Regional Investment Programme
M25 Junction 10/A3 Wisley Interchange
Preliminary Environmental Information Report

Volume 1 – Main Text

08/02/18

Status: A1 Signed off - Publication

Document Ref: HE552512-ATK-EAC-RP-LM-000001.docx

Notice

This document and its contents have been prepared and are intended solely for Highways England's information and use in relation to M25 Junction10/A3 Wisley Interchange.

Atkins Limited assumes no responsibility to any other party in respect of or arising out of or in connection with this document and/or its contents.

This document has 249 pages including the cover.

Document history

Job number: HE551522			Document ref: HE551522-ATK-EAC-RP-LM-000001				
Revision	**Status**	**Purpose description**	**Originated**	**Checked**	**Reviewed**	**Authorised**	**Date**
C04	A1	Issue for Consultation	JB	NDW	AMB	GB	08/02/18
C03	A1	For HE Sign Off	JB	NDW	AMB	GB	08/02/18
C02	A1	For HE Sign off	JB	NDW	AMB	GB	07/02/18
C01	A1	For HE Initial Review	JB	NDW	AMB	GB	09/01/18

Client signoff

Client	Highways England
Project	M25 Junction10/A3 Wisley Interchange
Document title	Preliminary Environmental Information Report – Volume 1 – Main Text
Job no.	HE551522
Copy no.	
Document reference	HE551522-ATK-EAC-RP-LM-000001C04
Status	A1 Signed off - Publication

Table of contents

Tables

Figures (within text)

Volume 1

1. Introduction

1.1 Overview of project

1.1.1 In December 2014 the Department for Transport (DfT) and the Highways Agency published its Road Investment Strategy (RIS) for 2015–2020. The RIS sets out the list of schemes that are to be delivered by Highways England over the period covered by the RIS (2015 – 2020). The RIS identified improvements to the M25 Junction 10/A3 Wisley Interchange as one of the key investments in the Strategic Road Network (SRN) for the London and south east region.

1.1.2 The M25 Junction 10/A3 Wisley Interchange lies in the south west quadrant of the M25 London Orbital Motorway. At Junction 10 the A3, a key radial route from London to Portsmouth, crosses the M25 motorway. Just to the north of Junction 10 on the A3 is the Painshill Junction with the A245. Together with M25 Junction 10/A3 Wisley Interchange, the junctions in the current configurations restrict traffic flow through the area and a package of options is required to improve junction performance and safety. The location of the M25 Junction 10/A3 junction is shown in Figure 1.1 in Volume 3 Figures.

1.1.3 The Scheme proposed provides increased capacity at the M25 roundabout by elongating the existing roundabout, providing additional lanes to provide more circulatory capacity and enabling more traffic to discharge the roundabout whilst providing dedicated free–flowing left turns. The elongated roundabout would use the existing bridges under the A3 and new bridges over the M25, with additional lanes and capacity between the traffic signals and dedicated left–turn filters at the traffic signals. Most of the existing roundabout and slip roads would be broken out and removed, with the existing structures over the M25 remaining in place. As stated in the DfT RIS Optimisation announcement in November 2017, the additional lane through junction 10, which is part of the M25 J10 to 16 Smart Motorway Project scheme, will be included in this scheme. This will minimise disruption to the public and provide efficiencies in construction

1.1.4 The Scheme includes widening the A3 from Ockham to M25 Junction 10 and M25 Junction 10 to Painshill from three lanes to four lanes in both directions to improve safety and capacity of the A3. There would also be widening of the A245 to three lanes between the Painshill junction and the B365 Seven Hills Road junction. As the A3 will be widened to four lanes the current access to it from side roads and private properties will need to be closed and alternative arrangements will be put in place to provide access to the road network for the properties affected. Alterations to signage and improvements to drainage are also included in the Scheme. Highways England expects to start construction in September 2020.

1.2 Purpose of the PEIR

1.2.1 The purpose of this Preliminary Environmental Information Report (PEIR) is to provide consultees with the information compiled by Highways England to date about the predicted environmental impacts of the Scheme and the proposed mitigation measures, and to inform the pre-application statutory consultation on the proposals. The report describes the Scheme, including construction details as currently proposed, timescales for delivery and alternatives considered.

1.2.2 For each environmental topic, the report:

- Describes the environmental baseline data collection work undertaken to date;
- Describes the existing baseline environment, based on the primary and secondary data collection to date;
- Identifies further work that is ongoing or that is likely to be undertaken to complete the Environmental Impact Assessment (EIA);
- Provides an assessment of the likely environmental impacts of the Scheme based on the currently available information; and
- Describes the range of mitigation measures that will be considered to avoid, reduce/mitigate or offset the identified environmental impacts.

1.2.3 This report constitutes the formal PEIR for the Scheme as required by Regulation 12 of the Infrastructure Planning (EIA) Regulations 2017 (as amended). The PEIR will be made available to prescribed consultees, local authorities, landowners and to members of the public and the wider community likely to participate in the public consultation. This will enable the consultees, including the local community, to understand the main environmental effects and implications of the Scheme to inform their responses to consultation.

1.2.4 Following the completion of the consultation, Highways England will take account of all comments and suggestions received from the consultees to help develop the scheme design. The responses to the consultation will feed into the way the EIA work is undertaken and reported and help Highways England finalise the Environmental Statement (ES) which will form part of the application for the Development Consent Order (DCO). The application will also annex a Consultation Report which will document the outcomes of the consultation and how this has informed the final Scheme.

1.3 Need for Environmental Impact Assessment

1.3.1 The requirement for certain projects to report their effects on the environment is derived from European Union (EU) legislation initially in Council Directive 85/337/EEC on the assessment of the effects of certain public and private projects on the environment. This legislation has been amended three times, in 1997, in 2003 and in 2009 with the amendments codified by Directive 2011/92/EU of 13 December 2011. The most recent changes being adopted in UK legislation by the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the “EIA Regulations 2017”). which transposes changes made to EU Directive 2011/92/EU1 (“the EIA Directive 2011”) by EU Directive 2014/52/EU2. The related Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (“the IP (EIA) Regulations 2017”) govern development given planning consent through the nationally significant infrastructure planning regime.

1.3.2 The EIA Regulations 2017, in Schedule 1 sets out thresholds for certain types of projects that by their scale or nature require an EIA to be prepared. Where projects do not meet these thresholds Schedule 2 of the Regulations lists projects (including highways projects) for which EIA may still be required if their effects on the environment are deemed to be significant. The process by which this decision is made is known as Screening and a Screening Report for M25

Junction 10/A3 Wisley Interchange was recently made. The Screening Report concluded that because of the likelihood of significant environmental effects a statutory EIA leading to an ES would be required.

1.3.3 The Scheme comprises an alteration of a highway lying wholly in England, for which Highways England, being a strategic highways company, is the highway authority. As the area of development for the alteration works exceed the 15 hectares (ha) limit prescribed in Section 22(4)(a) of the Planning Act 2008 (as amended), the Scheme will be a Nationally Significant Infrastructure Project (NSIP). This means that a DCO application will need to be made to the Secretary of State under Section 37 of the Planning Act 2008 to seek authorisation to build the Scheme.

1.3.4 The aim of EIA is to protect the environment by ensuring that the Planning Inspectorate, when making a recommendation to the Secretary of State to grant development consent for an NSIP that is likely to have significant effects on the environment, does so in the full knowledge of the likely significant effects, and takes this into account in the decision–making process. The aim of EIA is also to ensure that the public and stakeholders have the information to enable them to ensure they can be given early and effective opportunities to participate in the decision–making procedures.

1.3.5 The EIA will be carried out by a team of specialists working in close collaboration with the design engineers responsible for the preliminary design of the Scheme as part of an iterative design, consultation and assessment process. This will maximise the opportunity to avoid or reduce adverse environmental effects at source and to identify the most effective mitigation of those effects that cannot be avoided.

1.4 Overseeing organisation

1.4.1 The responsible organisation for the Scheme is Highways England. We are a government company charged with operating, maintaining and improving England's motorways and major A roads.

1.5 The designer

1.5.1 The designer is Atkins Ltd. We have appointed Atkins under our Project Support Framework to undertake the Preliminary Design of the Scheme for the M25 Junction 10/A3 Wisley Interchange which includes EIA and the preparation of an ES for the Scheme.

1.6 Key legislation and policy

Legislative framework

1.6.1 On 12 March 2014, the European Parliament voted to adopt substantive amendments to the EIA Directive 2011/92/EU1. These amendments made by EIA Directive 2014/52/EU2 were transposed into UK legislation in May 2017 as the IP (EIA) Regulations 2017 and will be relevant to this Scheme and the topic assessments.

Policy overview

1.6.2 A summary of what are considered to be the key implications of National, Regional and Local policy documents for the Scheme are shown in Table 1.1. This is followed by a summary of the key messages and implications of each.

1.6.3 Both Elmbridge Borough Council (EBC) and the Guildford Borough Council (GBC) have emerging Local Plans which, subject to an Examination in Public should be adopted within the next couple of years.

Table 1.1: Policy overview

Scale	Policy Document	Key Implications for the Scheme
National	National Policy Statement for National Networks (NPSNN) (2014)	Sets out the Government's policies to deliver NSIPs on the national road and rail networks in England. The Secretary of State uses the NPSNN as the primary basis for making decisions on development consent application for NSIPs in England.
	Road Investment Strategy: 2015 to 2020 (2014)	Promote safe movement, satisfy users of the network, support efficient movement, can be delivered and operated within environmental constraints, achieve better environmental outcomes and improved environmental performance, support local access and well–being and be demonstrably cost effective.
	Highways England: Strategic Business Plan 2015 to 2020 (2014)	Support short–term targets as well as long–term aspirations and not significantly impact on network availability. An improved environment is one of the key outcomes of the Plan, where the impact of Highways England activities is further reduced ensuring a long term and sustainable benefit. The Plan recognises the need to play a part in improving air quality and there are environmental Key Performance Indicators (KPIs) to mitigate Noise Important Areas and to deliver improved biodiversity.
Regional	Surrey County Council, Surrey Transport Plan (2011)	To help people to meet their transport and travel needs effectively, reliably, safely and sustainably within Surrey; in order to promote economic vibrancy, protect and enhance the environment and improve the quality of life. In the 2017 Problems and Challenges update to the Surrey Transport Plan, the Council identified that due to Surrey's location next to London, and the proximity of both Heathrow and Gatwick Airports, there is considerable demand for movement within, to, from, and through the county and the strategic network has evolved to principally serve London, with nationally important routes passing through. The non–strategic network serves to link the settlements. The Wisley Interchange are where these networks meet and cause congestion.
Local	Elmbridge Borough Council Core Strategy (2011)	To deliver additional development and infrastructure which provides benefits across the Borough to a changing population, in a way that does not compromise peoples' quality of life or have a detrimental impact on the environment. Para 5.5 identifies the overarching spatial strategy is set within the overall framework of protecting and enhancing green infrastructure, directing new development and

Scale	Policy Document	Key Implications for the Scheme
		supporting infrastructure to the most sustainable locations in accordance with existing settlement patterns, availability of land, the need for supporting infrastructure and services and any significant environmental constraints which may be relevant, whilst ensuring high quality and innovative design is a bedrock for future developments across the borough. Policy CS25 (Travel and Accessibility) states that it will support improvements to transport infrastructure by working in partnership with transport providers and Surrey County Council as the Highway Authority.
	Guildford Borough Council Local Plan (2003)	The overall aim is to promote development that meets the needs of the present without compromising the ability of future generations to meet their own needs. The Local Plan seeks to protect and enhance the quality of the urban and rural environment, make the best use of scarce land resources, minimising the impact of development on Greenfield Sites and to protect the countryside from inappropriate development and maintain it's open and rural character. The Local Plan identifies that responsibility for transport issues lie mainly with Surrey County Council but land use and transportation planning are directly linked and the Local Plan has an important role to play.

1.7 Pre–application consultation

1.7.1 Pre–application consultation is an important pre–requirement for application for DCO. It provides an opportunity for interested parties to comment on the proposals while they are at a formative stage, and for potential issues to be taken into account and, where necessary, address the issues before the application is submitted for examination.

1.7.2 Under the Planning Act 2008, there are three key statutory requirements in respect of pre–application consultation and publicity:

- Section 42 consultation with prescribed consultees (e.g. Natural England, Environment Agency, Historic England), local authorities, landowners and others with interests in land;
- Section 47 consultation with the local community in accordance with a Statement of Community Consultation; and
- Section 48 publicity of the proposed application.

1.7.3 A pre–application statutory consultation covering all the above–mentioned consultees is planned after submission of the PEIR for inclusion of the consultation outcomes and the proposed mitigation measures where appropriate in the ES. The details of the proposed statutory consultation have been included in section 2.5 of this PEIR.

1.8 Structure and contents of the Preliminary Environmental Information Report

1.8.1 The structure of the PEIR is as follows:

Box 1.1 Structure of the PEIR

Volume 1
Chapter 1 – Introduction
Chapter 2 – The Project
Chapter 3 – Assessment of Alternatives
Chapter 4 – Environmental Assessment Methodology
Chapter 5 – Air Quality
Chapter 6 – Noise and Vibration
Chapter 7 – Biodiversity
Chapter 8 – Road Drainage and the Water Environment
Chapter 9 – Landscape
Chapter 10 – Geology and Soils
Chapter 11 – Cultural Heritage
Chapter 12 – Materials and Waste
Chapter 13 – People and Communities
Chapter 14 – Climate Change and Disaster Prevention
Chapter 15 – Assessment of Cumulative Effects
References
Abbreviations and Glossary
Volume 2 – Appendices
Volume 3 – Figures
Volume 4 – Non Technical Summary

1.8.2 A non-technical summary of the PEIR is provided separately and gives a shorter, more accessible version of the report. This PEIR is part of a suite of documents which have been made available for the statutory consultation. Highways England will consider consultation responses from the public and stakeholders in continuing to assess the merits of the Scheme and where appropriate to improve and refine the proposals. The information presented in this PEIR will be developed further through the EIA process, and the findings of the EIA will be presented in the ES which will accompany the DCO application.

2 The Project

2.1 Need for the project

2.1.1 The M25 Junction 10/A3 Interchange is positioned on a critical section of the Strategic Road Network (SRN). The M25 forms part of the 'Ten–T' Trans–European Transport Network and is therefore a nationally important link providing access to global markets and connections to the channel ports for much of the UK as well as for the South East region. The A3 is also an important strategic route, linking London with the international port of Portsmouth, as well as Guildford, which is the largest centre of employment in Surrey.

2.1.2 This section of the SRN, through Junction 10, carries around 270,000 vehicles per day, making it one of the busiest in the country. About one third of all traffic approaching Junction 10 on both the A3 or the M25 use the roundabout to interchange between the two roads. Given the limited capacity of the existing roundabout to accommodate these large flows, significant delays and congestion occur in most peak periods. The junction is therefore a major impediment to the smooth flow of traffic on the SRN at this point. Journey time reliability is poor, with some journeys taking more than 2.5 times longer than expected in the peak periods. With forecast traffic growth and significant planned housing and economic development in the area, the problems at the junction are expected to deteriorate further unless an improvement scheme is undertaken. Junction 10 is also ranked as having the highest collision rate of junctions nationally. During the period of 2012-2016 (inclusive), Highways England reported accident data included 244 accidents (just under 50 per year on average) on and around the M25 Junction 10 and the A3 between Painshill and Ockham. This is partly attributable to the high levels of congestion at the junction, but is also due to there being a significant number of side roads and private accesses which connect directly to the A3 between Painshill and Ockham, thus reducing safe weaving distances for traffic. Further detail on the problems at Junction 10 are included in other project reports that are available if necessary.

2.2 Project objectives

2.2.1 The improvements to M25 Junction 10 as originally stated in the RIS should deliver: "free–flowing movement, together with improvements to the neighbouring Painshill interchange on the A3 to improve safety and congestion across the two sites". The expected cost of the Scheme was in the range from £100m to £250m. For the purposes of this report, this is referred to as the aim of the Scheme.

2.2.2 The current challenges at the M25 Junction 10/A3 Wisley Interchange as noted above include:

- Congestion and delay disrupting journeys on the SRN;
- Poor resilience resulting in frequent disruption and unreliable journey times;
- Safety concerns; and
- Congestion causing a barrier to growth. Enterprise M3 Local Enterprise Partnership has highlighted the M25 Junction 10/A3 Wisley Interchange as a part of the transport network where projected increases in traffic would cause

further congestion and delays and hinder growth in the area unless addressed.

2.2.3 The Scheme objectives as set out in the Client Scheme Requirements are as follows:

- Route Operation:
  - Support any projected traffic increases from other committed schemes on the SRN and avoid or mitigate against causing adverse effects elsewhere on the Local Road Network.
- Capacity:
  - Reduce the average delay (time lost per vehicle per mile) on the mainline A3 and on M25 through junction running; and
  - Smooth the flow of traffic by improving journey time reliability (Planning Time Index) on the mainline A3.
- Safety:
  - Reduce annual collision frequency and severity ratio on the mainline A3, slip roads and M25 Junction 10 gyratory.
- Social:
  - Support the projected population and economic growth in the area;
  - Support walking and cycling by incorporating safe, convenient, accessible and attractive routes for pedestrians, cyclists and equestrians and improving crossing facilities; and
  - Take account of the concerns of local communities and other key stakeholders raised during consultations.
- Environment:
  - Support compliance with the UK's legally binding limits and targets on air quality and water quality status and support targets to cut greenhouse gas emissions and objectives for local air quality management areas;
  - Avoid, mitigate and compensate for adverse effects on the integrity of the Thames Basin Heaths Special Protection Area (SPA) and other statutory designated nature conservation sites and promote opportunities;
  - Recognise the significance of designated heritage assets close to the route of the Scheme, including at Painshill Park and at Wisley Gardens through incorporating suitable mitigation and/or design measures to avoid or reduce significant harm;
  - Improve the quality of life for nearby residents, through addressing the effects of noise on people in the declared noise important area's (NIA's) and ensuring that significant noise effects are mitigated; and
  - Ensure through good design, that an appropriate balance is achieved between functionality and the Scheme's contribution to the quality of the surrounding environment, addressing existing problems wherever feasible, avoiding, mitigating or compensating for significant adverse impacts and promoting opportunities to deliver positive environmental outcomes.

2.3 Project description

2.3.1 Drawings showing the Scheme are shown in Volume 3 Figures of the PEIR. The Scheme has been developed over previous project stages and is the result of analysis and assessment of traffic, engineering, buildability and environmental factors as well as consultation with stakeholders and members of the public. Although the layout of the Scheme has been developed to a sufficient level of detail to show the size and location of the various elements that comprise it, further design and assessment will take place during this stage to refine it and provide more certainty on the layout of the Scheme. As such there is some level of uncertainty on the design of the Scheme at this point in the process. The boundary of the works has therefore been drawn with reference to the 'Rochdale Envelope' to allow for design development and the uncertainties that are inevitable at this stage. The area for the works included with the DCO boundary are shown in Figure 2.1 in Volume 3.

Junction 10

2.3.2 The Scheme proposed provides increased capacity at the M25 roundabout by elongating the existing roundabout, providing additional lanes to provide more circulatory capacity and enabling more traffic to discharge the roundabout whilst providing dedicated free–flowing left turns. The elongated roundabout would use the existing bridges under the A3 and new bridges over the M25, with additional lanes and capacity between the traffic signals and dedicated left–turn filters at the traffic signals. Most of the existing roundabout and slip roads would be broken out and removed, with the existing structures over the M25 remaining in place. The alterations to junction 10 include the increase from 3 lanes to 4 lanes on the M25 through the junction and extended slip lanes to enable the introduction of smart motorway arrangements on the M25 junction 10 to 16 section in the future.

A3 Widening

2.3.3 The Scheme also includes widening the A3 from Ockham to M25 Junction 10 and the M25 Junction 10 to Painshill from three lanes to four lanes in both directions to cater for the volumes of traffic expected to use these roads in the future. There would also be widening of the A245 to three lanes between the Painshill junction and the B365 Seven Hills Road junction. As the A3 will be widened to four lanes the current access to it from side roads and private properties will need to be closed and alternative arrangements will be put in place to provide access to the road network for the properties affected. Highways England expects to start construction in September 2020.

M25 Works

2.3.4 The Scheme also includes provision for new or amended signs and gantries with associated cabling works along the A3 and the M25. On the M25 to the east of junction 10, beyond the area where the works to the layout of the highway would take place, alterations to signs and signals on existing gantries would be required but the gantries themselves would not be altered. The Scheme also makes allowance for improved drainage measures to be introduced on the altered sections of the A3 and M25.

Side Roads and Local Access

2.3.5 The widening of the A3 necessitates the closure of the existing direct accesses to it and alternative provisions have been made which include:

- A new 2–way link road directly from the east side of the Ockham interchange roundabout along the north western edge of the Wisley airfield site before tuning north west to rise and cross over the A3 on a new bridge close to the line of Elm Lane. This access ties into the existing level of Wisley Lane beyond the Royal Horticultural Society's (RHS) entrance, which will need to be amended. The existing access to and from Wisley Lane from the northbound A3 will be closed. The new crossing would provide access over the A3 for non–motorised users (NMU) and the existing footbridge would be removed An area of land for flood compensation is included where the structure carrying the road over the Stratford Brook watercourse might reduce the flood zone here. This is shown on Figure 9.8 Sheet 2 of the Preliminary Environmental Design drawings in Chapter 2 of Volume 3;
- The existing Elm Lane connection to the A3 would be closed and to enable the residents of Elm Corner to access the road network, Elm Lane and Old Lane would be joined via the existing byway open to all traffic (BOAT). The existing BOAT would be reconstructed as a single lane, two–way local access road providing access from Elm Corner to the A3 via Old Lane and the M25 clockwise to A3 slip road This is shown on Figure 9.8 Sheet 2 of the Preliminary Environmental Design drawings in Chapter 2 of Volume 3;
- A new two–way access road connecting Birchmere Scout Campsite, Hut Hill Cottage and Pond Farm to Old Lane at the Ockham Bites site via a rebuilt Cockrow overbridge would be provided. The bridge could be constructed as a 'multi–use bridge' to provide habitat connectivity between ecologically valuable land on either side of the A3. The existing access to the A3 northbound to M25 clockwise slip road at Junction 10 would be closed off. The existing track along Deers Farm Close and past Park Barn Farm would be retained. This is shown on Figure 9.8 Sheet 3 of the Preliminary Environmental Design drawings in Chapter 2 of Volume 3;
- The connection to Old Lane from the A3 southbound on slip will remain;
- A two–way local access road with passing bays would be provided from Redhill Road to Seven Hills Road, providing access to Long Orchard Farm, Long Orchard House and San Domenico (Euro Garages). This is shown on Figure 9.8 Sheet 4 of the Preliminary Environmental Design drawings in Chapter 2 of Volume 3;
- A new road bridge spanning the widened A3 will be provided just to the south of the end of Redhill Road, linking the access road from Seven Hills Road South to a new two–way local access road running parallel along the south east side of the A3 as far as Court Close Farm, Heyswood Guides Camp and New Farm. This new link road and bridge will also form part of the NMU network around the Scheme, via a bridleway link to the re–provided NMU route south from Painshill interchange This is shown on Figure 9.8 Sheet 4 of the Preliminary Environmental Design drawings in Chapter 2 of Volume 3; and
- Widening the A245 from the Painshill Junction to Seven Hills Road Junction to dual three lane all purpose (D3AP), with a two–way access road between Old

Byfleet Road to Seven Hills Road South for Felton Fleet School. The existing right turn from Old Byfleet Road to the A245 would be closed This is shown on Figure 9.8 Sheet 4 of the Preliminary Environmental Design drawings in Chapter 2 of Volume 3;

Bridges

2.3.6 In addition to the Cockrow Bridge noted above there are three other bridges to be replaced that are used for private means of access, all of which also function as parts of the Public Rights of Way (PRoW) network so the Scheme includes:

- Reinstatement of Buxton Wood Bridge across the amended M25 as an accommodation/bridleway bridge; and
- Reinstatement of Clearmount Bridge across the amended M25 as an accommodation/bridleway bridge; this could have a wider bridge deck to provide multi–functional features, including potentially providing some planted vegetation to allow habitat connectivity across the bridge.
- Reinstatement of Hatchford Park Bridge across the amended M25 as an accommodation/bridleway bridge.

2.3.7 A further new bridleway bridge would be provided over the M25 just to the east of Junction 10 to link up more conveniently areas of Common Land to the north and south of the motorway, provide better access for users of the publicly accessible land and facilitate the north south route for NMU's.

Replacement Land

2.3.8 The Scheme is located within an area of land designated as Common Land or Access Land and is additionally designated for its ecological value as a SPA and Site of Special Scientific Interest (SSSI). Land take from these areas is required to accommodate the Scheme and suitable replacement land is required to compensate for the loss of this land. The Scheme includes areas of replacement land for loss of Common or Access Land and for the loss of SPA and SSSI land. A greater area of replacement land is provided than is taken by the Scheme in recognition that it is not immediately of a similar quality than that taken. The areas of replacement land are provided in four locations shown in Figure 13.1 in Volume 3:

- On the holding known as Park Barn Farm to the north west of the junction;
- On an area of land off Old Lane to the south east of the junction;
- On the holding known as Pond Farm to the west of the junction; and
- On two adjacent areas of land to the east of the junction, just to the north of the M25.

2.3.9 These areas of land have been selected on the basis of a combination of:

- Proximity and linkages to the designated land taken;
- Similarity of features, character, vegetation or habitat as the land lost or the potential to achieve these either with or without further work;
- Sufficient size to accommodate the areas lost at the appropriate replacement ratios; and

- Availability or potential availability for purchase.

2.3.10 Further details on the replacement land are given in a separate report that will be included as an Annex to the ES.

Public Rights of Way

2.3.11 As part of the Scheme, the following PRoW works will be proposed, to ensure that the Scheme re–provides or enhances existing NMU routes and connectivity and provides suitable rights of access to the remaining areas of existing Registered Common and Access Land and to and through the replacement land areas:

- Upgrading the existing equestrian route in the northern quadrant to bridleway status, to connect NMUs at Redhill Road to the bridleway bridge at Clearmount; this will also provide a basis for bridleway links to Areas N1, N2 and N4;
- Bridleway connection to this upgraded equestrian route from the local road or bridleway bridge over the A3 by Red Hill;
- A bridleway/cycleway link connecting the local access road along the east side of the A3 to Painshill interchange and to Pointers Road, with a link to the bridge over the A3 to Redhill Road;
- A new bridleway bridge across the M25 to the south east of the Junction 10 roundabout, with bridleway links to Pointers Road and across Ockham Common (by upgrading the existing equestrian route) to Old Lane;
- A bridleway/cycleway link along the south east side of the A3 between the above bridge and Ockham interchange, with links to the replacement Cockrow bridge, Old Lane, Wisley Lane bridge and Footpaths 14, 13 and 13a;
- Connecting the south end of Footpath 9 to the bridleway on Footpath 10 by Hut Hill;
- Provision of Pegasus crossings at Ockham interchange to provide safe access under the A3 to the B2215;
- Upgrading the existing equestrian route from Clearmount Bridge to bridleway status and connecting it to the replacement for Cockrow Bridge;
- Upgrading the existing equestrian route across Ockham Common to bridleway status and connect it to the replacement for Cockrow Bridge; and
- Upgrading Footpath 7 to bridleway status to provide appropriate connection between two areas of existing Registered Common Land over the replacement Buxton Wood bridge – this will also entail a small realignment onto the farm track on the south side of Buxton Wood Bridge to avoid the existing set of steps.

2.3.12 These NMU works (shown on the Preliminary Environmental Design drawings Figure 9.8 and Figure 13.2 in Volume 3) will also contribute towards achieving the objectives of the Scheme, as set out in section 2.2.

Land take

2.3.13 The permanent land take (i.e. the areas outside the existing highway boundary but within the proposed highway boundary) required for the Scheme is approximately 26 ha. The permanent land take required would include a number of areas covered by environmental designations.

2.3.14 The requirement for and extent of temporary land take is currently being developed but an area of 33 ha is included within the DCO boundary in which necessary construction activities might take place. The land taken temporarily will be restored and returned to its original landowners after construction has been completed. As far as possible the land will be returned in the same condition as it was before the works commenced. Where this is not possible measures will be put in place to achieve this including management operations over a long period of time. In some cases it may be possible to return the land in an different condition which could lead to enhancements in the long term in agreement with the original landowner.

