/60/EC.
- Priority Substances Directive 2008/105/EC.
- Groundwater Directives 2008/105/EC and 2006/118/EC.
- Floods Directive 2007/60/EC.
- The Environmental Liability 2004/35/EC.
- The Freshwater Fish Directive 2006/44/EC.

13.2.2. National, regional and planning policies relevant to the assessment of road drainage and the water environment are listed below:

- Water Act 2014.
- Floods and Water Management Act 2010.
- Environment Act 1995.
- Land Drainage Acts 1991 and 1994.
- Water Resources Act 1991.
- Environment Protection Act 1990.
- Highways Act 1980.
- Salmon and Freshwater Fisheries Act 1975 (as amended).
- Environmental Permitting Regulations (England and Wales) 2016.
- Environmental Damage (Prevention and Remediation) Regulations 2015.
- Eels (England and Wales) Regulations 2009.
- Flood Risk (England and Wales) Regulations 2009.
- Groundwater (England and Wales) Regulations 2009.
- Water Environment (Water Framework Directive) (England and Wales) Regulations 2017.
- Control of Pollution (Applications, Appeals and Registers) Regulations 1996 (SI1996/2971).
- National Policy Statement for National Networks (NPSNN).
- National Planning Policy Framework (NPPF).
- National Planning Practice Guidance (NPPG).
- The Government's water strategy for England, Future Water, 2011.

13.2.3. Table 13.1 summarises SMBC's local policies applicable to the water environment.

Table 13.1: Local Policies

Solihull Local Plan: Shaping a Sustainable Future, 2013	The Solihull Local Plan: Shaping a Sustainable Future was adopted by the Council on 3rd December 2013 and forms the statutory development plan for the area and the starting point in planning decisions. Relevant policies which relate specifically to the water environment, flood management and sustainable drainage systems (SuDS) include Policy P10 Natural Environment, Policy P11 Water management, Policy P15 Securing Design Quality.

13.2.4. Under the Environmental Permitting (England and Wales) Regulations 2016 an Environmental Permit is required from the Environment Agency for certain works within 8m of the top of the bank surrounding Main Rivers. A permit may also be required for the discharge to surface waters or ground of any unclean construction site runoff, although permits are not required for the discharge of highway runoff under the Highways Act 1980 providing the discharge does not cause water pollution.

13.2.5. Similarly, consent for certain works that may affect the flow in Ordinary Watercourses (i.e. all other watercourses that are not Main Rivers) under The Floods and Water Management Act 2010 and The Land Drainage Act 1991 (as amended) is required from the Lead Local Flood Authority (LLFA), which in this case is SMBC. The distance from the watercourse that this applies to will be confirmed with SMBC in due course.

13.2.6. The NPPF and the Flood Risk and Coastal Change NPPG recommends that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) and should develop policies to manage flood risk from all sources taking account of advice from the Environment Agency and other relevant flood risk management bodies, such as LLFAs and Internal Drainage Boards. Local Plans should apply a sequential, risk-based approach to the location of development to avoid, where possible, flood risk to public and property and manage any residual risk, taking account of the impacts of climate change, by:

- Applying the Sequential Test.
- Applying the Exception Test if necessary.
- Safeguarding land from development that is required for current and future flood management.
- Using opportunities offered by new development to reduce the causes and impacts of flooding.
- Seeking opportunities to facilitate the relocation of development, including housing, to more sustainable locations where climate change is expected to increase flood risk so that some existing development may not be sustainable in the long-term.

13.2.7. Planning policy also encourages developers to include sustainable drainage systems (SuDS) in their proposals where practicable. SuDS provide a way to attenuate runoff from a site to the rate agreed with the Environment Agency to avoid increasing flood risk, but they are also important in reducing the quantities and concentration of diffuse urban pollutants found in the runoff.

13.2.8. Defra published in 2015 guidance on the use, design and construction of SuDS (Non-statutory technical standards for SuDS (Defra, 2015). The type of SuDS proposed depends on local circumstances (e.g. ground conditions) and in the following order of preference as set out in the Building Regulations 2010 Approved Document H:

- Soakaway or some other adequate infiltration system when that is not practical;
- To a watercourse. When that is not practical; and if the above are not possible; and
- To a surface water sewer.

13.2.9. Current best practice guidance on the planning for and design of SuDS treatment is provided by C753 The SuDS Manual, DMRB HA 103/06, and the DMRB HD 33/06 Surface and Subsurface Drainage Systems for Highways. In the context of highways developments, the assessment guidance described in the DMRB HD45/09 is the most appropriate method of assessment to determine the risk to the water environment and the need for treatment measures and this is described in more detail later in this chapter.

13.3. The Study Area

13.3.1. As part of the assessment process an approximate 1km study area has been defined around the proposed scheme. 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 ground water conditions described. In addition, factors such as historical contamination that may influence the hydrology of the study area have also been considered.

13.3.2. Water features located outside the study area, but immediately within its surrounds, have been included where it appears at present that there is hydraulic connectivity to features within the study area and the possibility that they could be significantly affected. Professional judgment has been applied to identify the extent to which such features are included.

13.3.3. The flood risk study area will comprise 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).

13.3.4. The final extent of the study area will be agreed in consultation with the applicable statutory consultees and subsequently confirmed as the assessment is undertaken and refined. The study area implemented to inform the assessment will be presented within the Environmental Statement for the proposed scheme.

13.4. Baseline Conditions

13.4.1. The relevant physical characteristics of the study area and the water features present are described in this section. Refer to Figure 13 which identifies the location of surface water bodies.

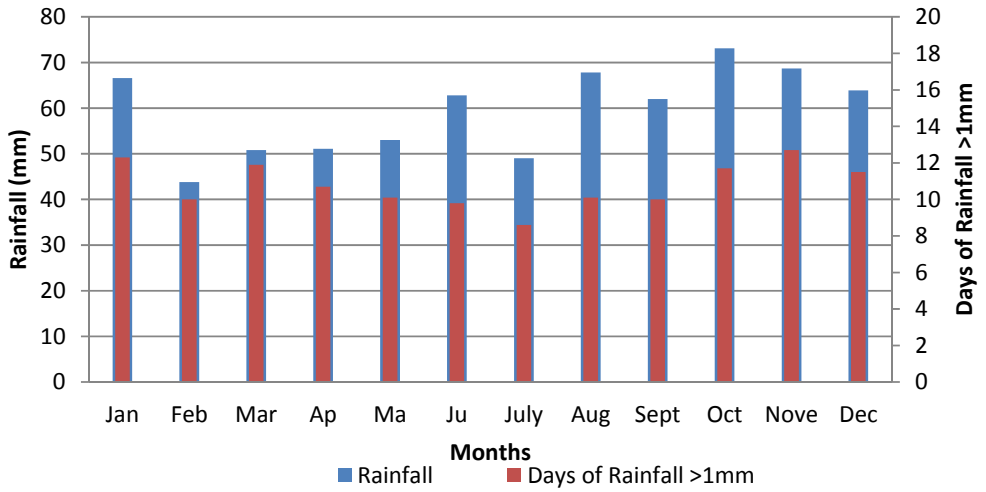
Topography, Rainfall and Land Use

13.4.2. Topographic data for the study area has been obtained from online Ordnance Survey maps. The study area is only very gently undulating with all elevations being between approximately 90m and 120m. There are valleys with low gradients around the various watercourses. To the north of the proposed scheme boundary, the land elevation is approximately 100m above ordnance datum (AOD) at Park Farm to the north of Middle Bickenhill. The land gently slopes down to Hollywell Brook (approximately 85m AOD), which is orientated west-east parallel with the A45. The land rises from Hollywell Brook towards Diddington Hall (100m AOD) to the south of the A45. The elevation then declines south towards Shadow Brook at around 95m, which also flows west to east across the existing M42. The land rises again to approximately 98m to the east at Siden Hill Wood southeast of Hampton in Arden. To the west the land rises to approximately 120m AOD at Hampton Lane Farm, east of Catherine de Barnes. Finally, to the south of the proposed scheme boundary the land rises to approximately 120m at Eastcote.

13.4.3. The proposed scheme is located within an area where the land use is predominantly arable agriculture to the east of Solihull. The northern extent of the proposed scheme borders the NEC site and to the northeast is Birmingham Airport, including associated facilities such as hotels, car parks, fuel stations and landscape features such as the ornamental Pendigo Lake. A railway line crosses the A45 south of Birmingham International Railway Station to the west of the M42 Junction 6. The proposed new road passes immediately west of the village of Bickenhill, with the village of Catherine de Barnes being within 1km of the proposed scheme to the southwest.

13.4.4. Using the Met Office website, the nearest weather station is located at Coleshill, approximately 6km north of the M42 Junction 6. Based on the available data from this weather station, it is estimated that the study area is likely to receive an average of more than 700mm rainfall per year, with it raining more than 1mm on around 129 days per year. Plate 13.1 illustrates this data to show how the average rainfall varies throughout the year (data for the period 1981 - 2010).

Plate 13.1: Coleshill Weather Station, Rainfall and Days of Rainfall >1mm



13.4.5. Plate 13.1 shows that the highest rainfall volumes are expected during the late summer through to mid-winter, with it being driest between February and May.

13.4.6. On the National River Flow Archive website, the nearest catchment with rainfall statistics is the River Cole at Coleshill (http://nrfa.ceh.ac.uk/data/station/info/28066). Standard Annual Average Rainfall (SAAR) for the period 1961 - 1990 suggests a slightly greater annual average rainfall than the Met Office with 723mm per year.

Surface Hydrology

13.4.7. From an initial review of the proposed scheme and study area, the proposed scheme and associated works would cross two Main Rivers (noting that the Main River Designation occurs just downstream of the existing M42), Holywell Brook to the north of the M42 Junction 6 and Shadow Brook immediately north of the B4102 crossing of the M42 (see Figure 13).

13.4.8. Holywell Brook flows east out of Pendigo Lake at the NEC, under the M42 parallel to the A45, with two standing water bodies connected to the brook downstream of the lake. It is a tributary of the River Blythe into which it flows approximately 1.5km downstream at SP 21390 83920.

13.4.9. Shadow Brook rises between Bickenhill and Catherine de Barnes and flows to the northeast and into the River Blythe near Diddington Hall at SP 21610 82540, approximately 2km downstream. A tributary of Shadow Brook, which is an Ordinary Watercourse, rises slightly further to the south and flows across the M42 and to the northeast north of Hampton-in-Arden and into Shadow Brook at approximately SP 20640 82240.

13.4.10. Main Rivers are a statutory type of watercourse in England and Wales, usually larger streams and rivers, but also including some smaller watercourses. The Environment Agency's powers to carry out flood defence works apply to Main Rivers only. In England Main Rivers are designated by Defra and works that can affect the flow in them are controlled through Water Activity Permits for Flood Defence enforced by the Environment Agency in accordance with the requirements of the Environmental Permitting (England and Wales) Regulations 2016 and the Water Resources Act 1991 (as amended). For Ordinary Watercourses permission will be required from the LLFA under the Floods and Water Management Act 2010 and the Land Drainage Act 1991.

13.4.11. There are several field drains and streams less than 300m west of Bickenhill, which coalesce to form a tributary of Low Brook, into which it flows close to the A45 Coventry Road. Low Brook flows northwards becoming a Main River just north of the A45. It is understood to be culverted across Birmingham Airport before eventually flowing into Hatchford Brook north of Marston Green at approximately SP 17170 86340.

13.4.12. Holywell Brook, Shadow Brook and the tributary of Shadow Brook are themselves tributaries of the WFD designated River Blythe (Blythe from Patrick Bridge to River Tame, GB104028042572). Although not specifically identified on designation maps, all tributaries of WFD waterbodies need to be assessed as part of a WFD assessment.

13.4.13. There are two other WFD designated reaches of the River Blythe within 1km of the proposed scheme including the Blythe from Source to Cuttle Brook (GB104028042400) which crosses the M42 approximately 450m south of the proposed scheme, and the Blythe from Temple Balsall Brook to Patrick Bridge (GB104028042571), the source of which is located approximately 230m east of the M42 at the southern extent of the proposed scheme.

13.4.14. While Low Brook is not WFD designated, it is a tributary of the WFD designated Hatchford-Kingshurst Brook from Source to River Cole (GB104028042490).

13.4.15. The Environment Agency's Catchment Data Explorer website provides information on the WFD designated watercourses in the vicinity of the site:

- **Blythe from Patrick Bridge to River Tame (GB104028042572)** – This waterbody flows north from Patrick Bridge at the east of Hampton in Arden to its confluence with the River Tame at Coleshill. It also includes a tributary that flows west from Meriden to meet the Blythe just south of Molands Bridge. It passes the M42 Junction 6 approximately 1.3km to the east. The watercourse receives flows from Hollywell Brook at SP 21390 83923 and Shadow Brook at SD 21612 82541, both of which are crossed by the proposed development. The waterbody is not designated artificial or heavily modified and is approximately 20.5km in length and has a catchment area of 63.04km^2. It was classified as being at Poor Ecological Status under the 2016 Cycle 2 classification due to it being Poor in terms of phosphate, macrophytes and phytobenthos. On the other hand, fish and invertebrates were classified as Good. It is also at Good Chemical Status. The watercourse is protected under the Drinking Water Directive, Nitrates Directive and Urban Waste Water Treatment Directive.
- **Blythe from Source to Cuttle Brook (GB104028042400)** – This waterbody is designated from Wood End, which is located to the northeast of Redditch, and flows generally in a northeasterly direction tracking the M42 until just south of Catherine de Barnes, where it crosses the M42 (approximately 450m south of the scheme) before continuing in a southeasterly direction to meet Cuttle Brook at Temple Balsall. It is not designated as artificial or heavily modified. It is approximately 22.9km in length and has a catchment area of 62.2km^2. It was classified as being at Poor Ecological Status under the 2016 Cycle 2 classification due to it being Poor in terms of phosphate, macrophytes and phytobenthos. Fish were classified High and invertebrates were classified as Good. It has a target of Moderate Ecological Status by 2027. It is currently classified as being at Good Chemical Status. The watercourse is protected under the Nitrates Directive.
- **Blythe from Temple Balsall Brook to Patrick Bridge (GB104028042571)** – This waterbody flows north from Cuttle Brook at Temple Balsall to Patrick Bridge to the northeast of Hampton-in-Arden. The designation also includes a tributary which has its source less than 350m to the east of the M42 at the southern extent of the proposed development, close to the sewage treatment works at Eastcote. This tributary flows directly east to meet the Blythe at Windmill farm. The watercourse is not designated artificial or heavily modified. It is approximately 10.2km in length and has a catchment area of 35.7km^2. The watercourse is at Moderate Ecological Status under the 2016 Cycle 2 classification. It is not achieving Good Ecological Status due to Moderate macrophytes and phytobenthos combined. It is also Poor for phosphate. It is however at Good Chemical Status. The watercourse is protected under the Nitrates Directive and Urban Waste Water Treatment Directive.

- **Hatchford-Kingshurst Brook from Source to River Cole (GB104028042490)** – This waterbody is designated from north of Marston Green railway station, and flows northeast to meet the River Cole north of Chelmsley Wood. It is approximately 2.3km in length with a catchment area of 44.98km^2. It is a heavily modified waterbody and is at Moderate Ecological Potential and Good Chemical Status. Biological quality elements are failing to meet Good on the basis of invertebrates, which are classified as Moderate, and not all mitigation measures being implemented. The watercourse is protected under the Nitrates Directive.

13.4.16. All of the River Blythe WFD waterbodies described above are within the Humber River Basin District, the Tame Anker and Mease Management Catchment and the Blythe Rivers Operational Catchment. Reasons for not achieving good status in the Blythe Rivers catchment are predominantly related to agricultural and rural land management, and water industry influences on these watercourses. For instance, there are known to be regular discharges from Barston Sewage Treatment Works to the River Blythe. Hatchford Brook falls within the Tame Lower Rivers and Lakes operational catchment and also received drainage from Birmingham Airport.

13.4.17. The Grand Union Canal, which crosses the B4102 less than 800m west of the proposed scheme at Catherine de Barnes, is also designated under the WFD as an artificial waterbody (Grand Union Canal, Solihull to Birmingham, GB70410204). At Catherine de Barnes the canal is aligned north-west to south-east. This designated reach is approximately 17km long and is currently at Moderate Ecological Potential as not all mitigation measures have been implemented. This is despite Biochemical Oxygen Demand (BOD) and Dissolved Oxygen (DO) both being classified as Bad. The canal is however at Good Chemical Status. As the canal will not receive flows from any waterbody that might be affected by the proposed scheme, it is unlikely to be affected by the proposed scheme. However, this will be confirmed following a site visit.

13.4.18. 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 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. River Blythe and Hatchford Brook in this instance).

13.4.19. There is an ornamental lake within the grounds of the NEC known as the Pendigo Lake, which is within 400m of the proposed scheme, and from which Hollywell Brook rises. The artificial lake is thought to be around 3m deep[34]. There are two standing water bodies connected to Hollywell Brook downstream of Pendigo Lake. There are also a number of small ponds scattered across the proposed development area, notably seven small ponds surrounding Woodhouse Farm and a relatively large pond at Diddington Hall. The majority of ponds in the area do not seem to be online as far as can be ascertained from online Ordnance Survey mapping, with the exception being those previously mentioned along Hollywell Brook, and an online pond on Low Brook east of Elmdon to the south of Coventry Road.

[34] http://www.bbc.co.uk/history/domesday/dblock/GB-416000-282000/page/3

13.4.20. There are a number of field drains within the proposed scheme study area including (see Figure 13):

- A small drain north of Wyckhams Close west of M42 Junction 6 at SP 19541 83039.
- An unnamed drain north of Park Farm, which flows east from the existing M42 (SP 199 844) towards an unnamed waterbody near Church Farm Barn, which then flows southeast to the River Blythe. This watercourses passes through disused workings (Packington Landfill Site) to the north of Little Packington.
- There are four unnamed drains to the north of Bickenhill at the existing Clock Interchange junction.
- There are four field drains to the east of Woodhouse Farm; and
- There are several artificial drains associated with a sewage treatment works at SP 192 799.

13.4.21. The River Blythe is designated as a SSSI, ID 1022297. This is due to the river being a particularly fine example of lowland river on clay, with diverse morphological features and plant communities. These features are relevant to WFD and will be an important consideration of the impact assessment. The SSSI has a current condition of 'Unfavourable – No Change' due to invasive freshwater species (DEFRA, 2016).

13.4.22. The whole of the proposed scheme study area is located within an existing Nitrate Vulnerable Zone (NVZs) for surface water, and will remain within this zone under the proposed 2017 NVZs.

13.4.23. Additional information on water quality, resources, biological diversity and WFD classifications has been requested from the Environment Agency to supplement this baseline. In addition, details of any known Private Water Supplies will be identified from SMBC.

Geology, Groundwater and Soils

13.4.24. According to the British Geological Survey website[35], the bedrock underlying the proposed scheme consists predominantly of Sidmouth Formation Mudstone. There are some areas of Branscombe Mudstone Formation – Mudstone, notably to the northeast of the proposed scheme and around Catherine de Barnes. Arden Sandstone Formation (Sandstone, Siltstone, Mudstone) is found in small patches including at the NEC, the immediate east of Bickenhill and south of Catherine de Barnes. Superficial deposits are generally sparse in the area, but there are small scattered patches of glaciofluvial deposits (sands and gravels), and this is more widespread around Catherine de Barnes. Alluvium is found in the immediate vicinity of the larger watercourses.

13.4.25. According to the Environment Agency's What's In My Backyard website[36] the bedrock aquifer designation is Secondary B. These are 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. The superficial aquifer designation is a mixture of non-classified and Secondary A aquifer. The designated areas are mainly around the NEC, Catherine de Barnes and Hampton in Arden, with other small patches scattered over the site. Secondary A aquifer are permeable layers capable of supporting water supplies at a local

[35] http://mapapps.bgs.ac.uk/geologyofbritain/home.html
[36] http://maps.environment-agency.gov.uk/wiyby

rather than strategic scale, and in some cases forming an important source of baseflow to rivers.

13.4.26. According to the Cranfield Soil and Agrifood Institute Soilscapes website (http://www.landis.org.uk/soilscapes/), the proposed scheme is underlain by slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils.

13.4.27. There are no groundwater source protection zones in the vicinity of the proposed scheme. However, the majority of the proposed scheme does lie within a drinking water safeguard zone.