Construction, operation and long–term management

2.3.15 Specific construction, operational and long–term management arrangements are not known in detail at this stage of the Scheme. Potential locations of construction compounds for the contractor have been identified and are included within the temporary land take for the Scheme. The assessments of construction effects will assume best practice, based on industry guidance and professional experience. Construction of the Scheme is planned to commence in September 2020, with the Scheme planned to be open for traffic in September 2022.

Decommissioning

2.3.16 In view of the indefinite design life of the Scheme, it is not considered appropriate for this to form part of the environmental assessment. The focus of the Scheme will be upon seeking to minimise disruption and to re–use materials that will also form part of the materials assessment. Decommissioning of the Scheme has therefore not been included in this PEIR.

2.4 Site and surroundings

Order limits

2.4.1 The proposed draft DCO boundary identified by a red line (known as the ‘Order limits’) has been established and includes all works that will be proposed by the Order including both the Nationally Significant Infrastructure Project (NSIP) and any of the associated development. A draft plan of the DCO boundary is provided in Figure 2.1 in Volume 3.

Site context and adjoining uses

2.4.2 The M25 Junction 10/A3 Wisley Interchange lies in the south west quadrant of the M25 London Orbital Motorway. At Junction 10, the A3, a key radial route from London to Portsmouth, crosses the M25 motorway. Just to the north of Junction 10 on the A3 is the Painshill Junction with the A245. To the south of Junction 10 on the A3 is the Ockham Junction with the B2039 and B2215. The Scheme is located within the County of Surrey and within the Boroughs of

Guildford and Elmbridge. The location of the M25 Junction 10/A3 junction is shown in Figure 1.1 in Volume 3.

Environmental overview

2.4.3 The M25 Junction 10/A3 junction is set within a predominantly wooded area to the south of Cobham and Byfleet and is an attractive area despite the presence of the A3 and M25. Much of the area around the junction is covered by the internationally designated Thames Basin Heaths SPA and nationally designated Ockham and Wisley Commons SSSI, as well as designations as a Local Nature Reserve (LNR), Site of Nature Conservation Interest (SNCI) and ancient woodland.

2.4.4 The Royal Horticultural Society's (RHS) headquarters are located at Wisley gardens to the south west and Painshill Park is to the north east of Junction 10; both are designated as Registered Parks and Gardens of Historic Interest. Much of the area around the junction is designated as Common Land and/or Access Land and these areas, along with RHS Wisley and Painshill Park, are well used by the public. There are some facilities for walkers/cyclists along the A3 on the southbound carriageway but they are in a poor state There are at–grade, controlled pedestrian and equestrian crossings at the junction and a number of PRoW in the surrounding area.

2.4.5 There are a number of Noise Important Areas (NIAs) at the M25 Junction 10/A3 Wisley Interchange. No Air Quality Management Areas (AQMA) have been declared by the local authorities for the area immediately around the junction and there are few human health receptors nearby. The nearest AQMA is in Cobham to the north east of Junction 10.

2.4.6 There are four Scheduled Monuments in the area immediately around the junction and a number of Listed Buildings in the study area.

2.4.7 There are no Source Protection Zones (SPZ) near the junction and flooding is not an issue although the River Mole, River Wey and Guileshill Brook are nearby and the Stratford Brook crosses the Scheme at Ockham Junction.

2.4.8 There are a number of disused landfill sites that accepted inert waste in the study area and the sand and gravel geology means that the area is sensitive to pollution incidents.

2.4.9 These key environmental constraints are shown on the overall environmental constraints drawing (Figure 2.2) with other detailed environmental constraints drawings in Volume 3.

2.5 Consultation (overview)

Consultation undertaken to date

2.5.1 The Scheme and public consultation were announced in October 2016 via a Department for Transport (DfT) press release which covered several South East RIS schemes. Local media were also alerted by the Highways England press office and invited to attend a dedicated briefing session on Monday 5 December 2016 when the consultation opened.

2.5.2 A letter of invitation to the exhibitions was sent to 36,500 households within the locality. Information was also available via the Highways England website and

posters advertised that hard copy brochures and questionnaires were available from six libraries across the area. Advertising in the local media was also undertaken, both in hard copy and online.

2.5.3 The Option Selection Stage public consultation period ran from 5 December 2016 to 6 February 2017, a period of 8 weeks. During this time, seven events open to the public were held across the M25 Junction 10 area in addition to an event directed at Local Authorities, Parishes and key stakeholders. These events were held to both the north and south of M25 Junction 10, in Cobham and Ripley respectively.

2.5.4 The consultation material consisted of a consultation brochure and questionnaire, exhibition boards available to view at the events, and two key technical reports, the Technical Appraisal Report and the Environmental Study Report, available in hard copy at exhibitions and in PDF format on the Highways England Scheme webpage.

2.5.5 A 3D visual representation of what each option could look like in 2035 was displayed at the exhibitions. The two options which the Option Selection Stage consultation sought views on were:

- Option 9 – a new flyover to link right–turning movements from the A3 onto the M25; and
- Option 14 – enlarging the existing roundabout to add more capacity.

2.5.6 Views were also sought on the decision to reject Option 16 and on the proposal to widen the A3 between Ockham and Painshill to 4 lanes (currently 3 lanes), creating an extra lane for vehicles turning left onto the A245 at the Painshill roundabout, and changing local accesses to make these safer and cause fewer delays on the A3.

2.5.7 Stakeholders and members of the public were invited to complete a questionnaire on the proposals (or write in separately) where they could express a preference for either of the Scheme options and give their views.

2.5.8 Of the two options presented during the public consultation, Option 9 gained the most support (64% vs. 29% for Option 14). However, concerns were raised about its scale and the impact it would have on the land around the junction.

2.5.9 Stakeholders had a more mixed view, with the majority (26 of 39) preferring to give no preference at this stage.

2.5.10 Key concerns across both the questionnaire respondents and those who submitted letters (long form responses) included:

- The potential environmental impacts of the Scheme (air, noise and visual) – particularly for Option 9;
- The potential loss of habitat and SPA/Common Land;
- The longevity of Option 14 in delivering benefits to congestion;
- Local roads and driveways that have direct access to the A3; and
- Concern whether the Scheme could deliver significant benefits without any further action being taken on the M25 itself.

2.5.11 In terms of local accesses, considerable effort during and following the public consultation period was invested in developing and improving design ideas to

meet local stakeholder needs. At the end of the Option Selection Stage consultation, discussions with stakeholders regarding a number of local access options took place and some consensus was reached regarding preferred options.

2.5.12 Highways England's current development of a separate scheme to upgrade M25 Junction 10–16 to Smart Motorway was also considered as these works would provide additional capacity during peak periods. Other key topics that arose from both the public exhibitions and open text comments in the questionnaire responses included:

- Congestion in Cobham and Ripley;
- Introducing south facing slip roads at Ockham Park junction; and
- The potential development at Wisley Airfield.

2.5.13 During the Option Selection Stage consultation continued engagement took place with the following key statutory and non–statutory environmental bodies:

- Environment Agency;
- Historic England;
- Natural England;
- Royal Society for the Protection of Birds (RSPB);
- Open Spaces Society;
- Surrey County Council;
- Surrey Wildlife Trust;
- GBC;
- EBC;
- Woking Borough Council (WBC);
- Connect Plus;
- Forestry Commission
- Painshill Park; and
- RHS Wisley.

2.5.14 Discussions were also held with many individual members of the public and groups who could be affected by the Scheme to understand their concerns and to try to resolve these in the design of the Scheme.

Proposed consultation

2.5.15 Under Section 47 of the Planning Act 2008, Highways England are required to consult with the local community before submitting an application for a DCO so that the public can have their say and help shape the Scheme. Highways England is also required to consult with the relevant local authorities (Surrey County Council, EBC, GBC) about the consultation approach.

2.5.16 Formal statutory pre–application consultation is proposed for the Preliminary Design Stage, with the following specific consultation objectives:

- To gather feedback from stakeholders and present as evidence which will feed into the consultation report and provide the project team with insight to help refine the preferred route;
- Ensure all relevant issues are identified and considered before the Scheme is finalised;
- Consider the need for design refinements and other mitigation to address specific concerns;
- To ensure that there are no better, less damaging alternatives that should be pursued for meeting the objectives of the Scheme;
- To ensure that the draft DCO makes appropriate provision for meeting mitigation obligations and requirements to address issues raised by consultees;
- Clearly understand and, where possible, resolve the concerns of stakeholders;
- To measure the success of the consultation communications and feedback methods;
- To ensure coordination within Highways England and other traffic authorities who may be planning or carrying out programme works nearby (working with Connect Plus); and
- Work with other projects in the Road Investment Programme to maximise stakeholder engagement where they will be interested in the whole range of South East Road Investment Programme schemes. This will ensure consistent messaging across the programme/schemes and reduce consultation fatigue.

2.5.17 Public consultation on the Scheme is planned to be held between 12th February and 6th March 2018.

2.5.18 Other proposed consultation events include:

- Drafting Statements of Common Ground;
- Holding key stakeholder webinars every 6 weeks;
- Distributing a newsletter every 8 weeks;
- Holding environmental stakeholder workshops; and
- Holding meetings with key stakeholders as necessary.

2.5.19 Consultation with people living in the vicinity of a proposed development site is an important aspect of any NSIP and will help to deliver a better project outcome. Therefore, comments made during the public consultation period will be recorded and carefully considered by Highways England when further developing the proposals for the Scheme.

2.5.20 Following the consultation period, Highways England will produce a consultation report to summarise the views and comments received, and outline how they have been taken into consideration in refining the Scheme. This report will be sent to the Planning Inspectorate as part of the DCO application which is planned for submission in the summer 2018. The Planning Inspectorate will decide whether the application meets the required standards to proceed to examination, and will determine whether the pre–application consultation has

been adequate. The consultation report will be available on the Highways England website and at the public viewing locations used to promote the consultation materials.

3 Assessment of Alternatives

3.1 Introduction

3.1.1 In December 2014, following a number of studies looking at modal alternatives, a scheme for the M25 Junction 10/A3 Wisley Interchange 'to allow free–flowing movement in all directions, together with improvements to the neighbouring Painshill Interchange on the A3 to improve safety and congestion across the two sites' was included in the Government's RIS. The process by which the alternative proposals were developed, assessed and either discarded or chosen for further consideration is summarised below. Further detail on this process is given in a variety of reports prepared during the project's development and can be made available if requested.

3.2 Strategic alternatives

3.2.1 A two–stage approach was undertaken in developing options for the Scheme. Firstly, a number of high–level, strategic solutions were developed which considered ways to solve the problems identified. Secondly, with the strategic option selected more detailed Scheme options were developed and assessed.

Strategy, Shaping and Prioritisation Stage

3.2.2 A range of strategic options which could potentially be considered to address the key problems at M25 Junction 10 were identified in the Strategy, Shaping and Prioritisation Stage. These strategic options gave high level consideration to a range of alternatives dealing with transport supply and demand, and included options for different modes of travel as well as different scales of highway intervention. Based on assessments undertaken by the project team a strategic option focussing on localised highway improvements at M25 Junction 10 and Painshill Interchange was confirmed as the preferred solution and taken forward to the Option Identification Stage.

Option Identification Stage

3.2.3 At the start of the Option Identification Stage, Atkins undertook a high–level modelling exercise to identify a range of options and determine whether they would provide sufficient capacity for a design life of ten to fifteen years. The testing considered the scale of intervention required to ensure that the interchange would operate below capacity in ten and fifteen years' time. It was found that either the existing roundabout would need to be significantly enlarged or at least all left turns and two busy right turns would need to be removed from the Junction 10 roundabout. A long list of twenty–one options that fulfilled these criteria was developed and assessed and which was reduced down to the most suitable ten options. These ten options were subject to further assessment and testing to examine their viability to achieve the objectives for the Scheme.

3.2.4 Of the ten options considered the following options were selected for further assessment:

- Option 16 – a large, cyclic arrangement similar to M25 Junction 12 with the M3. This obtained the highest overall assessment score despite being one of the most costly and having the greatest environmental impact;

- Options 9 – which had dedicated left turns plus two free flow right turns from the A3 to M25 anti–clockwise and from the A3 to M25 clockwise. This option achieved the next highest assessment score and was thus selected for further consideration; and
- Option 14 – this option featured an elongated roundabout and dedicated left filters which scored marginally less than the other chosen options. However, it was the most affordable of all options and had the least environmental impact so for that reason it was agreed that it should be taken forward for further evaluation.

3.2.5 Predicted traffic flows on the A3 for the design year of 2037 would require the widening of the A3 carriageway from D3AP to dual four lane all purpose (D4AP) between Ockham Junction and Painshill Junction. All three options therefore included widening of the A3 as well as improvements at the Painshill junction. Similar changes to side roads required as a result of the A3 widening were included for all three options.

3.2.6 At the end of the Option Identification Stage and ahead of consultation the cost of Option 16 was reviewed and it was deemed to be too expensive to be supported going forward and was therefore dropped from the consultation and future work.

3.2.7 It was recognised that the statement in the 2015 RIS for the Scheme 'to allow free–flowing movement in all directions' was not compatible with the environmentally sensitive nature of the area. For this reason, the Options that did not provide this were not considered suitable to be taken forward to the next stage of the project.

3.3 Alternative development options

3.3.1 Following Scheme Option Identification, Options 9 and 14 were taken forward for further design and assessment in this Preliminary Design Stage.

Option 9 – Dedicated left turns plus two free flow right turns A3 to M25 Junction 9 and A3 to M25 Junction 11, Painshill and A3 D4AP

3.3.2 This option was based on providing half of the movements of the standard 4 level free flow interchange. The option consisted of free flow right turns from the A3 northbound to the M25 anti–clockwise and from the A3 southbound to the M25 clockwise. Free flow left turns from the A3 northbound to the M25 clockwise and the A3 southbound to the M25 anti–clockwise were also provided. The right turns were provided on a large long span viaduct passing close to the centre of the existing junction with intermediate supports to fit within the constraints of the existing layout. All other vehicle movements would be carried out on the existing roundabout. New segregated NMU routes would be required. This option would include widening of the A3 carriageway to four lanes in each direction. The A3 proposals would also include widening of the A245 from two to three lanes between the Painshill Interchange and the junction with Seven Hills Road. The widening would take place symmetrically on the existing line of the A245. The Painshill improvements would also reduce congestion on the A3 northbound.

3.3.3 Although less environmentally damaging than Option 16 this option would have significant adverse effects. The land required to build this option within an area

designated for its internationally and nationally important ecological value made it difficult to support. Similarly, a large area of Common Land or Access Land would be taken and which would need to be replaced. The slip roads necessary to carry the right turning traffic would need to be elevated over the existing three level junction leading to increased visual impacts as well as increased noise effects on local people and bird species in the SPA. There would also be very large adverse effects on the setting of the scheduled monuments close to the junction and possible direct effects on the remains as well. For these and for other non–environmental reasons this option was not preferred.

Option 14 – Elongated + dedicated left filters, Painshill and A3 D4AP

3.3.4 This option modified the existing roundabout by creating new structures over the M25 and reusing the existing structures under the A3. The circulatory carriageway under the A3 would be widened to four lanes, five lanes of circulatory carriageway would be provided where unconstrained by the existing structures. Right turns would be carried out on the modified roundabout and left turns would use dedicated left filter lanes. Slip roads would be realigned to aid construction sequencing. NMU facilities would remain largely unchanged but minor upgrades would be required. The widening to four lanes would aid weaving and merging on the A3 as well as providing an opportunity to address side road access, lay–by provision and walking and cycling routes. The A3 improvements would also include widening of the A245 from two to three lanes between the Painshill Interchange and the junction with Seven Hills Road. The widening would take place symmetrically on the existing line of the A245. The Painshill improvements would also improve conditions on the A3 northbound.

3.3.5 This option would have a much smaller footprint than Option 9 and hence would have a smaller effect on the designated land and habitats around the junction and require less replacement land. As the elongated roundabout would be at the same elevation as the existing gyratory the adverse visual and noise effects associated with Option 9 would also be avoided. The enlarged roundabout would bring the road infrastructure closer to the scheduled monument to the south west of Junction 10 but it would not have as large an effect as Option 9. For these and other reasons including affordability Option 14 was preferred.

3.3.6 Both Options 9 and 14 also required alterations to the side roads currently joining the A3 including Wisley Lane as well as private accesses, bus stops and lay–bys. The side roads options common to both Options 9 and 14 were developed further during the Option Selection Stage and are described below.

Access to Birchmere Scout Campsite and Pond Farm

3.3.7 A two–way access road connecting Deers Farm Close to Birchmere Scout Campsite and Pond Farm was proposed with the existing access to Junction 10 slip road to be closed off. The existing track along Deers Farm Close and past Pond Farm would be refurbished to a single–track road with passing places.

3.3.8 The alternative to this arrangement during this Stage was to retain the existing access to the slip road at the junction but this was not feasible with the free flow left turns proposed.

Elm Lane/Access to Elm Corner

3.3.9 This option joins Elm Lane and Old Lane via the existing BOAT. The existing unsurfaced BOAT would be reconstructed to a single–track road providing access to Junction 10 slip road and the A3 via Old Lane.

3.3.10 The alternative to this arrangement was to maintain the link to Elm Lane and then on to the Ockham Interchange via a new road link between the Ockham Junction and Wisley Lane but the residents of properties in Elm Corner served by Elm Lane expressed a preference for access to Old Lane via the BOAT.

Access to Long Orchard Farm and Long Orchard House

3.3.11 This option proposes a two–way local access road with passing bays from Redhill Road to Seven Hills Road, providing access to Long Orchard Farm, Long Orchard House and San Domenico (Euro Garages).

3.3.12 There was no alternative to this arrangement except for providing access to the road network via Redhill Road instead of Seven Hills Road but this was rejected by the residents affected.

A245/Painshill Junction

3.3.13 This option consisted of widening the A245 from Painshill Junction to Seven Hills Road Junction to three lanes in each direction and a two–way access road between Old Byfleet Road to Seven Hills Road South for Felton Fleet School. The existing right turn from Old Byfleet Road to the A245 would be closed.

3.3.14 No alternative was proposed for this option.

Wisley Lane Options

3.3.15 Two options for the re–provision of access to Wisley Lane were proposed. One option consisted of a two–way local access road between Ockham Junction and Wisley Lane parallel and north west of the A3 located partly within RHS Wisley. The existing access from Mill Lane to the A3 Portsmouth Road would be closed and diverted on to the new access road. This option would have a direct effect on the Registered Park and Garden at RHS Wisley, the loss of screening trees along the boundary and heritage impacts and was rejected in favour of an alternative to the east of the A3.

3.3.16 The second option consisted of a two–way link road from Ockham Junction to Wisley Lane, with an overbridge over the A3 carriageways linking Elm Lane to Wisley Lane. This option would affect woodland in the Common Land adjacent to the Wisley Airfield site. The existing Wisley Lane footbridge would be removed with NMU access being provided over the new bridge. The rest of Elm Lane linking to the A3 would be stopped up. This option was seen to be narrowly preferable to the option to the west of the A3 as it could be partly built on brownfield land on the disused Wisley Airfield, amongst other considerations.

Painshill Options

3.3.17 Two options were developed to provide access to properties in Painshill Park that gained access directly off the A3 southbound carriageway. One option consisted of the conversion of the service road to the south east and parallel to

the A3 to a two–way road with passing bays from the Gothic Tower within Painshill Park to the gas compound north of Heyswood campsite. An overbridge over the A3 carriageways was required to link this road to Redhill Road (and Seven Hills Road South). This option was on the periphery of the Grade I Registered Park and Garden with limited effect on the key features of the Park so despite the potential effect on the setting of the Gothic Tower this option was preferred to the alternative.

3.3.18 The alternative option consisted of the conversion of the service road to the south east and parallel to the A3 to a two–way road with passing bays from the Gothic Tower to the A245 in Cobham using the existing roundabout near the Sainsbury's superstore. An overbridge over the River Mole was required to connect this road to the A245. This option would pass through the operational sections of the Grade I Registered Park and Garden and affect the setting of the listed bridge over the River Mole as well as other listed buildings within the Park. It was strongly opposed by the residents of the listed buildings affected and would adversely affect the aquatic ecology of the River Mole. Consequently, it was rejected in favour of the alternative option.

Legal and Policy Tests

3.3.19 Having established options that were viable and could satisfy the Scheme objectives, during the Option Selection Stage the Scheme options were also considered further in relation to the legal and policy tests set out in the NPSNN. The Scheme was thought likely to be a highway–related NSIP on the basis that either of the options currently under consideration would be of a scale large enough to exceed the qualifying area thresholds stipulated in the Planning Act 2008.

3.3.20 At the Option Selection Stage, the focus was to identify those tests that could potentially preclude the Secretary of State from being able to grant development consent, if a particular Scheme option could result in a breach of the UK's international obligations or any duty imposed under UK legislation. The tests of most relevance to the consideration of options for the Scheme are as follows:

- The European Directive 2008/50/EC, Ambient Air Quality and Cleaner Air for Europe, transposed in to UK legislation by the Air Quality Standards Regulations 2010, which would prevent consent from being granted for any scheme that would result in non–compliance with legally binding limit values for prescribed pollutants, including nitrogen dioxide (NO_2) and particulates of less than 10 microns (PM_{10}). The annual limit values for both are 40 $\mu g/m^3$;
- The European Directive 2000/60/EC, Establishing a Framework for the Community Action in the Field of Water Policy, transposed in to UK legislation by the Water Environment (Water Framework Directive) (England and Wales) Regulations 2003 and the Water Industry Act 1991 (Amendment) (England) Regulations 2009. This legislation would prevent consent being granted for any scheme likely to cause deterioration in water quality status; or prevent a waterbody from achieving good ecological status; or compromise the achievement of Water Framework Directive (WFD) objectives in other classified water bodies within the same catchment;
- The European Directives 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna and 2009/147/EC on the Conservation of Wild

Birds, which are transposed in to UK legislation by the Conservation of Habitats and Species Regulations 2010 (as amended by the Conservation of Habitats and Species (Amendment) Regulations 2012). These directives would prevent development consent from being granted for any scheme that would give rise to an adverse effect on the integrity of a European site (a SPA or a Special Area of Conservation (SAC)), either individually or cumulatively, unless there was no less damaging, feasible alternative; that there were Imperative Reasons of Overriding Public Interest and that suitable compensation could be secured;

- The European Habitats Directive 92/43/EEC and Habitats Regulations 2010 as amended would also prevent consent and/or a mitigation licence from being granted for any scheme that would harm or disturb a European Protected Species, unless there were no satisfactory alternatives; that the favourable conservation status of the species would be maintained and that the development would be in the public interest; and
- The Wildlife and Countryside Act 1981, as amended by the Countryside and Rights of Way Act 2000, which would prevent development consent from being granted for any scheme that would disturb or harm nationally protected species, unless there were no satisfactory alternative solution.

3.3.21 In addition, under Section 104 (7) of the Planning Act 2008, development consent cannot be granted for any scheme if the benefits of that scheme do not outweigh its adverse impacts overall.

3.3.22 The difference in operational performance between Option 9 and Option 14 was found to be relatively modest, whilst the difference in environmental impact was significant. When the legal tests were also factored in, given the potential for adverse effects on the integrity of the Thames Basin Heaths SPA, there were very real risks attached to Option 9 and the ability to meet the tests required for any derogation from compliance with the Habitats and Wild Birds Directives. On this basis, the assessments pointed towards Option 14 as being the option most likely to gain consent at examination.

3.3.23 It was recognised that it would be important to demonstrate that the benefits of Option 14 would outweigh its impacts and further work would be required to identify mitigation opportunities and design improvements if this option were taken forward as the preferred route.

3.3.24 The options for local access roads at both Painshill and at Wisley also presented significant challenges. Whilst the assessments appeared to point towards the Painshill – Redhill Road option and the Wisley Lane east of the A3 option, the appraisals were finely balanced and further, more detailed assessments and design development were necessary before a final decision could be made.

3.3.25 Although the case for Option 14 over Option 9 became clear during the Option Selection Stage, a number of side road options were investigated that took into account the environmental and engineering constraints of the Scheme. The different options for the side roads included those for Wisley Lane, the access to Pond Farm and access to the properties in Painshill Park with access off the A3. Further design, assessment and consultation was undertaken for these side roads and variations on the options for these were developed. Following the Option Selection Stage, the preferred option for the M25 Junction 10/A3 Wisely Interchange was announced by Highways England on 29th November 2017. The

preferred option is described above in section 2.3 with the revised side road options that were chosen as noted below. The Scheme layout is shown in Volume 3.

Side road options

3.3.26 Wisley Lane – A variation on the proposal to the east of the A3 – this option does not affect the SPA, Wisley Lane and access to RHS Wisley will remain open during construction and less Common Land is taken. It also includes bridleway links on both sides and a revised entry into RHS Wisley.

3.3.27 A variation of the access to Birchmere Scout Camp option which provides access via a replacement Cockrow bridge over the A3. The same standard of replacement bridge over the A3 is required whether either option as this is the route to Pond Farm. This bridge will provide for vehicles and bridleway users, as does the present bridge, and can be provided as a multi–function 'green' bridge for either option. The main difference is that it replaces the long vehicular route created from Pond Farm to Wisley Lane with a short vehicular link from Old Lane to the new bridge and then to the existing track. This option would have less overall effect on the SPA and the Common Land.

3.3.28 A variation of the Painshill option which had a bridge over the A3 is being progressed as the preferred option, making it as compact as possible to reduce land take, but with vehicles being routed via Seven Hills Road south to reach it rather than Redhill Road. Bridleway links will be added on both sides. The bridge would make provision for NMU's and do away with the need for a separate bridge to link rights of way on either side of the A3. By keeping this option as close to the A3 as possible loss of screening vegetation will be kept to a minimum and reduce the effect on the Gothic Tower.

4 Environmental Assessment Methodology

4.1.1 Environmental Impact Assessment (EIA) is a process for identifying the likely environmental effects (positive and negative) of proposed developments, and their significance, before development consent is granted. The aim of EIA is to ensure that the following are undertaken:

- a thorough assessment of likely effects of a proposed development on the environment; and
- consideration of mitigation measures and alternatives in light of potential environmental effects.

4.1.2 Through this process, the development should include measures to prevent, reduce or offset any significant, adverse environmental effects of the proposals, and enhance the positive impacts. The findings of the assessment are presented in an Environmental Statement (ES).

4.1.3 The purpose of the ES is to help the decision maker, statutory consultees, other stakeholders and the public to properly understand the predicted effects and the scope for reducing them, before a decision is made as to whether to permit the development activity. For the Scheme, the DCO application for Highways England will be supported by an ES produced in accordance with the EIA Regulations 2017.

4.1.4 The EIA Regulations 2017 impose procedural requirements for carrying out EIA for NSIPs which are considered as 'EIA development'. The ES is the document that reports on the likely impacts on the environment resulting from the proposed development. The ES must as a minimum comply with Schedule 4 Part 2 of the EIA Regulations 2017. Advice published by the Planning Inspectorate states that the ES should clearly explain the processes followed, the forecasting methods used and the measures envisaged to prevent, reduce and where possible offset any significant adverse effects. This has been undertaken in respect of the PEIR, and will continue to be carried out throughout the EIA process.

4.2 Proposed structure of Preliminary Environmental Information Report

Structure of each environmental topic chapters

4.2.1 Each environmental topic will be considered in this PEIR as far as possible, on a consistent basis, with each chapter being structured as follows:

- Introduction;
- Study area;
- Consultation;
- Baseline conditions;
- Potential impacts;
- Potential mitigation measures; and
- Summary.

4.2.2 Information on planning and policy context and on the methodologies used for each topic have been included within the appendices in Volume 2 of this PEIR.

4.3 Baseline

4.3.1 The existing baseline conditions are defined to allow the assessment of changes that would be caused by the Scheme. The identification of the baseline requires the description of the existing situation so a prediction of how it is likely to change in the absence of the Scheme.

4.3.2 The description of the baseline conditions identifies receptors that may be affected by the Scheme and also their 'value' or 'sensitivity' to potential change.

4.4 Study Area

4.4.1 Study areas are defined individually for each environmental topic, according to the geographic scope of the potential impacts relevant to that topic or of the information required to assess those impacts. It draws on guidance in the Highways England's Design Manual for Roads and Bridges (DMRB) where this specifies the extent of study areas. The study areas are defined within each relevant topic chapter of this report.

4.5 Design and mitigation process

4.5.1 Proposals for mitigation follow the mitigation hierarchy of avoid, reduce, remedy and compensate. Incorporated mitigation includes Best Practicable Measures, construction environmental management procedures identified in a Construction Environmental Management Plan (CEMP) and will also describe design features that have been adopted to reduce or prevent impacts, such as noise attenuation measures. Incorporated mitigation is included within the assessment.

4.5.2 Mitigation is defined as "measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects" (DMRB Volume 11, Section 2, Part 7 HA 218/08). Enhancement measures are defined as "measures over and above normal mitigation" (Interim Advice Note (IAN) 125/15).

4.5.3 During the Option Selection Stage the need for eliminating or mitigating any adverse environmental impacts was considered. Generic mitigation measures were identified at that stage to be developed fully during this Preliminary Design Stage. For the purposes of the PEIR the generic mitigation for the Option Selection Stage is assumed to be included in the Scheme with further detail or other measures also included where they are available at the time of writing. Where possible, consideration has been given to reducing or avoiding adverse environmental impacts and these will be developed further during the Scheme development as an iterative process. Mitigation measures will be informed by survey data being collected for the purposes of the Preliminary Design Stage and developed in consultation with statutory bodies. The Scheme will include all mitigation considered necessary to reduce effects to an acceptable level and the assessment will report on this basis. As well as mitigation, the Scheme will also include compensation for adverse effects where necessary and again the assessment will be based on the Scheme with this included.

4.5.4 During construction, the responsibility for further environmental mitigation and the adherence to environmentally responsible working practices will fall to the

contractor. A CEMP will be prepared by the designer (Atkins) during this Preliminary Design Stage and refined as the Scheme progresses from development to construction and handover. The CEMP will detail practices that the contractor is to apply on site that will demonstrate commitments to environmental management. It will detail both generic and specifically targeted practices to enable construction to be undertaken with minimal impact on the environment and will also enable monitoring requirements to be set up.

4.6 Assessment years and scenarios

Temporal scope

Scheme phases

4.6.1 The PEIR includes consideration of effects arising from the construction and operation of the Scheme. Decommissioning is not relevant for the Scheme as noted above.

Do–minimum and Do–something scenarios

4.6.2 The assessment of effects involves comparing a scenario with the Scheme against one without the Scheme over time. The absence and presence of the Scheme are referred to as the 'Do–Minimum' (DM) and 'Do–Something' (DS) scenarios respectively. Dependent upon the topic, the scenarios are assessed in the baseline year and a future assessment year or a series of future assessment years (for example 15 years after opening, or the worst year in the first 15 years of operation).

4.6.3 The DM scenario is defined by DMRB as "the conditions that would persist in the absence of the implementation of a construction or improvement project, but given that maintenance is ongoing" (DMRB HA 218/08). Identification of the baseline therefore requires first the identification of the existing situation, and then the prediction of how it is likely to change between now and implementation of the Scheme.

Dealing with uncertainty

4.6.4 EIA is an iterative process, and the Scheme may include somewhat uncertain aspects. At the time that the EIA is submitted, it is proposed that no aspects of design would vary so much as to represent effectively different schemes. The EIA would ensure it addresses the potential for a range of impacts resulting from any undecided parameters.

4.6.5 The Rochdale Envelope principle would be applied in accordance with the Planning Inspectorate Advice Note 9 Using the 'Rochdale Envelope'. The ES will explain clearly any elements of the Scheme yet to be finalised, with justification. Where flexibility is sought in the Scheme design, the maximum potential adverse impacts of the Scheme will be assessed. The ES will confirm maximum and other dimensions of the Scheme, and that any changes to the development within such parameters would not result in significant impacts not previously identified and assessed.

4.7 Identification of potential effects

4.7.1 Schedule 4 Part 1 Regulation 20, of the EIA Regulations 2017 requires:

4.7.2 'A description of the likely significant effects of the development on the environment, which should cover the direct effects and any indirect, secondary, cumulative, short, medium and long–term, permanent and temporary, positive and negative effects of the development, resulting from:

- The existence of the development;
- The use of natural resources; and
- The emission of pollutants, the creation of the nuisances and the elimination of waste.'

4.7.3 A range of environmental topics may be affected by the Scheme. Effects may be negative or positive, temporary or permanent. They may also be described as:

- **Direct or Primary Impacts**: caused by activities which are an integral part of the proposals resulting in a change in environmental conditions, such as construction works causing an increase in dust concentrations in the air;
- **Indirect or Secondary Impacts**: due to activities that affect environmental conditions or the receptors, which in turn affects other aspects of the environment or receptors;
- **Cumulative**: comprising multiple effects from different sources within the proposals (synergistic or interrelationships), or cumulatively with other developments (additive), on the same receptors; and
- **Residual**: effects that remain after the positive influence of mitigation measures are taken into account.

1.1.1 Each of these effects can persist over a period of time and can be considered as:

- **Short term**: effects that would last for a limited duration, for example, noise generated during construction of the Scheme; and
- **Long term:** permanent effects from the operational activities on the M25 Junction 10.

4.8 Assessment of significance

4.8.1 The significance of an environmental effect is typically a function of the 'value' or 'sensitivity' of the receptor and the 'magnitude' or 'scale' of the impact. Combining the environmental value of the resource or receptor with the magnitude of change produces a significance of effect category. In arriving at the significance of effect, the assessor also considers whether the effect is direct, indirect, secondary, cumulative, short, medium or long–term, permanent or temporary, positive or negative.

4.8.2 Methods and requirements specific to each assessment topic are set out in the relevant topic chapters (Chapters 5 to 14), however, the proposed general approach will be adopted in accordance with relevant guidance and best practice.

4.8.3 With the receptors identified and their sensitivity classified, the potential impacts of the proposed works to these aspects, for construction and operation where appropriate, will be established and the magnitude of the impact determined.

4.8.4 In accordance with guidance in DMRB Volume 11, Part 5, for each topic the assessment will combine the magnitude of the impacts and the sensitivity of the resources/receptors that could be affected in order to classify the effect (see Table 4.1) to establish their significance (from very large to neutral). General descriptors for the significance of effect are provided in Table 4.2.

Table 4.1: Significance of effects

Environmental Value (Sensitivity)	Magnitude of impact (degree of change)				
	Major	**Moderate**	**Minor**	**Negligible**	**No change**
Very high	Very large	Large or very large	Moderate or large	Slight	Neutral
High	Large or very large	Moderate or large	Slight or moderate	Slight	Neutral
Medium	Moderate or large	Moderate	Slight	Neutral or slight	Neutral
Low	Slight or moderate	Slight	Neutral or slight	Neutral or slight	Neutral
Negligible	Slight	Neutral or slight	Neutral or slight	Neutral	Neutral

Table Source: DMRB Volume 11, Section 2, Part 5, HA 205/08, Table 2.4

Table 4.2: Descriptors of the Significance of Effect Categories

Significance Category	Typical descriptors of effect
Very Large	Only adverse effects are normally assigned this level of significance. They represent key factors in the decision–making process. These effects are generally, but not exclusively, associated with sites or features of international, national or regional importance that are likely to suffer a most damaging impact and loss of resource integrity. However, a major change in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision–making process.
Moderate	These beneficial or adverse effects may be important, but are not likely to be key decision–making factors. The cumulative effects of such factors may influence decision–making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision–making process, but are important in enhancing the subsequent design of the project.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

Table Source: DMRB Volume 11, Section 2, Part 5, HA 205/08, Table 2.3

4.8.5 The classification of effects also considers the following descriptors:

- Adverse, neutral or beneficial;

- Permanent or temporary;
- Duration/frequency or likelihood;
- Direct or indirect;
- Secondary; or
- Cumulative.

4.8.6 The duration of the effect will be assessed to be either temporary or permanent where:

- Temporary (e.g. demolition and construction phase):
  - Short term (< 5 years);
  - Medium term (5–10 years); or
  - Long term (> 10 years); and
- Permanent (e.g. once the proposed works are completed and operational).

4.8.7 Whilst the criteria derived vary between disciplines (from a very formal set of criteria based on nationally recognised standards for air quality, to more qualitative criteria derived to assess landscape impact or heritage) each specialist will have used the common terminology set out above alongside their topic–specific guidance and their professional judgement to assess the significance of effects. Where alternative basis of assessment apply, this is explained in the appropriate chapter.

4.9 Cumulative effects

4.9.1 Cumulative effects are the result of multiple actions on environmental receptors. There are principally two types of cumulative impact:

- The combined action of a number of different environmental topic specific impacts upon a single resource/receptor (synergistic or interrelationships); and
- The combined action of a number of different projects, in combination with the project being assessed, on a single resource/receptor (additive).

1.1.2 Schedule 4, Part 1, Regulation 20, of the EIA Regulations 2017 requires an ES to include the assessment of cumulative effects. Schedule 3 Regulation 14(b) of the EIA Regulations 2017 refers to the cumulation of impacts with other development. Therefore, the environmental effects of the Scheme will also be assessed in combination with the effects of other projects as part of the EIA process, where relevant information is available. What projects that should be considered as part of a 'cumulative' assessment for these purposes is not defined in the EIA Directive or Regulations and there is no standard approach to the assessment of cumulative effects, with different projects adopting different approaches. However, potential cumulative impacts with other major developments need to be identified, as required by the Directive. To aid in this, the Planning Inspectorate's Advice Note 9 suggests the categories of developments that should be included in such cumulative assessments.

4.9.2 The cumulative assessment for the Scheme within this PEIR therefore includes developments which fall into but are not necessarily limited to the following categories:

- Trunk road and motorway projects which have been confirmed (i.e. have gone through the statutory processes);
- Development projects with valid planning permissions as granted by the LPA, and for which formal EIA is a requirement or for which non–statutory EIA has been undertaken;
- Applications for consent which have been made, but which have not yet been determined (see thresholds below);
- Allocated sites in emerging or adopted Local Plans; and
- Other types of application which could have implications for the Scheme.

4.9.3 Using these categories, developments have been identified with reference to local knowledge, published information and consultation with LPAs in the area.

1.1.3 Further details on the scope of the cumulative effects assessment is provided in Chapter 15 Assessment of Cumulative Effects.

Chapters 5–14

5 Air Quality

5.1 Introduction

5.1.1 This chapter provides the preliminary environmental assessment of the Scheme, based upon information available as of December 2017. The following should be taken into account in this preliminary assessment:

- The assessment has been based on the air quality assessment of the Scheme as assessed at Option Selection Stage (Option 14, which most closelyreflects the current Scheme), as the final design of the Scheme and trafficmodelling has not yet been completed;
- Information regarding changes in traffic during the construction phase are currently unknown, but will be assessed once this information is available; and
- The results from the Option Selection Stage are presented. These will be updated for the Environmental Statement (ES) when a final design is confirmed and the associated traffic model is completed.

5.2 Study area

5.2.1 The air quality assessment study area is set in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1 HA 207/07 'Air Quality'[1].

5.2.2 The air quality study area for assessing the potential effects of construction dust during the construction phase is defined as the area within 200 m of the construction site boundary, as set out in DMRB HA 207/07 (paragraph 3.45).

5.2.3 The air quality study area for assessment of construction traffic and during the operational phase is determined in accordance with traffic change criteria set out in the DMRB HA 207/07 which defines affected road networks (ARN) for local (paragraph 3.12) and regional (paragraph 3.20) air quality assessments. An assessment is required for local air quality where there are receptors identified within 200 m of the ARN.

5.2.4 For the purposes of this PEIR the air quality study area is assumed to be based on the ARN that was defined at Option Selection Stage for Option 14. Thestudy area includes the area within 200 m of the Scheme extent, including theM25 Junction 10, the M25 extending between Junction 9 and 11, the A3, andother local roads. The Scheme is located primarily within the boundaries ofGuildford Borough Council (GBC) and Elmbridge Borough Council (EBC), whilethe study area extends into the local authority areas of Runnymede BoroughCouncil (RBC), Woking Borough Council (WBC) and Mole Valley District Council (MVDC), and borders the Royal Borough of Kingston upon Thames (RBK). The ARN will be reviewed in the ES on the basis of the updated, strategic traffic modelling.

[1] DfT (2007). DMRB Volume 11, Section 3, Part 1 HA 207/07 'Air Quality'. Retrieved 2017, from http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf

5.3 Consultation

5.3.1 Consultation with local authorities will be undertaken to obtain relevant air quality monitoring data, in addition to that already obtained and presented in this PEIR, and to ensure relevant receptors have been included in the assessment.

5.3.2 Consultation with Natural England has already been undertaken by the Project Ecologist and will continue to discuss the approach to assessing air quality impacts on Designated Sites, the location of protected species within those sites and the need if any, for mitigation.

5.4 Baseline conditions

5.4.1 Information on existing ambient air quality i.e. baseline conditions, and identification of potential air quality constraints to the Scheme has been collated from the following sources:

- AQMA mapping[2];
- Defra's Pollution Climate Mapping (PCM) model data for 2015[3];
- Local Authority Local Air Quality Management Reports[4];
- Highways England NO_2 diffusion tube survey data[5];
- Ordnance Survey base mapping to identify locations of sensitive receptors (residential properties, schools, hospitals and elderly care homes); and
- Natural England Multi–Agency Geographic Information for the Countryside (MAGIC) website[6] to identify boundaries of designated ecological sites.

5.4.2 Figure 5.1 in Volume 3 shows the air quality constraints within the air quality study area, as defined at Option Selection Stage.

Pollutants

5.4.3 The air pollutants of concern in the context of the local air quality assessment for the Scheme are Nitrogen Dioxide (NO_2) and Particulate Matter (PM_{10}), as these pollutants are most likely to be present in ambient air at concentrations close to or above statutory limit values at receptors near to roads. In addition, the ecological assessment considers NO_x and nitrogen deposition. The regional assessment of vehicle emissions associated with the Scheme considers NO_x, CO_2 and PM_{10}. Further information on pollutants is provided below. Air quality criteria are provided in section A.1 Planning and policy context in Volume 2.

Nitrogen Dioxide/Oxides of Nitrogen

5.4.4 NO_2 is a secondary pollutant produced by the oxidation of nitric oxide (NO). NO and NO_2 are collectively termed NO_x. About a quarter of the UK NO_x emissions are from road transport. The majority of NO_x emitted from vehicles is in the form of NO, which oxidises rapidly in the presence of ozone (O_3) to form NO_2. In high

[2] http://uk-air.defra.gov.uk/aqma/maps, accessed September 2017
[3] http://uk-air.defra.gov.uk/data/gis-mapping , accessed 04/09/17
[4] EBC (2016) Air Quality Annual Status Report; Woking Borough Council (2016) Air Quality Annual Status Report; Guildford Borough Council (2016) Air Quality Annual Status Report, Mole Valley District Council (2016) Air Quality Annual Status Report, Runnymede Borough Council (January 2017) 2015 Air Quality Annual Status Report
[5] Connect Plus (2017) Air Quality Management Plan
[6] http://magic.defra.gov.uk/

concentrations, NO_2 can affect the respiratory system and can also enhance the response to allergens in sensitive individuals. Additionally, there is increasing awareness of an association between long-term average concentrations (chronic exposure) of NO_2 and mortality. NO does not have any observable effect on human health at the range of concentrations found in ambient air. Elevated concentrations of NO_x can have an adverse effect on vegetation, including leaf or needle damage and reduced growth. Deposition of pollutants derived from oxides of nitrogen emission contribute to acidification and/or eutrophication of sensitive habitats.

Particulate Matter

5.4.5 The principal sources of 'primary' polluting particles are combustion processes, which include traffic and industry. Road transport produces 13% of primary PM_{10} emissions in the UK, of which the majority of emissions are from diesel engines. Finer fractions of particulate matter are associated with a range of symptoms of ill health including effects on the respiratory and cardiovascular systems, on asthma and on mortality.

Carbon Dioxide

5.4.6 CO_2 is a greenhouse gas and is used as an indicator of the wider scale, non–local effects of transport schemes. Exposure to CO_2 does not affect human health or ecology at ambient levels and so is not significant as a local air pollutant but is important for its national and international role in climate change.

Other Pollutants

5.4.7 National assessments have demonstrated that there is no risk of exceedance of the air quality objectives set for 1,3–butadiene, benzene, carbon monoxide, lead or sulphur dioxide due to emissions from traffic anywhere in the UK. These pollutants are therefore not considered further as there is not considered to be a potential for significant effects associated with these pollutants.

5.4.8 In addition to these air pollutants, dust may be generated during the construction phase in areas adjacent to the Scheme and associated works areas. Dust per se is not considered as a local air pollutant but may cause a perceived loss of amenity and can give rise to soiling (dust deposition).

Air Quality Management Areas

5.4.9 No AQMAs have been declared within the GBC and MVDC areas.

5.4.10 EBC has declared seven AQMAs for exceedances of the annual mean AQS objective for NO_2. Of these the Cobham High Street and Esher AQMAs could potentially be affected by the Scheme as they are within 200 m of the ARN as defined at Option Selection Stage.

5.4.11 RBC has declared two AQMAs: one along the M25 corridor within the RBC administrative area; and one in Addlestone Town Centre. The M25 AQMA was declared for exceedances of both the annual and 24–hour mean AQS objectives for PM_{10} as well as the annual mean AQS objective for NO_2 and is within the air quality study area. The Addlestone Town Centre AQMA is currently thought unlikely to be affected as it is not expected to be within 200 m of the ARN, although this will be reviewed once the revised ARN for the ES is derived.

5.4.12 WBC has declared two AQMAs for exceedances of the annual mean NO_2 AQS objective: Anchor Hill AQMA and Guildford Road AQMA. Neither are likely to be affected as they are not within 200 m of the ARN defined at Options Selection Stage, although this will be reviewed against the ARN for the ES.

5.4.13 RBK has declared its entire borough an AQMA for exceeding the annual mean NO_2 AQS objective and the annual mean and 24–hour mean PM_{10} AQS objectives. This AQMA could potentially be affected as it is within 200 m of the ARN as defined at Options Selection Stage.

5.4.14 The four AQMAs within the air quality study area which could potentially be affected are described below in Table 5.1 and illustrated in Figure 5.1 in Volume 3.

Table 5.1: Description of AQMAs within the Air Quality study area

Local Authority	Name	Air Quality Criteria Exceeded	Description
EBC	Cobham AQMA	NO_2 annual mean	An area along the High Street, Cobham.
	Esher AQMA	NO_2 annual mean	An area extending along the High Street, Church Street and including parts of Esher Green and Lammas Lane.
RBC	M25 AQMA	NO_2 annual mean PM_{10} annual and 24–hour mean	AQMA combining 2 areas: • Area 1 extending 70 m east and west of the centre line of the M25 between Junction 11 and the southern boundary of the Borough at New Haw/Byfleet; and • Area 2 extending 55 m east and west of the centre line of the M25 between Junctions 11 and 13.
RBK	Kingston upon Thames AQMA	NO_2 annual mean PM_{10} annual and 24–hour mean	The whole borough

Defra Mapping

Pollution Climate Mapping

5.4.15 Defra's PCM model outputs are used in annual reporting to the EU regarding compliance with the limit values. This model provides estimates of roadside concentrations of pollutants, including annual mean NO_2 and PM_{10}. The modelled roadside concentration comprises a background component together with a roadside increment.

5.4.16 Not all roads are included within the PCM model. In the vicinity of the air quality study area, Defra's PCM model only includes parts of the A244, A245, A307 and A318. The PCM mapping shows that for the base year of the air quality assessment (2015) none of the roadside annual mean PM_{10} or NO_2 concentrations for the sections of roads which are within the study area exceeded the EU limit values of 40 $\mu g/m^3$.

5.4.17 Defra PCM links are illustrated in Figure 5.1 in Volume 3.

Air Quality Monitoring

5.4.18 Air quality monitoring data from continuous monitoring stations (CMS) and passive diffusion tubes in and close to the air quality study area are presented in Table 5.2 to Table 5.7 below.

Highways England Monitoring

5.4.19 Connect Plus measure NO_2 concentrations using diffusion tubes at a number of sites around the M25 on behalf of Highways England. The survey started in September 2013, and results for three years are currently available. Five of the sites (CP4, CP8, CP9, CP10 and CP27) are in close proximity to the Scheme or ARN as shown in Figure 5.1 in Volume 3. The annual mean NO_2 concentrations for these monitoring sites for the yearly periods between September 2013 and 2016 are presented in Table 5.2, below. The results show that there were no recorded exceedances of the NO_2 annual mean air quality criterion at any of these sites over the three–year survey period. The highest measured concentration was 33.4 µg/m^3 in the September 2014–2015 period at CP4, located to the north west of M25 Junction 10, adjacent to the M25, while the lowest measured concentration was 18.5 µg/m^3 at site CP27, south east of Junction 10, during the September 2013–2014 period.

Table 5.2: Connect Plus Services – Air Quality Monitoring Data, NO_2 (µg/m^3)

Site ID	Site Type	X, Y	Sept 2013 – Sept 2014 annual mean	Sept 2014 – Sept 2015 annual mean	Sept 2015 – Sept 2016 annual mean
CP4	Roadside	506191,159955	32.8	33.4	28.6
CP8	Roadside	508378,159813	21.3	21.7	28.8
CP9	Roadside	510561,161143	25.1	28.6	27.3
CP10	Roadside	505578,161229	22.5	23.9	22.6
CP27	Roadside	509891,158070	18.5	20.9	20.5

5.4.20 Highways England has also conducted a six–month diffusion tube survey for the purpose of informing the M25 Junction 10 Improvements for six months in 2016. The survey consisted of 13 diffusion tubes located near to Junction 10 at roadside or kerbside locations. Survey locations are illustrated in Figure 5.1 in Volume 3. The results are provided below in Table 5.3. The results show that there were no recorded exceedances of the NO_2 annual mean air quality criterion at any site in 2015, as adjusted. The highest concentration was 33.7 µg/m^3 at a site near the A3 south of Burnt Common (HE_7).

Table 5.3: Highways England NO_2 Diffusion Tube Monitoring Data (µg/m^3)

Site ID	HE Site ID	Site Type	X, Y	Unadjusted 2016 average (Jan – Jun)	Adjusted, Annualised 2015
HE_1	M25J10A3_003	Roadside	506541, 158842	19.3	15.9
HE_2	M25J10A3_007	Roadside	505870, 160652	28.8	23.8
HE_3	M25J10A3_002	Kerbside	507841, 158598	37.9	31.3
HE_4	M25J10J16_028	Kerbside	502386, 167101	27.9	23.1

Site ID	HE Site ID	Site Type	X, Y	Unadjusted 2016 average (Jan – Jun)	Adjusted, Annualised 2015
HE_5	M25J10J16_002	Kerbside	503688, 165230	35.0	29.0
HE_6	A3Gui_022	Roadside	504001, 154442	38.0	30.9
HE_7	A3Gui_023	Roadside	504053, 154326	41.4	33.7
HE_8	M25J10J16_001	Roadside	504370, 164047	34.9	28.8
HE_9	M25J10A3_010	Roadside	505442, 161843	24.8	20.5
HE_10	M25J10A3_011	Roadside	505452, 162542	31.5	26.0
HE_11	M25J10A3_008	Roadside	505552, 161219	24.1	19.9
HE_12	M25J10A3_005	Kerbside	506335, 159238	26.7	22.0
HE_13	M25J10A3_006	Kerbside	506271, 160104	27.4	22.6

Local Authority Monitoring

5.4.21 All of the local authorities undertake air quality monitoring in the vicinity of the air quality study area for the Scheme as defined at Option Selection Stage.

Continuous Monitoring

5.4.22 None of the local authorities operate a CMS measuring concentrations of either NO_2 or PM_{10} within the air quality study area. The closest CMS to the study area which measure NO_2 are located at roadside sites in Weybridge and Hampton Court in EBC's area, and at a kerbside site in Dorking in MVDC's area, which was in operation until 2014. Concentrations at the Weybridge site exceeded the annual mean NO_2 AQS objective between 2012 and 2014, but have been below the AQS objective since. Concentrations at the Hampton Court site exceeded the AQS objective in all years, while concentrations at the Dorking site were well below the AQS objective in all years. The annual mean NO_2 concentrations at these sites are provided in Table 5.4 below. The 1–hour mean AQS objective was met in all years at all sites.

Table 5.4: Annual Mean NO_2 Concentrations (µg/m^3) from CMS near the Scheme

Site ID	Local Authority	Site Type	X, Y	2010	2011	2012	2013	2014	2015	2016
E1 (Weybridge)	EBC	Roadside	507480, 164923	42	36	43	43	40	38	38
E2 (Hampton Court)	EBC	Roadside	515338, 168292	51	51	41	47	47	40	44
Dorking	Mole Valley	Kerbside	517034, 149803	25	23	23	22	22	–	–

– = data not available/monitoring not undertaken
Exceedances of annual mean NO_2 UK AQS objective are highlighted in bold
Data have been sourced from local authority reports

5.4.23 The Dorking kerbside site also measured PM_{10} concentrations until 2014. Concentrations were well below both the annual mean and daily mean AQS objectives at this site, as summarised in Table 5.5 and Table 5.6, below.

Table 5.5: Annual Mean PM_{10} Concentrations (µg/m^3) at CMS near the Scheme

Site ID	Local Authority	Site Type	X, Y	2010	2011	2012	2013	2014	2015	2016
Dorking	Mole Valley	Kerbside	517034, 149803	19	21	20	21	18	–	–

Table 5.6: Number of Exceedances of 24–hour Mean PM_{10} Objective at CMS near the Scheme

Site ID	Local Authority	Site Type	X, Y	2010	2011	2012	2013	2014	2015	2016
Dorking	Mole Valley	Kerbside	517034, 149803	0	11	10	2	2	–	–

Passive Monitoring

5.4.24 Passive monitoring of NO_2 using diffusion tubes has been undertaken by all the local authorities in the vicinity of the air quality study area. The locations are further described in Table 5.7, below, together with tabulated results for the period of 2010 to 2016, where available. Local authority monitoring locations are also illustrated in Figure 5.1 in Volume 3, where thematic mapping is applied comparing annual mean measurements for 2015, the air quality base year, with the annual mean objective of 40 µg/m^3. Key areas and traffic corridors where exceedances of the annual mean AQS objective for NO_2 were measured in recent years include:

- Near M25 Junction 10, adjacent to A3 northbound off-slip (G_6) (not representative of exposure);
- On the A245 over the M25 north west of Junction 10 (Wk_3) (not representative of exposure);
- Near the A3 junction with Copsem Lane, north east of Junction 10 (E_9) (not representative of exposure); and
- At roadside/kerbside sites within Cobham and Esher AQMAs (E_3, E_4, E_5, and E_7, E_8, E_10, E_11).