13.4.28. The PCF Stage 2 EAR (WSP, May 2017a) indicates that there is a medium sized surface water abstraction point north-east of the proposed scheme, east of Little Packington on the River Blythe, which is used for agriculture or private purposes. There is also a small sized single groundwater abstraction point for agricultural processes approximately 1km north of the junction along the A452, west of Little Packington. Further details on current abstractions have been requested from the Environment Agency to inform the PCF Stage 3 assessment.

Flood Risk

13.4.29. The majority of proposed scheme route option alignment is located within Flood Zone 1 (Environment Agency Flood Map for Planning, 2017) and is therefore considered to have a low risk of fluvial flooding (less than 1 in 1,000 year, or <0.1% Annual Exceedance Probability (AEP) of fluvial or tidal flooding in any given year). 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.

13.4.30. Areas of higher risk are associated with Hollywell Brook and Shadow Brook (and associated tributaries) (EA Main Rivers). The proposed scheme alignment is shown to be at risk from fluvial flooding with Flood Zones 2 and 3 (including 3b, functional floodplain) present at the locations of the proposed watercourse crossings.

13.4.31. The risk of surface water flooding, groundwater emergence, flooding from artificial sources and sewers/drains is considered low at present across the site.

Pollution Incidents

13.4.32. The PCF Stage 2 EAR (WSP, May 2017a) reports five pollution incidents within 1km of the proposed scheme. These include one major incident on the M42 between junction 5 and 6 in 2003, which involved spillage of organic chemicals / products. The remainder were significant pollution incidents, occurring near Park Farm in 2001, at Birmingham Airport in 2002, south of Stonebridge in 2002 and adjacent to the railway in 2003. Further and up to date details of pollution incidents in the proposed scheme study area have been requested from the Environment Agency.

Sites of Ecological Importance

13.4.33. Using the multi-agency geographical information for the countryside (Magic) online map (http://magic.defra.gov.uk/), the following statutory designated sites of ecological importance are found within the vicinity of the proposed scheme:

- River Blythe SSSI, for lowland river on clay with diverse morphological features and plant communities. It has a status of ‘Unfavourable – Recovering’.
- Bickenhill Meadows SSSI which consists of two individual parcels of land (see Chapter 8: Biodiversity), and features natural lowland grasslands and is located west and east of the Catherine-de-Barnes Lane (B4438) around SP 188 816. It

has a status of 'Unfavourable – Recovering', this area features MG4/MG5 habitats that may be groundwater dependent.
- Shadowbrook Meadows Local Nature Reserve.

13.4.34. Further information on ecological protected species can be found in Chapter 8: Biodiversity.

13.5. Additional Survey Requirements

13.5.1. A Flood Risk Assessment (FRA) will be required due to some elements of the proposed scheme being partly located within Flood Zones 2 and 3. This is in accordance with the NPPF and the DMRB, an FRA is needed to determine the risks of flooding to the proposed scheme, the risks of flooding that could result from the proposed scheme, and whether flood mitigation measures would be required.

13.5.2. An information request has been submitted to the Environment Agency for a wide variety of detailed water resources and flood modelling data for the study area. This includes flood risk and associated hydraulic models, WFD reports, ecology data for the watercourses, water quality data for nearest monitoring stations, pollution incidents, discharge consents and surface and groundwater abstractions. Data had not been received at the time of writing and full details will be included in the Environmental Statement. Details on Private Water Supplies in the area have also been requested from SMBC.

13.5.3. It is proposed to collect water samples from all watercourses that may receive road drainage on a quarterly basis beginning in Autumn 2017 and ending Summer 2018 (i.e. 4 No. samples from each receiving watercourse will be collected). Samples will only provide an indication of background quality, but this will be sufficient to inform the water quality risk assessment that will be carried out for the proposed scheme to inform the need for treatment measures. Further investigation of the hydrological connectivity between watercourses and the Bickenhill SSSI and the Shadowbrook Meadows Local Nature Reserve and the potential effect in their catchments will also be undertaken.

13.5.4. Proposed scheme designs will be reviewed to inform the site investigation phase. Water drainage and asset plans will be obtained from Severn Trent Water to understand what assets they currently have in the study area and how these control surface water drainage.

13.5.5. Additional survey requirements for flood risk will depend on the availability and condition of the models received by the Environment Agency.

13.6. Value of the Environmental and Resource Receptors

13.6.1. The importance of the potentially affected water environment features has been established on the basis of a 4-point scale, using criteria outlined in DMRB, Volume 11, Section 3, Part 10, HD45/09 Road Drainage and the Environment (HD45/09) guidance.

13.6.2. Professional judgement has been applied when assigning an importance category to all water features. The WFD status of a watercourse is not an overriding factor and in many instances it may be appropriate to upgrade a watercourse which is currently at poor or moderate status to a category of higher importance to reflect its overall value in terms of other attributes and WFD targets for the watercourse. Likewise, just because a watercourse may currently be below Good Ecological Status, this does not mean that a poorer quality discharge can be emitted. All controlled waters are protected from pollution under the Water Resources Act 1991 (as amended) and future WFD targets also need to be considered.

13.6.3. Based on the current baseline data and assessed against Table 13.7, the local water resources receptors within the study area have been assigned the following importance:

- River Blythe: Very High Importance.
- Shadow Brook and Hollywell Brook: Medium to High Importance.
- All other watercourses: Medium to Low Importance.
- Pendigo Lake: Medium Importance.
- Other lakes/ponds: Medium to Low Importance.
- Groundwater: Medium importance.

13.6.4. In general, the flood risk for the proposed scheme is of medium importance given its predominantly agricultural setting.

13.6.5. The above importance levels for water receptors are provisional pending a further baseline data collection and evaluation, and review of ecological surveys of watercourses and ponds to determine the potential for relevant protected species (e.g. water vole, otter and great crested newts).

13.7. Potential Impacts and Effects

13.7.1. The proposed scheme has the potential to cause adverse effects to the water environment during its construction and operation.

13.7.2. During proposed scheme construction the following adverse effects may occur:

- Impacts on water quality, both surface and groundwater, due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through mobilisation of contamination following disturbance of contaminated ground or groundwater, or through uncontrolled site run-off and where applicable these will be considered against the potential impacts to ecological receptors; and
- Potential increase in volume and rate of surface water runoff from new impervious areas leading to an impact on flood risk.

13.7.3. During proposed scheme operation the following adverse effects may occur:

- Impacts on the surface or groundwater quality from highway run-off (including the use of de-icants) or as a result of accidental spillages.
- Impacts on hydrogeology could occur from contaminant release during accidental spillages or via unlined SuDS.
- Changes in the natural form which may have a subsequent effect on surface water drainage patterns, including local nature conservation sites.
- Potential increase in volume and rate of surface water runoff from new impervious areas leading to an impact on flood risk.
- Impacts on hydraulic processes and sediment dynamics in watercourses and their floodplains.
- Physical damage to the morphology of water bodies during construction that could have both temporary and long term impacts on the hydromorphological conditions of the water bodies.

13.7.4. It is possible that improvements to the existing drainage network for the M42 and structures conveying watercourses beneath the M42 could potential result in beneficial effects on the water environment.

13.7.5. The following section describes these impacts and effects in more detail.

Routine Runoff and Spillages

13.7.6. During construction there is a water pollution risk from runoff containing fine sediments and chemicals from spillages, as well as the potential for construction works to have adverse physical impacts to watercourse, if appropriate mitigation measures and construction methods are not implemented.

13.7.7. There is also the potential for fine sediment and chemical pollutants (both dissolved and sediment-bound) pollutants to be deposited on to the new road carriageway by passing traffic, which may be washed off with road runoff into receiving watercourses or to ground, if soakaways or unlined SuDS are proposed. Furthermore, during colder winter months de-icant salts may be applied to the carriageway and enter runoff where they may have adverse effects on receiving watercourses. An assessment is, therefore, required to determine the risk to the water environment so that appropriate treatment measures can be included in the drainage design.

13.7.8. There is also an inherent risk with highway traffic that a road traffic incident could cause a spillage (e.g. fuel, bulk transport of acid or food stuffs that could exert a biochemical oxygen demand) that might lead to a serious pollution incident, and during the operation of the road via surface water runoff that may contain pollutants as well as spillage incidents. There is also the potential for groundwater to be affected during construction and operation of the proposed scheme.

13.7.9. Runoff rates and water quality impacts should be mitigated with SuDS, with a preference for surface attenuation and bioremediation (e.g. swales, ponds and wetlands).

Watercourse and Floodplain Crossings

13.7.10. General water and environment design guidance for water body crossings (including flood risks) is a strong preference for open span structures. It is important to emphasise that this includes floodplains as well as channels. However, if poorly designed, open span crossings or more obstructive culverts can have the following adverse effects:

- Flood risks can be affected upstream and downstream of a water body crossing due to afflux and attenuation. It is important to design structures in accordance with channels and floodplains so that there is no impact on flood levels away from the crossing location. It can sometimes be necessary to extend highways site boundaries in order to provide sufficient space for hydraulic mitigation.
- Scour can result from structural flow constrictions, which can affect site or nearby assets, maintenance requirements, and habitat continuity.
- Culverting can cause direct loss of riparian, bank and bed habitats, and indirect loss due to shading effects. Culverts can also sever the continuity of the channel with the riparian, floodplain, hyporheic and groundwater zones, and alter flow dynamics and sediment transport.
- Structures can often impede the movement of migratory and other species, and interrupt the continuity of the natural hydraulic and sediment regimes.
- Excessive shading can reduce light intensity, photosynthesis, metabolic activity and biochemical cycling e.g. nitrification. It can also affect temperature, thereby limiting habitat colonisation by some species, and causes the reduction in dissolved oxygen concentration (which is directly dependent on temperature). Shading is also thought to affect fish habitat and migration. Structure dimensions and habitat sensitivity determine whether shading is ‘excessive’. It can be mitigated with multi-span structures, light chimneys, and sometimes with artificial lighting.

13.7.11. Other modifications to watercourses such as diversions can result in direct loss of habitats, and/or disruption to natural flow and sediment regimes, which can cause loss of substrate and hydraulic habitats. The cost of water body crossing is often dependent on length, so the least expensive option is usually perpendicular to the water body crossing. This may require extensive realignments and training upstream and downstream. This could mean lengthening or shortening the water body and changing channel gradients, with direct changes to physical habitat areas, and consequent changes to hydraulic / substrate habitats in terms of changes to flow velocities and substrate erosion transport or deposition.

13.7.12. New development must not cause deterioration of any relevant WFD parameter (i.e. the reduction in class of any parameter) in the WFD waterbodies described above, or prevent the improvement to meet future WFD objectives. Where a new physical modification might result in non-compliance with the objectives of the WFD, it would need to meet the requirements of Article 4.7 which includes stringent tests in terms of need, alternative options, and costs to be considered.

13.7.13. The proposed scheme may also alter the hydrological catchments of the two Bickenhill SSSI units and the Shadow Brook Meadows Local Nature Reserves. An appropriate assessment will be required to consider the risk, and should it be considered that there could be a risk to the conservation status, mitigation will be required (e.g. ensuring earthworks drainage replicates the existing situation as far as reasonably practical).

Flood Risk

13.7.14. For the majority of the route alignment the risk of flooding is considered low and the proposed scheme is expected to have little impact. However, where the highway intersects the watercourses within the study area, there is potential that the proposed crossings could cause afflux upstream of structures and as a result increase flood risk to the surrounding area.

13.7.15. The route alignment is located predominantly on undeveloped (greenfield) land currently used for agricultural purposes. Given that the proposed highway will increase the impermeable area along the entirety of its length, there is the potential for the surface water flood risk, both to the highway alignment and surrounding area, to significantly increase. As a result, surface water from the proposed scheme needs to be assessed in more detail alongside the development of a suitable drainage strategy in order to manage the risk sensitively and sustainably.

13.7.16. Whilst the risk of groundwater flooding is currently considered low, a ground investigation is proposed which will provide further information on the risk of groundwater emergence along the route alignment. Should the risk of groundwater flooding be higher, it may be necessary to prepare a groundwater mitigation strategy at the detailed design stage. It is suggested that these risks can be mitigated through appropriate flood routing and installation of appropriate drainage. Ground conditions along the alignment will also have a bearing on any attenuation measures (for example this will determine whether infiltration measures are feasible) recommended as part of the surface water management strategy. As such, these must be confirmed to enable development of an appropriate surface water drainage strategy for the new road.

13.7.17. At present the risk of flooding from sewers/drains is considered to be low due to the rural nature of the proposed scheme alignment. However, if there are sections of new road that drain to existing networks, and the change in flows are not appropriately catered for by improvements to those drainage networks, there is the potential for an increase in local surface water flood risk. Management of surface water that uses the sewer system must be considered as part of a detailed drainage strategy, and further investigation into current and required capacity will need to be carried out with Severn Trent Water where this is the case.

13.8. Summary of Mitigation Proposals

Construction Phase Mitigation Measures

13.8.1. The proposed scheme construction contractor would prepare and implement a CEMP which would include a range of measures associated to mitigate potential impacts as associated with water resources. Such measures would accord with legal compliance and best practice guidance when working with or around sensitive water resources.

13.8.2. During the proposed scheme construction phase, any discharges to surface water of 'unclean' runoff would require discharge consent. The conditions attached to any such consent, and limits on oils, suspended solids and other pollutants, would need to be adhered to by the selected construction contractor. Works undertaken above or within 8m of a watercourse would also require appropriate permissions from the Environment Agency or LLFA.

13.8.3. It is anticipated that monitoring of watercourses at risk of pollution during the construction phase would be required. Monitoring requirements and locations will be discussed and agreed with Highways England and Environment Agency during the impact assessment.

13.8.4. At the proposed scheme site there would be a requirement to protect construction plant, materials and construction workers from impacts due to flooding. Such measures would include, for example, locating construction compounds and storage areas outside of areas susceptible to flooding and having in place emergency flood response procedures. The implementation of such measures would also avoid any potential pollution of local watercourses by construction materials in the event of flooding.

Operational Phase Mitigation Measures

13.8.5. The proposed scheme design requires the existing crossings of Hollywell Brook and Shadow Brook to be widened. The channel designs for these crossings will be developed and informed by hydromorphological, flood risk and ecological assessment, but would ensure that existing flow conditions within the channels are maintained and not significantly impacted by constrictions such that there would be no significant adverse impacts on channel flooding characteristics. The morphological and ecological function of these channels will be taken into account during the design of new or modified structures and where possible opportunities for enhancement will be explored.

13.8.6. The proposed scheme would be provided with an appropriate surface water management system. The drainage for the proposed scheme would be designed and constructed in compliance with DMRB and the Manual of Contract Document for Highways Works (MCHW). The proposed drainage strategy will be developed in consultation with the Environment Agency, SMBC, Seven Trent Water and other statutory agencies, taking into account the findings of the FRA and water risk assessment prepared for the proposed scheme. The proposed drainage system will include the use of SuDS where possible to enable attenuation of surface water flows due to increases in the impermeable area as a result of the construction of the proposed scheme. Balancing ponds provided for the attenuation of flows would also provide water quality treatment reducing suspended solids, sediment-bound pollutants and soluble metals in the final discharge to receiving watercourses.

13.8.7. The 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 as described above would incorporate appropriate measures to minimise impacts associated with accidents and spillages by containing them upstream of the receiving watercourse.

13.9. Summary of PCF Stage 2 Assessment

13.9.1. The PCF Stage 2 assessment indicated that there may be a slight adverse impact to the surface watercourses at the proposed scheme from pollution with an increased size of impermeable area in the catchments. This pollution would include that from construction, routine runoff and accidental spillage. There would also be slight adverse impacts in terms of alteration to flow characteristics that may affect channel, erosive or deposition processes.

13.9.2. In terms of flooding, the PCF Stage 2 assessment suggested a moderate / large adverse risk of river flooding around Hollywell Brook and Shadow Brook. A slight adverse risk was given to surface water flooding.

13.9.3. For groundwater, a slight adverse pollution impact was identified from construction and slight adverse impact to groundwater levels and flows. A slight adverse impact was also identified for loss or indirect loss of Groundwater Dependent Terrestrial Ecosystems.

13.9.4. Standing waterbodies were given a slight adverse impact at PCF Stage 2 from pollution due to construction, routine runoff and accidental spillage.

13.9.5. The PCF Stage 2 report stated that there was uncertainty over whether significant effects are likely in relation to pollution from runoff and flood risk, with limited drainage design and flood risk strategy information available at that stage of assessment. Development of preliminary drainage designs in conjunction with a flood risk assessment and a routine runoff assessment at PCF Stage 3 will enable reassessment of the impacts, and development of the proposed scheme to minimise potential effects on the water environment.

13.10. Proposed Scope of Assessment

13.10.1. The baseline for water resources within the study area will be presented, together with an outline of the potential impacts on the water environment during construction and operational stages. Further desk study and water quality monitoring is proposed to augment the baseline data presented in this Scoping Report. This will include collecting water samples from each of the watercourses that may receive highway runoff on a quarterly basis between the Autumn 2017 and Summer 2018 (i.e. 4 No. samples from each receiving watercourse). The precise locations of sampling are yet to be determined. Each sample will be tested

for a range of physico-chemical parameters, metals and hydrocarbons that may typically be found in road runoff to establish a baseline and to inform the water quality impact assessment.

13.10.2. The potential for operational impacts will be quantitatively assessed using the methodologies contained within the DMRB Volume 11, Section 3, Part 10: Water Quality and Drainage (HD 45/09) (Ref 14.35). This will include spillage risk and the Highways Agency Water Risk Assessment Tool (HAWRAT).

13.10.3. HAWRAT highlights potential problems with routine road drainage outfalling into receiving water bodies. The outfalls from the drainage strategy will be assessed to highlight any areas where treatment is required to protect the receiving water resources – be it surface watercourses or groundwater in the case of infiltration drainage systems.

13.10.4. For any significant potential impacts the mitigation measures required to attenuate those risks would be assessed and presented.

13.10.5. A Preliminary WFD Compliance Assessment will be produced based on a combination of desk study and a hydrogeomorphological walkover survey. This will consider whether the proposed scheme has the potential to cause deterioration in ecological status/potential of waterbodies, whether the proposed scheme has the potential to prevent waterbodies from meeting their objective of good ecological status/potential, and whether the proposed scheme has the potential to prevent or compromise WFD objectives being met in other waterbodies. Depending on the outcome of the Preliminary WFD Assessment and consultation with the Environment Agency, further more detailed assessment may be required, and will be scoped at a later stage.

13.10.6. The following assessments will be required for flood risk:

- A more detailed baseline assessment of flood risk based on detailed flood maps and modelled flood extents provided by the Environment Agency.
- Assessment of the impact of the proposed crossings on flood risk elsewhere (based on hydraulic modelling of the Main River Watercourses).
- Assessment of the hydrology of the Ordinary Watercourses to determine flows and inform appropriate watercourse crossing sizes.
- Consultation with the Environment Agency through the formal Pre-Application Advice process to understand the development restrictions from their position as a statutory consultee and to determine the best way forward with regards to option selection, highway development and structure/crossing designs.
- A detailed, site specific FRA that compiles all of the information gathered and presents an acceptable way forward with regard to flood risk.

13.11. Proposed Assessment Methodology including Significance

13.11.1. The water quality and drainage assessment will be undertaken with regard to advice and methodologies set out in Department of Transport TAG Unit A3, Environmental Impact Assessment. Chapter 10 presents ‘Impacts on the Water Environment’ (Department of Transport, January 2014), and DMRB Volume 11, Section 3, Part 10: Water Quality and Drainage (HD 45/09). The assessment will consider potential impacts on water quality, impacts on flood risk and impacts on groundwater resources during proposed scheme construction and operation.

13.11.2. It is evident from reviewing the proposed scheme information that there is potential for the development to affect watercourses and floodplains, introduce new road runoff to receiving watercourses, and construction works would require new earthworks that have the potential to affect water bodies. Further assessment of the potential effects on the water environment will therefore be required as part of the EIA.

13.11.3. With reference to best practice (e.g. CIRIA guides), a qualitative assessment of the risk to the water environment during construction works will be undertaken. This will also make recommendations for mitigation measures to manage and control works during construction to avoid, prevent and minimise the risk of pollution. Liaison with the Environment Agency will be undertaken to identify any water related licences / consents/permits that may be required for construction and operation of the proposed scheme.

13.11.4. The assessment of impacts and effects on water quality and drainage associated with the proposed scheme will regard advice and methodologies set out in HD 45/09 (Ref 14.35). Paragraphs 6.6 to 6.8 of HD45/09 cover the scoping of water environment impact assessment for road schemes. This includes tests as to whether or not the project will affect watercourses, flood plains, and Source Protection Zones, how the project may alter road layouts, drainage and traffic flows, and what earthworks are required. Changes to water quality and/or drainage can have an effect on a number of services provided by the water environment. These include biodiversity of aquatic life, water supply, transport and dilution of waste products, fisheries and conveyance of flood flows. DMRB HD45/09 guidance describes the types of potential impact which may occur during the life of a road, which includes construction, operation, and maintenance phases.

13.11.5. An assessment of the potential ecological impacts of routine runoff on surface waters is required in order to determine whether there is an environmental risk and if pollution mitigation measures are needed in specific circumstances. HAWRAT was developed for this purpose and the methodology behind it has been derived from a collaborative research programme undertaken by the Highways Agency and Environment Agency which investigated the effects of routine road runoff on receiving waters and their ecology. An assessment of the potential impact to water resources from routine runoff will be undertaken using Method A from HD45/09. This assessment will also help to inform the development of appropriate water treatment measures. Should it be decided to drain road runoff to ground the Method C assessment would be used.

13.11.6. It is also important to assess the risk of a serious spillage incident occurring and for this Method D of HD45/09 would be used. This method combines various risk factors, including traffic volume, percentage of heavy goods vehicles, and the risk attributed to different types of road to determine the probability of an accident resulting in a serious pollution incident. The standard is typically 1 in 50 years, other than where the receiving watercourse is sensitive (e.g. the River Blythe is a SSSI) where it the acceptable return period increases to 1 in 100 years. The spillage risk from all road catchments will be determined and used to inform the inclusion of necessary spillage containment measures.

13.12. Flood Risk Assessment

13.12.1. The flood risk associated with the proposed scheme will be assessed in accordance with the requirements of the NPPF. Results of the assessment will be presented in a standalone FRA with summary text included in the Environmental Statement.

13.12.2. It is envisaged that the FRA will summarise the proposed surface water drainage strategy. The preparation of both of these items will include consultation with the LLFA (i.e. SMBC), Environment Agency and Severn Trent Water. The consideration of the drainage strategy will address the following in particular:

- Existing drainage regime.
- Appropriate points and rates of discharge, and other drainage constraints.
- Expected foul and surface water flows and attenuation volumes.
- Feasibility of SuDs.
- Proposed drainage strategy for foul and surface water.

13.13. Evaluation of Significance

13.13.1. The importance of the potentially affected water environment features will be established on the basis of a 4-point scale, with the magnitude of identified impacts will be determined on the basis of a 7-point scale both of which are available in HD45/09 guidance (Highways England, 2009).

13.13.2. The significance of potential water resource effects, which can be beneficial or adverse, will be obtained by combining the importance of the attribute and the magnitude of the impact. The criteria for defining significance of potential effects on the water environment can be found in DMRB, Volume 11, Section 3, Part 10.

13.13.3. Significance will be assigned after consideration of proposed mitigation that will be included within the design and construction methodology, for example a CEMP.

13.14. Assumptions and Limitations

13.14.1. The proposed drainage design strategy is subject to review and ongoing development during PCF Stage 3 – this includes confirmation of highway discharge rates and the exact nature of the watercourse crossings. The proposed drainage strategy will be further developed in consultation with the Environment Agency, SMBC, Severn Trent Water and other statutory agencies, taking into account the findings of the FRA as referred to herein.

14. CLIMATE

14.1. Introduction

14.1.1. This section presents the outcomes of the scoping assessment for the climate related topics. To align with the requirements of the EIA Regulations 2017 and the NPSNN, this section has been divided into two separate aspects:

- Greenhouse gas (GHG) impact assessment - effects on climate change of GHG emissions arising from the proposed scheme, including how the project will affect the ability of Government to meet its carbon reduction plan targets (in accordance with NPSNN para 5.17);
- Climate change resilience assessment - the resilience of the proposed scheme to climate change impacts, including how the proposal will take account of the projected impacts of climate change (in accordance with NPSNN para 4.40 and the EIA Regulations).

14.1.2. For purposes of clarity, this section addresses each of the two climate topic assessments separately. In-combination effects of a changing climate and the proposed scheme on the surrounding environment will be considered in the 'Cumulative Effects' section (Refer to Section 15) of the Scoping Study.

14.1.3. As stated in the Fifth Assessment Report (AR5) Synthesis Report published by the Intergovernmental Panel on Climate Change (IPCC)[37], mitigation (i.e. reducing GHG emissions) and adaptation (i.e. responding to climate change impacts) are complementary approaches to reducing risks of climate change impacts over different timescales.

14.1.4. Mitigation, in the short-term and medium-term, can substantially reduce climate change impacts in the latter decades of the 21st Century. Benefits from adaptation can be realised now to address current risks, and can be realised in the future to address emerging risks. Innovation and investments in environmentally sound infrastructure and technologies can both reduce GHG emissions and enhance resilience to climate change.

14.2. Study Area

14.2.1. The study area will be agreed in consultation with the applicable statutory consultees and subsequently confirmed as the assessment is undertaken and refined. The study area implemented to inform the assessment will be presented within the Environmental Statement for the proposed scheme.

GHG Impact Assessment

14.2.2. The study area will cover all GHG emissions arising during the proposed scheme construction and operation. At present the proposed scheme preliminary footprint covers an area of approximately 324 ha (i.e. the land within the redline boundary).

Resilience Assessment

14.2.3. The study area for the in-combination climate change impact assessment will be the entire proposed scheme construction footprint and the immediate surrounding natural environment.

14.3. Summary of Relevant Policy

14.3.1. Table 14.1 provides a summary of national and local policy of relevance to climate.

[37] IPCC (2014), Climate Change 2014: Synthesis Report. Web link: http://ar5-syr.ipcc.ch/topic_summary.php (accessed 12 September 2017).

Table 14.1: Legislation and Planning Policy Context

Policy	Summary of Requirements and Relevance
EIA Directive 2014/52/EU	As of May 2017, an EIA must include assessment of the impact of a proposed development on climate change (for example the nature and magnitude of GHG emissions). Transposed into UK national legislation through the Infrastructure Planning (EIA) Regulations 2017[38].
Climate Change Act 2008	Sets a legally binding target for the UK Government to reduce national GHG emissions from 1990 levels by at least 80% by 2050. The target supported by series of five-year 'carbon budgets' and an independent committee to monitor progress.
National Planning Policy Framework (NPPF)	States that the purpose of planning is to contribute to the achievement of sustainable development, and that positive improvements should be sought in the quality of the built, natural and historic environment, as well as in people's quality of life. The NPPF is supported by National Planning Practice Guidance (NPPG).
National Policy Statement for National Networks (NPSNN)	Sets out how climate change should be taken into account when developing infrastructure. Road projects require "…*evidence of the carbon impact of the project and an assessment against the Government's carbon budgets*". Evidence of mitigation is also required, for design and construction, to demonstrate that the carbon footprint is not 'unnecessarily high'.
England Biodiversity Strategy[39] (2011)	Establishes principles for considering biodiversity and the effects of climate change. The EIA will reflect these principles and identify how the Scheme's effects on the natural environment will be influenced by climate change, and how ecological networks will be maintained.
The West Midlands Local Transport Plan (2016)[40]	Published by the West Midlands Integrated Transport Authority, the plan sets out the Combined Authority's approach, objectives, indicators and development principles for an integrated transport across the West Midlands region, over a twenty year period. Stated objectives include: • Reduction of transport-related environmental impacts, including GHG emissions; and • Maintenance / development of transport infrastructure for greater reliability and resilience to climate change impacts. Principles provided to guide future transport planning and development for consideration; several have relevance to climate change related topics. For instance: use of low carbon infrastructure; use of durable materials; re-use of excavated and waste materials; incorporation of SuDS; reducing run-off rates; avoiding increased flood risks; and, 'future proofing' infrastructure for climate change impacts.
Solihull Metropolitan Borough Council (SMBC) Local Plan (2013)[41]	The plan sets out SMBC's commitment and aims relating to: • Reduction of GHG emissions by improving accessibility and encouraging sustainable travel. • Supporting national and local targets to build resilience of the

[38] Web link: www.legislation.gov.uk/uksi/2017/572/contents/made (accessed 20 September 2017).
[39] Web link: www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services (accessed 12 September 2017).
[40] The West Midlands Local Transport Plan (2016): www.tfwm.org.uk/media/2430/2026-delivery-plan-for-transport.pdf (accessed 20 September 2017).
[41] Solihull Metropolitan Borough Council Local Plan (2013): www.solihull.gov.uk/Portals/0/Planning/LDF/Local_Plan_Final.pdf (accessed 20 September 2017)

Policy	Summary of Requirements and Relevance
	community and environment to climate change. The plan recognises the need for developers in ensuring resilience to the impacts of a changing climate for the anticipated lifespan of the development through consideration of a range of adaptation measures, including the location, design, materials, build and operation of developments.
Solihull Climate Change Strategy (2009)[42]	The strategy recognises the transport is a significant source of GHG emissions in the area, and commits to taking action to reduce these emissions.

14.4. Baseline Conditions

GHG Impact Assessment

14.4.1. The baseline for the lifecycle GHG impact assessment will be a business as usual scenario whereby the proposed scheme does not go ahead, for those lifecycle stages that have been scoped into the assessment.

Climate Change Resilience Assessment

14.4.2. Historical climate data recorded by the closest weather station to the study area (Coleshill Weather Station) for period 1981 - 2010 indicates the following:

- Average annual maximum daily temperature was 13.8°.C
- Warmest month on average was July (mean maximum daily temperature of 21.8°C).
- Coldest month on average was January (mean daily minimum temperature of 6.9°C).
- Mean annual rainfall levels were 712.4mm.
- Wettest month on average was October (73.1mm of rainfall on average for the month).
- Driest month on average was February (43.8mm of rainfall on average for the month).
- Windiest month on average was January.
- Least windy month was August.

14.4.3. The Local Climate Impacts Profile for Birmingham (2008) covers the metropolitan borough directly adjacent to the proposed scheme area, and analyses the impact that climate change and severe weather has had on Birmingham and the surrounding areas from 1998 to 2008. Within this ten year period, there were 75 significant weather events identified, some of which also affected the whole West Midlands region. The tornado July 2005 event, the flooding events of June and July 2007 and the heatwave of July 2006 are the three most significant weather events within the ten year period. The scale of impacts of the weather events demonstrates generally that significant disruption, damage and casualties have increased and impact levels have intensified from 1998 onwards.

14.4.4. Specifically relating to highways, flooding on major roads on numerous occasions has resulted in access and use issues, placing pressure on the Highways and Drainage Department of Birmingham City Council, the Environmental Agency, and the West Midlands Fire and Rescue Service.

[42] Solihull Council Climate Change Strategy (2009): www.solihull.gov.uk/Portals/0/StrategiesPlansPolicies/LandscapeandEcology/Solihull_Climate_Change_Strategy.pdf

14.4.5. The UK Climate Projections 2009 (UKCP09) for the West Midlands suggest that, by the 2050s, the region will experience:

- An increase in summer mean temperature of 2.6°C, and an increase in winter temperatures of 2.1°C.
- A decrease in summer mean precipitation of 17%, and an increase in winter mean precipitation by up to 13%.

14.4.6. The Climate Change Strategy for Solihull (2009) summarises projected changes in the climate for the West Midlands region, and identifies transport as one of the key aspects in the region that will be affected by climate change. An example relevant to road infrastructure is higher temperatures in summer increasing demand for water, reducing water availability and drying out soils, potentially leading to subsidence.

14.4.7. A more in-depth review of available and relevant information sources will be undertaken during preparation of the Environmental Statement to establish baseline data and current understanding with regards to climate change and extreme weather risks.

14.5. Value of the Environment and Resource Receptors

GHG impact Assessment

14.5.1. GHG emissions have a cumulative impact on a global scale. Identifying local receptors that would be directly impacted by the proposed scheme is not relevant. In the broader scale, the immediate receptor has been defined as UK national GHG inventory.

14.5.2. Sensitivity of the national GHG inventory to emissions from the proposed scheme is defined as the impact on the country's ability to reach its desired GHG reduction target. However, this is not practically measurable due to the influence that other regional and national activities (both existing and predicted) will have on the outcome.

14.5.3. Receptor sensitivity will, therefore, be based on the magnitude of calculated emissions.

Climate Change Resilience Assessment

14.5.4. By default, the 'receptor' for the climate change resilience assessment comprises the proposed scheme itself.

14.6. Potential Impacts and Effects

GHG Impact Assessment

14.6.1. There is good scientific evidence to show that climate is changing because of emissions of GHG resulting from human activity, with global consequences.

14.6.2. By the very nature of any transport infrastructure scheme, no matter the nature or level of mitigation measures implemented, there will be effects relating to GHG emissions, as materials will be used and construction activity will occur. Limitations exist in the feasible alternatives for scheme design and materials specification due to legal requirements for quality and safety considerations in UK road schemes.

14.6.3. A lifecycle approach will be followed to identify the potential key contributing GHG emission sources and / or activities associated with the proposed scheme (refer to Table 14.2). This approach is consistent with the principles set out in BS EN 15804, PAS 2080, and associated IEMA guidance.

Table 14.2: Key Potential GHG Emissions Sources

Lifecycle Stage	Activity	Primary Emission Sources
Pre-construction stage	• Enabling works	• Vehicles and fuel use for generators on site • Workers travelling to / from the site
	• Land clearance	• Loss of carbon sink
Product stage	• Raw material extraction and manufacturing of products required for the proposed scheme[43]	• Embodied GHG emissions
Construction process stage	• On-site construction activity • Transport of construction materials (where not included in embodied GHG emissions) • Transport of construction workers • Disposal of construction waste	• GHG emissions from vehicle use • GHG emissions from disposal of waste.
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 Change Resilience Assessment

14.6.4. The proposed scheme itself may be vulnerable to a range of climate change risks. These include, but are limited to:

- Material deterioration due to high temperatures and also from periods of heavy rainfall.
- Flood risk on within the network and damage to drainage systems.
- Storm damage to structures and other assets.

14.7. Proposed Scope of the Assessment

GHG Impact Assessment

14.7.1. The proposed scheme comprises a major road improvements project, which will involve significant construction materials and activities (including change of land use). On this basis all lifecycle stages have been scoped in for the lifecycle GHG assessment.

14.7.2. The only exception to this comprises the decommissioning stage, as the decommissioning or renewal of the infrastructure comprising the proposed scheme is not reasonably foreseeable.

[43] Excludes transport unless by exception – see construction process stage.

Climate Change Resilience Assessment

14.7.3. Climate change effects are already impacting the reliability of local transport infrastructure; indeed, one of the stated objectives of the proposed scheme is to increase resilience and reliability of the network (refer to Section 2.2). Based on this, an assessment of climate change resilience will be conducted.

14.8. Proposed Assessment Methodology including Significance

GHG Impact Assessment

14.8.1. The proposed scope of the assessment will include product and construction process stages, as identified in Table 14.2.

14.8.2. It is anticipated that whilst the proposed scheme will have a design life in practice, the proposed scheme will be maintained beyond this timeframe and therefore including the GHG emissions with is demolition and decommissioning is not realistic or relevant.

14.8.3. In line PAS 2080: Carbon Infrastructure and World Business Council for Sustainable Development / World Resources Institute (WRI) Greenhouse Gas Protocol guidelines, the GHG emissions study will be reported as tonnes of carbon dioxide equivalent (tCO2e) and consider the six Kyoto Protocol gases, namely:

- Carbon dioxide (CO_2);
- Methane (CH_4);
- Nitrous oxide (N_2O);
- Sulphur hexafluoride (SF_6);
- Hydrofluorocarbons (HFCs); and
- Perfluorocarbons (PFCs).

14.8.4. GHG emissions will be assessed using a calculation-based methodology as per the below equation:

Activity data x GHG emissions factor = GHG emissions value

14.8.5. In order to undertake the analysis, two types of data will be collected for the GHG assessment: activity data and GHG emissions factors.

14.8.6. A set of standard data quality principles will be applied so that the results from the GHG assessment are as accurate and representative as possible:

- **Age:** Activity data and GHG emissions factors applicable to the study period will be used;
- **Geography:** Activity data will reflect the design of the proposed scheme. GHG emissions factors will be representative of the UK construction industry and UK transport sector;
- **Technology:** The default solution will be to apply data which is representative of the UK construction industry and transport sector. However, technology specific data may be used for the purpose of developing scenarios of the future;
- **Methodology:** Activity data will be gathered from the proposed scheme's engineering and design teams to enable consistency and completeness of data collection; and
- **Competency:** Data gaps will be addressed through, for instance, peer reviewed papers (published in recognised journals) or industry specific literature (e.g. UK construction trade associations). GHG emissions factors from a range of sources will be used: Environmental Product Declarations (adhering to BS EN 15804 standard), lifecycle assessment tools (aligned with best practice), and industry specific and UK Government sources.

14.8.7. In line with the NPSNN (2014)[44], significance of impacts will be assessed by comparing estimated GHG emissions arising from the proposed scheme with UK carbon budgets, and associated reduction targets.

14.8.8. In line with Schedule 4 Part 5 of the EIA Regulations, a description of the likely significant effects of the development on the environment, resulting from the vulnerability of the project to climate change, will be provided.

14.8.9. The emissions assessment outcomes will also be put into context in terms of sector specific carbon impacts by comparing estimated project emissions against other similar infrastructure schemes.

Climate Change Resilience Assessment

14.8.10. This assessment will address the resilience assessment of the proposed scheme to climate change impacts. The assessment will include all infrastructure and assets associated with the proposed scheme. It will assess resilience against both gradual climate change, and the risks associated with an increased frequency of extreme weather events.

14.8.11. The assessment will include all infrastructure and assets associated with the proposed scheme. It will assess resilience against both gradual climate change, and the risks associated with an increased frequency of extreme weather events as per the UKCP09 climate change projections.

14.8.12. The assessment will assume that the proposed scheme will be designed to be resilient to impacts arising from current weather events and climatic conditions, and designed in accordance with current planning, design and engineering practice and codes. The assessment will also identify and take into account the existing resilience and adaptation measures for each risk either already in place or in development for infrastructure and assets.

14.8.13. The degree to which the frequency of these potential hazards may change as a result of climate change is explained in the UKCP09 climate change projections.

14.8.14. In line with Schedule 4 Part 5 of the EIA Regulations, a description of the likely significant effects of the development on the environment, resulting from the vulnerability of the project to climate change, will be provided.

14.9. Assumptions and Limitations

14.9.1. The methodology as detailed above assumes that the following information is available:

- Information on energy use, types and quantities of materials used and waste generated will be available during the design process. Where it is not available assumptions based on industry approximations and professional best practice will be made.

14.9.2. GHG Emissions from the end of life stage of the proposed scheme have been scoped out of the assessment due to the anticipated operational length of the proposed scheme.

14.9.3. All assumptions and limitations, including any exclusions, together with assumptions for choices and criteria leading to exclusion of input and output data will be documented as part of the assessment.

[44] National Policy Statement for National Network', UK Department for Transport (December 2014). Web link: www.gov.uk/government/uploads/system/uploads/attachment_data/file/387222/npsnn-print.pdf (last accessed on 4th October 2017)

15. CONSIDERATION OF COMBINED AND CUMULATIVE EFFECTS

15.1. Introduction

15.1.1. The Environmental Statement will include a chapter on potential combined and cumulative effects, where:

- **Combined effects** are those that result from a single project. Such effects can be created by the interaction of different environmental effects acting upon a single receptor e.g. a specific receptor being subject to noise, air quality and visual effects associated with a proposed development.
- **Cumulative effects** are created when the effects of the proposed scheme acting together with any effect associated with other proposed developments within the same vicinity.

15.1.2. Combined and cumulative effects thus result from multiple actions that accrue over time and space. They are generally additive or interactive in nature.

15.2. Study Area

15.2.1. The study area will not be defined prior to undertaking the assessment, but will depend on the findings of specialist topics and information on the extent of impacts of other developments in the area.

15.3. Potential Impacts and Effects

15.3.1. A cumulative impact appraisal was undertaken at PCF Stage 2, the results of which are summarised below. The assessment will be updated during PCF Stage 3 to take into account any additional proposed developments within the vicinity of the proposed scheme and the results of the proposed scheme environmental assessment.