Table 5.7: Local Authority Diffusion Tube Monitoring Data, NO_2 (µg/m^3)

Site ID	LA ID	Site Name	Site Type	X, Y	2010	2011	2012	2013	2014	2015	2016
Guildford Borough Council											
G_6	GD5	Wisley (5)	Kerbside	507947, 159099	40	44	44	45	40	46	^
G_28	RP1	Ripley High Street	Roadside	505243, 156819	–	–	–	–	–	–	32
G_29	RP2	Newark Lane	Kerbside	505090, 156777	–	–	–	–	–	–	27
G_30	WS1	Elm Corner	Semi-rural	507346, 158005	–	–	–	–	–	–	13
^Decommissioned end of June 2016											
Elmbridge Borough Council											
E_3	Cobham 1	26 High St	Urban traffic	510828, 159996	42	42	40	40	42	35	33
E_4	Cobham 6	Harlequin Dry Cleaners, 2 Anyards Rd	Urban traffic	510814, 160099	36	31	34	33	33	28	29
E_5	Cobham 7	Exclusively Surrey, 38A High Street	Urban traffic	510861, 159906	41	38	42	38	43	36	34
E_6	Downside 3	Bookham Rd	Rural background	511429, 157606	35	31	30	32	31	26	21
E_7	Esher 1	Lamp post outside the Hair Gallery, Church St	Urban traffic	513840, 164693	58	49	49	52	48	49	45
E_8	Esher 4	Bus stop opposite Sandown House, Portsmouth Rd	Urban traffic	514058, 164855	50	46	47	45	46	43	40
E_9	Esher 5	Roundabout, Copsem Lane/A3	Urban traffic	514150, 162470	54	49	53	50	52	51	44
E_10	Esher 7	Outside Clinton Cards, 35–39 High St	Urban traffic	513982, 164750	55	54	53	48	53	48	41
E_11	Esher 8	Outside 9 Church St	Urban traffic	513832, 164684	54	53	55	47	51	44	42
E_12	Esher 9	Lamp post next to Churchard, Church St	Urban traffic	513821, 164712	42	34	36	36	37	32	33
E_13	Esher 10	Traffic sign, outside 15 Esher Green	Urban traffic	513886, 164767	35	33	36	36	36	33	30
E_14	Esher 11	The Bear, Copsem Lane side	Urban traffic	513893, 164607	46	39	40	42	39	39	33
E_15	Esher 13	Panahar Tandoori, 124–126 High St	Urban traffic	513736, 164489	50	44	42	41	38	40	36

Site ID	LA ID	Site Name	Site Type	X, Y	2010	2011	2012	2013	2014	2015	2016
Woking Borough Council											
Wk_3	M25	M25	Other	505611, 161180	–	66	50	52	50	61	51
Wk_4	Church	Church Road	Kerbside	506401, 160504	–	27	41	44	20	25	24
Wk_13	LD	Lincoln Drive	Kerbside	503244, 159659	–	22	22	20	16	21	19
Wk_18	PR	Dartnell Avenue (previously Parvis Road)	Kerbside	504926, 161063	–	26	26	27	23	28	26
Runnymede Borough Council											
R_3	RY8	Ongar Place First School, Milton Road, Addlestone	Roadside	504325, 163940	32	24	21	29	26	35	24
R_5	RY19	78 Woodham Lane, New Haw	Roadside	505227, 162701	46	45	37	44	37	34	33
Mole Valley District Council											
MV6	MV6	SCC depot	Kerbside	517137, 157240	43	36	33	39	28	28	26
MV10	MV10	Green Lane	Kerbside	517712, 156743	43	41	32	34	34	31	31
MV11	MV11	Green Lane	Kerbside	517871, 156748	36	36	30	31	25	28	28
MV12	MV12	Green Lane	Kerbside	517674, 156840	38	33	32	30	26	25	25

5.5 Potential impacts

5.5.1 The Scheme has the potential to affect local air quality, both during construction and once in operation.

5.5.2 Construction

Dust Emissions

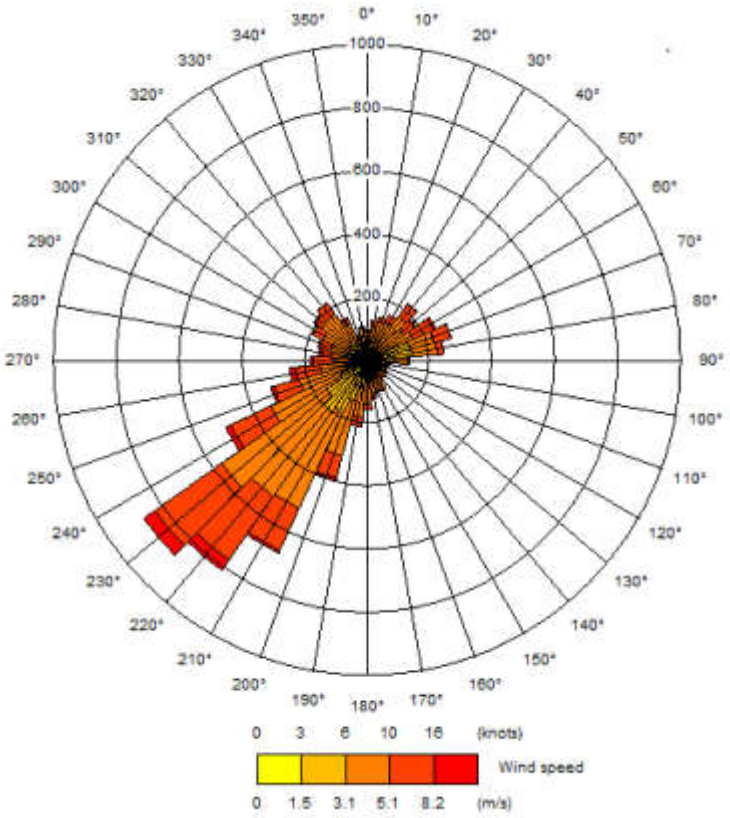
5.5.3 There is the potential for elevated dust deposition and soiling at properties within 200 m of the indicative construction site boundary as a consequence of the works, if dust raising activities are not effectively controlled and mitigated. The level and distribution of dust emissions would vary according to the duration and location of activity, weather conditions, and the effectiveness of suppression measures.

5.5.4 Receptors within 200 m of the indicative construction site boundary for the Scheme are shown in Figure 5.2 in Volume 3. The Scheme has the potential for construction dust to affect up to 190 properties. Works are expected to take place over 24 months.

5.5.5 The prevailing winds recorded at Gatwick Airport meteorological station (approximately 25 km south east of the Scheme) are from the south west as shown in the windrose in Figure 5.3 below. The highest wind speeds are also recorded from this direction. This suggests that the wind is more likely to transport the dust raised on site towards the north east of the construction works.

5.5.6 Receptors to the north east of the construction works include properties in Elm Corner, and properties to the east of the A3 including within Painshill Park and Cobham. In addition the Thames Basin Heaths SPA and Ockham & Wisley Commons SSSI are both located within 200 m of Junction 10.

Figure 5.2: Windrose for Gatwick Airport Meteorological Station (2015)



Construction Traffic

5.5.7 An increase in vehicle movements is expected to occur during the construction period, associated with the transport of materials, plant and labour to and from site. At this stage, the numbers of expected vehicle movements are not yet known, so cannot be quantitatively assessed. It is also not yet known the details of any traffic management or if existing traffic will need to be diverted during the construction phase, so no assessment of these changes has been carried out. Any impact would be expected to be less than that during operation, and would be temporary. This will be examined further once information on changes in traffic movements is available.

Operation

5.5.8 At Options Selection Stage, concentrations were estimated for the opening year at 17 selected human health receptors. Details of the receptors are provided in Table 5.8 and shown in Figure 5.4 in Volume 3. Concentrations of NO_2 were estimated in accordance with IAN 170/12 v3 (LTTE6), as this approach was considered the most realistic for estimating future concentrations, taking into account uncertainty in long term trends. Concentrations of both NO_2 and PM_{10} were compared with relevant UK AQS objectives to determine whether there are likely to be any exceedances. Results are presented in Table 5.9 and Table 5.10 below.

5.5.9 There are expected to be exceedances of the NO_2 annual mean AQS objective at three receptors (R1, R7 and R12) both with and without the Scheme (Table 5.13). The highest concentration is estimated to be 43.9 µg/m^3 at receptor R7,

located at the junction of the A245 and A307 in Cobham. This is a robust estimate of future NO_2 concentrations that has used the LTT approach.

5.5.10 The greatest increase in annual mean NO_2 concentrations is expected to be a 'medium' increase of 3.1 µg/m^3 at receptor R7 as a result of the increase in traffic flows with the Scheme.

5.5.11 Other receptors with 'small' increases in annual mean NO_2 concentrations with the Scheme include receptors R1, R2, R6, R10, R11, R12, R14, R15, R16. Receptor R1 is located at the junction of the A245 with B365, west of Painshill Interchange, while receptor R2 is located in Ripley. Receptor R10 is located in the M25 AQMA, and receptors R14 and R15 border the M25 AQMA. Receptor R16 is located within the Cobham AQMA. The remaining receptors are located near the M25 (R11), and near the A3 (R6, R12). The increases in concentrations are due to increases in traffic flows on the roads close to the receptors.

5.5.12 There are also expected to be improvements with the Scheme. The greatest decrease in annual mean NO_2 concentrations with the Scheme is expected to be a 'small' decrease of 1.6 µg/m^3 at receptor R3, located on the A307 in Cobham. There is also expected to be a small decrease at receptor R5, located on the A307 in Esher in the Esher AQMA. In all cases the decreases in concentrations are as a result of the reduction in traffic flows on the roads close to the receptors.

5.5.13 The remaining receptors are estimated to experience an imperceptible change in annual mean NO_2 concentrations with the Scheme.

5.5.14 There is expected to be a 'small' increase in NO_2 concentrations at receptors within both the M25 and Cobham AQMAs, but concentrations are not expected to exceed the AQS objectives at receptors in these locations. There is expected to be a 'small' decrease in NO_2 concentrations at receptors within the Esher AQMA. The change at receptors in the Addlestone AQMA is expected to be negligible.

5.5.15 In line with Defra's technical guidance LAQM.TG16 there are not expected to be any exceedances of the 1-hour mean AQS objective given that annual mean NO_2 concentrations are all estimated to be less than 60 µg/m^3.

5.5.16 There are not expected to be any exceedances of the PM_{10} annual mean AQS objective, and all changes are expected to be imperceptible. In addition, there were no receptors where concentrations were expected to exceed the PM_{10} daily mean AQS objective.

Table 5.8: Selected Human Health Receptor Locations Included at Option Selection Stage

Receptor ID	Grid Reference	Receptor Location
R1	509111, 160796	Old Lodge, Seven Hills Road, Cobham
R2	505161, 156751	Aberdeen House, High Street, Ripley
R3	511914, 161634	Fairmile Lea Lodge, Portsmouth Road, Cobham
R4	506084, 159446	6 Horticultural Society Cottages, Wisley
R5	513789, 164565	Heather Place, Esher
R6	514019, 162421	Copsem Lane, Esher
R7	510316, 160422	Facade of 65 Portsmouth Road, Cobham

Receptor ID	Grid Reference	Receptor Location
R8	510683, 157820	Rye Saltars, Horsley Road, Downside
R9	514728, 158522	1 Staff House, QETC Leatherhead Court, Woodlands Road, Leatherhead
R10	504262, 164022	2 Katherine Close, Addlestone
R11	505650, 161296	Day Nursery, Byfleet Cricket Pavilion
R12	509374, 160600	Felton Fleet School, Byfleet Road, Cobham
R13	510328, 160955	44 Queens Court Ride, Cobham
R14	504162, 164438	Jubilee High School, School Lane, Addlestone
R15	504380, 164040	160 Liberty Lane, Addlestone Road, Addlestone
R16	510845, 159945	24A High Street, Cobham
R17	504961, 164927	Wyvern Place, Green Lane, Addlestone

Table 5.9: Estimated Annual Mean NO_2 Concentrations (µg/m^3) at Selected Human Health Receptors, LTTE6

Receptor ID	Background 2015 NO_2	2015 Base NO_2	Background 2022 NO_2	2022 DM NO_2	2022 DS NO_2	2022 NO_2 Change	2022 NO_2 Change Criteria
R1	17.6	54.4	12.7	40.8	41.7	0.9	Small increase
R2	16.8	35.2	12.1	28.9	29.7	0.8	Small increase
R3	17.2	28.1	12.6	23.6	22.0	–1.6	Small decrease
R4	13.0	25.3	9.9	19.3	19.0	–0.3	Imperceptible
R5	17.6	24.0	13.4	18.8	18.1	–0.7	Small decrease
R6	17.3	40.9	12.7	32.5	33.3	0.8	Small increase
R7	17.0	52.4	12.7	40.8	43.9	3.1	Medium increase
R8	11.2	24.1	8.5	19.7	19.5	–0.2	Imperceptible
R9	12.1	27.1	9.2	21.6	21.8	0.2	Imperceptible
R10	15.8	31.8	12.1	24.9	25.6	0.7	Small increase
R11	15.5	41.8	11.9	33.2	34.6	1.4	Small increase
R12	17.6	60.2	12.7	43.6	45.0	1.4	Small increase
R13	17.0	33.3	12.7	26.3	26.7	0.4	Imperceptible
R14	15.8	38.5	12.1	28.5	29.4	0.9	Small increase

Receptor ID	Background 2015 NO_2	2015 Base NO_2	Background 2022 NO_2	2022 DM NO_2	2022 DS NO_2	2022 NO_2 Change	2022 NO_2 Change Criteria
R15	15.8	37.6	12.1	29.8	30.8	1.0	Small increase
R16	13.1	30.2	9.9	24.2	26.1	1.9	Small increase
R17	15.8	38.6	12.1	29.7	29.8	0.1	Imperceptible

Table 5.10: Estimated Annual Mean PM_{10} Concentrations (µg/m^3) at Selected Human Health Receptors

Receptor ID	Background 2015 PM_{10}	2015 Base PM_{10}	Background 2022 PM_{10}	2022 DM PM_{10}	2022 DS PM_{10}	2022 PM_{10} Change	2022 PM_{10} Change Criteria
R1	16.4	18.7	15.6	17.7	17.7	0.1	Imperceptible
R2	15.9	17.0	15.1	16.1	16.2	0.1	Imperceptible
R3	15.8	16.5	15.0	15.8	15.7	–0.1	Imperceptible
R4	17.3	17.8	16.6	17.1	17.1	0.0	Imperceptible
R5	15.7	16.1	14.9	15.3	15.2	–0.1	Imperceptible
R6	15.9	17.5	15.1	16.6	16.7	0.1	Imperceptible
R7	15.8	18.3	15.0	17.3	17.7	0.3	Imperceptible
R8	16.7	18.2	16.1	17.4	17.4	0.0	Imperceptible
R9	17.0	18.8	16.4	17.9	18.0	0.1	Imperceptible
R10	17.7	19.6	17.1	18.5	18.7	0.1	Imperceptible
R11	17.8	21.3	17.2	20.0	20.3	0.2	Imperceptible
R12	16.4	19.0	15.6	18.0	18.1	0.2	Imperceptible
R13	15.8	16.8	15.0	16.0	16.0	0.0	Imperceptible
R14	17.7	20.6	17.1	19.1	19.2	0.1	Imperceptible
R15	17.7	20.5	17.1	19.3	19.5	0.2	Imperceptible
R16	15.6	16.6	14.9	15.8	16.0	0.1	Imperceptible
R17	17.7	19.1	17.1	18.2	18.2	0.0	Imperceptible

Compliance Risk Assessment

5.5.17 Compliance with the EU Air Quality Directive has been considered using the principles in IAN 175/13 where Defra PCM model links coincide with the modelled area to aid the assessment of significance of effect.

5.5.18 Defra's revised Air Quality Plan was published in 2017, which aids the consideration of compliance. The roads considered in the assessment are within Euro Zone 31 (South East) and Zone 1 (Greater London Urban Area). The maximum concentration across the roads considered within the study area is projected to be 28.8 µg/m^3 in 2022.

5.5.19 Based on the illustrative receptor modelling at the Option Selection Stage the maximum increase in annual mean NO_2 concentration is of medium magnitude (maximum increase of 3.1 µg/m^3 at Receptor R7 at the junction of the A245 and A307 in Cobham). Hence the highest roadside NO_2 annual mean concentration within the air quality study area in 2022 with the Scheme (using the Defra PCM mapping of roadside NO_2 concentrations for 2022) is calculated to be 31.9 µg/m^3. This is below the EU limit value of 40 µg/m^3 and therefore the Scheme would not impact on achieving compliance with the EU Air Quality Directive.

Ecological Assessment

5.5.20 Selected ecological receptors included in the local air quality assessment at Option Selection Stage are shown in Table 5.11 and in Figure 5.3. The NO_x concentrations at the ecological receptors were estimated for the Scheme during the Options Selection Stage, and are presented in Volume 2 Appendix A. The results indicate that in the opening year, NO_x concentrations exceeded the critical level both with and without the Scheme at Ockham & Wisley Commons SSSI, Thames Basin Heaths SPA, Esher Commons SSSI (north transect and up to 100 m from the road on the south transect), and the Epsom & Ashtead Commons SSSI up to 100 m from the road.

5.5.21 Increases in NO_x concentrations of 2 µg/m^3 or more were estimated to occur in the opening year with the Scheme at the Ockham and Wisley Commons SSSI/Thames Basin Heaths SPA, Esher Commons SSSI (north transect only up to 25 m), and Epsom and Ashtead Commons SSSI (east transect only up to 10 m).

Table 5.11: Selected Ecological Receptors Included at Option Selection Stage

Receptor ID	Receptor Location	Number and Direction of Transects
Ockham and Wisley Commons SSSI	M25 Junction 10	Two (North, South)
Ockham and Wisley Commons SSSI and Thames Basin Heaths SPA	South of M25 Junction 10, adjacent to A3	Two (North, South)
Esher Commons SSSI	North east of M25 Junction 10, adjacent to A3	Four (North, South, East and West)
Bookham Commons SSSI	South east of M25 Junction 10, adjacent to Cobham Road	Two (East, West)
Papercourt SSSI	South west of M25 Junction 10, adjacent to B367 Newark Lane	One (West)
Epsom and Ashtead Commons SSSI	North of M25 Junction 9, adjacent to A243 Kingston Road	One (East)

5.5.22 For those sites expected to exceed the critical level for NO_x in the opening year, a calculation of nitrogen deposition was made. The total nitrogen deposition rates and change in deposition are provided in Volume 2 Appendix A. The lower end of the relevant critical load range was taken to be 10 kg/ha/yr in each case, which is representative of the heathland and woodland habitat types present at the sites considered in this part of the assessment (Ockham and Wisley

Commons SSSI, Epsom and Ashtead Commons SSSI, and Esher Commons SSSI).

5.5.23 Nitrogen deposition rates in the opening year scenarios were above the lower end of the critical load range at all modelled locations. The maximum change on the transects through the Ockham and Wisley SSSI at Junction 10 is 1.73 kg/ha/yr with the Scheme or the equivalent of 17.3% of the critical load due largely to the introduction of the new roads. At 100 m distance the change is lower at 0.17 kg/ha/yr (1.7%). The maximum changes at Epsom and Ashtead Commons SSSI and Esher Commons SSSI are 0.11 kg/ha/yr and 0.12 kg/ha/yr respectively, which are equivalent to 1.1% and 1.2% of the critical loads respectively.

5.5.24 It should be noted that this assessment used the boundary of the Designated Site but did not consider the specific location of protected species/habitats within the site boundaries. For example, the Thames Basin Heaths SPA supports important breeding populations of a number of birds of lowland heathland, however the areas closest to the ARN are wooded areas, which act as a buffer to the more sensitive areas away from the roads. Further work will be undertaken for the ES to update the assessment in line with the updated traffic model and investigate the results in greater detail, including the specific location of protected species/habitats within the site boundaries.

5.5.25 Further assessment work will also be undertaken in collaboration with the Project Ecologist to investigate the significance of these changes, particularly in the context of protected species. Consultation will be undertaken with Natural England and, where necessary mitigation options examined.

Regional Air Quality

5.5.26 Estimated annual emissions of NO_x, PM_{10} and CO_2, calculated using the DMRB toolkit v5, are provided in Table 5.12.

5.5.27 Pollutant emissions in the opening year are expected to increase with the Scheme by between 1% and 3% in 2022, in line with the 3% increase in vehicle kilometres travelled, and by between 2% and 4% in 2037, in line with the 4% increase in vehicle kilometres travelled.

5.5.28 Emissions of PM_{10} are expected to increase overall from the base year by both 2022 and 2031, but by less than the increase in total vehicle kilometres travelled. Emissions of NO_x and CO_2 are expected to decrease overall from the base year by both 2022 and 2037, despite the overall increase in vehicle kilometres travelled with the Scheme, due to improvements in vehicle technology.

Table 5.12: Regional Emissions Results

Year	Scenario	NO_x (kg/yr)	PM_{10} (kg/yr)	CO_2 (t/yr)	Veh kms travelled/year
2015	Base	1,067,683	62,444	796,755	5,647,745
2022	DM	553,540	62,177	435,598	6,326,573
	DS	564,693	63,903	440,889	6,521,337
	Change with DS	11,153	1,726	5,290	194,764
	% Change from DM	2.0%	2.8%	1.2%	3.1%

Year	Scenario	NO_x (kg/yr)	PM_{10} (kg/yr)	CO_2 (t/yr)	Veh kms travelled/year
	% Change from Base	–47.1%	2.3%	–44.7%	15.5%
2037	DM	434,916	70,227	493,889	7,259,116
	DS	448,564	73,016	505,902	7,567,202
	Change with DS	13,648	2,789	12,013	308,086
	% Change from DM	3.1%	4.0%	2.4%	4.2%
	% Change from Base	–58.0%	16.9%	–36.5%	34.0%

Significant effects

Construction

5.5.29 Any air quality effects due to construction will be temporary and can be suitably minimised by the application of standard and appropriate mitigation measures. On this basis, there is unlikely to be a significant effect on air quality due to the construction of the Scheme.

Operation

5.5.30 In accordance with the IAN 174/13, Table 5.13 outlines the evaluation of local air quality significance of the Scheme. The Scheme is not expected to have a significant effect on human health receptors. Table 5.14 provides a summary of the receptors which are considered within the evaluation of significance. Of these three receptors, one receptor (R7) is expected to be representative of around 3 properties in the vicinity, and the other two receptors (R1 and R12) are only representative of the individual property in each case. These effects are predicted to arise whether or not the scheme is built. The significance of the effect on ecological receptors is currently unknown and needs further investigation, however it is anticipated that any adverse effect could be mitigated through appropriate types of planting and habitat creation.

Table 5.13: Overall Evaluation of Local Air Quality Significance

Key Criteria Questions	Yes/No
Is there a risk that environmental standards will be breached?	Yes – Three receptors (R1, R7 and R12) are expected to exceed the annual mean NO_2 AQS objective both with and without the Scheme.
Will there be a large change in environmental conditions?	No – Of these three receptors, one receptor (R7) is expected to have a medium increase, while the other two (R1 and R12) are expected to have a small increase. No receptors are expected to have a large change.
Will the effect continue for a long time?	Yes – At the receptor with a medium change (R7), it is expected that it would take over six years before concentrations returned to DM levels.
Will many people be affected?	No – The receptor with the medium change (R7) is only representative of approximately 3 properties, while the properties with the small changes (R1 and R12) are representative of the individual properties only.

Key Criteria Questions	Yes/No
Is there a risk that designated sites, areas, or features will be affected?	Yes. Ockham and Wisley Commons SSSI, Epsom and Ashtead Commons SSSI, and Esher Commons SSSI
Will it be difficult to avoid or reduce or repair or compensate for the effect?	No – Approporiate planting and habitat creation measures could be put in place on adjacent land that is within the red line boundary for the scheme.
On balance is the overall effect significant?	On balance, the overall effect is not significant for human health receptors. Although there are increases in NO_2 concentrations at receptors which are exceeding annual mean AQS objectives without the Scheme, these receptors are located in areas not representative of a large number of people. In terms of the effect on designated ecological sites, it is anticipated that any adverse effect at Ockham and Wisley Commons SSSI/Thames Basin Heaths SPA could be mitigated through land compensation.

Table 5.14: Potential significant air quality effects at human health receptors

Receptor	Sensitivity of receptor	Magnitude of impact	Significance of effect	Comments
R1	High	Small Adverse	Not Significant	Only representative of the individual property.
R7	High	Medium Adverse	Not Significant	Only representative of around 3 properties.
R12	High	Small Adverse	Not Significant	Only representative of the individual property.

5.6 Potential mitigation measures

Construction

5.6.1 Mitigation measures to control dust emissions during construction will be specified within contract documentation and incorporated in a CEMP. The precise measures would depend on the intended construction methods and the potential degree of dust generation at each site. Such measures may include but not necessarily be limited to:

- Regular water–spraying and sweeping of unpaved and paved roads to minimise dust and remove mud and debris;
- Using wheel washes, shaker bars or rotating bristles for vehicles leaving the site where appropriate to minimise the amount of mud and debris deposited on the roads;
- Sheeting vehicles carrying dusty materials to prevent materials being blown from the vehicles whilst travelling;
- Enforcing speed limits for vehicles on unmade surfaces to minimise dust entrainment and dispersion;

- Ensuring any temporary site roads are no wider than necessary to minimise their surface area;
- Damping down of surfaces prior to their being worked; and
- Storing dusty materials away from site boundaries and in appropriate containment (e.g. sheeting, sacks, barrels etc.).

5.6.2 If necessary monitoring parameters and a programme will be established.

Operation

5.6.3 The assessment at Options Selection Stage indicated that there are not expected to be any significant adverse effects with the Scheme for the human health receptors. This will be investigated and confirmed for the ES using an updated traffic model and the latest air quality tools and information.

5.6.4 The Scheme could potentially lead to significant adverse effects on the Designated Sites in the study area. Further assessment work will be required at the assessment for the ES to investigate this and, if necessary, examine mitigation options, such as compensation, exchanging or replacing land, new planting or barriers. If required, monitoring parameters and a programme will be established.

5.7 Summary

5.7.1 The air quality study area, as defined at Option Selection Stage, is located within the boundaries of GBC, EBC, WBC, RBC and MVDC, and borders RBK. There are four AQMAs within this indicative air quality study area which could potentially be affected by the Scheme.

5.7.2 Local air quality monitoring data indicates that there are currently exceedances of the annual mean NO_2 AQS objective within a number of key traffic corridors predominantly at roadside or kerbside locations not representative of exposure. However, there were no exceedances of the annual mean NO_2 or PM_{10} EU limit values at roads included within the Defra PCM model.

5.7.3 The findings of the assessment to date are based on the results from Option Selection Stage. There were expected to be exceedances of the annual mean NO_2 AQS objective in the opening year both with and without the Scheme at three of the modelled receptors. One of these receptors is expected to have a 'medium' increase in NO_2 concentrations. The other two receptors are expected to have a 'small' increase with the Scheme.

5.7.4 There is expected to be a 'small' increase in NO_2 concentrations at receptors within both the M25 and Cobham AQMAs, but concentrations are not expected to exceed the AQS objectives at receptors in these locations. There is expected to be a 'small' decrease in NO_2 concentrations at receptors within the Esher AQMA. The change at receptors in the Addlestone AQMA is expected to be negligible.

5.7.5 There were not expected to be any exceedances of the annual mean PM_{10} AQS objective and the change in PM_{10} concentrations was expected to be imperceptible in all cases.

5.7.6 There were not expected to be any exceedances of the NO_2 1–hour mean AQS objective or of either PM_{10} AQS objective with or without the Scheme.

5.7.7 There are not expected to be any Defra PCM links that exceed EU limit values in 2022 in the air quality study area with or without the Scheme. Hence there is not expected to be a compliance risk due to the Scheme.

5.7.8 Given the magnitude of changes and number of receptors likely to be affected, it can be considered that the Scheme would not have a significant effect on local air quality at human health receptors.

5.7.9 However, the risk of a potentially significant adverse effect on the Designated Sites in the study area has not yet been ruled out. Further assessment work will be required to investigate this for the ES and, if necessary examine mitigation options.

5.7.10 It should be noted that the results presented in this PEIR are based on air quality modelling using traffic data from the Option Selection Stage that is to be superseded as the Preliminary Design Stage progresses. The determination of the overall Scheme significance will therefore be revisited during the assessment for the ES.

6 Noise and Vibration

6.1 Introduction

6.1.1 This chapter provides the preliminary environmental assessment of the Scheme, based upon information available as of December 2017. It provides information relating to the baseline conditions, the expected impacts and the mitigation measures that may be required to avoid significant effects from occurring. The following should be taken into account in this preliminary assessment:

- The assessment has been based on the noise assessment of the Scheme as assessed at Option Selection Stage (Option 14B, which most closely reflects the current Scheme), as the final design of the Scheme and traffic modelling has not yet been completed;
- Information regarding changes in traffic during the construction phase are currently unknown, but will be assessed once this information is available; and
- The results from the Option Selection Stage are presented. These will be updated for the Environmental Statement (ES) when a final design is confirmed and the associated traffic model is completed.

6.2 Study area

6.2.1 The study area for the assessment of noise and vibration effects is defined in the DMRB Volume 11, Section 3, Part 7 HD 213/11 Noise and Vibration as 600 m from the carriageway edge of any proposed new routes or existing routes to be bypassed or improved, and 600 m from any other affected routes within 1 km of the proposed new routes or altered existing routes. An affected route is defined as where it is calculated that there is a possibility of a change of 1dB $L_{A10,18h}$ in the short term or 3dB $L_{A10,18h}$ in the long term (assessed between the opening year and the future year).

6.2.2 The DMRB HD 213/11 provides the following methodology for identifying the size and extents of the study area:

1. Identify the start and end points of the physical works associated with the road project;
2. Identify the existing routes that are being bypassed or improved and any proposed new routes between the start and end points (for each option);
3. Define a boundary 1 km from the carriageway edge of each of the options identified in (2) above;
4. Define a boundary 600 m from the carriageway edge around each of the options identified in (2) above and also 600 m from any other affected routes within the boundary defined in (3) above. The total area within these 600 m boundaries is termed the 'calculation area';
5. Identify any affected routes beyond the boundary defined in (3) above; and
6. Define a boundary 50 m from the carriageway edge of routes identified in (5) above.