Combined Effects

Construction

15.3.2. The PCF Stage 2 appraisal indicated that some of identified receptors have the potential to experience combined effects associated with dust, air emissions, noise, severance and visual intrusion during the proposed scheme construction phase - these receptors include (but are not limited to):

- Properties located in Bickenhill and along Catherine De Barnes Lane (B4438);
- Users of NMU facilities which comprise of, but not limited to, the PRoWs and cycleways that cross the study area.
- The GAA.
- Aspbury's Copse Ancient Woodland and Bickenhill SSSI and a number of LWSs.

15.3.3. Mitigation measures to control individual impacts, as well as potential combined effects, will be developed during PCF Stage 3 through design when a greater understanding and appreciation of the potential impacts are identified.

Operational Phase

15.3.4. There is the potential for combined effects during operation of the proposed scheme, both beneficial and adverse. These effects will be identified and discussed as part of the assessment.

15.3.5. However, the proposed scheme would include appropriate landscape mitigation planting which would progressively mature and integrate the proposed scheme into the prevailing landscape. As such, whilst operational combined effects would be potentially permanent, they are anticipated to reduce with time as the proposed scheme landscape design matures. In addition to a number of noise reduction measures, excess material production ecological mitigation features will be explored to reduce operational combined effects as far as practicable.

Cumulative Effects

15.3.6. An initial assessment of cumulative effects has identified that there is the potential for cumulative effects with a number of developments within proximity to the proposed scheme. At present developments that fall within the proposed scope of the assessment, with the potential to cause cumulative effects include:

- *Extra* MSA Site.
- High Speed 2 (HS2) main line.
- HS2 Birmingham International Station.
- Airport NEC Integrated Transport Access Regional Infrastructure Fund (ANITA RFA) – public transport improvements project.
- A45 Transport Corridor Regional Growth Fund.
- Birmingham Airport Runway Extension Planning Application (2008).

15.3.7. Cumulative effects associated with these developments may be generated by a change in air quality emissions and noise levels, loss of ecological resources, changes to the area ability to manage flood risk events through to changes to agricultural land and land uses, and changes to landscape and amenity.

15.4. Population and Health

15.4.1. There is no consolidated methodology or practice for this topic, however the scope of the assessment is considered to be covered by existing Highways England Guidance as set out below. This recognises the specific requirements of the NPSNN for consideration of health, specifically within paragraphs 4.79-4.82. This will address health by utilising the following guidance:

- Air Quality: HA 207/07, IAN 185/15, IAN 175/13, IAN 174/13, IAN 170/12;
- Noise and vibration: HD 213/11, IAN 185/15;
- Road Drainage & The Water Environment HD 45/09; and
- Equestrians, Cyclists, and Community Effects: DMRB Volume 11 Section 3 Part 8.

15.4.2. It is considered that these assessments, conducted principally in isolation as is required by their methodologies, will not provide a sufficient analysis of the effects of the proposed scheme. To enable such conclusions to be drawn, a qualitative assessment of information collated via the topic assessment listed above will be undertaken and presented within the Cumulative Effects section of the Environmental Statement.

Significance Criteria for Population and Health

15.4.3. Reporting of population and health effects will be provided within the relevant topic chapters. The Environmental Statement will set out the methodology recognising the requirements of the NPSNN (2014), including how significance of effects are to be determined.

15.5. Methodology

15.5.1. The assessment of the combined and cumulative effects of the proposed scheme will draw upon the guidance provided by the DMRB Volume 11 Section 2 Part 5: Assessment and Management of Environmental Effects. Cumulative effects will be reported in accordance with the guidance provided in paragraph 3.23 of HD48/08 (HA, 2008). The proposed methodology also takes into account Planning Inspectorate's Advice Note 17 – Cumulative effects assessment relevant to NSIPs[45].

15.5.2. DMRB guidance suggests that it is appropriate to consider the cumulative effects of the proposed scheme, other existing or consented developments, and schemes that are 'reasonably foreseeable' to occur within the timescale of the proposed development. As stated in DMRB guidance, 'reasonably foreseeable' is interpreted to include other projects that are 'committed' - these will include (but not necessarily be limited to):

- Trunk road and motorway projects that have been confirmed (i.e. those that have gone through the statutory processes).
- Development projects with valid planning permissions as granted by the Local Planning Authority, and for which an EIA is a requirement or for which non-statutory environmental impact assessment has been undertaken.

15.5.3. Further guidance on the definition of reasonably foreseeable schemes has been provided in a Cumulative Assessment Requirements Instruction Note (Highways England, 2013). 'Committed' projects should not necessarily be limited to those with planning permission or other statutory permissions.

15.5.4. Land allocations on their own will not be considered as there is no certainty that developers will come forward with projects, whilst the nature and programme for such projects (and their associated environmental effects) are unknown.

Combined Effects

15.5.5. The assessment methodology for combined effects will involve the identification of effect interactions associated with the proposed scheme upon separate environmental resources. The significance of construction and operational phase environmental effects will be brought forward from the technical chapters of the EIA into a matrix, providing a clear summary of potential effects upon defined environmental resources. The potential significance of identified combined effects upon environmental resources will be based upon the balance of significance scores (refer to sections below on significance).

Cumulative Effects

15.5.6. A review of other potential developments in the vicinity of the proposed scheme will be undertaken through liaison with the local planning authorities. It is anticipated that such developments will be included within the traffic model being used to assess the traffic impacts of the proposed scheme. The developments to be included in the cumulative impact assessment will be agreed with Highways England and the local planning authorities prior to the assessment being undertaken.

15.5.7. The cumulative effects assessment will then involve the identification of potential changes that could be caused by other future developments together with the

[45] https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2015/12/Advice-note-17V4.pdf

proposed scheme using professional judgement. Rather than reporting every interaction, the proposed methodology for the assessment of cumulative effects will concentrate on the main potential significant effects, aiming to differentiate between permanent, temporary, direct, indirect and secondary effects, positive or negative effects. The following factors will be considered in determining the potential significance of cumulative effects:

- Which receptors/resources would be impacted.
- How activities would change the condition of the receptors/resources.
- The likelihood of impacts occurring.
- The ability for the receptors/resources to adsorb effects before changes becomes irreversible.

Significance of Effects

15.5.8. The significance of potential combined and cumulative effects will be determined in accordance with Table 2.6 of DMRB Volume 11, Section 2, Part 5 (HA 205/08) as shown in Table 15.1.

Table 15.1: Terminology Used to Describe the Potential Significance of Combined and Cumulative Effects

Significance	Effect
Severe	Effects that the decision-maker must take into account as the receptor / resource is irretrievably compromised.
Major	Effects that may become key decision-making issue.
Moderate	Effects that are unlikely to become issues on whether the project design should be selected, but where future work may be needed to improve on current performance.
Minor	Effects that are locally significant.
Not Significant	Effects that are beyond the current forecasting ability or are within the ability of the resource to absorb such change.

15.5.9. Where potentially significant combined and cumulative effects are identified, additional mitigation proposals will be recommended as applicable. Some such mitigation measures may be beyond the control of Highways England for the proposed scheme, but could provide useful guidance to relevant planning authorities when considering other development planning applications.

16. SUMMARY, CONCLUSIONS AND NEXT STAGES

16.1. Characteristics of the Development

16.1.1. The proposed scheme involves the construction of a new bypass, a new junction on the M42 in addition to upgrades and improvements to the existing M42 Junction 6 and the Clock Interchange Junction - which is classed as an NSIP.

16.1.2. The Junction 6 scheme would help facilitate significant economic growth in the area given that it would lie at the heart of an area of dynamic growth and is surrounded by a unique mix of existing and proposed major assets that serve both the local and wider economy. Junction 6 is the gateway to an expanding Birmingham Airport, the NEC, Birmingham Business Park and Jaguar Land Rover (JLR).

16.1.3. In addition to the committed growth in the area, there is also the proposed addition of HS2's Birmingham Interchange station planning to be operational by 2026 and SMBC's ambitious plans for mixed use development of UKC. All of these will continue to add significant demand to the network and increase dependence on Junction 6.

16.1.4. Current congestion and journey reliability issues on the M42 and at J6 are a significant constraint to future investment and economic growth. Without infrastructure investment to improve the junction, a major investment opportunity of national significance could be lost.

16.2. Location of the Development

16.2.1. The proposed scheme would be located to the west of the existing M42 Junction in the area of green belt between junctions 5 and junctions 6 and would involve tie-in points to the existing Strategic Road Network (SRN) at the following locations; M42 Clock Interchange (SP: 18778 82970) and a proposed junction (SP: 19307 81306); and junction enhancements at the existing M42 Junction 6 (SP: 19819 83061).

16.2.2. The M42 Junction 6 provides connections between the national motorway network, and A45 Coventry Road which provides strategic access to Birmingham, to the west, and Coventry to the east. J6 lies on the eastern edge of Birmingham, approximately nine miles from the city centre, with its nearest town being Solihull.

16.2.3. M42 J6 lies at the heart of an area of dynamic growth and is surrounded by a unique mix of major assets that serve both the local and wider economy. It is located just north of Solihull centre and provides the main access to an expanding Birmingham Airport, JLR, the NEC and Birmingham Business Park.

16.3. Characteristics of Potential Impacts and Effects

16.3.1. Proposed scheme construction activities have the potential to give rise to a range of potential environmental impacts, and resultant effects (e.g. temporary offices, construction compounds, material storage areas and worksites; temporary accesses and haul routes; demolition of structures, removal of existing infrastructure; vegetation clearance, soil removal; ground and excavation works; routing of services and utilities). Activities during the proposed scheme operation phase that might give rise to environmental impacts, and resultant effects, related to changes in traffic flow and composition (potential for consequential noise and air quality impacts); additional street lighting and signs; and highway maintenance and management practices.

16.3.2. Table 16.1 summarises the proposed scope of the EIA, which is based upon the consideration of potential impacts and the significance of potential effects.

Table 16.1: Summary of Proposed Scheme EIA Scope

Air Quality	There are existing areas of poor and relating good air quality within the study area, which is considered representational of the rural landscape and the infrastructure corridor of the M42, where associated traffic emissions along the M42 showed an increase in close proximity to the roadside that dispersed further away from the road. The proposed scheme would alter the location and patterns of traffic flows, which in turn could impact upon air quality. However, whilst the proposed scheme is not anticipated to result in significant air quality effects, air quality will be considered in detail in the Environmental Statement due to the nature of the proposed scheme.
Cultural Heritage	The proposed scheme has the potential to impact upon a limited number of cultural heritage receptors in the vicinity of the proposed scheme, namely Bickenhill Conservation Area in addition to impacts on the setting of both designated and undesignated heritage assets. The is also the potential for impacts upon both designated and undesignated archaeological remains given the proposed scheme would in the majority be constructed within greenbelt which is currently agricultural land. Thus a detailed assessment will be undertaken which will assess the potential impacts of the proposed scheme on archaeology and identified heritage assets, including their setting.
Landscape and Visual Impacts	Given the nature of the proposed scheme has the potential to generate a range of landscape and visual. Landscape effects would reduce over time following maturation of the proposed scheme landscaping. Visual effects upon representative viewpoints during proposed scheme construction and operation have the potential to range from negligible to major adverse in the short term (depending on the receptor sensitivity and the predicted impact magnitude), although effects would reduce over time again due to maturation of the proposed scheme landscaping. As a consequence, it is proposed that a detailed assessment will be undertaken which will assess the potential effects of the proposed scheme on identified the prevailing landscape and visual receptors.
Biodiversity	The proposed scheme as the potential to result in impacts to Castle Hill Farm Meadows LWS (due to habitat loss), Bickenhill SSSI in the event of uncontrolled construction activities and possible changes in water and air quality emissions during operation and Aspbury's Copse Ancient Woodland due to partial loss. In addition to potential impacts upon a range of ecological habitats and species. A key challenge will be to deliver a proposed scheme design that delivers no-net-loss of biodiversity in the long term through appropriate mitigation and enhancement. Given the potential ecological and biodiversity effects of the proposed scheme, a detailed assessment will be undertaken and reported in the Environmental Statement.
Geology and Soils	There are a number of locations along the proposed scheme where contaminated materials may be encountered in addition to agricultural soils being lost. However, with appropriate design of the proposed scheme taking into account prevailing ground conditions, and adherence to appropriate construction and operational practices that accord with legal compliance and best practice guidance when working with or around contaminated materials, effects associated with soils and geology are predicted to be of no more than minor significance. Given that most geology and soil effects can be appropriately managed, a simple level of assessment will be undertaken and reported in the Environmental Statement.
Materials	The proposed scheme would require primary aggregates and a wide array of construction materials. In addition, the proposed scheme would generate a range of waste types, primarily inert and non-hazardous waste.

	The majority of wastes produced would be inert construction and demolition wastes resulting from the construction of scheme in cutting for the majority of the alignment to varying depths. The proposed assessment will focus on quantifying volumes of materials and waste arising, identifying mitigation measures to reduce the volumes and assessing the effects on the local environment. The assessment will investigate the likely availability of materials and as part of the design process will recommend measures to drive resource efficiency. It is proposed at this stage a Simple level of assessment will be undertaken with the need for a Detailed level of assessment being based upon the findings of this initial Simple assessment (as defined in IAN 153/11).
Noise and Vibration	Given the very close proximity of receptors of high sensitivity to the proposed route alignment (predominantly residential properties); there is the potential for significant adverse construction noise effects. During proposed scheme operation, noise effects at residential receptors may range from moderate beneficial to large adverse. Given the potential noise effects of the proposed scheme, a detailed assessment will be undertaken and reported in the Environmental Statement.
People and Communities	The proposed scheme has the potential to affect journeys and conditions for pedestrians and other non-car based travellers - the facilities for such uses included in the proposed scheme design aim to provide at least the level of provision that exists at present with enhanced provisions where deemed appropriate and reasonable. In addition, the proposed scheme would affect the driving environment and reduce delays, with knock on benefits for driver stress. A simple assessment of the proposed scheme on the effects on all travellers will be undertaken taking into consideration receptors within the proposed scheme extent. The proposed scheme also has the potential to impact upon local communities and private assets, particularly in relation to the demolition of private property, community severance, and effects on agricultural land and individual farm units. It is thus proposed that a detailed assessment is undertaken on the effects of the proposed scheme on community and private assets.
Road Drainage and the Water Environment	The main sensitive water features in the vicinity of the proposed scheme are River Blythe and its tributaries that are present or cross the proposed works in some degree, and Bickenhill SSSI which has habitats that may be groundwater dependent. Due to a small element of proposed works currently anticipated to be constructed within a flood zone 2/3, a flood risk assessment will be undertaken as part of PCF Stage 3 to identify flood storage / compensation areas (if required) in order to avoid significant effects. Given the presence of water sensitive receptors and the risks associated with flooding, a detailed assessment will be undertaken and reported in the Environmental Statement.
Climate	Regardless of the nature or level of mitigation measures implemented, GHG emissions will be generated throughout the life span of the proposed scheme, which will, to some extent, affect the UK Government's ability to meet legally binding GHG emissions reduction targets. Potential GHG emissions arising from the proposed scheme include: fuel consumed by vehicles and plant during enabling works and construction, embodied carbon in the raw materials and products used, and the fuel consumed during the additional vehicle journeys enabled by the scheme. Therefore, a lifecycle GHG impact assessment will be conducted and reported in the Environmental Statement. Due to the nature and location of the proposed scheme, it has the potential to impact the overall resilience of the surrounding environment against the projected impacts of climate change (e.g. the proposed scheme has the

	potential to exacerbate local flood risk due to increased run off during periods of heavy rainfall). Therefore, an in-combination climate change impact assessment will be conducted and reported in the Environmental Statement. The region is already experiencing extreme weather events that impact on the highway network. Climate projections indicate that, over the coming decades, the region will experience increased temperatures and precipitation, both of which have the potential to affect the reliability and integrity of the proposed scheme. Therefore, an assessment of the scheme's resilience to projected climate change will be conducted and reported in the Environmental Statement.
Cumulative Effects	The Environmental Statement will present a two-stage approach to assessing potential cumulative effects. The first stage will identify potential combined effects – namely the potential for several different environmental effects associated with the proposed scheme acting upon single receptors. The second stage will consider potential cumulative effects resulting from proposed scheme effects acting together with the effects from other development proposals within the study area. Mitigation measures will be recommended as guidance for planning authorities when considering other applications in the vicinity of the proposed scheme.

16.4. Conclusion

16.4.1. The characteristics of the proposed scheme, together with the prevailing local environmental conditions, indicates that proposed scheme construction and operation has the potential to generate some potentially significant environmental effects. The proposed scope of the environmental assessment that will be reported in the Environmental Statement seeks to predict the likely effects of the proposed scheme, following the appropriate inclusion of impact avoidance measures in the proposed scheme design and following the implementation of appropriate mitigation and management measures that aim to reduce effects to non-significant levels. The proposed assessment will also identify potential beneficial effects and allow for potential enhancement opportunities to be identified and included in the proposed scheme design where feasible.

16.5. Next Stages

Preliminary Environmental Information Report

16.5.1. The next step in the EIA process will be the preparation and publication of the PEIR. The focus of the PEIR is to enable the local community to understand the potential environmental effects of the proposed scheme, and thus to inform their consultation responses regarding the proposed scheme.

16.5.2. Details of how the PEIR will be published and consulted upon will be set out in the Statement of Community Consultation to be published in late 2017.

16.5.3. The PEIR will be 'preliminary' whose function is to obtain the views of various stakeholders (including the wider community) regarding the proposed scheme. During this time the proposed scheme design and EIA process will be on-going and thus the understanding of the likely environmental effects of the proposed scheme would be evolving as new information and mitigation details emerge. As such, the red line boundary as detailed in Figure 1.1 is anticipated to change as the proposed scheme design evolves.

DCO Application and Environmental Statement Structure

16.5.4. It is anticipated that the Environmental Statement will be submitted as part of the DCO application in 2018. Once the application has been accepted by the PINs,

there is a set period for the DCO process. It is anticipated that the Secretary of State's decision would be made in 2018. Details of the acceptance and evaluation process as applicable to the proposed scheme will be published on the National Infrastructure Planning website.

16.5.5. The proposed structure of the Environmental Statement is set out in Table 16.2.

Table 16.2: Outline Structure of Proposed Environmental Statement

Non-Technical Summary	Summary of the Environmental Statement using non-technical language.
Volume 1: Main Document	
Chapter 1:Introduction	Introducing the proposed scheme, the applicant, the purpose of the Environmental Statement and an outline of previous related documents.
Chapter 2: Site and Surroundings	Chapter will set out the context of the proposed development, any relevant designations and sensitive receptors. This chapter will identify land that could be directly or indirectly affected by the proposed development, taking into account any associated auxiliary facilities, landscaping areas and potential off-site mitigation or compensation schemes.
Chapter 3: Proposed Scheme Description	The description will clearly define: The elements of the proposed development which are integral to the Nationally Significant Infrastructure Project; The 'associated development' under the Planning Act 2008; and The ancillary matters. The description will include, where appropriate, land use requirements; site preparation; construction processes and methods; transport routes; gantries, signage and lighting; operational requirements; maintenance activities; emissions (water, air and soil pollution, noise, vibration and light). The description will include an outline of the likely construction phasing and processes, including plans of temporary works, site compounds and permanent and temporary changes to local roads.
Chapter 4: Scheme History and Alternatives	An outline of the main alternatives considered will be presented as a separate chapter.
Chapter 5: EIA Methodology and Consultation	A summary of the scoping consultation results, including responses from consultation bodies.