6.2.3 Based on the above, the detailed noise calculation area (within 600 m of any affected route that is within 1 km of the Scheme) has been determined. This is shown in Figure 6.1 for the previous design phase.

6.2.4 Determination of the affected routes, and consequently the study area, may be constrained by the geographical extent, and area of validity, of the traffic modelling made available for the Scheme appraisal. The study area for future noise impact assessments will be determined once the strategic traffic model has been finalised.

6.3 Consultation

6.3.1 Consultation has been undertaken with Elmbridge Borough Council in November 2017 to identify noise sensitive receptors that should be considered in the Noise and Vibration assessment and potential locations for noise monitoring. Elmbridge Borough Council indicated several properties that should be included in the assessment (Convent Lane, Seven Hills Road, Pointers Road, Ockham Lane and Hatchford Park) and confirmed that San Domenico should be considered a noise sensitive receptor for this assessment.

6.3.2 Initial contact with Surrey County Council was made in December 2017, however detailed conversations have not yet taken place regarding the assessment approach, areas with existing noise and vibration concerns, and further noise sensitive receptors that should be included in the assessment from other proposed or committed developments.

6.4 Baseline conditions

6.4.1 Information regarding the existing ambient noise climate i.e. baseline conditions, and identification of potential noise impact constraints to the Scheme has been determined through reference to the following sources:

- Ordnance Survey base mapping to identify locations of residential and non–residential noise sensitive receptors (residential properties, schools, hospitals and elderly care homes);
- Natural England's MAGIC website[7] to identify boundaries of designated ecological sites that may be considered as sensitive to noise;
- Extrium Noise Map Viewer showing Defra NIA mapping[8]; and
- Extrium Noise Map Viewer showing Defra Strategic Noise Mapping for Environmental Noise Directive (Directive 2002/49/EC) and the Environmental Noise (England) Regulations 2006 (as amended) (2015)[9].

Noise Sensitive Receptors

6.4.2 The M25 Junction 10/A3 Wisley Interchange Scheme is located between the urban areas of Ripley and Cobham in Surrey. The land use within 600 m of the Scheme consists mostly of green space, including Chatley Wood, Ockham Common and Wisley Common. The majority of the noise sensitive receptors are located close to the Painshill Interchange to the north east of the study area.

[7] http://magic.defra.gov.uk/
[8] http://extrium.co.uk/noiseviewer.html#
[9] http://extrium.co.uk/noiseviewer.html#

6.4.3 The closest buildings to the M25 Junction 10/A3 Wisley Interchange are in proximity to the Painshill Interchange and include Pains Hill Bungalow (45 m), Pains Hill (50 m), and Feltonfleet School (50 m). There is a mixed-use development between the A3 and A245 within 300 m of the Painshill Interchange, and further residential buildings located at Seven Hills Road, approximately 430 m from the Painshill Interchange. The land south west of the Painshill Interchange towards the M25 and beyond, is sparsely populated with few noise sensitive receptors located within 600 m of the Scheme in this area.

6.4.4 A number of other notable noise sensitive receptors have been identified within 600 m of the M25, A3, and A245 Byfleet Road, including: Feltonfleet School, St George's Nursing Home, Hilton Hotel, Notre Dame Senior School, Notre Dame Preparatory School, Cobham Free School, Painshill Fire Station, Silvermere Equestrian Centre's Riding School, Elm Corner and RHS Gardens at Wisley.

6.4.5 In addition to the existing noise sensitive receptors located close to the Scheme, it is understood that there are proposals to develop the land occupied by the former Wisley Airfield into residential housing. The planning application for the development was rejected on several grounds in April 2016, a decision which is currently being appealed by the developer. If the appeal is successful and the planning application is approved, the development will include some mitigation as part of its design. The proposed Wisley Airfield development will be included in the traffic model and hence will be within the appraisal of the Scheme.

6.4.6 The locations of the nearest noise sensitive receptors to the Scheme are shown in Figure 6.1 and Figure 6.2 in Volume 3.

6.4.7 Ecological receptors are also present in proximity to the Scheme. There are several species of birds inhabiting the Thames Basin Heath SPA, which qualifies for the breeding population of three species of bird, nightjar, woodlark and Dartford warbler. These three species of bird could be adversely affected by changes to noise levels caused by the Scheme. The SPA is adjacent to the south east and south west of M25 Junction 10. The location of the SPA is shown in the Figure 2.2 Environmental Constraints Plan in Volume 3. More details about the ecological receptors can be found in the Chapter 7, Biodiversity.

Noise Climate

6.4.8 Road traffic noise from the M25 and the A3 are the main noise sources influencing noise levels in the study area. There is potential for aircraft noise to contribute to the noise climate as the study area is positioned between Heathrow and Gatwick airports. There are no railways or heavy industrial noise sources within 1 km of the Scheme.

6.4.9 A noise survey will be undertaken during Preliminary Design Stage to ascertain the baseline noise levels at noise sensitive receptors within the study area of the Scheme.

6.4.10 The measured noise levels obtained during the baseline noise survey will be supplemented with information from publicly available online mapping sources. Strategic noise maps were published during 2015 by Defra for both major road and railways sources to meet the requirements of the Environmental Noise Directive (Directive 2002/49/EC) and the Environmental Noise (England) Regulations 2006 (as amended). The strategic noise maps for road traffic noise

during the daytime (07:00–23:00) and night–time (23:00–07:00) periods are shown in Volume 3 Figure 6.3 and Figure 6.4.

6.4.11 The 'Important Areas' for noise (NIAs) were identified to highlight any particular constraints for the Scheme. NIAs are the locations where the 1% of the population most affected by the highest noise levels from major roads and railways are located according to the strategic noise mapping undertaken by Defra. The summary of the NIAs are as follows:

Table 6.1: Location and distances of NIAs from the Scheme

NIA ID	Location	Source of noise	Distance in metres	Comment
5859	Pointers Road, Cobham	Road	150	Adjacent to M25
5858	Horsley Road, Cobham	Road	1615	Adjacent to M25
5868	Sanway Road, West Byfleet	Road	750	Adjacent to M25
1285	Glen Court, West Byfleet	Road	2260	Adjacent to M25
1015	Parvis Road, West Byfleet	Road	2450	Adjacent to A245
1281	Parvis Road, Byfleet	Road	2150	Adjacent to A245
1008	Byfleet Road, Cobham	Road	1620	Adjacent to A245
1009	Byfleet Road, Cobham	Road	1400	Adjacent to A245
5866	Byfleet Road, Cobham	Road	765	Adjacent to A245
5867	Byfleet Road, Cobham	Road	1100	Adjacent to A245
1004	Byfleet Road, Cobham	Road	65	Adjacent to A245
5864	Portsmouth Road, Cobham	Road	400	Adjacent to A245
13498	High Street, Cobham	Road	1200	Adjacent to A245
5861	Portsmouth Road, Cobham	Road	29	Adjacent to A3
5865	Portsmouth Road, Cobham	Road	7 to 21	Adjacent to A3 and A245
5863	Mossfield, Cobham	Road	730	Adjacent to A3
5862	Near Old Common Road, Cobham	Road	1380	Adjacent to A3
13499	Portsmouth Road, Cobham	Road	2660	Adjacent to A3/ Portsmouth Road

6.4.12 The locations of the NIAs in proximity to the Scheme are shown in Volume 3 Figure 2.2 Environmental Constraints Plan and are also shown in Volume 3 Figure 6.1 and Figure 6.2.

6.5 Potential impacts

Construction

6.5.1 The main construction activities that are likely to take place are site preparation, demolition, earthworks, retaining wall construction and road works. All activities have the potential to cause some disturbance at nearby sensitive receptors. Demolition works and piling works (for new bridges and retaining walls) are likely to cause some of the highest noise levels dependent on the methods chosen.

Should it be necessary to close the M25 or A3 to undertake any part of the works then the potential for adverse noise impacts at night is very high. This would also be coupled with the potential wider impacts of re–routed traffic probably during the night–time.

6.5.2 A construction programme detailing the specific activities that will take place, phasing and duration of each activities, and a plant list are not yet available for the Scheme.

6.5.3 The breeding productivity of the qualifying birds inhabiting the Thames Basin Heath SPA may be adversely impacted from construction works. Loud impact sounds, typically characterised as ‘bangs’ or ‘clangs’, can startle birds and cause them to temporarily fly away. During a prolonged period of construction works, the qualifying birds may become habituated to construction noise or depending on their sensitivity to impact or impulse sounds, may permanently leave the area.

6.5.4 The need for temporary noise mitigation during the construction phase will be determined by undertaking a BS5228–1:2009+A1:2014 assessment once the required information becomes available. The assessment will take into account the following factors:

- The ambient noise environment at the closest noise sensitive receptors to the construction works;
- The distance between the nearest noise sensitive receptor and the construction works;
- The duration and time of day that the construction works occur; and
- The noise produced by the plant or equipment involved in the construction activities, which is influenced by the sound power of the equipment and its usage pattern.

6.5.5 An increase in vehicle movements is expected during the construction period, as a result of workers and HGVs travelling to and from site. At this stage the numbers of expected vehicle movements are not yet known, so cannot be quantitatively assessed. It is also not yet known if existing traffic will need to be diverted during the construction phase. Consequently, it is not possible to undertake a construction traffic noise impact assessment at this time, however, the impacts from this will be assessed once the required information becomes available.

6.5.6 No information is available about the piling method to be used for constructing the elongated roundabout at Junction 10. However, as no buildings are located in the immediate vicinity of Junction 10, no significant impacts are expected for human receptors. Potential impacts to human and ecological receptors will be examined more closely when construction information is available.

6.5.7 Using best practicable means and general good working practices during the construction phase will also reduce the occurrence of transient ‘maximum’ noise levels that can cause disturbance to local residents and birds inhabiting the Thames Basin Heath SPA.

6.5.8 Frequent and open communication with local residents will reduce the potential for impacts to occur and complaints to arise during the construction phase.

6.5.9 Temporary environmental noise barriers can reduce noise levels by up to 10dB, however, this depends on the barrier’s dimensions and the position of the

nearest receptors relative to the construction site. Once baseline noise monitoring results and construction phase information are available, further comments can be made as to whether temporary environmental noise barriers will sufficiently mitigate against significant adverse effects from construction noise and vibration.

Operation

6.5.10 Once the Scheme is operational, the noise climate could be affected (positively or negatively) by changes in vehicle activity (flows, speeds and composition). Additionally, noise levels at nearby receptors could also be affected by any changes to the distance between carriageways and noise sensitive receptors, as a result of changes to the horizontal and vertical road alignment for the operational Scheme.

6.5.11 Detailed predictions have been carried out during the Option Selection Stage for a total of 5662 residential receptors identified within the study area; together with a total of 119 non–residential noise sensitive receptors, including schools, churches, RHS Wisley and a hotel. The predictions shown below were based on a variant of the Scheme that incorporated the proposed elongated roundabout design at Junction 10 (Option 14) and an overbridge to provide access to Wisley Lane (WIS 10), which is the best approximate for the Scheme design (Option 14 and WIS 11) from the information currently available. The predictions do not include noise barriers (existing or new) but do assume low noise road surfacing will be laid due to the Scheme and the Smart Motorways Programme on the M25, located adjacent to the Scheme.

6.5.12 The detailed predictions considered the short–term changes to noise levels in the opening year of the Scheme and the long–term changes to noise levels 15 years after the opening of the Scheme. For opening year impacts comparison was made between the Do Something (DS) scenario ie with the Scheme in operation and the Do Minimum (DM) scenario ie without the Scheme in 2022; for the long–term impacts, comparison is made between the DS scenario in 2037 and the DM scenario in 2022.

6.5.13 Table 6.2 below shows the noise changes for all modelled receptors within the detailed calculation area in the short–term (opening year), categorised into the noise change bands corresponding to the magnitude impact ratings, as required by DMRB.

Table 6.2: Short–term traffic noise reporting table (DMRB A1.1)

Change in noise level		Number of dwellings	Number of other sensitive receptors
Increase in noise level, $L_{A10, 18h}$	0.1 – 0.9	2020	21
	1 – 2.9	393	6
	3 – 4.9	0	0
	>=5	0	0
No change	= 0	1517	20
Decrease in noise level, $L_{A10, 18h}$	0.1 – 0.9	1300	47
	1 – 2.9	431	15
	3 – 4.9	1	0
	>=5	0	0

6.5.14 The above demonstrates that short–term changes in noise level of at least 1dB $L_{A10,18h}$ are expected at several properties due to the Scheme. Minor noise increases were predicted at 393 residential properties and 6 non–residential properties. Minor noise decreases were calculated at 431 residential and 15 non–residential properties. A moderate noise decrease was predicted at one residential property close to the Painshill Interchange. Figure 6.5 in Volume 3 illustrates the impacts in the opening year.

6.5.15 Table 6.3 below shows the noise changes for all modelled receptors within the detailed calculation area in the long–term (future year) categorised into the noise change bands.

Table 6.3: Long–term traffic noise reporting table (DMRB A1.2)

Change in noise level		Number of dwellings	Number of other sensitive receptors
Increase in noise level, $L_{A10, 18h}$	0.1 – 2.9	934	32
	3 – 4.9	0	0
	5 – 9.9	0	0
	>=10	0	0
No change	= 0	146	5
Decrease in noise level, $L_{A10, 18h}$	0.1 – 2.9	3675	68
	3 – 4.9	905	14
	5 – 9.9	2	0
	>=10	0	0

6.5.16 Table 6.3 above demonstrates that the majority of long–term changes in noise level due to the Scheme were predicted to be negligible. Minor noise decreases were calculated at 905 residential properties and 14 non–residential properties. Moderate noise decreases were predicted at two residential properties close to the M25. Figure 6.6 in Volume 3 illustrates the impacts over the long term.

6.5.17 This section describes the significance of effects from the operation of the Scheme. The effects are summarised in Table 6.4 and Table 6.5, which show the significance for both residential and non–residential properties. The

assessment includes significance for both the opening and future years. The impact categories used vary from 'less than adverse' to 'significant' effects, with 'adverse' effects in between.

6.5.18 Table 6.4 below summarises the changes in significance of effects due to the Scheme on opening.

Table 6.4: Significance in the opening year

Effects	Opening year significance					
	Residential (daytime)			Non–residential (daytime)		
	Number of properties DM	Number of properties DS	Difference	Number of properties DM	Number of properties DS	Difference
Less than adverse effects	1066	1091	25	78	80	2
Adverse effects	4196	4203	7	24	23	–1
Significant effects	400	368	–32	17	16	–1

6.5.19 Table 6.4 above shows that in the opening year there are predicted to be 25 fewer residential properties that would experience noise levels above the adverse threshold due to the Scheme. There would be a total of 368 residential properties and 16 non–residential properties expected to experience noise levels above the significant effect level, which constitutes a decrease of 33 properties compared with the DM scenario.

6.5.20 Table 6.5 below summarises the changes in significance of effects due to the Scheme in the future year, compared with the DM in the opening year.

Table 6.5: Significance in the future year compared with DM opening year

Effects	Future year significance					
	Residential (daytime)			Non–residential (daytime)		
	Number of properties DM	Number of properties DS	Difference	Number of properties DM	Number of properties DS	Difference
Less than adverse effects	1066	1978	912	78	83	5
Adverse effects	4196	3274	–922	24	20	–4
Significant effects	400	410	10	17	16	–1

6.5.21 Table 6.5 above shows that in the future year, the number of properties expected to experience a 'less than adverse' effect has increased by 912 properties. A total of 410 residential properties and 16 non–residential properties are expected to exceed the significant effect level in the future year of the Scheme, which constitutes 10 more residential properties and one fewer non–residential property compared with the DM scenario ie with the Scheme, in the opening

year. These additional receptors were located in Pyrford, Cobham and Ockham Road North, however, the greatest contributions to noise levels in these areas was from traffic on local roads rather than the roads proposed or modified by the Scheme.

6.5.22 The Scheme includes proposals for new or modified access roads to ensure that access to existing properties or areas of interest is retained (previously called PAIN 4C, SAN 02, ELM 05 and CAMP 03 in the Option Selection Stage). The proposed access roads were considered to have a negligible impact to nearby properties in the opening year and the design year. This is because the number of properties that the proposed access roads will service is very small, resulting in low traffic flows and a negligible impact.

6.5.23 The use of mitigation measures will reduce noise at locations already experiencing high road traffic noise levels, such as Important Areas, and locations predicted road traffic noise levels above the SOAEL due to the Scheme's proposals. This will reduce the number of properties where significant effects are predicted.

6.5.24 As mentioned above, the use of low noise road surfacing can reduce noise levels by up to 3.5 dB $L_{A10,18h}$. Usage of low noise road surfacing has been included in the design of the Scheme for new and modified roads as shown in section 6.6, mainly located on the A3 and at Junction 10. At this stage, no further use of low noise road surfacing is envisaged.

6.5.25 Environmental noise barriers can also achieve reductions in noise of up to 10dB depending on the length and height of the barrier and its position relative to the receptors and the Scheme. The benefits of environmental noise barriers will be investigated further during the Preliminary Design Stage upon receipt of updated traffic data for the Scheme.

6.6 Potential mitigation measures

Construction

6.6.1 To mitigate any potential noise problems during the construction phase, the construction contractor will consult with the Environmental Health Departments at the relevant LPAs to obtain guidance on their requirements for managing and controlling noise and vibration from construction works.

6.6.2 A Construction Environmental Management Plan (CEMP) will be prepared and implemented by the contractor and be approved by the Local Authorities prior to the commencement of construction works. The CEMP will outline the following:

- Environmental management and responsibilities;
- Monitoring and auditing processes;
- Procedures that will be used to complete different construction activities;
- Complaints response procedures; and
- Community and stakeholder liaison processes.

6.6.3 The contractor may also submit a Section 61 application under the Control of Pollution Act 1974 for some construction works, especially if night–time working is proposed.

6.6.4 The contractor should also be encouraged to join (if not already a member) the Considerate Contractors Scheme that is recognised by industry and the Government for encouraging firms to be sensitive to the environment.

6.6.5 Good stakeholder relations are often the most effective way to manage potential noise impacts on site. Therefore, the contractor should keep local residents and other affected parties informed of the progress of the works, including when and where the noisiest activities will be taking place and how long they are expected to last. All noise complaints should be effectively recorded, investigated and addressed.

6.6.6 In addition, the contractor should use the following good working practices that will minimise impacts to local residents and ecological receptors:

- All vehicles and plant should be fitted with effective exhaust silencers which should be maintained in good and efficient working order;
- All compressors and generators should be 'sound reduced' models fitted with properly lined and sealed acoustic covers which should be kept closed whenever the machines are in use;
- All ancillary pneumatic percussive tools should be fitted with mufflers or suppressors as recommended by the manufacturers which should be kept in a good state of repair;
- Machines in intermittent use should be shut down when not in use or where this is impracticable, throttled down to a minimum;
- The site compound and static machines should be sited as far as is practicable from noise sensitive buildings;
- Where practicable, plant with directional noise characteristics should be orientated to minimise noise at nearby properties;
- Plant should be certified to meet the current EU legislation and should be not be louder than the noise levels provided in Annex C and D of BS 5228–1;
- Where appropriate, temporary noise barriers or other noise containment measures should be installed to minimise construction noise levels;
- The loading or unloading of vehicles and the movement of equipment or materials should be undertaken in a manner that minimises noise generation;
- Concrete mixers should not be cleaned by hammering the drums; and
- When handling materials, care should be shown not to drop materials from excessive heights.

6.6.7 In addition to the above good working practices, where piling is required, the piling method should be selected carefully to minimise noise and vibration impacts at receptors. Where practicable, piling methods that result in low levels of vibration, such as rotary bored piling should be used. Methods that cause much higher levels of vibration, such as percussive piling, can cause cosmetic damage to buildings within 50 m of the construction works and should be avoided wherever possible.

6.6.8 Even with appropriate mitigation in place, it may not be possible to eliminate all noise impacts. However, best practice, considerate working hours as well as

frequent and open communications with stakeholders will help to reduce the residual impact of construction noise and vibration.

Operation

6.6.9 The assessment of the Option 14 and WIS 10 variant of the Scheme indicated that significant effects are predicted in some locations for the DM scenario and for the Scheme. Direct effects were predicted at the B2039 at Ockham and Wisley Lane. Indirect significant effects were predicted at Pyrford and the A245 at Cobham. Mitigation measures are likely to be required when the Scheme is operational to minimise and reduce impacts at the Important Areas located in proximity to the project area.

6.6.10 Negligible impacts are generally expected as a result of the access road proposals as these roads will have low traffic flows when the Scheme is operational. Therefore, no mitigation is envisaged for the access road proposals.

6.6.11 Noise mitigation with regard to road traffic noise can consist of noise barriers, earth bunds, or low noise road surfacing, and may include any existing noise mitigation in situ that will be retained by the Scheme.

6.6.12 An allowance for noise barriers was included in the cost estimate for the Scheme as it was recognised the existing barriers would be removed and new barriers would be required to replace them. Use of further noise barriers will be considered based on the outcomes of further detailed noise modelling for the Scheme when updated traffic data becomes available. This includes the possible requirement for noise barriers to reduce road traffic noise levels at the Thames Basin Heath SPA for ecological receptors.

6.6.13 All new or modified roads proposed by the Scheme will be resurfaced with a low noise road surface, excluding those that are currently concrete surfaced where introduction of a low noise surface is impractical. According to the DMRB, usage of a low noise road surface can reduce road traffic noise levels by up to 3.5dB $L_{A10,18h}$.

6.6.14 Further assessment of potential mitigation requirements and options will be undertaken during the current design phase, once the Scheme design, and the traffic model upon which the noise impact calculations are undertaken, are both suitably further developed. This will permit a robust appraisal of the suitability and viability of different mitigation options, if subsequently shown to be necessary.

6.7 Summary

6.7.1 In order to meet the requirements for a Preliminary Design Stage noise and vibration assessment, baseline noise surveys will be undertaken at several locations within the study area to establish the prevailing noise climate. A construction noise and vibration assessment, using the BS 5228 methodology, will be completed to identify any impacts arising from the construction phase.

6.7.2 A “simple” DMRB noise assessment undertaken during the previous design phase highlighted the requirement for the project to proceed to a “detailed” DMRB assessment during the Preliminary Design Stage to confirm the level of operational noise impact for the preferred option. The detailed noise modelling

will incorporate new traffic data obtained from a strategic traffic model and any new mitigation measures incorporated into the design.

6.7.3 The results of the “simple” assessment during the Option Selection Stage indicated that in the opening year of the Scheme, a negligible change in noise levels would occur at the majority of properties. However, 399 properties would experience minor noise increases and minor noise decreases would occur at 446 properties. A moderate noise decrease was predicted at one residential property close to the Painshill Interchange. The results also showed that fewer properties were predicted noise levels that would cause a significant adverse effect as a result of the Scheme than without.

6.7.4 The majority of long–term changes in noise level due to the Scheme were predicted to be negligible. Minor noise decreases were calculated at 919 properties and moderate noise decreases were predicted at two residential properties close to the M25. No noise minor, moderate or major noise increases were predicted, however, nine more properties were predicted significant adverse effects compared with the DM scenario in the opening year.

6.7.5 Significant adverse effects generally occurred at properties on Wisley Lane and the B2039 at Ockham. Indirect effects occurred at Pyrford and the A245 at Cobham.

6.7.6 When the detailed noise modelling has been undertaken for the Scheme design, the results from the detailed noise modelling will be assessed against the impact magnitude thresholds stated in the DMRB, and significance criteria for impacts to human health. Existing noise mitigation measures incorporated into the Scheme design and the need for additional mitigation measures will be reviewed based on these results.

7 Biodiversity

7.1 Introduction

7.1.1 This chapter provides a qualitative assessment as to whether there are likely to be any significant adverse ecological effects on nature conservation resources resulting from the implementation of the Scheme. In addition, this chapter identifies proposed mitigation and compensation options, some of which may lead to beneficial effects on nature conservation resources (for example by improving connectivity).

7.1.2 This chapter provides details of the assessment undertaken to date, including identifying potential mitigation that could reduce any adverse ecological impacts, and should be read in conjunction with the ecological information provided in Volume 2 Appendix C.

7.1.3 This assessment is based on the preliminary information available at the time of writing the report, and may change as a result of design changes, consultation and further survey.

7.2 Study area

7.2.1 The study area was identified by determining an Ecological Zone of Influence (EZoI) encompassing all of the predicted effects of the Scheme on nature conservation resources.

7.2.2 The EZoI includes the DCO boundary to the Scheme (Figure 2.1 in Volume 3), but due to the relative importance of some nature conversation resources and the mobility of some species, the study area for desk study has been extended to include certain resources at different spatial extents (measured from the DCO boundary), based on current best practice guidance, as follows:

- Thirty kilometres for Special Areas of Conservation (SACs) where bats are a qualifying feature for which the SAC was selected;
- Two kilometres from the Scheme for statutory designated sites of nature conservation importance:
  - Special Areas of Conservation (SACs)[10];
  - Special Protection Areas (SPAs)[11];
  - Ramsar sites[12];
  - Sites of Special Scientific Interest (SSSIs);
  - National Nature Reserves (NNRs); and
  - Local Nature Reserves (LNRs).
- Two kilometres for non-statutory Sites of Nature Conservation Importance (SNCIs) and Conservation Verges;

[10] Including candidate SACs (cSACs)
[11] Including proposed SPAs (pSPAs)
[12] Including proposed Ramsar sites (pRamsars)

- One kilometre for notable[13] habitats, ancient woodland, and notable[14] or legally protected species;
- Ten kilometres for bats[15]; and
- Fifty metres for veteran trees.

7.2.3 Volume 3 Figure 7.1 shows the study area.

7.3 Consultation

7.3.1 To date the following environmental organisations have been consulted with regards to aspects of the Scheme such as option selection and design, potential mitigation and compensation features, and species survey methodologies:

- Natural England (option selection and design, potential mitigation and compensation features, and species survey methodologies);
- Environment Agency (option selection and design);
- Surrey Wildlife Trust (option selection and design, potential mitigation and compensation features);
- Royal Society for the Protection of Birds (option selection and design, potential mitigation and compensation features);
- Surrey Amphibian and Reptile Group (species survey methodologies); and
- Forestry Commission (option selection and design).

7.3.2 Consultation will continue with these organisations throughout the Preliminary Design stage, in order to ensure their input is incorporated into the impact assessment, the final design of the Scheme and its associated mitigation and compensation.

7.4 Baseline conditions

7.4.1 There are five statutory designated sites within 2 km of the Scheme, as summarised in Table 7.1 below and on the Environmental Constraints Plan, Figure 2.2 in Volume 3. These statutory sites include one European designated SPA[16], three nationally designated SSSIs[17] and one LNR[18] (refer to Appendix C for relevant legislation).

[13] This refers to Habitats of Principle Importance, as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006).
[14] This refers to Species of Principle Importance, as listed under Section 41 of the Natural Environment and Rural Communities (NERC) Act (2006).
[15] For larger projects, a search distance of up to 10 km for bats is recommended (Collins, J (ed) (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines (3rd edn). The Bat Conservation Trust. London).
[16] Designated under Article 4.1 of EC Directive 79/409 on the Conservation of Wild Birds (the Birds Directive)
[17] Sites of Special Scientific Interest (SSSIs) are protected under the Wildlife and Countryside Act 1981 (as amended) and The Countryside and Rights of Way Act 2000
[18] LNRs are protected under the National Parks and Access to the Countryside Act 1949

Table 7.1: Summary of statutory designated sites within 2 km of the Scheme

Site name	Approximate distance and direction from the Scheme	Citation description	Area (ha.)	Central Grid reference
Thames Basin Heaths SPA	Partially falls within the Scheme. Directly adjacent to the south-east and south-west of M25 Junction 10	ARTICLE 4.1 QUALIFICATION (79/409/EEC) During the breeding season the area regularly supports: nightjar (*Caprimulgus europaeus*); 7.8% GB population, woodlark (*Lullula arborea*); 9.9% GB population, Dartford warbler (*Sylvia undata*); 27.8% GB population.	8,275	TQ078590
Ockham and Wisley Commons SSSI	Partially falls within the Scheme. Directly adjacent to the south-east, south-west, north-east and north-west of M25 Junction 10	The site consists of a large tract of heathland lying between the Mole and Wey rivers near Cobham. The site contains areas of heath, bog, open water, secondary woodland and scrub. The large variety of habitats allows for a rich community of heathland plants and animals, including a large number of rare and local insects.	269	TQ070585 TQ082585 TQ084592 TQ078595
Ockham and Wisley LNR	Partially falls within the Scheme. Directly adjacent to the south-east, south-west and north-west of M25 Junction 10. 85 m to the north-east of M25 Junction 10	Declared a LNR in 2005.	332	TQ070585 TQ082585 TQ084592 TQ078595
Papercourt SSSI	1.5 km west of the southern extent of the Scheme	This site consists of a complex of wetland habitats including unimproved meadows, marshes, streams and flooded gravel pits. These support a number of local plants and a wide variety of breeding and wintering birds.	70	TQ036566
Esher Common SSSI	1.8 km northeast of the northern extent of the Scheme	Esher Common includes much of Arbrook, Esher, Oxshott, West End and Fairmile Commons and the Ledges, covers a large tract of land between the River Mole, Oxshott and Esher. The site lies partly on acidic soils, and partly on damp, clay soils. Heathland, grassland, scrub, woodland and areas of marsh, bog, and open water, present a rich variety of habitats supporting many species of plants and animals. This site is an important area for invertebrates.	361	TQ132622

7.4.2 Two SACs where bats are listed as one of the qualifying features of the designation were identified within 30 km of the Scheme, see Table 7.2 below and the Environmental Constraints Plan in Volume 3.

Table 7.2: Summary of bat SACs within 30 km of the Scheme

Site name	Approximate distance and direction from the Scheme	Description	Area (ha.)	Central Grid reference
Mole Gap to Reigate Escarpment SAC	6.9 km, south-east of the Scheme	Bechstein's bat (*Myotis bechsteinii*) are an Annex II species present as a qualifying feature of the SAC, but not a primary reason for site selection. Bechstein's bat are an Annex II species present as a qualifying feature of the SAC, but not a primary reason for site selection. The site is situated within the North Downs and extends 13 km from Leatherhead to Reigate. The site consists of chalk downs supporting the only stable area of box (*Buxus sempervirens*) scrub in the UK and priority orchid sites. The site also contains some sections of semi-natural woodland and is deemed important for great crested newts, hazel dormouse and several bat species.	892	TQ199533
Ebernoe Common SAC	29.3 km south of the Scheme	The site is situated within the South Downs. Bechstein's bat and barbastelle bat (*Barbastella barbastellus*) are Annex II species that are a primary reason for selection of this site. Ebernoe Common has an extensive block of beech (*Fagus sylvatica*) high forest and former wood-pasture over dense holly (*Ilex aquifolium*), and has a very rich epiphytic lichen flora. The beech woodland is associated with other woodland types, open glades and pools, which contribute to a high overall diversity. The woods are important for a number of bat species.	235	SU977273

7.4.3 Seventeen SNCIs were identified within 2 km of the Scheme boundary. Information on these sites is provided in Table 7.3 below and the Environmental Constraints Plan in Volume 3.

Table 7.3: Summary of SNCI within 2 km of the Scheme

Site name	Approximate distance and direction from the Scheme	Description	Area (ha.)	Central Grid reference
Elm Corner Woods SNCI	Partially falls within the Scheme footprint	The site contains a mixture of woodland with patches of associated wet drainage areas. The site has been identified as important due to its position in reference to other designated sites i.e. Ockham and Wisley Common SSSI, and Wisley Airfield SNCI.	10.2	TQ068579
Wisley Airfield SNCI	Partially falls within the Scheme footprint	The site consists of a disused airfield surrounded by ancient hedgerows and rough grassland. The west of the site is important for a number of plant species and the east of the site is noted for amphibians and reptiles.	117	TQ076578
Hunts Copse SNCI	Immediately adjacent to the Scheme (proposed road improvements on Elm Lane)	The site is coppiced ancient woodland. Due to its location, the site is considered to act as a buffer to Ockham & Wisley Commons SSSI and is important as an ecological unit within the area.	5.2	TQ080580
River Wey Elmbridge SNCI	Approximately 115 m to the north of the western edge of the Scheme	Approximately 7.5 km of the River Wey. The river supports a number of fish species including bullhead (*Cottus gobio*) and potentially brook lamprey (*Lampetra planeri*).	7.5	TQ074656; TQ072601
Manor Farm and Meadows (including Common Meadows Pond) SNCI	Approximately 120 m to the north of the western edge of the Scheme	The site consists an area of wet meadow with value for both invertebrates and birds. Common Meadows pond has been identified as important due to its close proximity to other important sites and high diversity of aquatic species.	5.9	TQ068599
Field West of Old Common SNCI	Approximately 300 m to the north-east of the northern edge of the Scheme	The site consists of rough grassland and an embankment. The site is considered suitable for reptiles and amphibians.	2.2	TQ103609
Ripley Green SNCI	Approximately 320 m to the west of the southern edge of the Scheme	The site is located within the wider area of Ripley Green which consists of a cricket field, playground and car park. The part of the site designated as a SNCI site is composed of a variety of grassland, scrub and woodland communities and a	25	TQ055573

Site name	Approximate distance and direction from the Scheme	Description	Area (ha.)	Central Grid reference
		shallow stream. The site contains over 250 species of plant including locally scare species.		
Manor House SNCI	Approximately 380 m to the north of the western edge of the Scheme	The site is located within the borough of Woking. The site consists of species-rich flood meadow.	3.2	TQ072602
St George's Hill Golf Course SNCI	Approximately 630 m to the north-west of the northern edge of the Scheme	The site consists of a large golf course, with a mixture of semi-natural habitats including mixed and coniferous woodland, acid grassland and heath. The site is noted as important for invertebrates.	94	TQ080620
Wisley Bridge SNCI	Approximately 640 m to the west of the western edge of the Scheme	The site has been selected for its population of vulnerable Copse Bindweed (*Fallopia dumetorum*) and species listed on the UK biodiversity action plan and principle importance under Section 41 of the NERC Act.	0.11	TQ060695
River Wey-Woking (not including Pyrford Place Lake) SNCI	Approximately 700 m to the north-west of the A3 at its closest point	Approximately 16.8 km of the River Wey, supporting a wide variety of invertebrate species, amphibians, birds, and a population of water voles (*Arvicola amphibius*).	17	TQ008532; TQ072614 (TQ051583)
Old Common SNCI	Approximately 790 m to the north-east of the northern edge of the Scheme	The site contains a mixture of acid grassland, wet and dry woodland, disused allotments and a pond. The site is considered important for several invertebrates including seven nationally scarce species.	9.1	TQ108610
Pyrford Place Lake SNCI (part of River Wey SNCI)	Approximately 1.2 km to the north-west of the southern edge of the Scheme	No Citation Available	N/A	TQ008532 - TQ072614 (TQ051583)
Warren Farm Wood, Hoe Valley SNCI	Approximately 1.5 km to the west of the southern edge of the Scheme	The site is consists of broadleaved woodland, a species rich marsh for which it is designated for. In addition to this it is also known for its alder woodland.	5	TQ046575
Clandon Woods SNCI	Approximately 1.5 km to the south of the	The site is woodland (mostly semi-natural) and stretches across Clandon and Ripley.	175	TQ054523, TQ058535, TQ065530,

Site name	Approximate distance and direction from the Scheme	Description	Area (ha.)	Central Grid reference
	southern edge of the Scheme	The woodland contains a range of community types and regionally important base-enriched hornbeam (*Carpinus betulus*).		TQ065547, TQ067537, TQ071525, TQ071532
Wheeler's Meadow (South) SNCI	Approximately 1.8 km to the west of the southern edge of the Scheme	The site is located beside the River Bourne and forms part of the network of meadows along the river course. The site is primarily made up of unimproved wetland which is uncommon in Surrey.	1.1	TQ043579
Wheeler's Fields (Grayshott Fields, Hoe Valley) SNCI	Approximately 1.9 km to the west of the southern edge of the Scheme	The site is made up of wet tussocky meadows, drains and marshes which are seasonally flooded. The site is considered important for its tall grassland habitat which provide suitable habitat for a variety of invertebrates, mammals and reptiles and birds with a hobby (*Falco Subbuteo*) recorded flying over the site.	3.7	TQ042581

7.4.4 There are four conservation verges within 2 km of the Scheme. Details of these are provided in Table 7.4 below and the Environmental Constraints Plan in Volume 3.

Table 7.4: Summary of non-statutory conservation verges within 2 km of the Scheme

Site Ref	Site Name	Length (m)	Grid Reference	Approximate Distance and Direction from the Scheme	Site Description	Nature Conservation Interest
CV005	Bolder Mere	800	TQ079582	Immediately adjacent to the proposed Elm Road improvements.	Both verges of Old Lane, approximately 200 m in either direction from central grid reference (TQ07945825).	Significant population within the county of common toad.
CV058	Wisley Lane 2	172	TQ063592	500 m to the south-west of the western edge of the Scheme.	Wisley Lane, Wisley. Southern side of the road opposite Deers Farm from TQ06235932 to TQ06345919.	Supports County Scarce plants sheep's bit and royal fern.

Site Ref	Site Name	Length (m)	Grid Reference	Approximate Distance and Direction from the Scheme	Site Description	Nature Conservation Interest
CV057	Wisley Lane 1	611	TQ059591	700 m to the west of the western extent of the Scheme.	Wisley Lane, Wisely. Both sides of the road from TQ05765964 to Wisley bridge (TQ06015945).	Supports copse-bindweed (Nationally threatened: vulnerable) and bur chevil (scarce in Surrey)
CV007	Bridge Road	804	TQ106595	1.4 km to the south-east of the northern extent of the Scheme.	Both verges of Old Lane, approximately 200 m in either direction from central grid reference.	Significant population within the county of common toad (*Bufo bufo*).

Ancient Woodland and veteran trees outside of ancient woodland

7.4.5 There are 23 parcels of ancient woodland within 1 km of the Scheme. A summary of these is provided in Table 7.5 below and the Environmental Constraints Plan, Figure 2.2 in Volume 3.

7.4.6 The Woodland Trust website identified no veteran trees within 50 m of the Scheme boundary. However, an arboricultural assessment of the Scheme footprint has not yet been conducted. This survey may identify additional veteran trees.

Table 7.5: Summary of ancient woodland within 1 km of the Scheme

Site Name	Approximate Distance and Direction from the Scheme	Area (ha)	Grid Reference
Woodland adjacent to Heyswood Girl guide camp (SRY_6438 & SRY_6439)	Partially within Scheme boundary. Note this woodland is split into two areas and is dissected by a National Grid site.	2.0	TQ089602
Hatchford Wood (SRY_1646)	Partially within Scheme boundary	14.7	TQ088583
Woodland south of Battleston Hill near Elm Lane (SRY_1649)	Directly adjacent to the Scheme boundary	1.4	TQ065576
Woodland to the east of The Bogs on Pointer's Road (SRY_1645)	10 m north, along Pointer's Road	0.6	TQ094585
Park Wood north of A3 (SRY_4509)	15 m south, near Ripley	4.1	TQ056567
The Bogs (SRY_1837)	25 m north, along Pointer's Road	3.9	TQ091587
Woodland to the east of Hatchford Manor (SRY_1648)	110 m south-east near Hatchford	0.5	TQ095581
Hunt's Copse (SRY_6007)	185 m south-east, near Hatchford End	1.9	TQ080578

Site Name	Approximate Distance and Direction from the Scheme	Area (ha)	Grid Reference
Buckingham Lodge Wood (SRY_4503)	215 m east, near Ockham Park	1.4	TQ063570
Woodland adjacent to Hunt's Copse (SRY_6006)	290 m south-east, near Hatchford	0.4	TQ081578
Woodland adjacent to Ockham Mill Stream (SRY_1650)	340 m north-west, north of Ripley	0.4	TQ053577
Bramble Wood (SRY_1903)	415 m east near Pointers Green	4.2	TQ099584
Park Wood south of A3 (SRY_4502)	505 m south near Ripley and Ockham Park	9.3	TQ060563
Queen Anne's Hills West(SRY_2644)	560 m north, near Byfleet	0.6	TQ075601
The Hangers (SRY_4499)	600 m north-west, near Byfleet	6.5	TQ076604
Queen Anne's Hills East(SRY_2643)	650 m north, near Byfleet	0.4	TQ076602
Brickfield Copse north of M25 (SRY_1653)	690 m north-east near Hatchford	1.7	TQ100581
Brickfield Copse south of M25 (SRY_1641b)	700 m south-east near Hatchford	0.1	TQ100579
Brickfield Copse south of M25 (SRY_1904)	775 m south-east near Hatchford	0.6	TQ100577
The Decoy (SRY_6300)	805 m south-west, near Wisely Golf Course	3.2	TQ059590
Woodland adjacent to Pyrford Place (SRY_3380)	955 m north-west, near Wisely Golf Course	0.6	TQ050583
Woodland adjacent to Halfpenny Cross (SRY_1652)	965 m east, near Pointers Green	0.6	TQ104585
Woodland adjacent to The Decoy (SRY_6299)	975 m south-west, near Wisely Golf Course	0.7	TQ058590

Habitats

7.4.7 The most abundant habitat within the Scheme, immediately surrounding M25 Junction 10 is mixed woodland with Scot's pine (*Pinus sylvestris*), silver birch (*Betula pendula*) and pedunculate oak (*Quercus robur*) the most frequent species. Some areas of broadleaved woodland are present, such as to the north-west of Junction 10, which is dominated by young silver birch trees. A line of veteran pedunculate oak trees is present in the woodland to the north-west of the Scheme.

7.4.8 The southern extent of the Scheme is within an area of lowland heathland on both sides of the A3.

7.4.9 Ponds, lakes and ditches are also present in various locations on all sides of the Scheme with Bolder Mere to the south-east of the Scheme being noted as having reed bed habitat around its margins.

7.4.10 The Phase 1 Habitat Survey figure (Figure 7.2 in Volume 3) shows the habitats within and adjacent to the Scheme footprint.

7.4.11 There are six Habitats of Principal Importance (HPI)[19] within 500 m of the Scheme. These are lowland heathland, lowland mixed deciduous woodland, wood-pasture and parkland, rivers, ponds and reedbed. See Figure 7.10 in Volume 3 for a plan of the HPIs within 500 m of the Scheme.

Aquatic Ecology

7.4.12 Four Water Framework Directive (WFD) (2000/60/EC) surface water bodies have been identified across the study area (up to the 1 km study area boundary). These are:

- River Wey - Shalford to River Thames Confluence at Weybridge;
- Stratford Brook;
- Guileshill Brook; and
- River Mole (Horley to Hersham).

7.4.13 More details on the WFD status of these water bodies is provided in Chapter 8.

7.4.14 A River Corridor Survey (RCS) of Stratford Brook (located within the DCO boundary) was undertaken on 21st September 2017 on a 500 m reach upstream from the culvert of the A3 Ripley roundabout. The RCS can be found in Appendix C. The watercourse was found to be heavily shaded by mature woodland, predominantly alder within the first 300 m of the culvert, with a mixture of oak and other species along the banks of the most upstream 200 m. This shading prevented the presence of any in-stream aquatic vegetation.

7.4.15 Upstream, the watercourse was characterised by a succession of meanders with unvegetated gravel bars. Further downstream, the wetted width filled the whole channel with a mostly uniform depth. No flow was evident along the whole reach, with the water becoming increasing turbid towards the culvert.

Notable and Protected Species

Notable Plants

7.4.16 The desk study returned records for several notable plant species within 1 km of the Scheme, including pillwort (*Pilularia globulifera*), lesser water-plantain (*Baldellia ranunculoides*) and many-stalked spike-rush (*Eleocharis multicaulis*), all of which are considered scarce (or near threatened) in Surrey.

7.4.17 Two notable species: royal fern (*Osmundia regalis*) and cross-leaved heath (*Erica tetralix*) were recorded during surveys. Royal fern is scarce in Surrey, and cross-leaved heath is near threatened in England.

Bats

7.4.18 The desk study returned 284 records from Surrey Bat Group which identified the following 12 bat species within 10 km of the Scheme in the past 10 years:

- common pipistrelle (Pipistrellus pipistrellus);
- soprano pipistrelle (*Pipistrellus pygmaeus*);

[19] Habitat of Principal Importance for the Conservation of Biodiversity on the England Biodiversity List, refer to Appendix for further details

- Nathusius' pipistrelle (*Pipistrellus nathusii*);
- Natterer's (Myotis nattereri);
- brown long-eared (*Plecotus auritus*);
- noctule (Nyctalus noctula);
- serotine (Eptesicus serotinus);
- Daubenton's (Myotis daubentonii);
- Leisler's (Nyctalus leisleri);
- whiskered (Myotis mystacinus);
- Bechstein's (*Myotis bechsteinii*); and
- barbastelle (Barbastella barbastellus) bats.

7.4.19 Records include Natterer's and brown long-eared bats at Hatchford Woods Ice House (presumed to be hibernating bats), soprano pipistrelle and noctule bats roosting in Ockham Common bat boxes and several roosts that are likely to be in houses.

7.4.20 In addition, Mole Gap to Reigate Escarpment SAC is located approximately 7.8 km south-east of the Scheme and Ebernoe Common SAC is located approximately 29.5 km south of the Scheme. Both of these SACs include Bechstein's bat as a qualifying species, and Ebernoe Common SAC also include barbastelle as a qualifying species.

7.4.21 Trees with features suitable for roosting bats, such as splits and cavities, were noted in the woodlands surrounding M25 Junction 10. Further roost surveys will be undertaken in spring 2018.

7.4.22 Bat activity transect surveys are currently being undertaken in accordance with Bat Conservation Trusts Good Practice Guidelines[20], and were completed in October 2017.

7.4.23 In addition, bat trapping surveys[21] were carried out within the four quadrants surrounding M25 Junction 10, with two sessions conducted in each quadrant between July and August 2017. Species-specific lures were played for a number of cryptic species that were considered to potentially occur within the Scheme footprint, but could potentially be overlooked during transect surveys. This included barbastelle and Bechstein's bats, both of which are qualifying features of SACs within 30 km of the Scheme. A total of eight species were trapped during the surveys: common pipistrelle, soprano pipistrelle, Daubenton's, noctule, serotine, brown long-eared, Natterer's and whiskered bats. No barbastelle or Bechstein's bats were trapped.

7.4.24 The surveys to date have recorded the following ten foraging species: common pipistrelle, soprano pipistrelle, Nathusius' pipistrelle, Daubenton's, noctule, serotine, Leisler's, brown long-eared, Natterer's and whiskered bats. No barbastelle or Bechstein's bats have been recorded.

[20] Bat Conservation Trust (2016). Bat Surveys for Professional Ecologists. Good Practice Guidelines
[21] Harp traps and bat call lures were used to attract and catch bats within the survey areas

Great crested newts

7.4.25 The desk study returned eight records of great crested newts within 1 km of the Scheme. The desk study also identified aquatic habitat that could potentially be used by breeding great crested newts, including 65 water bodies and 53 ditches within 500 m of the Scheme (although some of these water bodies are separated from the Scheme by physical barriers, such as roads or rivers). Suitable terrestrial habitat, particularly woodland habitat, is also present. The terrestrial habitats provide habitat connectivity to nearby ponds and offer suitable foraging and hibernation opportunities for great crested newts.

7.4.26 Surrey Wildlife Trust confirmed an environmental DNA (eDNA)[22] record of great crested newts within the edge wetland features of Boldermere Lake in 2016.

7.4.27 During spring 2017, eDNA surveys were carried out of 13 potentially suitable ponds and ditches, with access permission, within 500 m of the Scheme). Of the 13 water bodies assessed, a single pond was confirmed to contain great crested newt eDNA. This water body is located within the heathland area in the south-west quadrant, and is approximately 480 m from the western end of the Scheme.

7.4.28 In addition, great crested newt population assessment surveys were carried out on Boldermere Lake and two ponds in the south-east quadrant and a large pond in the southwest quadrant.

7.4.29 Great crested newts were recorded in the two ponds in the south-east quadrant, in low numbers (less than ten individuals), but not in Boldermere Lake in 2017 (or its associated edge wetland features).

7.4.30 No great crested newts were recorded in the large pond in the south-west quadrant.

7.4.31 During a reptile survey on the 19th September 2017, a male great crested newt was recorded within Wisley Airfield, approximately 650 m to the south-west of Boldermere Lake, and on the 28th September 2017 a male great crested newt was recorded at the northern edge of Boldermere Lake (where great crested newts are known to occur).

Hazel dormouse

7.4.32 The desk study returned no records of hazel dormice within 1 km of the Scheme. The extended Phase 1 Habitat Survey identified conifer woodland, with occasional broadleaved species, as the main habitat present immediately surrounding Junction 10. Much of the woodland is considered sub-optimal for dormice due to the dominance of conifers and absence of a scrub layer. However, there are patches of more diverse habitat, such as adjacent to the M25 to the south-east of Junction 10, where species such as bramble, honeysuckle, holly, birch, gorse and sweet chestnut are present.

7.4.33 Dormouse surveys were undertaken in 2016 and 2017. No dormice were recorded.

7.4.34 A nut search of the woodland at Elm Corner SNCI (including the adjacent ancient woodland) on the 19th September 2017 produced no evidence of dormice. However, as a precaution it is considered that the woodland at Elm Corner SNCI

[22] Natural England (2014), (http://webarchive.nationalarchives.gov.uk/20140605105717/http://www.naturalengland.org.uk/ourwork/regulation/wildlife/gcn-eDNA-feature.aspx; accessed 12/09/17)

(including the adjacent ancient woodland), and the ancient woodland at the Girl Guides Camp at Painshill should undergo a dormouse nest tube survey. Dormouse nest tube surveys will commence in these areas in spring 2018.

Reptiles

7.4.35 The desk study identified records of common lizard (*Zootoca vivipara*), grass snake (*Natrix natrix*), slow worm (*Anguis fragilis*), adder (*Vipera berus*) and sand lizard (*Lacerta agilis*) within 1 km of the Scheme.

7.4.36 In addition, Wisley Airfield SNCI is identified in the desk study as being bounded by areas of long grass which is suitable habitat for common foraging reptiles. Grass snake, slow worm and common lizard have all been recorded in the east of this SNCI[23].

7.4.37 Areas of heathland are present at Ockham Common. This habitat has high suitability for reptiles, and is likely to support common reptile species as well as sand lizard. Sand lizards were identified in the desk study and have been confirmed by Surrey Wildlife Trust and SARG as having established following a successful re-introduction in 1991 in the mature heathland in the south-east quadrant of Wisley and Ockham Commons Surrey Wildlife Trust nature reserve (i.e. Ockham Common). Sand lizards were only reintroduced to Ockham Common and are considered to be absent from the habitats within the south-west, north-east and north-west quadrants of habitat surrounding M25 Junction 10.

7.4.38 The extended Phase 1 Habitat Survey of the SPA/SSSI/LNR identified that the main habitat within the footprint of the Scheme within the quadrants surrounding M25 Junction 10 is woodland. Due to the heavy shading of woodland this habitat has low suitability for reptiles. However, log piles and gaps around tree roots could potentially be used as reptile hibernating sites, particularly where they are on located on the edge of a woodland.

7.4.39 Common lizards were recorded in the small heathland glade in the north-west quadrant during surveys undertaken by Atkins in 2016.

7.4.40 Reptile presence/likely absence surveys were undertaken between August 2017 and early October 2017. Areas surveyed consist of:

- North-west quadrant of M25 Junction 10;
- North-east quadrant of M25 Junction 10;
- South-west quadrant of M25 Junction 10;
- South-east quadrant of M25 Junction 10;
- Elm Lane (Snakes Field);
- Boldermere Lake (eastern edge of lake);
- Wisley Airfield; and
- Painshill Park and properties adjacent to the east of the A3 verge in this location.

[23] Savills (2015) Wisley Airfield: Environmental Statement: Appendix 8.8 Reptile survey results

7.4.41 Some further surveys will be carried out in spring 2018. A summary of the initial results can be found in Table 7.6.

7.4.42 Although sand lizards are understood to be mainly found within the heathland habitat of Ockham Common, a single sand lizard (a juvenile male) was recorded within the open wooded area near the Ockham Bites café during an invertebrate survey on the 19th June 2017. This is within the Scheme footprint and indicates that sand lizards may occasionally occur within the wooded areas surrounding the heathland. However, no other sand lizards were recorded throughout the 2017 reptile surveys of this area.

Table 7.6: Summary of reptile survey results to date

Location	Reptile species recorded
North-west quadrant of Junction 10	Slow worm, common lizard
North-east quadrant of Junction 10	No reptiles recorded
South-west quadrant of Junction 10 (Wisley Common and Wisley Lane)	Slow worm, grass snake, common lizard
South-east quadrant of Junction 10 (Ockham Common)	Slow worm, grass snake, common lizard, adder, sand lizard
Elm Lane (Snakes Field)	Slow worm, grass snake, common lizard
Boldermere Lake	Grass snake
Wisley Airfield	Slow worm, grass snake
Painshill Park and associated areas	Slow worm, grass snake, common lizard

Otter and Water Vole

7.4.43 The desk study returned no records of otters within 1 km of the M25 Junction 10, and a single record of water vole from the River Wey (Woking) SNCI, located approximately 700 m to the north of the Scheme.

7.4.44 A survey of the wet ditch (connected to Ockham Mill Stream) which passes under Stratford Bridge to the east of the Ripley roundabout (central OS grid reference TQ0627957496) was carried out on the 21st September 2017. No evidence of otter or water vole was recorded along the wet ditch up to 500 m from the Ripley roundabout during the survey, and in addition, a mink (*Neovison vison*) was observed during the survey, thus reducing the suitability of the area for water voles. The wet ditch to the west of the Ripley roundabout will be surveyed for water vole and otter evidence during this stage, once access permissions have been agreed.

7.4.45 The only other water body within the Scheme footprint is Boldermere Lake. This lake was surveyed for otter and water vole evidence during the extended Phase 1 survey and great crested newt surveys. No evidence of otter or water vole was recorded during any survey visit.

Badger

7.4.46 Badgers (*Meles meles*) have been confirmed as present by the desk study and field surveys. There is potential for a main sett to be directly affected by the Scheme. However, a detailed assessment of the extent of this main sett and the potential for presence of associated outlier setts has not been undertaken at this stage.

7.4.47 A detailed update survey of the Scheme footprint and immediate surrounds for badger evidence, will be carried out during this Preliminary Design Stage.

Birds

7.4.48 The desk study identified a number of protected and rare species of bird within 1 km of the Scheme, including woodlark, nightjar, Dartford warbler and nightingale (*Luscinia megarhynchos*).

7.4.49 The Thames Basin Heaths SPA supports important breeding populations of a number of birds of lowland heathland, especially nightjar and woodlark, both of which nest on the ground, often at the woodland/heathland edge, and Dartford warbler, which typically nests in gorse. There is potential for direct loss of heathland habitat as a result of the Scheme and there could be indirect impacts on heathland birds through increased noise.

7.4.50 The ecological scoping survey and drive-by habitat assessment also identified that the woodland and scrub within the survey area offers suitable nesting opportunities for birds. Common waterfowl were present on the larger water bodies and the reedbed fringes to Boldermere Lake may provide habitat for birds associated with reedbeds, such as reed bunting. The River Mole could provide suitable habitat for kingfisher (*Alcedo atthis*).

7.4.51 An initial breeding bird survey was undertaken in spring/summer 2016. A total of 45 bird species were recorded within the survey area, of which 36 were thought to have bred within the survey area, based on breeding behaviour observed and/or habitats present. Of the 45 species recorded, 12 are notable for their inclusion on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), Annex 1 of the Birds Directive (2009/147/EC) and/or their Red or Amber List Birds of Conservation Concern (BoCC) status. Breeding was confirmed for seven notable species: common tern (*Sterna hirundo*), Dartford warbler, dunnock, mute swan (*Cygnus olor*), nightjar, song thrush (*Turdus philomelos*) and spotted flycatcher (*Muscicapa striata*). It is noted that the optimum survey window for woodlark was missed in 2016.

7.4.52 Four wintering bird surveys specifically focused on recording wintering woodlark within the heathland habitats within and adjacent to the Scheme were carried out between November 2016 and February 2017. No woodlarks were recorded.

7.4.53 Detailed breeding bird surveys were carried out in 2017, including species-specific surveys for Dartford warbler, nightjar and woodlark. The survey area included the SPA/SSSI/LNR site surrounding M25 Junction 10, plus a transect along Elm Lane and through Wisley Airfield. A total of 66 species were recorded during the surveys, of which 53 were thought to probably have bred within or adjacent to the survey area, based on breeding behaviour observed and/or habitats present.