Chapter 6: Air Quality **Chapter 7: Cultural Heritage** **Chapter 8: Landscape** **Chapter 9: Biodiversity** **Chapter 10: Geology and Soils** **Chapter 11: Materials** **Chapter 12: Noise and Vibration** **Chapter 13: People and Communities** **Chapter 15: Road Drainage and the Water Environment** **Chapter 16: Climate**	Chapters 6 - 17: will assess and explain the possible effects of the proposed scheme in relation to a series of specialist topics that will cover specific aspects of the environment. Each of the specialists' chapters will describe the following: An executive summary; An introduction to the subject (including legislation, policy and regulatory framework to the subject); Baseline environmental conditions; The likely significant adverse or beneficial changes in environmental conditions that could arise from the proposed scheme; The proposed mitigation measures; and An assessment of the residual effects.
Chapter 17: Assessment o Cumulative Effects	This chapter will present the inter-relationships and cumulative effects between the subjects covered in Chapters 6 -16, and between this project and other developments in the adjacent area.
Chapter 18: Summary of Residual Effects	Residual effects to be presented in a table.
Volume 2: Figures	
Volume 3: Technical Appendices	

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18. ABBREVIATIONS

AADT	Annual Average Daily Traffic
AEP	Annual Exceedance Probability
AD	Anno Domini
ADMS	Atmospheric Dispersion Modelling System
ALC	Agricultural Land Classification
AOD	Above Ordnance Datum
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
BAP	Biodiversity Action Plan
BCC	Birmingham City Council
BGS	British Geological Survey
BMVL	Best and Most Versatile Land
BOD	Biochemical Oxygen Demand
BS	British Standard
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environmental Management
CO_2	Carbon Dioxide
CoPA	Control of Pollution Act
CL:AIRE	Contaminated land: Applications in Real Environments
CRoW	Countryside and Rights of Way
CRTN	Calculation of Road Traffic Noise
dB	Decibel
DCO	Development Consent Order
Defra	Department for the Environment Food and Rural Affairs
DfS	Departure from Standard
DfT	Department for Transport
DCLG	Department for Communities and Local Government
DTM	Digital Terrain Model
DMRB	Design Manual For Roads and Bridges
DO	Dissolved Oxygen
EAR	Environmental Assessment Report
EC	European Community
EcIA	Ecological Impact Assessment
EHO	Environmental Health Officer
EIA	Environmental Impact Assessment
ELC	European Landscape Convention
EMP	Environmental Management Plan
END	Environmental Noise Directive
EnvIS	Environmental Information System
ES	Ecosite
ESA	Environmentally Sensitive Area
EU	European Union
FRA	Flood Risk Assessment
GAA	Gaelic Athletic Association
GCN	Great Crested Newt
GHG	Greenhouse Gas
GLVIA	Guidelines for Landscape and Visual Impact Assessment
HAPMS	Highways Agency Pavement Management System
HAWRAT	Highways Agency Water Risk Assessment Tool
HDV	Heavy Duty Vehicles
HE	Historic England
HEMP	Handover Environmental Management Plan
HER	Historical Environment Record
HGV	Heavy Goods Vehicle
HRA	Habitat Regulations Assessment

HRA	Hot Rolled Asphalt
IAN	Interim Advice Note
IAQM	Institute of Air Quality Management
IEEM	Institute of Ecological and Environmental Management
IEMA	Institute of Environmental Management and Assessment
IPCC	Intergovernmental Panel on Climate Change
JLR	Jaguar Land Rover
LAQM	Local Air Quality Management
LCA	Local Character Area
LBAP	Local Biodiversity Action Plan
LCT	Landscape Character Type
LDV	Light Duty Vehicles
LLFA	Lead Local Flood Authority
LOAEL	Lowest Observable Adverse Effect Level
LNR	Local Nature Reserve
LPA	Local Planning Authority
LPACO	Local Planning Authority Conservation Officer
LTT	Long Term Trend
LVIA	Landscape and Visual Impact Assessment
LWS	Local Wildlife Site
MAGIC	Multi-agency Geographic Information Centre
mAOD	Metres Above Ordnance Datum
MCHW	Manual of Contract Document for Highways Works
MSA	Motorway Service Area
NEC	National Exhibition Centre
NERC	Natural Environment and Rural Communities
NCA	National Character Area
NIA	Noise Important Areas
NMM	National Motorcycle Museum & Conference Centre
NMU	Non-Motorised User
NOEL	No Observed Effect Level
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxides
NPPF	National Planning Policy Framework
NPSE	National Policy Statement for England
NPSNN	National Policy Statement for National Networks
NSIP	Nationally Significant Infrastructure Project
NSR	Noise Sensitive Receptors
NVZ	Nitrate Vulnerable Zone
NWFD	Non Waste Framework Directive
NWBC	North Warwickshire Borough Council
PEIR	Preliminary Environmental Information Report
PCF	Project Control Framework
PINS	Planning Inspectorate
PM	Particulate Matter
PPG	Planning Practice Guidance
PPS	Planning Policy Statement
PRoW	Public Right of Way
RIGS	Regionally Important Geological Sites
RIS	Road Investment Strategy
RFC	Ratio of Flow to Capacity
SAAR	Standard Annual Average Rainfall
SAC	Special Area of Conservation
SMBC	Solihull Metropolitan Borough Council
SPA	Special Protection Area
SOAEL	Significant Observed Adverse Effect Level
SPZ	Source Protection Zone
SoCC	Statement of Community Consultation

SRN	Strategic Road Network
SRO	Senior Responsible Owner
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems
TAG	Transport Analysis Guidance
TRA	Traffic Reliability Area
UK	United Kingdom
UKC	United Kingdom Central (Previously known as the M42 Economic Gateway)
WCA	Waste Collection Authority
WebTAG	Transport Analysis Guidance Website
WFD	Water Framework Directive
WSP	WSP Global Inc
VE	Visual Envelope
VISSIM	Traffic Simulation
ZTV	Zone of Theoretical Visibility
ZVI	Zone of Visual Influence

19. APPENDICES

Appendix 1.2: Transboundary Effects

Appendix 6.1: Designated Heritage Assets

Appendix 1.2: Transboundary Effects Screening Matrix

A2.1. Regulation 32 of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 requires the consideration of any likely significant effects on the environment of another European Economic Association (EEA) State.

A2.2. Guidance upon the consideration of transboundary effects is provided in Planning Inspectorate Advice Note 12: Transboundary Impacts. The following screening matrix presents the consideration of transboundary effects for the proposed scheme, taking account of this guidance.

Table A1: Screening of potentially significant effects on the environment of other EEA states

Criteria and Relevant Considerations	Commentary with Regard to Proposed Scheme
Characteristics of the development • Size of the development • Use of natural resources • Production of waste • Pollution and nuisance • Risk of accidents • Use of technologies	The proposed scheme comprises the following components: • A new dumbbell junction approximately 1.8km south of the existing Junction 6 off the M42; • The construction of a new, 2.4km dual carriageway link road between the new Junction and Clock Interchange (an existing junction on the A45); • Modifications to the existing Clock Interchange junction; • Upgrades to the existing Junction 6; in addition to, • Realignments and improvements to local roads to the west of the existing M42 in proximity to the proposed bypass. The proposed scheme would be progressed within the administrative boundary of Solihull Metropolitan Borough Council. A review of the characteristics of the proposed scheme has concluded that: • Some of the resources required to construct the proposed scheme are likely to be obtained from the global market e.g. steel; however it is envisaged that such materials would be able to be obtained locally within the UK. • No waste, nuisances or accidents are likely that would extend beyond the border of the UK as a result of construction or operation of the proposed scheme. • No novel technologies are proposed that would introduce potential for transboundary effects to occur on other EEA states.
Geographical area • What is the extent of the area of a likely impact under the jurisdiction of another EEA state?	A review of the geographical area of impact associated with the proposed scheme has concluded that any environmental effects associated with its construction and operation are unlikely to extend beyond the jurisdiction of the UK, with the exception of potential release of greenhouse gas emissions from vehicles (traffic) in relation to their contribution to climate change.
Location of development • What is the existing use? • What is the distance to another EEA state? (Name EEA state)	A review of the location within which the proposed scheme would be constructed and would operate has concluded that existing land uses are mixed but predominantly agricultural. Some of the areas of land that would be permanently taken by the proposed scheme are currently occupied by similar land uses i.e. the existing highway network. The location of the proposed scheme is situated approximately 290km from France and 310km from the Republic of Ireland. The study areas proposed within each individual assessment have been reviewed, and it has been concluded that none of their boundaries would extend into these EEA states.
Cumulative impacts • Are other major developments close by?	The review of potential cumulative impacts as part of the EIA scoping process identified the following transport-related development proposals which could interact cumulatively with the proposed development: • Extra Motorway Service Area Site. • High Speed 2 main line. • High Speed 2 Birmingham International Station. • Airport NEC Integrated Transport Access Regional Infrastructure Fund – public

Criteria and Relevant Considerations	Commentary with Regard to Proposed Scheme
	transport improvements project. • A45 Transport Corridor Regional Growth Fund. • Birmingham Airport Runway Extension Planning Application (2008). Potential has been identified during the scoping process for cumulative effects to occur in relation to the topics of air quality, noise, ecology, landscape, flood risk and land use. These effects will be accounted for in the EIA process, and will be reported in the Environmental Statement for the proposed scheme. The form and nature of several of these developments are such that they are likely to result in the attraction or reassignment of traffic on the strategic and local highway network of the area which, in combination with the proposed scheme, could give rise to cumulative increases in greenhouse gas emissions.
Carrier • By what means could impacts be spread (i.e. what pathways)?	Environmental effects would derive from the physical introduction of highway built form into the receiving environment, and from vehicles (traffic) travelling on the improved highway network. Potential effects associated with noise, ecology, landscape, flood risk and land use (land take) would be relative to the proposed scheme, and would be focused within the adopted assessment study areas identified for these topics. Emissions to air (specifically greenhouse gas) derived from vehicles travelling on the improved highway would be spread and dispersed by normal atmospheric processes and conditions. Such emissions have the potential to combine with greenhouse gas emissions associated with other developments within EEA states, and with the cumulative developments identified above.
Environmental importance • Are particular environmental values (e.g. protected areas – name them) likely to be affected? • Capacity of the natural environment • Wetlands, coastal zones, mountain and forest areas, nature reserves and parks, Natura 2000 sites, areas where environmental quality standards already exceeded, densely populated areas, landscapes of historical, cultural or archaeological significance	A review of the geographic location of the proposed scheme against statutory and non-statutory nature conservation designations confirmed that: • There are no international nature conservation sites within 10km of the proposed scheme. • There are three (statutory) Sites of Special Scientific Interest of national importance within 2km of the proposed scheme. • There are three (statutory) Local Nature Reserves of local importance within 2km of the proposed scheme • There are six (non-statutory) Local Wildlife Sites/Ecosites of local importance within 250m of the proposed scheme. Accordingly, there would be no significant effects from construction and operation of the proposed scheme on European (Natural 2000) sites. Birmingham City Council has declared a city-wide Air Quality Management Area west of the existing M42 corridor. Three Scheduled Monuments of national importance in heritage terms are located within the 1km study area proposed for the cultural heritage assessment. No internationally important sites have been identified. No landscape designations of national importance have been identified within the 1km study area proposed for the landscape and visual effects assessment.
Extent • What is the likely extent of the impact (geographical area and size of the affected population)?	The only potential transboundary environmental impact is from greenhouse gas emissions, which could contribute to climatic changes on a global scale. Based on a review of the characteristics of the proposed scheme, it has been concluded that such changes to the existing strategic highway network are unlikely to result in a significant contribute to global climate change.
Magnitude • What will the likely magnitude of the change in relevant variables relative to the status quo, taking into	Total UK greenhouse gas emissions were estimated to be 495.7 million tonnes carbon dioxide equivalent (MtCO2e) in 2015, whilst greenhouse gas emissions from UK transport were estimated to be approximately 120 MtCO2e (Department for Business, Energy & Industrial Strategy (7 February 2017[1]). A review of the proposed scheme has concluded that there would be a negligible

[1] https://www.gov.uk/government/statistics/final-uk-greenhouse-gas-emissions-national-statistics-1990-2015

Criteria and Relevant Considerations	Commentary with Regard to Proposed Scheme
account the sensitivity of the variable?	contribution to the UK's overall greenhouse gas emissions associated with changes of the type proposed, and accordingly negligible potential to contribute to global climate change when considered against other EEA member state emissions in a transboundary context (and with other identified cumulative developments). Greenhouse gas emissions derived from the proposed scheme will be calculated as part of the EIA process.
Probability • What is the degree of probability of the impact? • Is the impact likely to occur as a consequence of normal conditions or exceptional situations, such as accidents?	There is a high probability that the proposed scheme would result in greenhouse gas emissions by virtue of its form and scale, and the volume and composition of traffic that would travel on the highway improvements. Greenhouse gases would principally derive from vehicle exhaust emissions during operation of the proposed scheme, with reduced emissions from plant, machinery and other vehicles during its construction. Both increases and decreases in air quality (and greenhouse gas emissions) are likely to occur at different locations as a result of proposed scheme implementation.
Duration • Is the impact likely to be temporary, short-term or long-term? • Is the impact likely to relate to the construction, operation or decommissioning phase of the activity?	Greenhouse gas emissions are likely to occur over a long-term duration, and would be predominantly associated with the operational stage of the proposed scheme where traffic would travel continuously on the improved sections of highway. Notwithstanding this, it is expected that improvements in the levels of greenhouse gas emissions from individual vehicles will be achieved in the medium- to long-term through technological advancements and the UK's drive to decrease dependency on carbon-based fuels (such as diesel).
Frequency • What is likely to be the temporal pattern of the impact?	The temporal pattern of greenhouse gas emissions is likely to be relatively constant, due to the proposed scheme forming part of the strategic highway network and being in constant use.
Reversibility • Is the impact likely to be reversible or irreversible?	The impact of greenhouse gas emissions is considered irreversible, as the highways improvements are unlikely to be decommissioned within human lifetimes.

Appendix 6.1: Designated Heritage Assets: M42 J6 Improvement Scheme

Reference	Grid Reference	Description	Shown on Figure
1017243	SP 20220 80785	Moated site at Moat House. **Scheduled Monument**.	6.2
1017529	SP 18982 79243	Moated site at Eastcote Hall. **Scheduled Monument**.	6.2
1017815	SP 20308 80770	Churchyard cross in St Mary and St Bartholomew's churchyard. **Scheduled Monument**.	6.2
1045849	SP1802079398	Henwood Mill. **Listed Building Grade II**.	6.2
1045901	SP 19019 79306	Dovecote at Eastcote Hall. **Listed Building Grade II**.	6.2
1055725	SP 20336 81020	Manor Cottage. **Listed Building Grade II**.	6.2
1055754	SP 20103 80904	Hampton Manor. **Listed Building Grade II**.	6.2
1055777	SP 20278 80771	Church of Saint Mary and Saint Bartholomew. **Listed Building Grade I**.	6.2
1055786	SP 20344 80802	White Lion Public House. **Listed Building Grade II**.	6.2
1057655	SP 20212 80774	The Moat House. **Listed Building Grade II***.	6.2
1075949	SP 18798 82253	Grange Farmhouse. **Listed Building Grade II**.	6.1
1075950	SP 17653 82117	Castle Hills Farmhouse. **Listed Building Grade II**.	6.2
1075961	SP 19010 79246	Eastcote Hall. **Listed Building Grade II***.	6.2
1075967	SP 19491 79140	Wharley Hall. **Listed Building Grade II**.	6.2
1076716	SP 17852 79890	Bogay Hall. **Listed Building Grade II***.	6.2
1076762	SP 20332 80872	22-30, High Street. **Listed Building Grade II**.	6.2
1076763	SP 20336 80895	32-42, High Street. **Listed Building Grade II**.	6.2
1076764	SP 20308 80770	Churchyard Cross. **Listed Building Grade II**.	6.2
1076765	SP 20334 80970	The Lodge, Hampton Manor. **Listed Building Grade II**.	6.2
1076769	SP 20274 80716	Church Farmhouse. **Listed Building Grade II**.	6.2
1253299	SP 19437 79210	Eastcote Manor. **Listed Building Grade II**.	6.2
1261972	SP 20113 80880	The clock tower attached to Hampton Manor. **Listed Building Grade II***.	6.2
1342829	SP 20396 80680	Fentham Club. **Listed Building Grade II**.	6.2
1342830	SP 18612 80308	Walford Hall Farmhouse. **Listed Building Grade II***.	6.2
1342867	SP 20067 80897	Garden terrace, walls and steps at Hampton Manor. **Listed Building Grade II**.	6.2
1343224	SP 18827 82409	Church Of Saint Peter. **Listed Building Grade I**.	6.1
1343225	SP 20838 82742	Pasture Farmhouse. **Listed Building Grade II**.	6.1
1343230	SP 19421 79299	Eastcote House. **Listed Building Grade II**.	6.2
1367098	SP 20650 84038	Park Farmhouse. **Listed Building Grade II***.	6.1
1370065	SP 19488 79177	Barn At Wharley Hall. **Listed Building Grade II**.	6.2
1393163	SP 20320 80824	K6 kiosk. **Listed Building Grade II**.	6.2
	SP 20284 80899	Hampton in Arden. **Conservation Area**.	6.2
	SP 18729 82362	Bickenhill. **Conservation Area**.	6.1

20. LOCATION AND DESIGN PLANS

Figure 1.1: The current proposed scheme Red Line Boundary

Figure: HE554185-ACM-GEN-M42_GEN_ZZ_ZZ-DR-CH-0001 to 0008 (proposed scheme drawings)

Figure 6.1: Location of Designated Heritage Assets

Figure 6.2: Location of Designated Heritage Assets

Figure 7.1: Landscape Viewpoint Locations and Landscape Character Designations

Figure 7.2: Landscape Viewpoint Locations and Landscape Character Designations

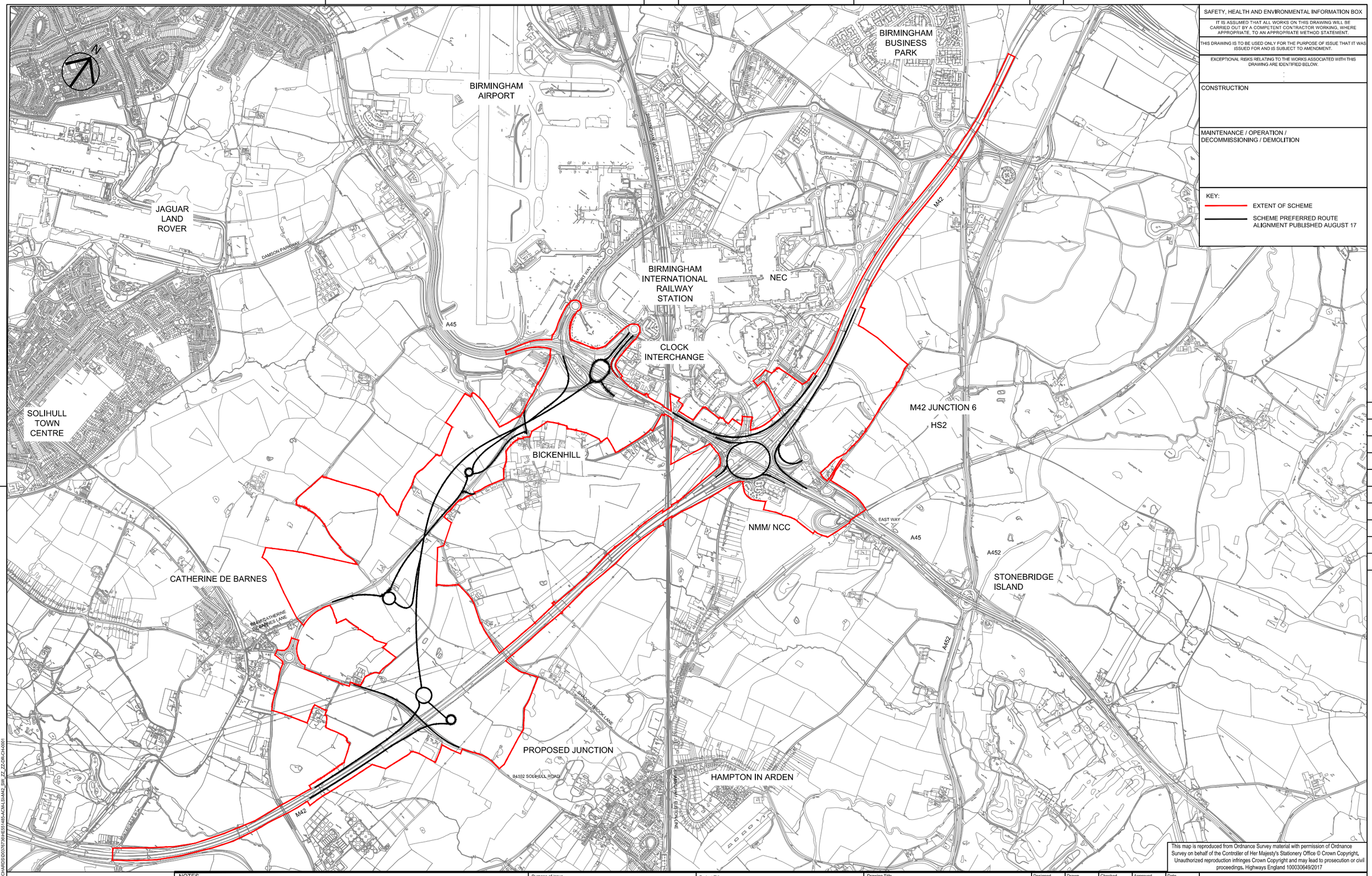
Figure 8.1: Statutory Nature Conservation Designations with the Study Area

Figure 8.2: Non-Statutory Nature Conservation Designations with the Study Area

Figure 11: Proposed Noise Study Area

Figure 12: People and Communities Baseline Environment

Figure 13: Water Resource Features and their Attributes



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KEY:

- EXTENT OF SCHEME
- SCHEME PREFERRED ROUTE ALIGNMENT PUBLISHED AUGUST 17

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6. INDICATIVE SCHEME LAYOUT BASED ON AUGUST 2017 PREFERRED ROUTE ANNOUNCEMENT. LAYOUT MAY BE REVISED WITHIN LIMITS OF THE REDLINE BOUNDARY AS PRELIMINARY DESIGN PROGRESSES.