7.4.54 Of the 66 species recorded, 24 are notable for their inclusion on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), Annex 1 of the Birds Directive (2009/147/EC) and/or their Red or Amber List BoCC status.

7.4.55 Breeding was confirmed for 14 notable species: common tern, cuckoo (*Cuculus canorus*), Dartford warbler, dunnock (*Prunella modularis*), hobby (*Falco subbuteo*), mallard (*Anus platyrhynchos*), mistle thrush (*Turdus viscivorus*), mute swan, nightjar, reed bunting (*Emberiza schoeniclus*), song thrush, spotted flycatcher, stock dove (*Columba oenas*) and woodlark.

7.4.56 All three Thames Basin Heaths SPA qualifying bird species were recorded as breeding within the south-east and south-west quadrants:

- South-east quadrant (Wisley Common): two nightjar territories, two Dartford warbler territories, one woodlark territory; and
- South-west quadrant (Ockham Common): four nightjar territories, four Dartford warbler territories, one woodlark territory.

7.4.57 In addition, a barn owl was observed hunting over the eastern edge of Ockham Common during a bat survey on the 25th July 2017. Barn owls are listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and are an Amber List BoCC. Due to the large number of dusk and dawn nightjar and bat surveys, it is considered that this isolated sighting on a single occasion does not indicate that barn owls bred within or adjacent to the survey.

Invertebrates

7.4.58 The desk study provided records of a number of invertebrate groups within 1 km of the Scheme, including a nationally scarce scavenger water beetle and various species listed as Nationally Notable A[24], including a brown ant and heath potter wasp (*Eumenes coarctatus*).

7.4.59 The Ockham Common and Wisley Common SSSI citation indicates that the open water surrounded by heathland presents an ideal habitat for many dragonflies and damselflies (Odonata), and over 20 species have been recorded within the SSSI, which is thus of national importance for this order. The site also supports many other local and rare invertebrates. It is of national importance for true flies (Diptera). A large number of locally scarce beetles (Coleoptera) are also found.

7.4.60 Initial results have identified a number of nationally scarce bees, wasps, beetles, flies and ants. The invertebrates recorded are all considered to be present throughout the wider SSSI, and are not confined to the footprint of the Scheme.

Non-native Invasive Species

7.4.61 The desk study did not identify any records of non-native invasive plant species listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended)[25]. However, the following species listed on Schedule 9 were recorded during the extended Phase 1 Habitat Survey:

- Rhododendron (*Rhododendron ponticum*) was noted as present in several of the woodlands;
- Indian balsam (*Impatiens glandulifera*) was noted as present in July 2016 close to the east end of the Scheme (near the bridge over the M25) to both the north and south of the M25; and
- Four ponds were all noted as supporting the non-native invasive New Zealand pygmy weed (*Crassula helmsii*).

7.4.62 During site visits in 2017, Indian balsam was noted within the wooded area immediately surrounding Ockham Bites café in August 2017. In addition, a small clump of Japanese knotweed was identified as being present within the wooded

[24] Taxa estimated to occur within 16-30 10-kilometre squares of the National Grid System
[25] It is illegal to plant or otherwise cause these species to grow in the wild

area of Wisley Common that runs northwards from RHS Wisley towards the M25 in June 2017.

7.5 Potential mitigation and compensation measures

7.5.1 Preliminary Environmental Design proposals are shown in Figure 9.8 in Volume 3. Based on the current understanding of the nature conservation constraints and opportunities, the following design suggestions have been made:

- As design continues, any further opportunities to reduce losses from designated sites and ancient woodland will be identified;
- Construction works will be timed to minimise impacts on species, for example, avoiding disturbance of breeding birds that may nest near to the Scheme footprint, such as Dartford warbler, woodlark and hobby (all of which are protected against disturbance during breeding under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended);
- A multi-functional bridge linking the south-east (Ockham Common) and south-west (Wisley Common) quadrants subject to sufficient funding being available. This multi-functional bridge will contain vegetative habitat to linking the two heathland areas of the SPA, and will be designed to encourage the movement of heathland species, including sand lizards (which are currently confined to Ockham Common);
- Opening up of the woodland either side of the Ockham Common to Wisley Common multi-functional bridge, in order to encourage heathland regeneration, and create a continuous connected belt of heathland habitat between the two quadrants;
- Restoration of heathland and sandy habitats within temporarily cleared areas of woodland within the SPA/SSSI. Cleared areas will be managed to allow heathland regeneration, and excess sandy soils will be used to create features, such as exposed banks to support key invertebrates, a qualifying feature of the SSSI;
- A multi-functional bridge linking the south-west and north-west quadrants subject to sufficient funding being available. This bridge will provide connectivity, between Wisley Common and the woodland and heathland within the north-west quadrant. This bridge may contain vegetation, connecting the habitats on either side of the bridge;
- Felling of some wooded areas within the north-west quadrant, in order to encourage heathland regeneration and increase the existing areas of heathland within this quadrant;
- Management of existing areas of Scots pine plantation within the north-east quadrant, in order to encourage a more diverse woodland structure, and enhance biodiversity;
- Provision of improved signage and preferred routes within Ockham Common and Wisley Common, to reduce pressure across the rest of this area of SPA;
- Provision of bird and bat boxes to mitigate for the loss of potential features within cleared areas of woodland;

- Improvement of existing noise barrier fencing around M25 Junction 10, in order to reduce the levels of operational road noise within the SPA and the wider SSSI;
- Mitigation measures will be implemented as set out in Chapter's 5 (Air Quality) and 8 (Water and Drainage) to avoid and/or reduce the significance of any potential effects caused by air and/or water pollution; and
- In order to avoid or minimise any potential habitat damage, loss and disturbance to notable and legally protected species caused by the construction works, good practice methodology, including a Construction Environmental Management Plan (CEMP), would be followed for all construction operations. The CEMP is likely to include the following measures:
  - Protection of designated sites, ancient woodland, and other notable habitats outside the working area from accidental incursion;
  - Protection of retained trees following standard practice;
  - Use of mitigation measures under licence if habitats or features afforded legal protection due to their use by protected species (such as badger, bat roosts, or hazel dormouse habitat) would be damaged during the works;
  - Use of precautionary method of working during construction to minimise risk to individual animals of protected species where licences would not be required; such as avoiding sensitive seasons for notable or legally protected species (i.e. bird breeding season; and
  - Provision of an Ecological Clerk of Works to advise on the above measures during construction.
- This assessment, and consultation with Natural England, will identify requirements for ecological monitoring during and after development. This may include monitoring for individual species, particularly if any European Protected Species licences are required, and will include monitoring of newly created habitats to inform decisions on their maintenance.

7.5.2 Potential impacts on the Thames Basin Heaths SPA are described in the table below, and either mitigation or compensation will be required. Potential impacts may also include loss of habitat in other designated sites and loss of ancient woodland, an irreplaceable habitat. If physical loss of ancient woodland cannot be avoided compensation will be required.

7.5.3 It is proposed that areas of land will be purchased and managed to create heathland and woodland. Areas identified include Park Barn Farm, and Pond Farm.

7.5.4 The land at Park Barn Farm consists of parcels of land totalling up to approximately 18.5 ha in size and is directly connected to the north-west quadrant, which consists of woodland with heathland patches and areas of dry grassland.

7.5.5 The land at Pond Farm is approximately 5.1 ha in size and is set within the SPA in the south-west quadrant, and is thus surrounded by existing heathland and woodland.

7.5.6 Both of these options would lead to increased areas of continuous heathland and woodland around M25 Junction 10.

7.5.7 In addition, an area of Scots pine plantation (approximately 10.3 ha in size) and grassland (approximately 14.6 ha in size), is immediately adjacent to the SSSI in the north-east quadrant. It is proposed that the Scots pine plantation is thinned and/or felled and replanted to produce a more diverse woodland with glades, and that some of the grass fields are managed to improve biodiversity and planted with scrub and/or woodland, to support the adjacent SSSI.

7.5.8 Additional areas of grazed grassland in the south-east quadrant, approximately 2.2 ha in size, are immediately adjacent to the SSSI and adjoins Hatchford Wood. These will be largely planted as woodland to support the adjacent SSSI.

7.6 Potential impacts

Valuation of resources

7.6.1 The following valuations[26] are based on the IAN 130/10 Ecology and Nature Conservation criteria listed in Table 7.7.

Table 7.7: Valuation of designated sites

Resource/ Receptor	Description	Study Area	Value
SAC	Mole Gap to Reigate Escarpment SAC and Ebernoe Common SAC	Up to 30 km from Scheme	European
SPA	The Thames Basin Heaths SPA	Up to 2 km from Scheme	European
SSSI	Ockham and Wisley Commons SSSI, Esher Common SSSI and Papercourt SSSI	Up to 2 km from Scheme	National
SNCI	There are 17 SNCIs within 2 km of the Scheme	Up to 2 km from Scheme	County
LNR	Ockham and Wisley LNR	Up to 2 km from Scheme	County

Ancient woodland

7.6.2 There are 23parcels of Ancient Woodland within 1 km of the Scheme. Ancient woodland is an irreplaceable habitat, and the examples present in close proximity to the Scheme will be valued based on the Surrey SNCI and SSSI criteria and survey data, and in consultation with Natural England.

Habitats

7.6.3 There are six Habitats of Principal Importance (HPI)[27] within 500 m of the Scheme. These are lowland heathland, lowland mixed deciduous woodland, wood-pasture and parkland, rivers, ponds and reedbed. These HPIs, where not designated and/or ancient woodland are considered to be of Local value.

7.6.4 The habitats within the highway soft estate including semi-improved neutral grassland and species-poor grassland, often forming a mosaic with tall ruderal and scrub vegetation, are of *Local* value for nature conservation.

[26] To be confirmed in consultation with Natural England
[27] Habitat of Principal Importance for the Conservation of Biodiversity on the England Biodiversity List, refer to Appendix for further details

Notable and legally protected species

7.6.5 Qualifying features of the Thames Basin Heaths SPA are known to be present within the heathland habitat surrounding the Scheme (nightjar, Dartford warbler and woodlark). These species are of *European* value for conservation due their status as qualifying features of the SPA. Based on the breeding bird surveys carried out in 2016 and 2017, these species are known to not occur within the Scheme footprint itself.

7.6.6 The invertebrate assemblage within the SSSI is of *National* value as this is a feature for which the SSSI is designated.

7.6.7 Great crested newt, all reptile species, noctule, soprano pipistrelle and brown long-eared bat are Species of Principal Importance[28]. Based on desk study data and initial assessments, it is considered that the Scheme footprint and immediate surrounds will only support populations of these species valued at the Local scale.

7.6.8 Hazel dormice, water vole and otter have not been recorded during the surveys that have been carried out to date, and therefore have not been assigned a value.

Characterisation of impacts (change)

7.6.9 The Scheme will result in habitat loss from the Thames Basin Heaths SPA, Ockham and Wisley Commons SSSI and LNR. Approximate estimates of land take are provided below.

7.6.10 In addition to the potential direct adverse impacts on the SPA/SSSI/LNR resulting from habitat loss, there is also the potential for indirect impacts such as noise disturbance of the qualifying SPA breeding bird species, or air quality impacts on the vegetation communities. There is also potential for other notable species to be affected by the Scheme.

7.6.11 Table 7.8 assesses the significance of impacts on nature conservation resources prior to mitigation.

Designated Sites and Ancient Woodland

7.6.12 The Scheme will involve an approximate permanent land take of 25.7 ha[29] (some land is covered by several designations and therefore the following figures do not add up to the total of 25.7 ha) and an additional temporary land take of 32.8 ha:

- 6.6 ha of the approximate permanent land take is designated as Thames Basin Heaths SPA (the land take from the SPA is also designated as SSSI and LNR). This equates to 0.08 % of the SPA (8,274.72 ha). An additional 6.7 ha of temporary land take is proposed (0.08 % of the SPA);
- 10.9 ha of the approximate permanent land take is designated as Ockham and Wisley Commons SSSI. This equates to 4.0 % of the SSSI (269.6 ha). An additional 11.3 ha of temporary land take is proposed (4.2 % of the SSSI);

[28] Species of Principal Importance for the Conservation of Biological Diversity in England are notified under Section 41 of the NERC Act 2006
[29] calculations are approximate, and may change as the Scheme details are refined.

- 12.6 ha of the approximate permanent land take is designated as Ockham and Wisley LNR. This equates to 3.8 % of the LNR (332 ha). An additional 11.0 ha of temporary land take is proposed (3.3 % of the LNR);
- 4.9 ha of the approximate permanent land take is designated as SNCI and an additional temporary land take of 1.7 ha is proposed. This consists of Elm Corner SNCI, Wisley Common SNCI and Hunts Copse SNCI;
- 0.71 ha of the approximate permanent land take is designated as ancient woodland, and 0.29 ha of temporary land take is proposed. However, although soils may be retained within temporary land take areas, it is assumed that works within ancient woodland would effectively constitute permanent land take. Therefore, it is assumed that approximately 1.0 ha of ancient woodland will be permanently lost; and
- Approximately 22.4 ha of permanent land take and approximately 22.4 ha of temporary land take is designated as Habitat of Principle Importance, consisting of lowland heathland, parkland and wood pasture, and deciduous woodland.

7.6.13 Within the SPA, the footprint of the Scheme falls within woodland habitat in both the south-west and south-east quadrants. Bird surveys to date have not recorded any evidence of qualifying SPA breeding bird species (Dartford warbler, nightjar and woodlark) within the footprint of the Scheme.

7.6.14 However, a confirmed woodlark territory has been identified in the adjacent recently cleared area of regenerating heathland in the south-west quadrant during the 2017 breeding bird surveys. This cleared area of regenerating heathland is adjacent to the Scheme boundary. In addition, two Dartford warbler territories and four nightjar territories were recorded within the existing heathland in the south-west quadrant during the 2017 breeding bird surveys.

7.6.15 Within the south-east quadrant, the Scheme footprint is set within a large area of woodland, adjacent to a large established area of heathland. Bird surveys in 2016 and 2017 have recorded at least four Dartford warbler territories, four nightjar territories and one woodlark territory within the adjacent heathland habitat.

7.6.16 Due to the footprint of the Scheme avoiding all potential breeding habitat for the qualifying bird species of the SPA, it is considered unlikely that the Scheme will result in the direct loss of any qualifying breeding bird territories.

7.6.17 Any increase in noise disturbance as a result of the construction and/or operation of the Scheme could potentially have a negative impact on the breeding densities of qualifying bird species in the nearby heathland. However, initial investigations have identified a potential for an improvement in the existing noise barriers around Junction 10, potentially leading to a reduction in noise levels once the Scheme is operational when compared to existing noise levels. Further noise surveys, assessment and mitigation design will take place during this stage of the project.

7.6.18 The habitat loss in the north-east and north-west quadrants would involve some land designated as SSSI (approximately 4.3 ha of permanent land take and 4.6 ha of temporary land take).

7.6.19 An increase in traffic flow as a result of the Scheme may result in increased air pollution within sensitive habitats adjacent to the affected road network, particularly within the SPA and SSSI. The structure and function of adjacent heathland habitats, which support the SPA bird populations, are sensitive to changes in oxides of nitrogen (NOx) concentrations and nitrogen deposition rates. Further studies are required to determine the effects of the Scheme on air pollutant emissions.

7.6.20 A Habitats Regulations Assessment is being undertaken for this Scheme, to ensure that any potential impacts on European designated sites are identified and assessed, in consultation with Natural England. A Habitats Regulations Screening Checklist has been produced and it is anticipated that Appropriate Assessment will be required.

Habitats

7.6.21 Of the 22.4 ha of permanent land take and 22.4 ha of temporary land take designated as Habitat of Principle Importance (HPI), approximately 0.5 ha of the permanent land take and approximately 0.5 ha of temporary land take is indicated on the map on MAGIC.gov as lowland heathland HPI. However, Phase 1 surveys of the Scheme footprint indicate that the areas designated as lowland heathland within the Scheme footprint do not currently contain heathland habitat, and instead consist of mixed woodland (see Figure 7.1 in Volume 3).

7.6.22 The remaining HPI is a mix of deciduous woodland (approximately 6.4 ha of permanent land take and 6.2 ha of temporary land take), and/or wood pasture and parkland (approximately 17.4 ha of permanent land take and 15.7 ha of temporary land take).

Notable and Protected Species

7.6.23 There is the potential for bats, great crested newts, common reptiles, notable breeding birds, notable invertebrates and badgers to occur within the footprint of the Scheme. However, initial assessments of species distribution and the habitats surrounding the Scheme footprint indicate that these species are likely to occur within the habitats adjacent to the footprint of the Scheme and will be retained in the adjacent landscape.

7.6.24 Whilst the potential mitigation measures will help to reduce the impacts of the Scheme on designated sites, habitats and protected species, it is anticipated that the Scheme will lead to unavoidable land take within the Thames Basin Heaths SPA, Ockham and Wisley Commons SSSI, Ockham and Wisley LNR, Elm Corner SNCI, Wisley Airfield SNCI and ancient woodland at Heyswood and Hatchford Wood.

7.6.25 A Habitats Regulations Assessment is being undertaken for this Scheme, to ensure that any potential impacts on European designated sites are identified and assessed, in consultation with Natural England. It is anticipated that Appropriate Assessment will be required. Assessment will be undertaken to confirm whether the physical loss of habitat would result in an impact on the integrity of the SPA. If risks of an impact are identified then measures will be designed to mitigate the risks. If an impact on integrity cannot be avoided, compensation measures will be identified.

7.6.26 If design cannot avoid the loss of land within ancient woodland, the residual impacts of the Scheme will include loss of irreplaceable habitat. Compensatory measures would include habitat creation, within which soil from any cleared areas of ancient woodland would be translocated and salvaged for use for part of the woodland creation.

Significant effects

7.6.27 Initial noise assessments anticipate that the existing noise barriers around the M25 J10 could be improved as part of the Scheme, and therefore noise levels within the surrounding areas (i.e. the SPA/SSSI/LNR) may be reduced as a result of the Scheme. However, the magnitude of these changes has not yet been determined.

7.6.28 In addition, initial assessments indicate that emissions may change as a result of the Scheme, due to changes in traffic. The impacts of these emission changes on the surrounding designated sites has not yet been determined. Increases in nitrogen levels could have negative impacts on heathland, allowing dominant plant species, such as grasses, to outcompete heather.

7.6.29 However, the SPA/SSSI contains a dense belt of woodland approximately 200 m wide between the M25/A3 and the heathland habitat for which the SPA and SSSI are designated. It is considered likely that any significant changes in emissions are likely to be confined to this woodland belt, rather than changing levels of air pollution within the heathland.

7.6.30 Although the noise and emissions impacts have not yet been confirmed, due to the permanent and temporary loss of habitat within the SPA, SSSI, LNR and SNCI, it is considered likely that the Scheme will have a significant impact on these designated sites.

7.6.31 A precautionary approach has been taken to identifying the residual significance of effects and it is likely that some may be reduced through mitigation by design or other measures (for example, a reduction in noise levels could potentially reduce the magnitude of impact on Thames Basin Heaths qualifying species).

7.6.32 Table 7.8 below identifies the significance of effects on nature conservation resources as a result of the Scheme, with mitigation. A precautionary approach has been taken, so the significance of effect of impacts on individual resources may be reduced after further design and when details of mitigation are confirmed.

Table 7.8: Potential significant nature conservation effects for the Scheme

Nature conservation resource	Value of resource	Potential impacts and mitigation	Significance of effect after mitigation
Thames Basin Heaths SPA	European	The potential impacts of the Scheme on the Thames Basin Heaths SPA is being assessed as part of a Habitats Regulations Assessment (HRA). Please refer to the HRA for details.	Please refer to the HRA for details.
Thames Basin Heaths SPA qualifying features	European	The potential impacts of the Scheme on the Thames Basin Heaths SPA qualifying features is being assessed as part of an HRA. Please refer to the HRA for details.	Please refer to the HRA for details.

Nature conservation resource	Value of resource	Potential impacts and mitigation	Significance of effect after mitigation
Mole Gap to Reigate Escarpment SAC	European	Due to distance of 6.9 km from the Scheme, and the absence Bechstein's bats from the Scheme footprint, impact on the SAC have been ruled out (refer to HRA Stage 1: Screening Report for more details).	Neutral
Ebernoe Common SAC	European	Due to distance of 29.3 km from the Scheme, and the absence barbastelle bats and Bechstein's bats from the Scheme footprint, impact on the SAC have been ruled out (refer to HRA Stage 1: Screening Report for more details).	Neutral
Ockham and Wisley Commons SSSI	National	Permanent loss of 10.9 ha (4.0 %) and temporary loss of 11.3 ha (4.2 %) of SSSI habitat. An increase in traffic flow as a result of the Scheme may result in increased air pollution within sensitive habitats adjacent to the affected road as a result However, the SSSI contains a dense belt of woodland approximately 200 m wide between the M25/A3 and the heathland habitat for which the SSSI is designated. It is considered likely that any significant increases in emissions are likely to be confined to this woodland belt, rather than increasing levels of air pollution within the heathland. Potential for indirect impacts from water pollution during construction and operation of the Scheme. Mitigation will include measures to protect SSSI from pollution and accidental incursion outside of the Scheme footprint.	Very large
Ancient Woodland	TBC (in consultation with SEB)	Permanent loss of 1.0 ha of Ancient Woodland habitat (while part is indicated as temporary land take, it is assumed that even temporary clearance will be considered as permanent loss). Potential for indirect impacts from air/water pollution during construction and operation of the Scheme. Mitigation will include measures to protect ancient woodland from pollution and accidental incursion outside of the Scheme footprint.	Moderate Residual impacts are anticipated to include loss of irreplaceable habitat. Compensation would be required.
SNCI (Elm Corner, Wisley Airfield and Hunts Copse)	County	Permanent loss of 4.9 ha and temporary loss of 1.7 ha of SNCI habitat. Potential for indirect impacts from air/water pollution during construction and operation of the Scheme.	Moderate

Nature conservation resource	Value of resource	Potential impacts and mitigation	Significance of effect after mitigation
		Mitigation will include measures to protect SNCI from pollution and accidental incursion outside of the Scheme footprint.	
Ockham and Wisley LNR	County	Permanent loss of 12.6 ha (3.8 %) and temporary loss of 11.0 ha (3.3 %) of LNR habitat. Potential for indirect impacts from air/water pollution during construction and operation of the Scheme. Mitigation will include measures to protect LNR from pollution and accidental incursion outside of the Scheme footprint.	Moderate
Other notable and protected species	Local	Although a full set of data has not yet been collected, initial results suggest that a low number of notable and/or protected species may occur within or adjacent to the footprint of the Scheme. Therefore, it is possible that these low numbers may be displaced into adjacent habitats. Potential disturbance as a result of increased noise levels during construction and operation. Works will be timed to minimise impacts on notable and protected species where possible. Bird and bat boxes will be provided to mitigate for loss of potential features within cleared areas of woodland. Multi-functional bridges with habitat linkages will provide new connectivity between existing areas of heathland, allowing potential movement of animals, such as reptiles. Temporarily cleared areas within the SSSI will be reinstated with habitats that are beneficial to the qualifying features of the SPA (for example, the creation of exposed banks for invertebrates).	Slight

7.7 Summary

7.7.1 The information gathered to date has provided an understanding of the baseline conditions within the EZoI for the Scheme. However, further data collection is proposed during the Preliminary Design Stage to update existing data and to complete data sets for notable and legally protected species.

7.7.2 Based on the preliminary environmental assessment carried out for this report, it has been established that the Scheme has the potential to have a significant adverse effect on the Thames Basin Heaths SPA, Ockham and Wisley Commons SSSI, Ockham and Wisley Common LNR, Elm Corner SNCI, Wisley Airfield SNCI, Heyswood ancient woodland and Hatchford Wood ancient woodland.

7.7.3 A Habitats Regulations Assessment is being undertaken for this Scheme, to ensure that any potential impacts on European designated sites are identified and assessed, in consultation with Natural England. It is anticipated that Appropriate Assessment will be required. If design cannot avoid the loss of land within ancient woodland, the residual impacts of the Scheme will include loss of irreplaceable habitat. In addition, the Scheme is likely to have slight effects on populations of some notable and protected species. However, at this stage, details of the mitigation and compensation measures that would combine to form the necessary mitigation have not yet been finalised. Therefore, a precautionary approach has been taken to identifying the residual significance of effects and it is possible that these residual effects may be reduced through mitigation by design or other measures.

7.7.4 Consultation with stakeholders will continue, and will guide the final mitigation and compensation strategy for the Scheme. However, it is considered that the mitigation and compensation proposals that have been provided in this report have taken into account the requirements of the NPSNN (as set out in section 7.12), by providing green corridors, minimising habitat fragmentation, enhancing existing habitats and creating new, linked habitats and the provision of vegetated multi-functional bridges to expand the range of existing notable and legally protected species populations in the local area.

8 Road Drainage and the Water Environment

8.1 Introduction

8.1.1 This chapter has been prepared to identify the likely significant effects with respect to the water environment resulting from the construction and operation of the Scheme.

8.1.2 Generic and specific effects on the water environment during the construction phase and the operational phase are identified and assessed.

8.1.3 The chapter is based on readily available information that has previously been presented in the Preliminary Design Stage Scoping Report and the Option Selection Stage Environmental Assessment Report. However, the baseline reported in Option Selection Stage was revisited during the Preliminary Design Stage scoping, in order to confirm any updates to baseline/existing conditions.

8.2 Study area

8.2.1 For the purposes of this assessment, the study area is defined as 1 km from the Scheme. A 1 km study area was chosen as research indicates that impacts associated with soluble pollutants will be sufficiently diluted beyond 1 km, thereby reducing any potential impact (DMRB HD 45/09). For groundwater, the potential zone of impact will be assessed on the underlying WFD groundwater body.

8.2.2 As the environmental assessment develops and the potential effects of the Scheme are fully assessed, the study area may extend further in order to gather data for relevant surface or groundwater bodies.

8.3 Consultation

8.3.1 Consultation with regulators, in the form of introductory meetings and follow up specific technical meetings on site (principally with the Environment Agency and Lead Local Flood Authorities and other interested parties) is ongoing (two meetings with the Environment Agency have been held) and should take place throughout the design process to ensure that the proposed Scheme is designed to be compliant with the objectives of the WFD and to ensure sustainable drainage mitigation is incorporated into the design so as to not increase surface water flood risk in the areas highlighted.

8.4 Baseline conditions

8.4.1 This section sets out the baseline conditions of the water environment. At this stage, a high–level desk–based assessment has been undertaken using publicly available spatial data under the Open Government Licence[30] and from open sources including the Environment Agency[31].

8.4.2 As no new information has become available since the Option Selection Stage, this chapter largely echoes that of the baseline reported in the previous stage.

[30] http://environment.data.gov.uk/ds/catalogue/#/catalogue
[31] http://apps.environment-agency.gov.uk/wiyby/default.aspx

However, the baseline reported in the previous stage has been revisited in order to confirm any updates.

8.4.3 Site visits planned for this stage of the assessment include WFD walkover surveys of the affected watercourses and lakes.

Surface water

8.4.4 Waterbodies within the study area fall within the Thames River Basin District (RBD) as set out within the Thames River Basin Management Plan (RBMP).

8.4.5 Four WFD (2000/60/EC) surface waterbodies have been identified across the study area (up to the 1 km study area boundary).

8.4.6 Note, the scoping WFD preliminary assessment (found in Volume 2 Appendix D), focuses on the waterbodies directly affected, whereas this chapter provides an overview of the water environment as a whole.

8.4.7 Table 8.1 provides details of these WFD surface waterbodies. Although the current overall status for all waterbodies is moderate, the requirement of the WFD is for all watercourses to meet good status or potentially good by 2027.

Table 8.1: WFD surface water

Receptor	Location description and distance from Scheme	Classification (2015) chemical status	Classification (2015) ecological status	Overall waterbody status
River Wey – Shalford to River Thames Confluence at Weybridge (GB106039017630)	Located to the west of the Scheme south of Junction 10. M25 crosses the watercourse approximately 400 m north west of the Scheme	Good	Moderate	Moderate
Stratford Brook (GB106039017890)	Located in the southern part of the Scheme. The A3 crosses the watercourse just north of the Ockham interchange	Good	Moderate	Moderate
Guileshill Brook (GB106039017880)	Located to the south of the Scheme. The A3 crosses the watercourse approximately 550 m south the Scheme	Good	Moderate	Moderate
River Mole (Horley to Hersham) (GB106039017621)	Located to the east of the Scheme north of junction 10. A3 crosses the watercourse approximately 50 m north of the Scheme near B365/A245 Cobham interchange	Good	Moderate	Moderate

8.4.8 There are other surface watercourses that are not classified under the WFD within the study area. However, as these lie within a WFD catchment, they therefore contribute to the WFD overall quality and status, and at this stage of the assessment they have also been assigned a medium importance. These non–WFD watercourses will be identified and assessed as part of the ES.