Revision Details	By / Check	Date	Suffix
First Issue	KR / LIB	03/10/17	P04

Purpose of issue: FOR INFORMATION

Client: Highways England, The Cube, 199 Wharfside Street, Birmingham, B1 1RN, 0

Working on behalf of highways england

Project Title: M42 JUNCTION 6 IMPROVEMENT

Drawing Title: M42 JUNCTION 6 REDLINE BOUNDARY

Designed	Drawn	Checked	Approved	Date
KR	KR	IJB	IJB	03/10/17

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Location M42_SW_ZZ_ZZ | Type -DR- | Role CH- | Number 0001

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First Issue		22/08/17	P01.1

Purpose of issue

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Project Title

M42 Junction 6 Improvements
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Drawing Title

GENERAL ARRANGEMNT
M42 JUNCTION 6
SHEET 1 OF 8

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Internal Project No.	Suitability
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M42_GEN_ZZ_ZZ -DR-CH-0001
Location | Type | Role | Number

Rev
P01.1

Plot Date : Wednesday, August 30, 2017 10:57:58 AM
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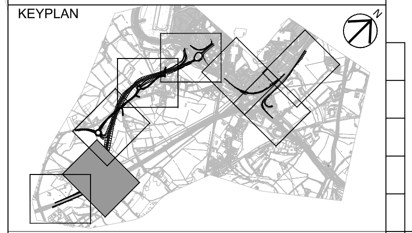

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Rev P01.1

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SHEET 3 OF 8

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Rev
P01.1

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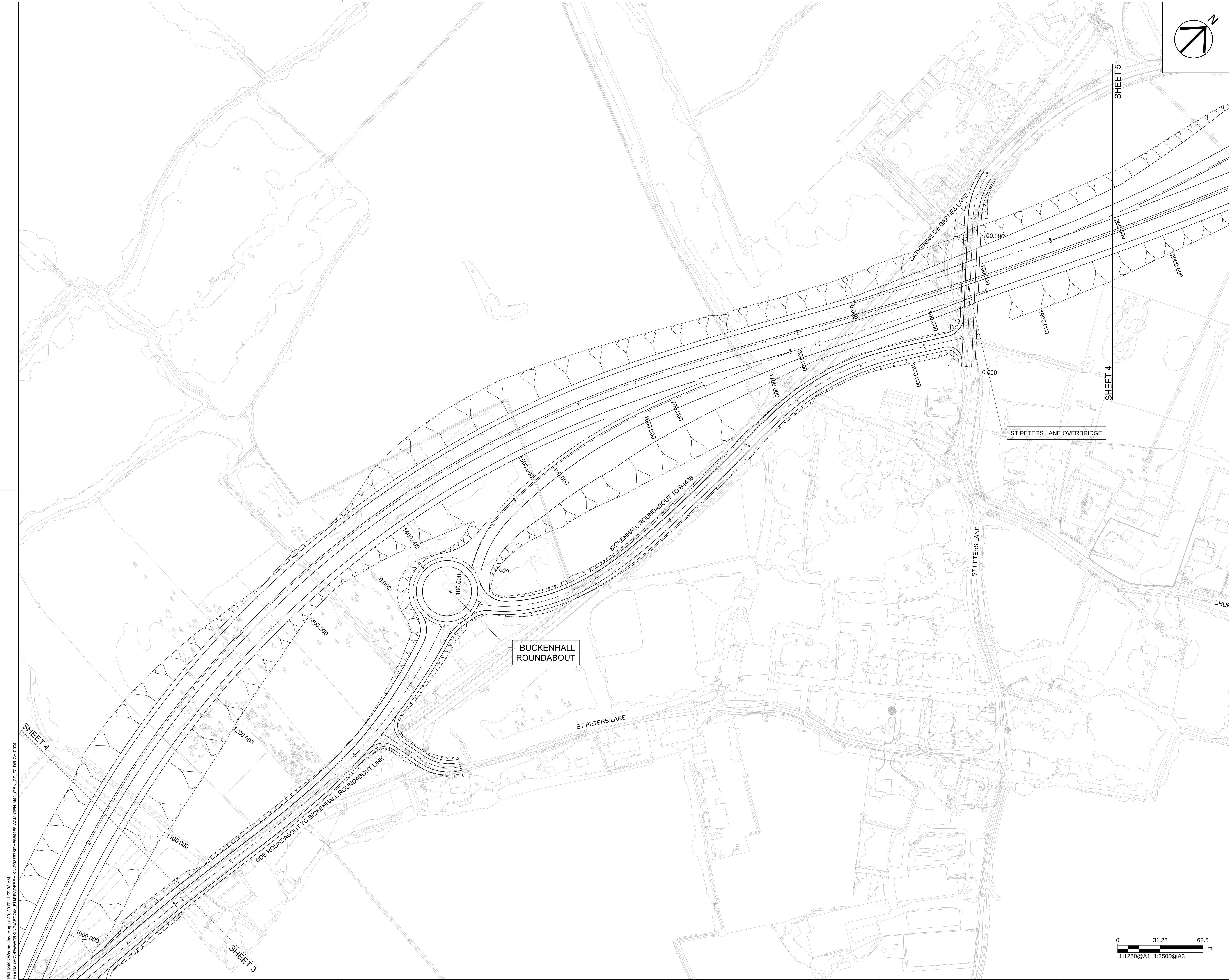

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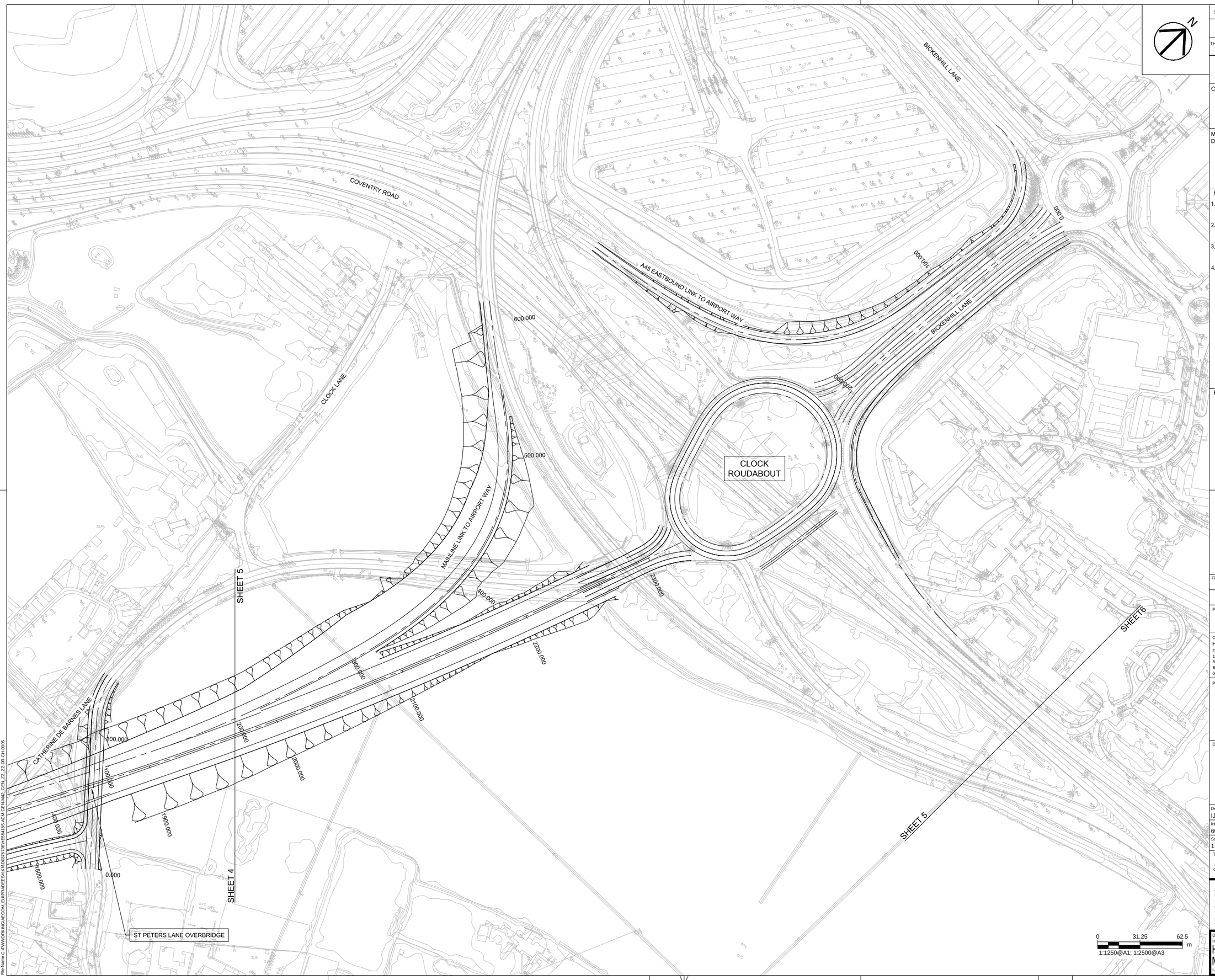

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M42_GEN_ZZ_ZZ	-DR-CH-0005			
Location	Type / Role / Number			

Plot Date: Wednesday, August 30, 2017 11:10:58 AM
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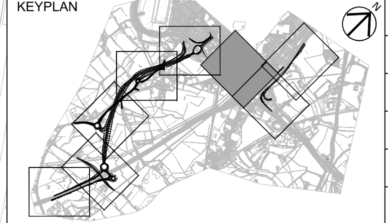

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M42 JUNCTION 6
SHEET 6 OF 8

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GENERAL ARRANGEMENT M42 JUNCTION 6 SHEET 7 OF 8

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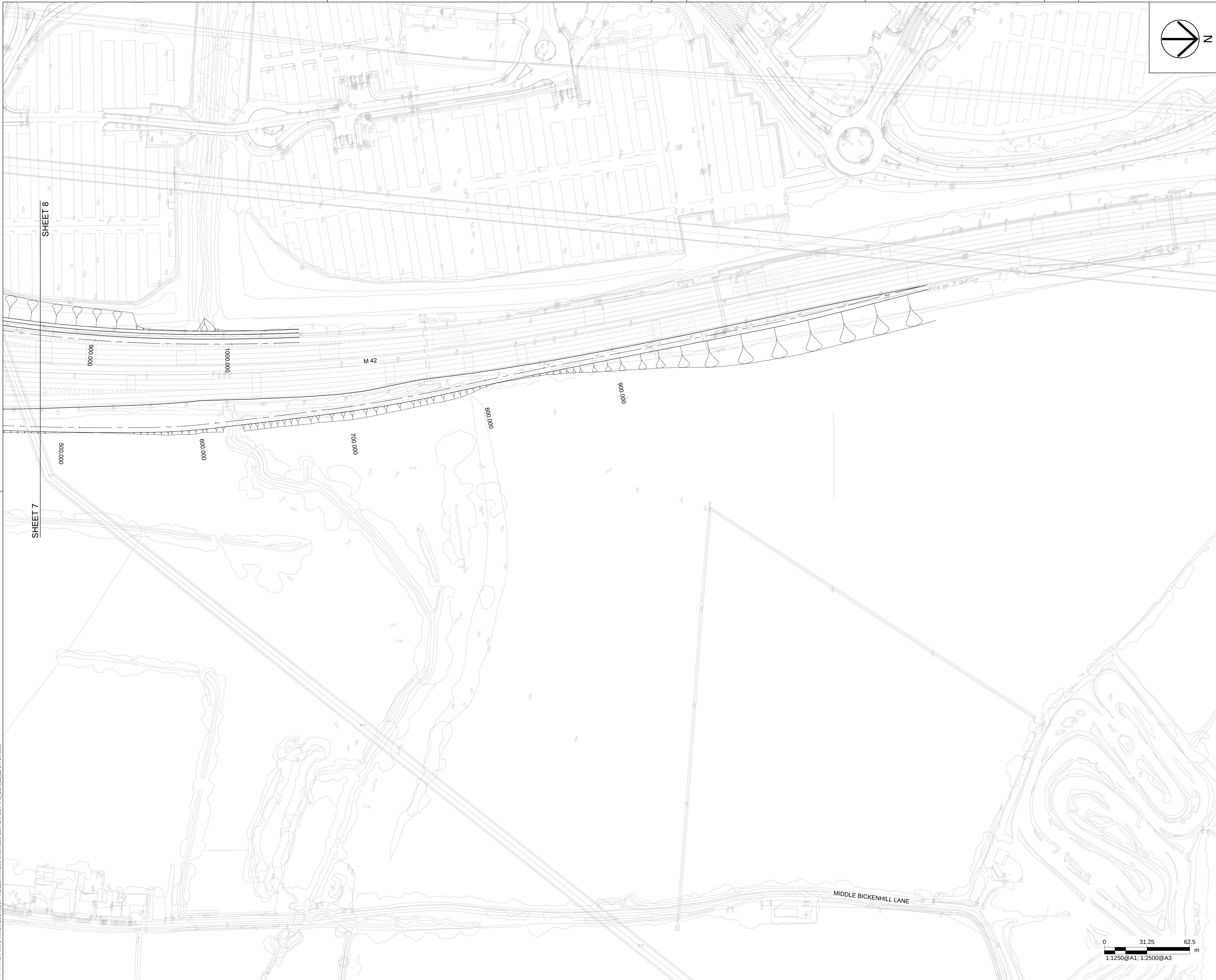

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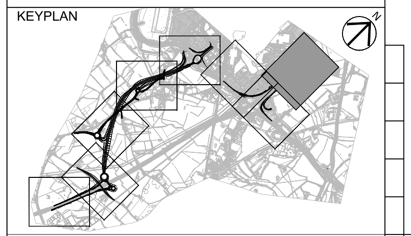

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GENERAL ARRANGEMENT
M42 JUNCTION 6
SHEET 8 OF 8

Designed	Drawn	Checked	Approved	Date
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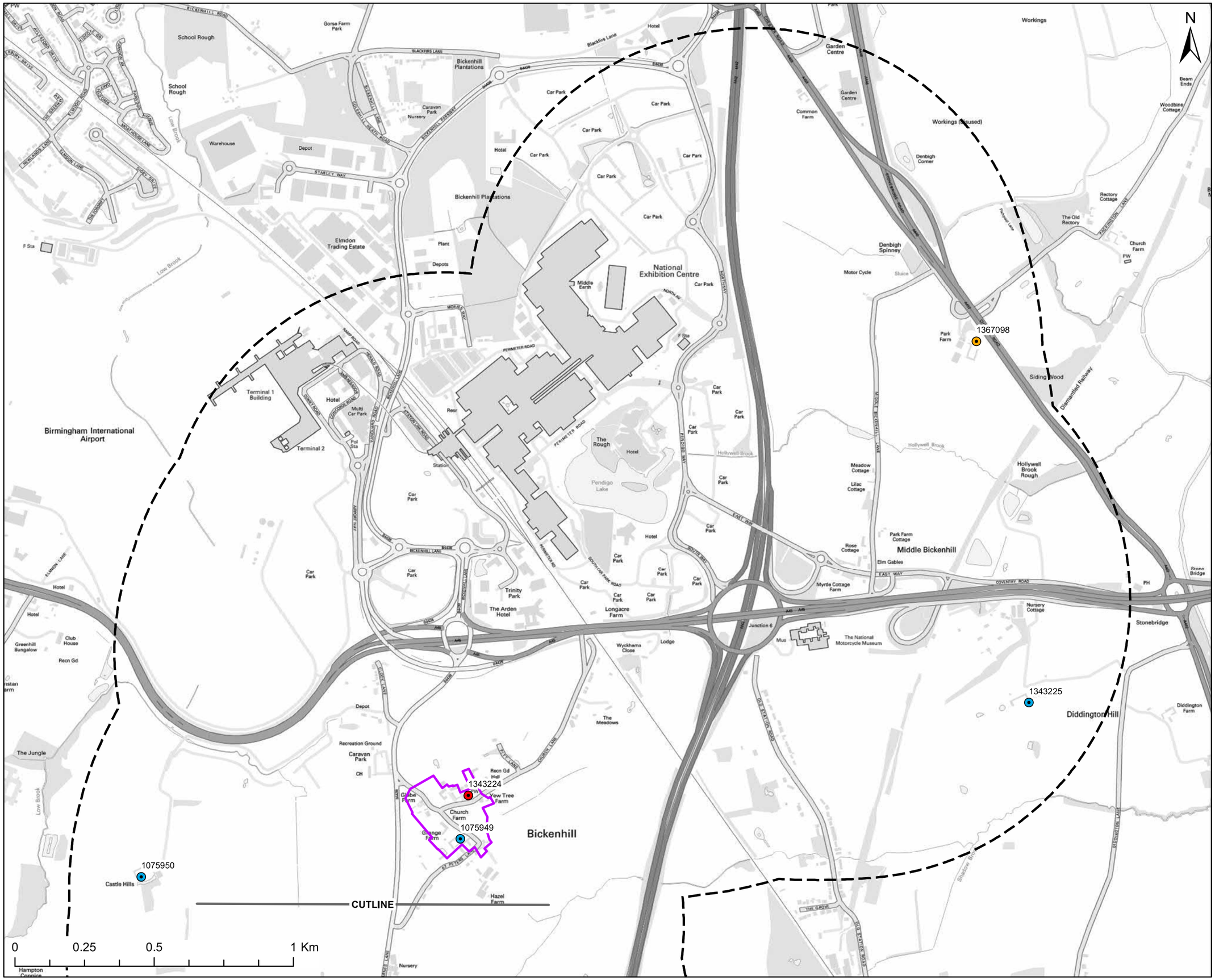
Highways England PIN | Originator | Volume
HE554185 -ACM -GEN -
M42_GEN_ZZ_ZZ -DR-CH-0008
Location | Type | Role | Number

Rev
P01.1

Plot Date : Wednesday, August 30, 2017 11:00:07 AM
File Name C:\PWWORKING\AECOM_EU\PRADEESH.KN\D0376739\HE554185-ACM-GEN-M42_GEN_ZZ_ZZ-DR-CH-0008



Filename: K:\Newproje\60543032 - M42 Jct 6\GIS\02_Maps\Heritage\FIGURE X - DESIGNATED HERITAGE 1KM.mxd

AECOM Limited
2 City Walk
Leeds, LS11 9AR
+44 (0)113 204 5000
www.aecom.com

Project Title:

M42 JUNCTION 6

Client:

HIGHWAYS ENGLAND

Location Inset:

LEGEND

- 1KM STUDY
- GRADE I LISTED BUILDING
- GRADE II LISTED BUILDING
- GRADE II* LISTED BUILDING
- SCHEDULED MONUMENT
- CONSERVATION AREA

Copyright:

AECOM Internal Project No:

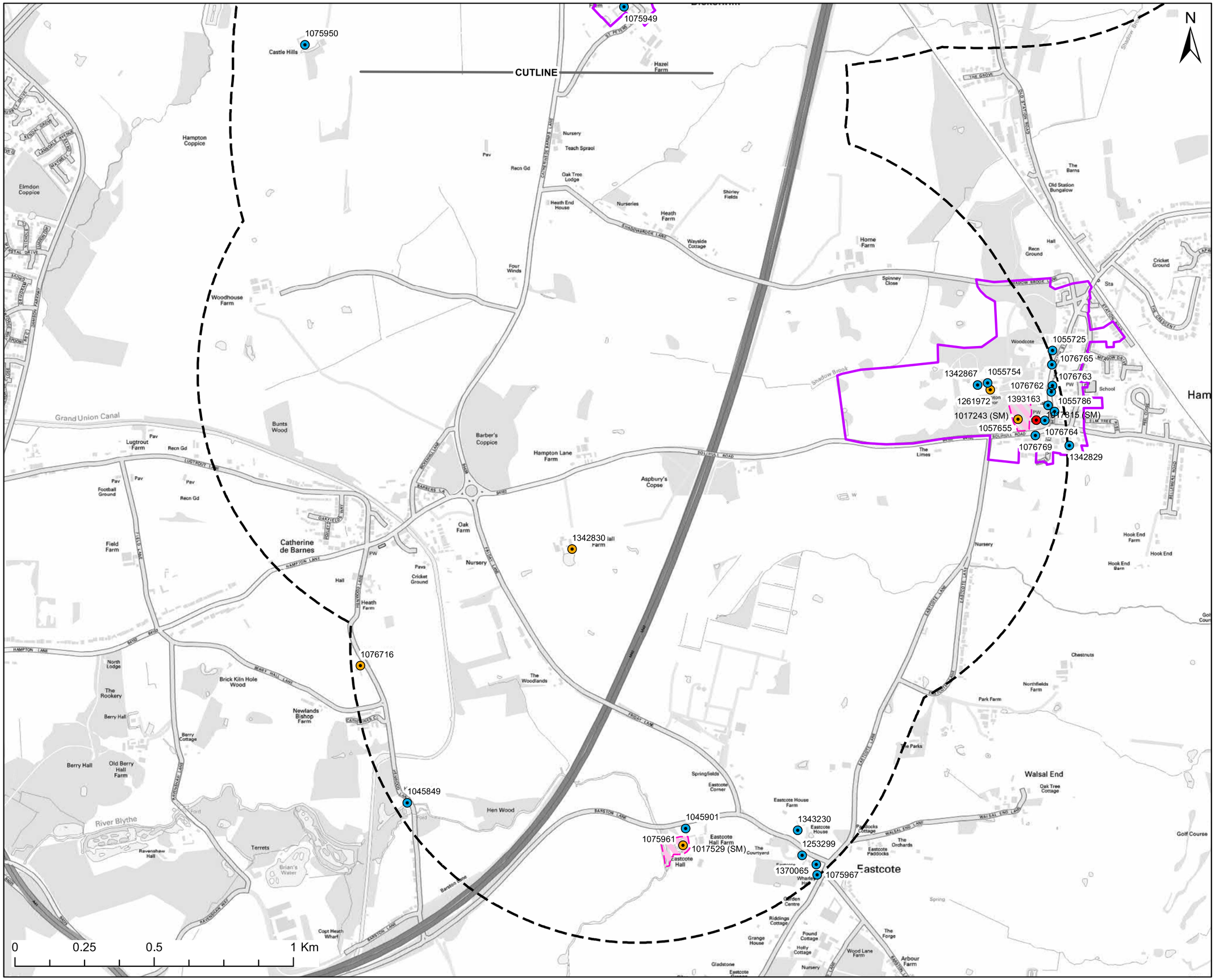
60543032

Drawing Title:

LOCATION OF DESIGNATED HERITAGE ASSETS

Scale at A3: 1:12,500

Drawing No:			Rev:
FIGURE 6.1			0
Drawn:	**Chk'd:**	**App'd:**	**Date:**
GB	FL	GC	20/09/17



Filename: K:\Newproje\60543032 - M42 Jct 6\GIS\02_Maps\Heritage\FIGURE X - DESIGNATED HERITAGE 1KM.mxd

AECOM Limited
2 City Walk
Leeds, LS11 9AR
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www.aecom.com

Project Title:

M42 JUNCTION 6

Client:

HIGHWAYS ENGLAND

Location Inset:

LEGEND

- 1KM STUDY
- GRADE I LISTED BUILDING
- GRADE II LISTED BUILDING
- GRADE II* LISTED BUILDING
- SCHEDULED MONUMENT
- CONSERVATION AREA

Copyright:

AECOM Internal Project No:

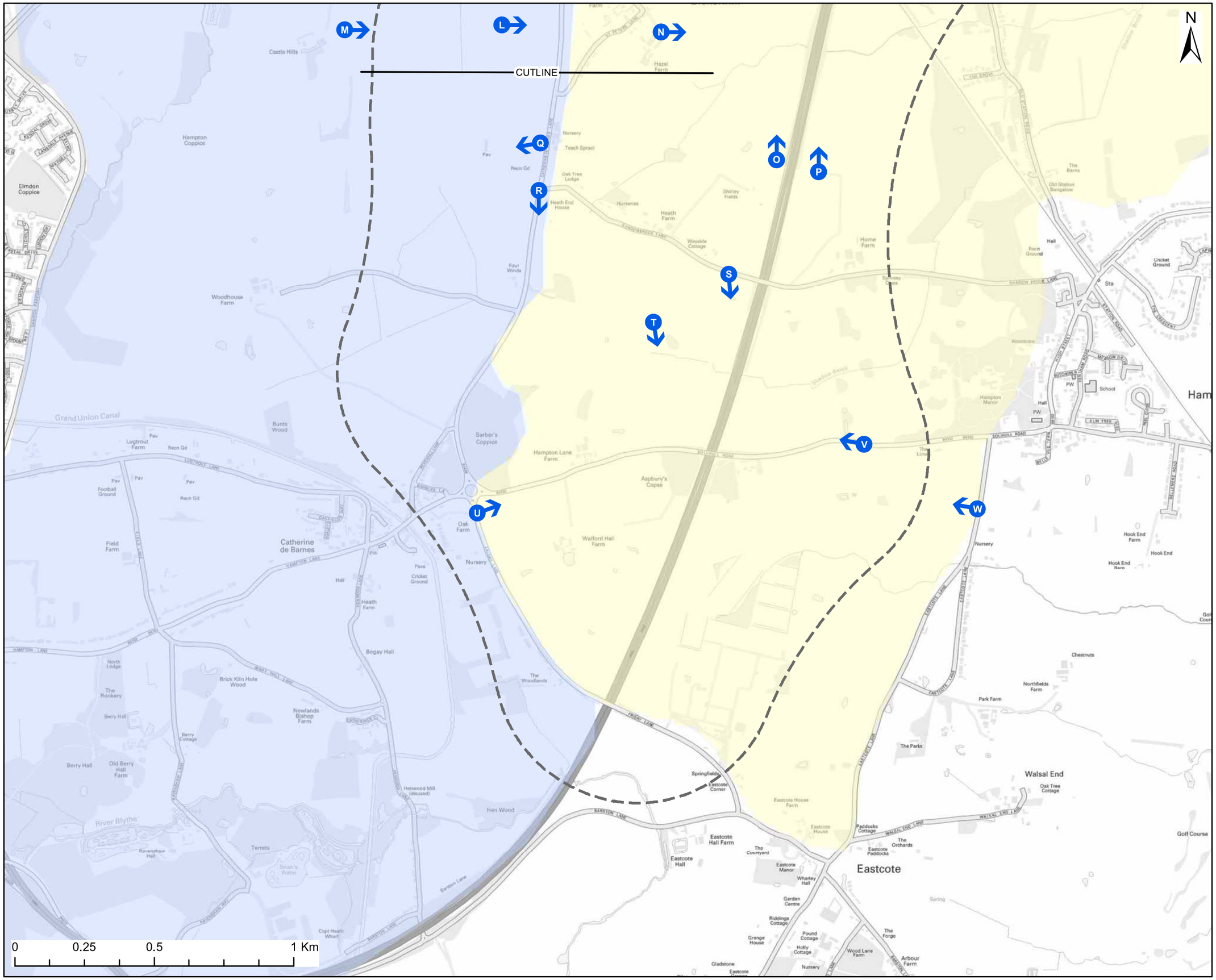
60543032

Drawing Title:

LOCATION OF DESIGNATED HERITAGE ASSETS

Scale at A3: 1:12,500

Drawing No:			Rev:
FIGURE 6.2			0
Drawn:	**Chk'd:**	**App'd:**	**Date:**
GB	FL	GC	20/09/17



Filename: K:\Newproje\60543032 - M42 Jct 6\GIS\02_Maps\Landscape\FIGURE 7.1 - LANDSCAPE VIEWPOINTS.mxd

AECOM Limited
2 City Walk
Leeds, LS11 9AR
+44 (0)113 204 5000
www.aecom.com

Project Title:

M42 JUNCTION 6

Client:

HIGHWAYS ENGLAND

Location Inset:

LEGEND

500m Study

Viewpoint Location

Local Lansdcape Character

LCA 1 - Solihull Fringe

LCA9 - Motorway Corridor

AECOM Internal Project No:

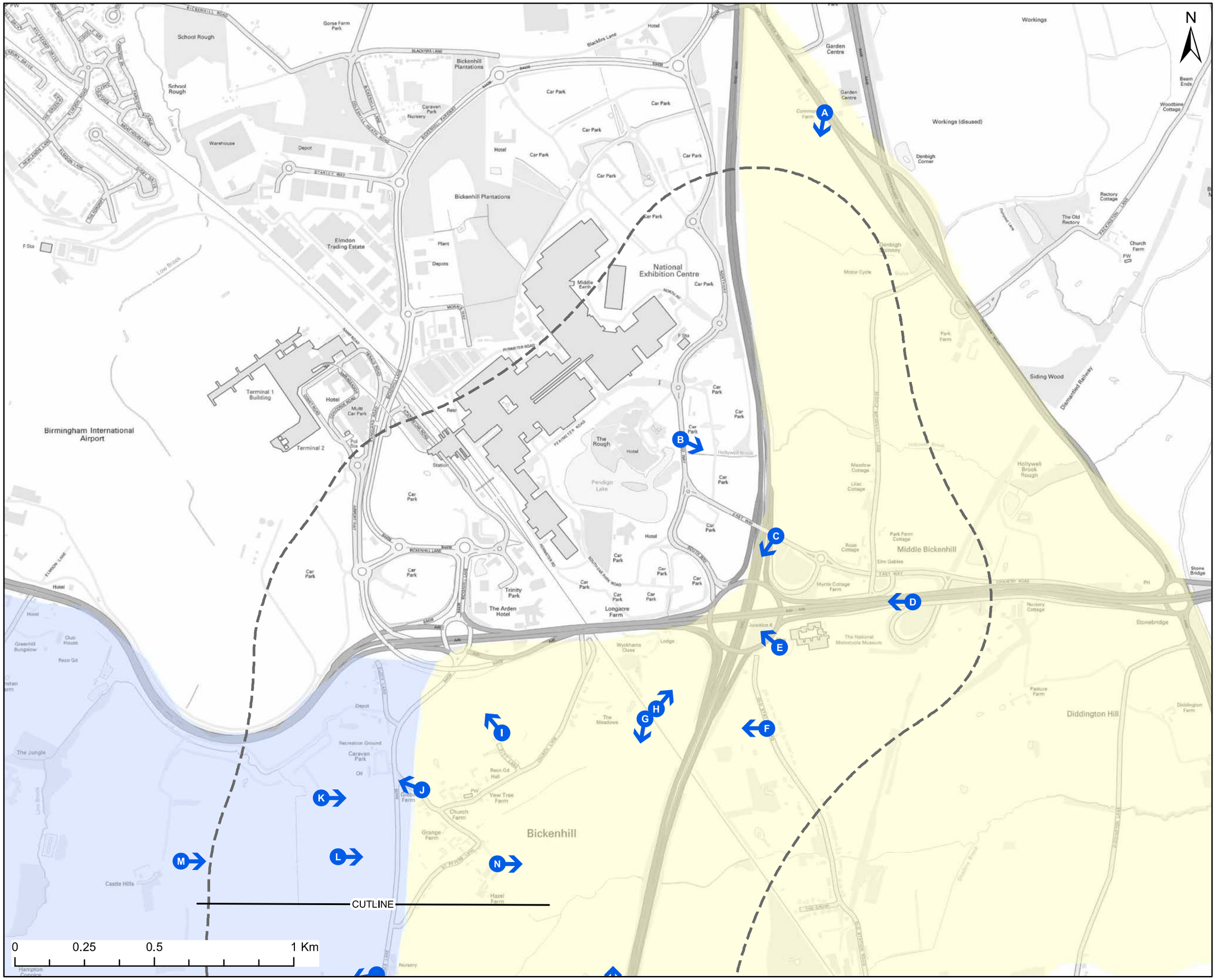
60543032

Drawing Title:

Landscape Viewpoint Locations

Scale at A3: 1:12,500

Drawing No:			Rev:
FIGURE 7.1			0
Drawn:	**Chk'd:**	**App'd:**	**Date:**
GB	MS	MS	25/09/17



Filename: K:\Newproje\60543032 - M42 Jct 6\GIS\02_Maps\Landscape\FIGURE 7.1 - LANDSCAPE VIEWPOINTS.mxd

AECOM Limited
2 City Walk
Leeds, LS11 9AR
+44 (0)113 204 5000
www.aecom.com

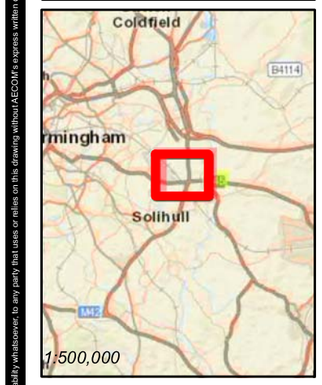
Project Title:

M42 JUNCTION 6

Client:

HIGHWAYS ENGLAND

Location Inset:



LEGEND

500m Study

Viewpoint Location

Local Lansdcape Character

LCA 1 - Solihull Fringe

LCA9 - Motorway Corridor

AECOM Internal Project No:

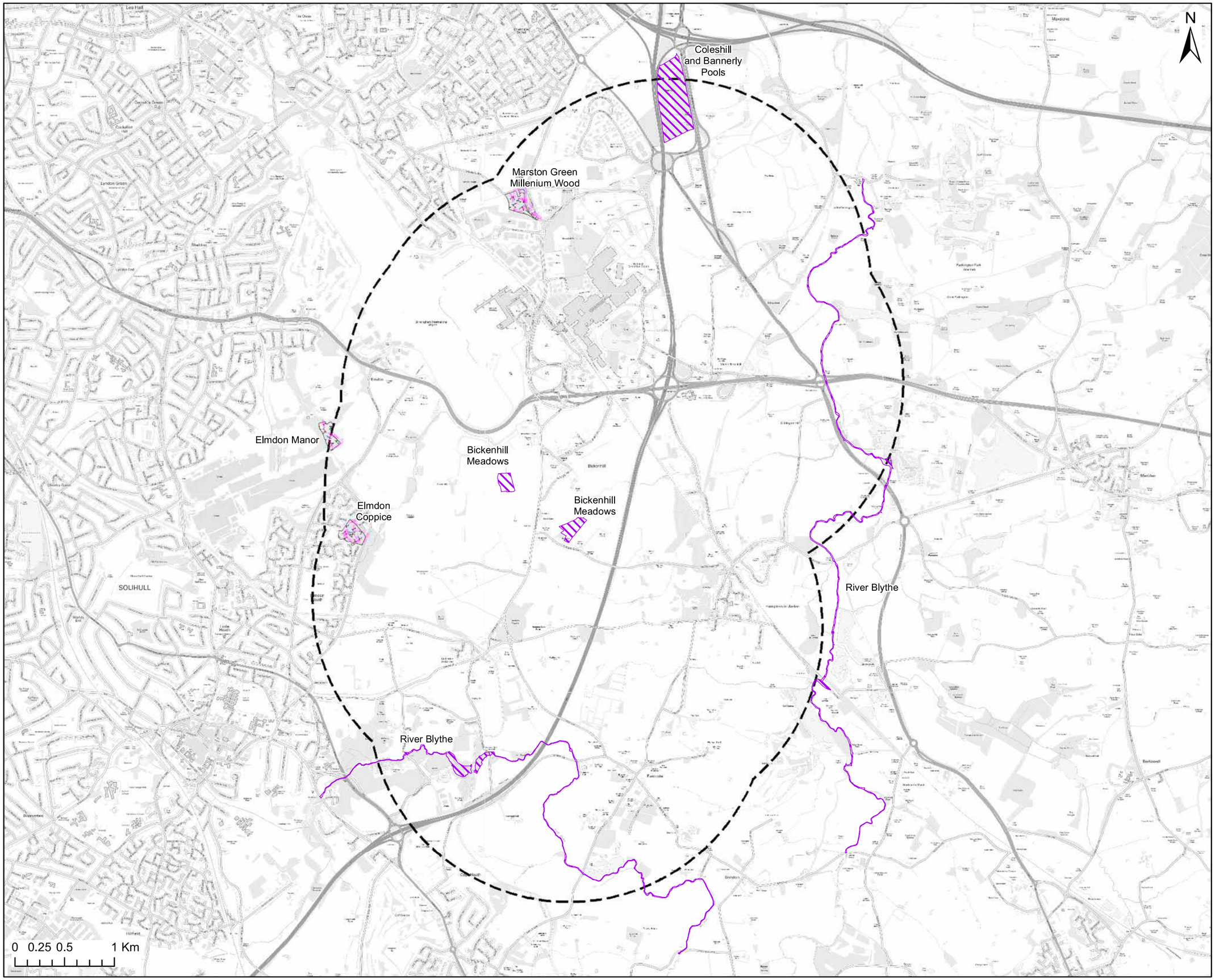
60543032

Drawing Title:

LANDSCAPE VIEWPOINT LOCATIONS

Scale at A3: 1:12,500

Drawing No:			Rev:
FIGURE 7.2			0
Drawn:	**Chk'd:**	**App'd:**	**Date:**
GB	MS	MS	25/09/17



Filename: K:\Newproje\60543032 - M42 Jct 6\GIS\02_Maps\Ecology\FIGURE 8.1.mxd

AECOM Limited
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Leeds, LS11 9AR
+44 (0)113 204 5000
www.aecom.com

Project Title:

M42 JUNCTION 6

Client:

HIGHWAYS ENGLAND

Location Inset:

LEGEND

- 2km study area
- Site of Special Scientific Interest (SSSI)
- Local Nature Reserve (LNR)

Copyright:

AECOM Internal Project No:

60543032

Drawing Title:

STATUTORY NATURE CONSERVATION DESIGNATIONS WITHIN THE STUDY AREA

Scale at A3: 1:35,000

Drawing No:			Rev:
FIGURE 8.1			0
Drawn:	**Chk'd:**	**App'd:**	**Date:**
GB	MS	MS	21/09/17

LWS Name	Reference
Bickenhill Plantation	1
Castle Hill Farm Meadows	2
Coleshill Pool Wood	3
Denbigh Spinney	4
Elmdon Manor Local Nature Reserve	5
Elmdon Nature Park	6
Greens Ward Piece	7
Hampton and Elmdon Coppice	8
Heath Corner	9
Henwood Mill	10
Henwood Tip	11
Meadow on Old Station Road, Hampton-in-Arden	12
Moulding green Farm, Hampton-in-Arden	13
Purnells Brook Woodland	14
Wayside Cottage Meadow	15

Proposed LWS Name	Reference
Aspburys Coppice	p1
Berry Hall Wood	p2
Blythe Floodplain	p3
Blythe Floodplain	p3
Brick Kiln Hole Wood	p4
Butlers Moors Wood	p5
Catherine-de-Barnes Hay Meadow	p6
Catherine-de-Barnes Meadow, South	p7
Disused Railway and Sidings	p8
Eastcote Hall Moat	p9
Fields Adjacent to River Blythe, Hampton Depot	p10
Grand Union Canal	p11
Hedgerow	p12
Holywell Brook	p13
Kingshurst Brook	p14
Land By Henwood Tip	p15
Marsh Adjacent to River Blythe	p16
Marsh Lane Nature Reserve	p17
Marshy Fields	p18
Marshy Fields	p18
Packington Park Great Pool and Hall Pool	p19
Pond at Hampton Manor Wood North	p20
Pond at Mouldings Green Farm	p21
Pond ay Hampton Manor Wood North	p22
Purnell Brook Meadows	p23
Royton End, Bradnock Marsh	p24
Siden Hill Wood	p25
Somers Gravel Pit	p26
Terrets and Pool	p27
Terrets and Pool	p27
Woodland at the Kennels, Packington	p28

N

0 0.25 0.5 1 Km

Filename: K:\Newproje\60543032 - M42 Jct 6\GIS\02_Maps\Ecology\FIGURE 8.2.mxd

AECOM Limited
2 City Walk
Leeds, LS11 9AR
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Project Title:

M42 JUNCTION 6

Client:

HIGHWAYS ENGLAND

Location Inset:

LEGEND

- 2km study area
- Local Wildlife Sites (LWS)
- Potential Local Wildlife Sites (pLWS)
- Ancient Woodland

AECOM Internal Project No:

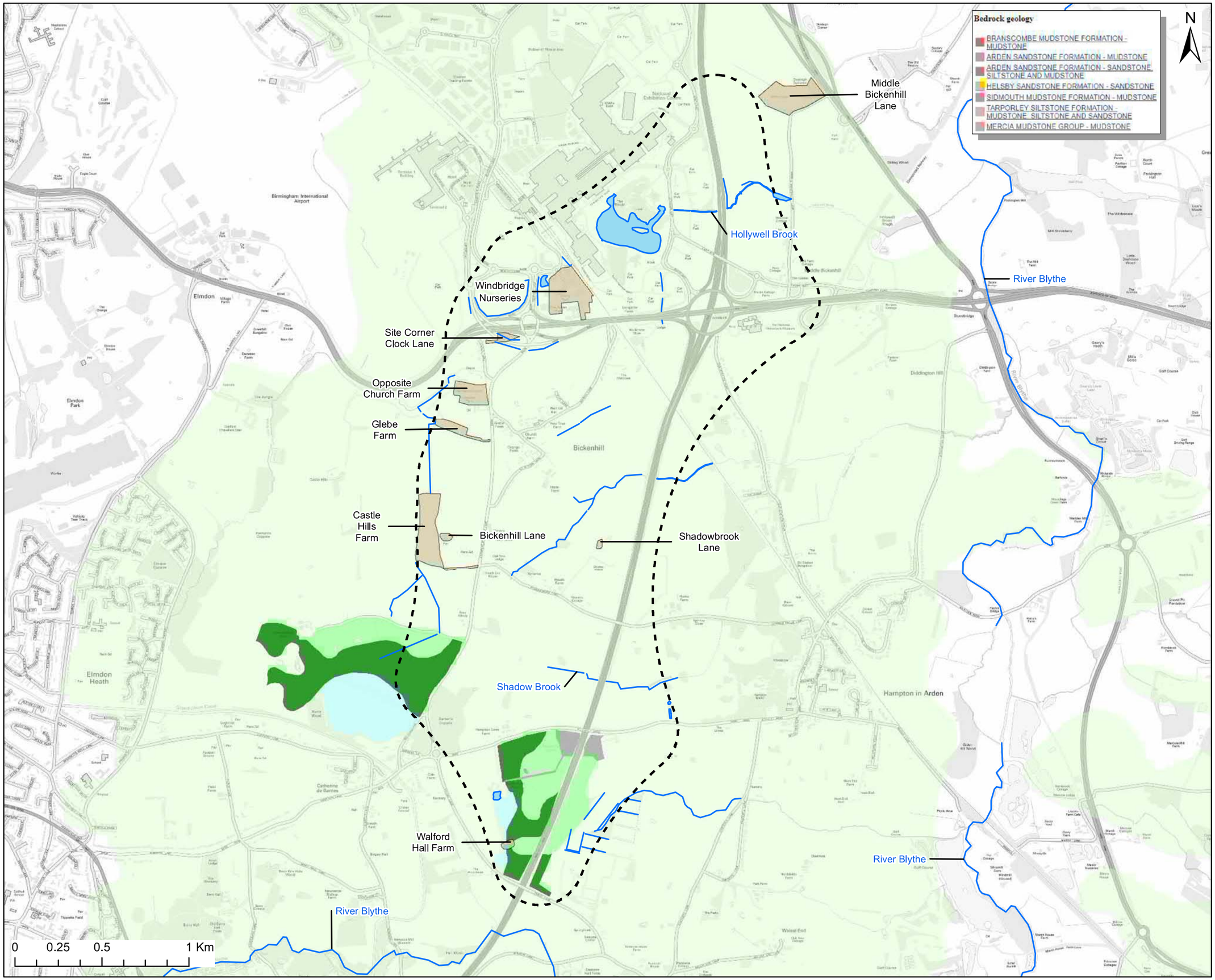
60543032

Drawing Title:

NON-STATUTORY NATURE CONSERVATION DESIGNATIONS WITHIN THE STUDY AREA

Scale at A3: 1:35,000

Drawing No:			Rev:
FIGURE 8.2			0
Drawn:	**Chk'd:**	**App'd:**	**Date:**
GB	MS	MS	21/09/17



Filename: K:\Newproje\60543032 - M42 Jct 6\GIS\02_Maps\Geology\FIGURE 9.mxd

AECOM Limited
2 City Walk
Leeds, LS11 9AR
+44 (0)113 204 5000
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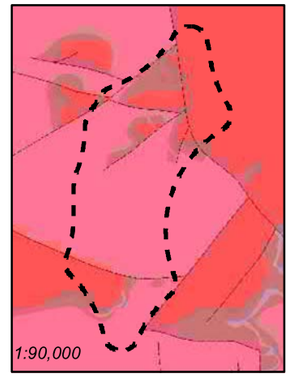
Project Title:

M42 JUNCTION 6

Client:

HIGHWAYS ENGLAND

Bedrock Geology



LEGEND

- 250m Study Area
- Watercourse
- Waterbodies
- Historic Landfill
- Grade 3 Aggricultural Land Classification (Natural England)

ALC Grades (Post 1988) © ADAS & Defra

- Grade 2
- Grade 3a
- Grade 3b
- Other

Copyright:

AECOM Internal Project No:

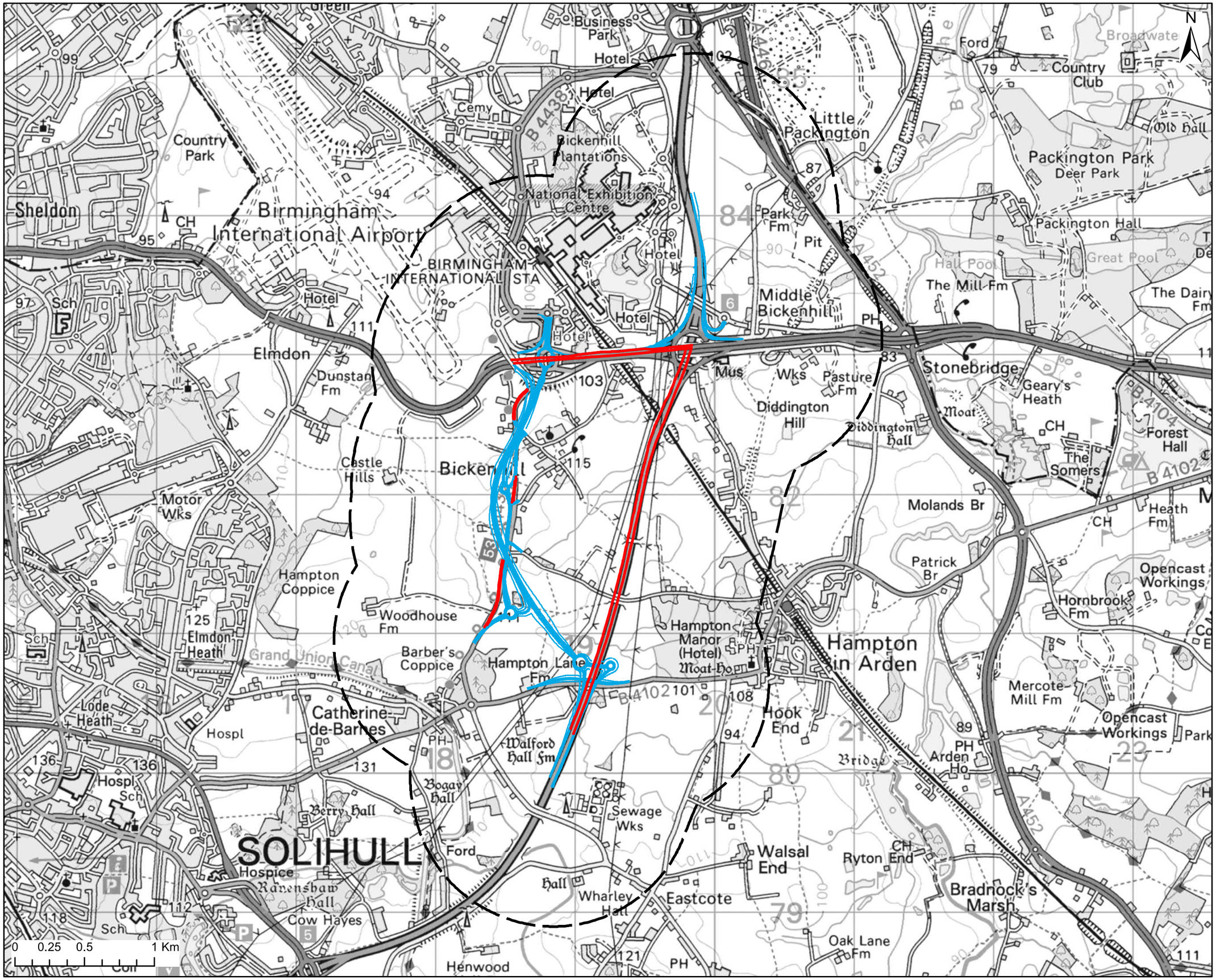
60543032

Drawing Title:

GEOLOGY AND SOILS

Scale at A3: 1:20,000

Drawing No:			Rev:
FIGURE 9			0
Drawn:	**Chk'd:**	**App'd:**	**Date:**
GB	MS	MS	21/09/17



Filename: K:\Newproje\60543032 - M42 Jct 6\GIS\02_Maps\FIGURE X - NOISE STUDY AREA.mxd

AECOM Limited
2 City Walk
Leeds, LS11 9AR
+44 (0)113 204 5000
www.aecom.com

Project Title:

M42 JUNCTION 6

Client:

Highways England

Location Inset:

LEGEND

Proposed Scheme

Copyright:

AECOM Internal Project No:

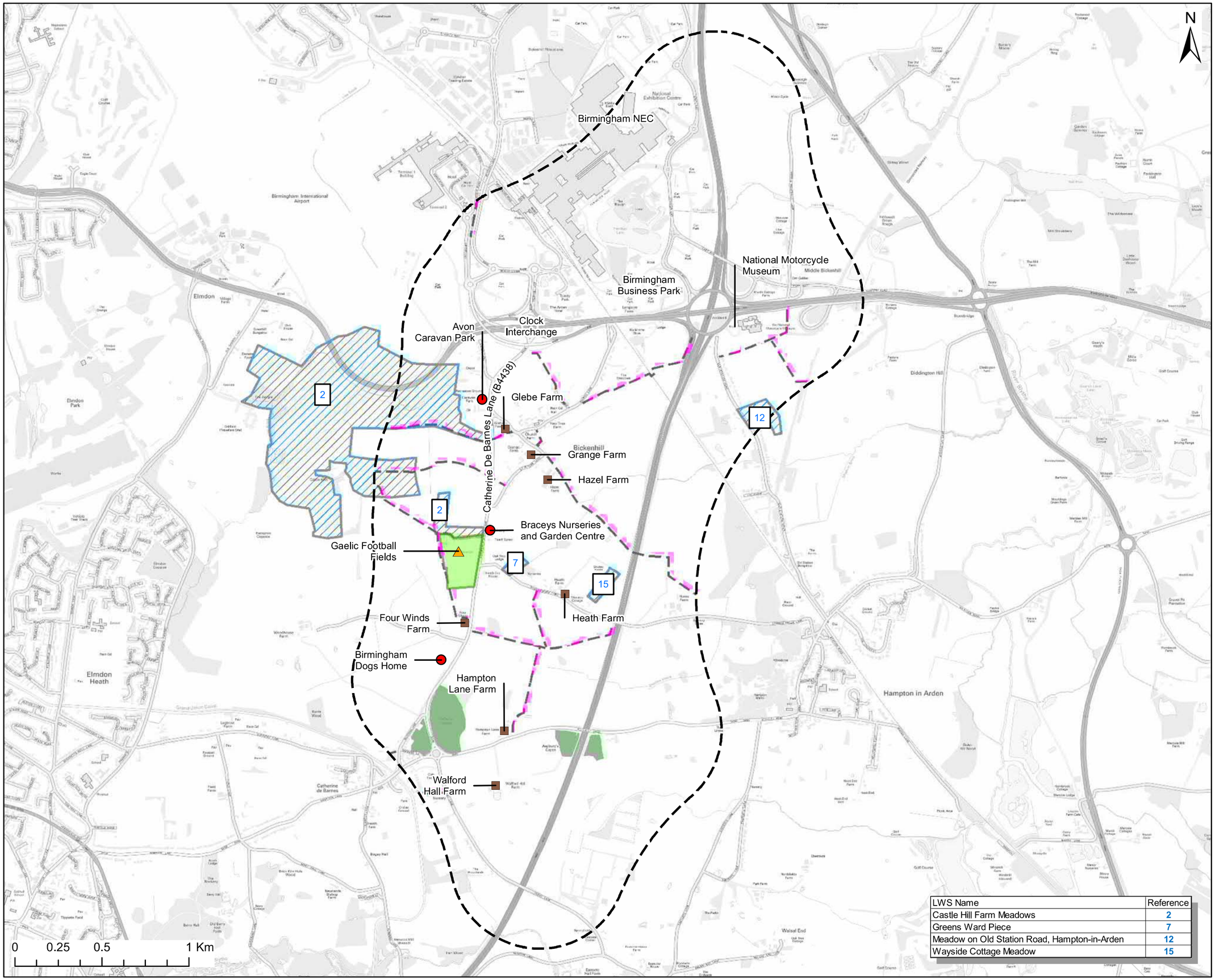
60543032

Drawing Title:

Noise Study Area

Scale at A3: 1:25,000

Drawing No:			Rev:
Figure 11			0
Drawn:	**Chk'd:**	**App'd:**	**Date:**
GB	MS	MS	06/09/17



LWS Name	Reference
Castle Hill Farm Meadows	2
Greens Ward Piece	7
Meadow on Old Station Road, Hampton-in-Arden	12
Wayside Cottage Meadow	15

Filename: K:\Newproje\60543032 - M42 Jct 6\GIS\02_Maps\General\FIGURE 12 - COMMUNITIES PLAN.mxd

AECOM Limited
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www.aecom.com

Project Title:

M42 JUNCTION 6

Client:

HIGHWAYS ENGLAND

Location Inset:

LEGEND

- 500m Study Area
- Farms
- Commercial Properties
- Community Facility
- Public Rights Of Way
- Local Wildlife Sites (LWS)
- Ancient Woodland

Copyright:

AECOM Internal Project No:

60543032

Drawing Title:

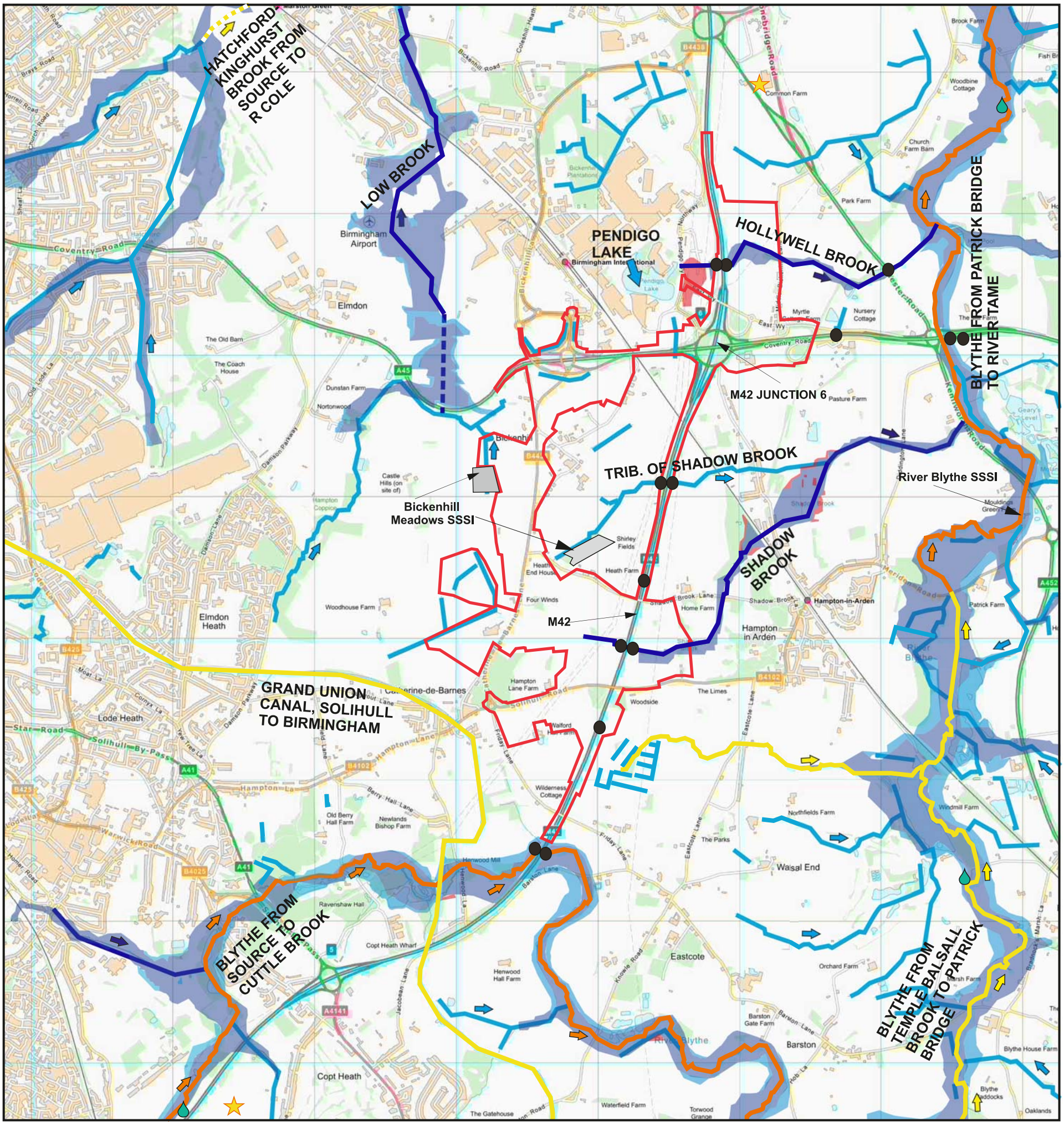
People and Communities Baseline Environment

Scale at A3: 1:20,000

Drawing No:	Rev:
FIGURE 12	0

Drawn:	Chk'd:	App'd:	Date:
GB	MS	MS	21/09/17

13.1 Water Resource Features and their Attributes



KEY

- DCO Boundary
- Main River (when not a WFD Reporting Reach)
- Ordinary Watercourse (when not a WFD Reporting Reach)
- WFD Watercourse - Poor Ecological Status
- WFD Watercourse - Moderate Ecological Status
- WFD Watercourse - Moderate Ecological Potential (Heavily Modified Waterbody)
- Approximate groundwater abstraction location
- Approximate surface water abstraction location
- Flood Zone 2
- Flood Zone 3
- Existing Highways Outfalls as shown on HADDMS

Note. Full details of abstractions, discharge consents and pollution incidents have been requested from the Environment Agency but had not been recieved at the time of writing. Abstraction data shown is derived from the Environment Agency website.

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Altrincham, WA15 8FH
Tel: +44 (0) 161 927 8200
www.aecom.com

Client: HIGHWAYS ENGLAND	Title: WATER RESOURCE FEATURES AND THEIR ATTRIBUTES
Project: M42 Jct 6 Improvement Scheme	

Design:	TJ		
Chk'd:	OT	App'd:	OT
Date:	21-09-2017	Scale:	1:15,000

No. FIGURE 13.1 — Rev: 0

cm | A3