Lakes and other surface water features

8.4.9 There is one WFD designated lake within the study area. This is Bolder Mere (GB30643218). This lake is also specifically referenced in the designation for the Ockham and Wisley Commons SSSI. It is located 840 m south west from Junction 10 and to the south east of the A3, with its western shoreline immediately adjacent to the carriageway.

8.4.10 The current overall status for this lake is moderate (driven by the moderate ecological status). As per surface water, the requirement of the WFD is to meet good status or potential by 2027. Subsequently, for the purposes of the baseline, a medium importance has been assigned so as not to prevent achievement of the 2027 status objective.

8.4.11 There are also some lakes and ponds that are not WFD designated within the bounds of the Scheme study area. The relationship and dependence these have with groundwater is unknown at the time of reporting. The feature will only be assessed if there are potential affects due to changes in groundwater.

8.4.12 Potential ecological effects on these features will be considered in Chapter 7, Biodiversity.

Groundwater

8.4.13 Based on geological open data (1:625k scale), all options are underlain by sand, silt and clay, with a pocket of clay in the south. The study area is underlain by a Secondary A Superficial Aquifers and there are also Principal Aquifers to the east and west of the study area, adjacent to the courses of the River Wey and River Mole, indicating high groundwater sensitivity.

8.4.14 The Principal Aquifer to the east of the study area lies approximately 500 m north east of Junction 10 and crosses the northern edge of the Scheme. The Principal Aquifer to the west of the study area lies approximately 300 m west of Junction 10 and crosses the western edge of the Scheme.

8.4.15 Secondary A Aquifers are capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. Principal Aquifers usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.

8.4.16 One WFD groundwater body has been identified across the study area. This is the Cobham Bagshot Beds (WFD ID GB40602G601400).

8.4.17 There are no Source Protection Zones (SPZs) within study area.

WFD compliance assessment

8.4.18 The Scheme is not considered to cause deterioration at the waterbody scale and should not prevent future attainment of Good Ecological Status or Good Ecological Potential. However, to achieve compliance with the Directive, the details of mitigation measures will need to be developed as part of future design

phases; in particular, careful consideration will need to be given to mitigation needed to avoid deterioration in the Potential of Bolder Mere WFD lake water body.

Abstractions and discharges

8.4.19 The Environment Agency website[32] indicates there are numerous surface and groundwater abstractions within the study area. Details of these abstractions are being obtained with a site specific Envirocheck report and will be assessed in terms of their sensitivity to the Scheme.

8.4.20 Based on the Highways Agency Drainage Data Management System (HADDMs) there are numerous highway outfalls across the study area. The status of these and the implications for the Scheme will be assessed during this Stage.

8.4.21 The site specific Envirocheck report will provide details of discharge consents in the study area.

8.4.22 Further investigation is required for abstractions to ensure local abstraction is not affected. At the time of reporting there was insufficient data to fully assess abstractions and discharges.

Flood risk

8.4.23 Flood Zones 2 and 3 are associated with the surface watercourses identified in **Table 8.1**. These flood zones refer to probability of river flooding, in the absence of flood defences. Flood Zone 2 is land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding. Flood Zone 3 is land having a 1 in 100 or greater annual probability of river flooding.

8.4.24 Surface water flooding (when rainwater does not drain through the drainage system or soak into the ground, but lies on or flows over the ground instead) issues/hot spots are within the study area. These areas include Redhill Bottom and Sandpit Hill north and south of the Junction 10 interchange respectively, areas on Wisley Common, Bolder Mere Lake, Stratford Bridge and Guileshill Brook. Surface water flood risk ranges from high to low.

8.4.25 Areas of groundwater flooding (when levels of water in the ground rise above the surface) are unknown at the time of reporting. The hydrogeological character of the study area means that groundwater flood risk may be an issue.

Aquatic ecology

8.4.26 Aquatic ecology has been considered in Chapter 7 Biodiversity.

Designated sites

8.4.27 There are three statutory designated sites within the study area. These are as follows:

- Thames Basin Heaths SPA;
- Ockham and Wisley Commons SSSI; and
- Esher Commons SSSI.

[32] http://apps.environment-agency.gov.uk/wiyby/default.aspx

8.4.28 Thames Basin Heaths SPA and Ockham and Wisley Commons SSSI surround Junction 10 and Esher Common SSSI is located adjacent to the A3 at the northern extent of the study area. Potential ecological effects are considered in Chapter 7 Biodiversity.

8.5 Potential impacts

8.5.1 Although the ecological sensitivity of the designated sites is recognised with Thames Basin Heaths SPA, Ockham and Wisley Commons SSSI and Esher Commons SSSI adjacent to the Scheme, to avoid over–estimating/double counting potential impacts, significant impacts are considered in Chapter 7 Biodiversity.

Construction

8.5.2 The means by which the Scheme will be built is currently under development. Temporary impacts during construction have the potential to affect the water environment through (but not limited to) the following:

- the excavation of materials, and the subsequent deposition of soils, sediment, or other construction materials;
- the spillage of fuels or other contaminating liquids;
- the mobilisation of contamination following the disturbance of contaminated ground or groundwater;
- runoff from construction sites to surface water bodies;
- disturbance of non–native invasive species – construction activities can result in the spread along surface water bodies and their riparian zone;
- de–watering – local changes to groundwater levels associated with pumping out of subterranean works areas (e.g. deep foundations). Disposal of pumped water to surface waterbodies; and
- cutting and deep foundations may create rapid vertical flow pathways into the underlaying aquifers or affect flow paths.

8.5.3 These impacts could result in sediment and/or other contaminants entering watercourses or groundwater affecting the quality of the water which could have implications for abstractions and WFD compliance.

8.5.4 The construction of the scheme will impact flood risk due to encroachment into Flood Zones 2 and 3. The new 2-way Wisley Lane link road directly from the east side of Ockham interchange roundabout will cross Stratford Brook. The current proposal for this crossing is a single span bridge, which will result in a loss of floodplain storage. The construction of Buxton Wood footbridge is anticipated to encroach into Flood Zones 2 and 3 of the River Wey.

8.5.5 During construction of a watercourse crossing (either a single span bridge or culvert or modification of a bridge or culvert (e.g. extension) there may be damage to the bed and banks of the watercourse. This may lead to disruption of the natural hydraulic and sediment transport processes. As well has the construction of the bridges mentioned above Stratford Bridge culvert will need to be strengthened and the existing culvert which takes a tributary of the River Wey

under the A3 adjacent to Bolder Mere Lake will need to be extended. The works on Elm Lane will also involve the replacement of a culvert to a box culvert.

8.5.6 Across the scheme there may be minor drainage ditches that may need to be realigned as part of the Scheme. Crossing of these ditches may also be required. Realigning or crossing these ditches presents a risk of loss/disturbance damage to aquatic ecology, substrate and riparian zones although these ditches are likely to be of minimal ecological value (although a survey will be needed to confirm this assumption).

8.5.7 The Scheme is not considered likely to cause deterioration at the waterbody scale and should not prevent future attainment of Good Ecological Status or Good Ecological Potential. However, to achieve compliance with the WFD, mitigation measures will be developed and in particular, careful consideration will be given to mitigation needed to avoid deterioration in the Potential of Bolder Mere WFD lake water body.

Operation

Water quality (both surface and groundwater)

8.5.8 During operation roads are designed to drain freely to prevent build–up of standing water on the carriageway whilst avoiding exposure to or causing flooding. Contaminants deposited on the road surface are quickly washed off during rainfall. Where traffic levels are high the level of contamination increases and therefore, the potential for unacceptable harm being caused to the receiving water also increases (HD 45/09).

8.5.9 There are potential impacts to surface and groundwater quality and flow volumes owing to the increase in impermeable area and additional risks associated with road runoff and pollution.

8.5.10 On all roads, there is also a risk that a spillage may lead to an acute pollution incident. Where spillages do reach a surface watercourse the pollution impact can be severe, but is usually of short duration, typical of an acute pollution impact. If groundwater is polluted the impact can be long lasting and difficult, if not impossible, to remediate (HD 45/09).

8.5.11 In addition, potential surface water abstractions downstream could be affected by the additional discharge. These potential water quality effects would be mitigated as part of standard drainage designs for the Scheme, to obtain relevant permissions and consents. They will also be considered as part of the WFD assessment.

Flood risk

8.5.12 There are potential impacts on fluvial flooding as a result of loss of floodplain due to construction and modification of river crossings. Any construction on land that is within a flood zone has the potential to alter flow paths and/or flood levels. By taking up some of the existing floodplain storage, there is less opportunity for water to spread out and this can result in increased flood levels. Flows can be restricted at watercourse crossings that can raise the likelihood of flooding upstream or to the constructed carriageway itself.

8.5.13 There is a potential for an increase in surface water flooding on the M25 and A3 due to increased impermeable area. With an increase in impermeable

catchment, more water is collected for a given rainfall event, which induces higher rates and volumes of runoff. This has the potential to overload the capacity of the drainage system. The increased flow rates can also contribute to larger flood peaks in receiving watercourses.

8.5.14 Drainage of cuttings may also add to surface water stream flows with the potential to open up flow paths from groundwater, depending on the depth of the water table in the area.

Morphology

8.5.15 River crossings (both WFD assessed watercourses and minor watercourses) at Stratford Brook Bridge (new bridge crossing and culvert extension), Bolder Mere Lake (culvert extension) and Buxton Wood footbridge may lead to disruption of the natural hydraulic and sediment transport processes and act as a barrier to fish passage and movement of other wildlife.

- Any realignments of both WFD assessed watercourse and minor watercourses associated with new structures (bridges and culverts and culvert extensions) can lead to loss of naturalised reaches.
- Potential direct loss of marginal habitat from the western shore of Boldermere Lake and changes to the lake's community structure caused by realignment of the carriageway and construction of associated retaining wall.

8.5.16 With the adoption of mitigation measures it is considered there will be no residual significant effects on water quality (surface and groundwater) or flood risk during construction or operation. The Scheme would also be compliant with the requirements of the WFD as the Scheme would not cause deterioration at the waterbody scale or prevent future attainment of Good Ecological Status or Good Ecological Potential.

8.6 Potential mitigation measures

Construction

8.6.1 Construction methods are currently being developed but mitigation is likely to include, but not be limited to the following.

- all works to be undertaken with regard to Pollution Prevention Guidelines (PPGs)[33]. These detail good practice advice for undertaking works which may have the potential to cause water pollution;
- temporary works sites, haul roads and other associated works should be designed and maintained to minimise impact;
- where temporary watercourse diversions are required or in–channel working, specific mitigation may be needed to ensure the temporary design is in line with the WFD and that temporary impacts are minimised;

[33] Pollution Prevention Guidelines (PPGs) with particular reference to PPG1 (general guide to the prevention of water pollution), PPG3 (use and design of oil separators in surface water drainage systems), PPG5 (works near or liable to affect watercourses) and PPG6 (working at construction and demolition sites). The PPGs contain a mix of regulatory requirements and good practice advice. They have been withdrawn by the Environment Agency but are still considered good practice advice to avoid pollution of watercourses. All of the PPGs are available from http://webarchive.nationalarchives.gov.uk/20140328084622/http://www.environment-agency.gov.uk/business/topics/pollution/39083.aspx

- close communications with the Environment Agency will be established on groundwater matters;
- areas which may generate contaminated water would need to be bunded and have water discharged to self–contained units with treatment facilities. There would be no discharge to groundwater;
- tests would be undertaken to ensure contaminated material is identified, isolated and reworked or removed to special landfill to avoid any leachate problems;
- floodplain working will be minimised as far as possible (consultation with the lead local flood authorities (LLFAs) will be required to ensure sustainable drainage mitigation is incorporated into the design so as to not increase surface water flood risk);
- temporary land–take required for construction will include adequate areas of land set aside for robust control measures, for example sustainable drainage control;
- sustainable drainage solutions incorporated, aiming to return groundwater to its source. Other mitigation may need to be considered to maintain groundwater levels; and
- for construction work which has drainage implications, the proposed drainage system should comply with the National Standards, such as Schedule 3 under the Flood and Water Management Act 2010. In addition, the DCO, or any associated planning obligations, will need to make provision for the adoption and maintenance of any Sustainable Drainage Systems (SuDS), including any necessary access rights to property:
  - Works commonly include modifications (widening, deepening, straightening or realigning) to channel upstream and downstream of crossing (to align channel with the new crossing). Bed protection or bank protection may also be used to manage erosion; and
  - Mitigation measures to avoid deterioration in the Potential of Boldermere WFD lake waterbody.

Operation

8.6.2 Operational mitigation is likely to include, but not be limited to the following. These measures have not yet been developed at this stage and have not been fully factored into the assessment of potential impacts. Design mitigation principles guiding WFD compliance are detailed further in Appendix L.

- pollution treatment measures are likely to be needed where a risk of pollution has been identified. Where possible, SuDS will be used, in line with National SuDS Guidance to collect and treat road drainage. Preference will be for discharges to ground with appropriate SuDS;
- road runoff should be infiltrated in the same catchment as it is generated to minimise impacts on the water balance;
- facilities will also be required to deal with accidental spillages occurring on the carriageway, particularly at high risk points, such as junctions and

roundabouts, to allow for containment and removal of pollutants from the system;

- single span structures are the preferred type of crossing because they minimise impact on the water environment if designed appropriately. They should be designed and constructed in such a way as to minimise disruption to the river and riparian zone. Abutments should be set well back from the bank edge to allow the river to function naturally and to maintain a wildlife corridor along the banks;
- culverts present a higher risk (than single span structures). They are therefore not a preferred method of watercourse crossing from the perspective of protecting and improving the water environment. However, where they may be the only feasible technical solution, environmentally sensitive culvert design should be followed, including but not limited to minimising the length and adopting an open arc structure that avoids disturbing the natural bed of the river rather than a box culvert; and
- compensation for floodplain loss may be required at some locations. Assessment of impact of any flood compensation land will be required, with level for level compensation being the normal practice. An area has been identified as potential floodplain compensation at Stratford Brook where the works will impinge on the floodplain here.

8.7 Summary

8.7.1 All elements of the Scheme could potentially, without appropriate mitigation, result in a deterioration of the water environment.

8.7.2 None of the elements are considered to cause deterioration at the waterbody scale assuming that the appropriate mitigation will be adopted. In particular:

- Adequate mitigation is put in place to avoid deterioration in Bolder Mere WFD lake waterbody. This mitigation is necessary to avoid adverse impacts at a waterbody scale associated with the construction of a retaining wall along the western shore of the lake; and
- Flood risk and WFD specialists are engaged to ensure that the bridge abutments do not adversely affect flows over the floodplain.

9 Landscape

9.1 Introduction

9.1.1 This chapter provides an assessment as to the likely landscape or visual effects resulting from the implementation of the Scheme.

9.1.2 This chapter outlines and summarises the findings of the assessment, and should be read in conjunction with the Volume 2 Appendix E which gives information on the planning policy context, methodology for assessment and detailed impact assessment schedules for receptors. The landscape and visual baseline and assessment is supported by figures in Volume 3.

9.2 Study area

Landscape

9.2.1 The desk top study and site visits undertaken during the Option Identification Stage and the Option Selection Stage informed the extent of the study area for both the landscape and visual effects.

9.2.2 It is expected that potentially significant landscape effects would be restricted to the land directly adjacent to the Schemebut consideration of landscape effects has been given to the study area defined as the area 1.5 km from the DCO boundary, or further where deemed necessary. Any effects upon landscape receptors located outside the 1.5 km study area are unlikely to be significant and have been scoped out from further assessments. Relevant designated areas around the junction are shown on Figure 9.1 in Volume 3.

Visual

9.2.3 The visibility towards the Scheme is restricted predominantly by the coniferous and birch woodland that surrounds the junction. Whilst the A3 through the junction is slightly elevated above the surrounding area, the slopes are relatively shallow which, combined with presence of the existing woodlands Means that it is reasonably well screened from the surrounding area.

9.2.4 When considering the Scheme in the context of the natural and man–made screening elements present around the junction, a study area of 1.5 km from the edge of the Scheme was considered sufficient to identify potentially significant visual effects. Any effects on visual receptors beyond the 1.5 km study area are unlikely to be significant and have been scoped out from further assessment. This study area for visual effects and a preliminary Zone of Theoretical Visibility is shown in Figure 9.6 in Voume 3.

9.3 Consultation

9.3.1 Consultation has been undertaken with stakeholders and local people throughout the assessment processto ensure that the Scheme is designed with appropriate mitigation proposals that reflect the impacts and sensitivities of the receptors.

9.3.2 Consultation with the following stakeholders has taken place and will be ongoing:

- Forestry Commission;

- Open Spaces Society; and
- Surrey County Council.
- Surrey Wildlife Trust
- Natural England
- Painshill Park
- RHS Wisley
- Forestry Commission

9.4 Baseline conditions

Landscape Features

9.4.1 The M25 Junction 10/A3 Wisley Interchange is located within an area of Registered Common Land (Wisley and Ockham Commons and Chatley Heath), between Cobham and Ripley to the south west of London. The landscape around the junction consists of a large scale coniferous and birch woodland with areas of open heathland incorporating large clearings. Further from the junction is a mosaic of agricultural fields with small hamlets and individual properties. These areas contain numerous woodland areas, copses and tree belts and hedgerows forming field boundaries. The Scheme lies on an area of higher ground between the valleys of the River Mole and River Wey. The topography of the area is illustrated in Figure 9.4 in Volume 3.

Landscape Character

9.4.2 The study area is located close to the border of the National Character Area (NCA) No.129 – Thames Basin Heaths and NCA No.115 – Thames Valley. The character areas are shown on Figure 9.2 Due to the localised nature and scale of the proposals, the effects on the NCA will not be considered and the assessment will focus on local landscape character areas identified within the Landscape Character Assessment produced at Local Authority level.

9.4.3 The Scheme is located on the boundary between Guidford and Elmbridge local authorities. Local landscape character areas are shown on Figure 9.3 in Volume 3.

9.4.4 The landscape character of Guildford Borough has been described in Guildford Landscape Character Assessment and Guidance (January 2007), prepared by Land Use Consultants. The Scheme is located wholly within the Wisley Wooded and Settled Heath (G2) Landscape Character Area that forms part of Wooded and Settled Heath Landscape Character Type. The key characteristic and attributes of this Landscape character area are summarised below.

Table 9.1: Summary of attributes and key characteristics of relevant landscape character areas within Guildford Borough Council

Guildford Borough Council		
Landscape Character Types	**Landscape Character Areas**	**Key attributes and qualities of landscape character**
Woodland and Settled Heath	G2: Wisley Wooded and Settled Heath	• A secluded, enclosed landscape of heathland commons lying between the Mole and Wey Rivers, now largely overgrown by secondary woodland; • Substantial areas of mixed woodland and scrub are interspersed with heathland, open water bodies, pasture, parkland and gardens; • Wisley and Ockham Commons are Open Access Land with a network of footpaths and rides through the woodland; • There are few rural roads but the major transport corridors of the A3 and M25 cross the area fragmenting the Commons and bringing noise and views of moving traffic; • Sparse settlement pattern of a few farmsteads and cottages plus large houses at Wisley and Foxwarren; • Presence of designed landscapes of RHS Gardens at Wisley and Foxwarren Park to the north; • Intermittent views into and through the woodland to pastures; and • Presence of heathland.

9.4.5 The landscape character of Elmbridge Borough Council is described in the Surrey Landscape Character Assessment (April 2015), prepared by Hankinson Duckett Associates (HDA). As this landscape character assessment covers the entire Surrey County, the boundaries of landscape character areas extend beyond Borough or District Councils boundaries. The assessment distinguishes between landscape types reflecting the dominant influences on landscape character and landscape character areas which are discrete geographic areas that possess the common characteristics described for the landscape type. Three relevant landscape character areas were identified to inform the baseline of landscape character for the Scheme:

- RF10 Lower Mole River Floodplain;
- SS9 Weybridge South Settled and Wooded Sandy Farmland, and
- SW5 Wisley Sandy Woodland.

9.4.6 The key characteristic and attributes of these landscape character areas are summarised below.

Table 9.2: Summary of attributes and key characteristics of relevant landscape character areas within Elmbridge Borough Council

Elmbridge Borough Council	
Landscape Character Areas	**Key attributes and qualities of landscape character**
RF10 Lower Mole River Floodplain	• Flat, low lying flood plain of the River Mole; • River forms wide meanders, and multiple channels. The valley floor also contains small watercourses, streams, lakes and water bodies often linked to the river; • Consists of a mixture of pastoral and arable fields, with riparian vegetation and occasional blocks of woodland. Incorporates occasional remnant parkland, including areas of large individual mature trees within fields; • Limited areas of ancient woodland; • Irregular, medium scale fields, with moderate hedgerow network (particularly to the south), ditches and tree lines; • The sense of enclosure varies along the character area, although vegetation helps reduce views of urban influence from adjacent settlements; • Major roads, including the M25, A3 and A244, the Waterloo to Woking railway line, and the Waterloo to Guildford via Cobham railway line, cut across the character area; • Public access into the character area and to the river are relatively limited, with only a small number of rights of way crossing the character area; • Settlement within the character area is also limited, mainly consisting of the occasional farmstead; and • Limited settlement and public access aid the sense of tranquillity, although the sense of remoteness is reduced by surrounding urban influence to the north.
SS9 Weybridge South Settled and Wooded Sandy Farmland	• A largely wooded area, but with significant areas of golf course cut from the woodland to the north west, north east, and south east; • In between the golf courses is a pattern of small, mainly pastoral, rectilinear fields with thick boundary vegetation. A number of these fields are subdivided for paddocks or horticultural uses; • There are a few small areas of ancient woodland, mainly towards the west of the character area, in particular to the north of Foxwarren Park; • Views across this relatively low–lying landscape are highly constrained by woodland and vegetation along boundaries and roads; • The A3 dual carriageway and A245 main road cross through the character area; • Painshill Park is located above the Mole Valley to the south, at the south eastern end of the character area; and • Limited public access limits opportunity for public appreciation of the intimate landscape.
SW5 Wisley Sandy Woodland	• The character area consists of extensive tracts of mixed woodland and scrub, some areas of Common Land, open water bodies, and a pocket of small pastoral fields; • Includes a relatively large block of ancient woodland at the south east corner of the character area; • The RHS Gardens at Wisley are within the south west corner of the character area, and Foxwarren Park is to the north;

Elmbridge Borough Council	
Landscape Character Areas	**Key attributes and qualities of landscape character**
	• Tree cover confines views generally, however there are distinctive views through the woodland along tracks, clearings within the woodland and across Bolder Lake; • Views of moving vehicles are possible within the vicinity of road corridors through the woodland; • The M25 motorway and A3 cut through the woodland, and form Junction 10 of the M25 where they meet, towards the centre of the character area; • Wisley and Ockham Commons are Open Access Land, with a number of informal tracks through the woodland connecting to a network of PRoW, there are small car parks and other basic facilities for recreational use of the woodlands; • There are a very limited number of isolated dwellings, including a few farmsteads, cottages and large houses at Wisley and Foxwarren, but the character area is mostly unsettled; • Large tracts of the character area are registered as Common Land and Wisley is noted as a historic garden and centre of horticulture; and • Busy roads, including the M25 motorway, fragment the character area and disturb the peace locally. But away from detracting activity, the majority of the wooded character area is peaceful, intimate, and has a sense of remoteness.

Visual

9.4.7 Visual receptors are the people who live or work in or visit the landscape, and who will experience views of the Scheme.

9.4.8 Receptors include the users of PRoW's and Wisley and Ockham Commons and Chatley Heath, residents in Elm Corner and other properties alongside the A3 as well as people working in businesses in the area including those on Redhill Road. Other visual receptors include people in Painshill Park and RHS Wisley.

9.4.9 It is expected that most of these receptors will be of high sensitivity. Receptors have been identified after consideration of the elements of the Scheme and the presence of screening elements that could restrict views from the Scheme.

9.4.10 There are the following visual receptors in the study area:

- Local communities (e.g. residents to the north of the A3 between Redhill Road and Seven Hills Road and at Elm Corner) or isolated residential properties (e.g., Hut Hill Cottage);
- People using nationally designated or regionally promoted footpaths, cycle routes, bridleways, the local PRoW network and areas of Open Access Land (e.g. network of footpaths within Commons);
- Visitors to publicly accessible sites including Registered Park and Gardens, historic sites and other visitor attractions (e.g. Painshill Park and RHS Gardens Wisley, the Scheduled Monuments and the Semaphore Tower.);
- Schools and other institutional buildings, and their outdoor areas (e.g. Felton Fleet School);

- People engaged in outdoor sport activity at playing fields; golf courses or pitches (e.g. Silver Mere Golf Club);
- People in their places of work (e.g. Seven Hills Hotel, businesses on Redhill Road and the Ockham Bites cafe); and
- Road users (e.g. users of the A3, M25 and local roads).

9.5 Potential impacts

9.5.1 It is likely that the Scheme would cause adverse landscape and visual impacts, due to the extent and scale of proposed changes to the highway and associated infrastructure such as lighting and gantries. Potential receptors are shown on Figure 9.9 in Volume 3 and detailed assesments of the effects on the them are given in Appendix E.

Landscape

9.5.2 An assessment of landscape effects deals with the effects of change and development on a landscape resource. The key landscape effects expected because of the Scheme are a loss of vegetation, alteration to the landform as well as the introduction of man–made features. The nature of effects on landscape character and landscape designations are assessed for both construction and operational phase of the Scheme.

9.5.3 The landform around the junction is gently sloping and therefore the introduction of new slip roads would require some earthworks, resulting in alterations to the existing landform as well as an extension to the road network.

9.5.4 The Scheme will also affect the existing levels of tranquillity within the wider local area. These changes combined may potentially affect the local landscape character.

9.5.5 It is expected that the Scheme would not result in significant effects for landscape character at the national level. The effects of the Scheme with mitigation on the local landscape character measures has been considered.

Visual

9.5.6 Visual effects will occur during both the construction and operational stage. During construction, effects are likely to occur because of the introduction of construction machinery, compounds and vegetation removal with the potential to create new sightlines to and views of the Scheme.

9.5.7 The visual receptors will also be affected by views of HGVs and other large machinery used within the construction site. However, the potential effects of construction activities would be temporary, short term and reversible.

9.5.8 It is expected that the greatest construction impact will occur close to the M25 Junction 10 because of the construction operations associated with the reconfigured junction works. Other improvements are centred on the existing road corridors that currently benefit from a high level of vegetation screening, however during construction activities new gaps in the existing vegetation will be created resulting in increased visibility.

9.5.9 Construction operations associated with proposed overbridges would also be prominent. Alteration of views during the construction stage would also occur

further away from the junction where, despite the main construction works associated with the M25 Junction 10 junction being potentially screened, views of works along the local access roads will be available.

9.5.10 The change in views during construction are likely to include:

- earthmoving operations;
- the formation of temporary spoil areas;
- road formation/ construction;
- the creation of new earthworks;
- creation of site compounds; and
- proposed overbridges/structures.

9.5.11 The operational effects will be long term and permanent although it is expected that the proposed mitigation planting will mature gradually following the construction to offset these. The Scheme will provide an opportunity to introduce environmental design measures or/and mitigation measures to help reduce the effects and provide landscape and visual enhancements where possible.

9.5.12 The impacts of the Scheme have been assessed in accordance with the methodology set out in Appendix E. The findings take into consideration the potential overall residual effect of the Scheme during both the construction and operational stages. The following sections indicate the likely effects of the component parts the Scheme on landscape and visual recptors.

A3 Widening between Ockham and Painshill

9.5.13 Landscape impacts will occur as a consequence of the localised widening works and creation of earthworks along the widened section of the A3 through this section. The carriageway widening works will require the clearance of vegetation and the subsequent influence of the road corridor will be increased.

9.5.14 Visual impacts will occur where the removal of vegetation and the introduction of associated carriageway infrastructure including earthworks, gantries and signs becomes more apparent to adjacent sensitive receptors. This will occur over the length of the A3 between Ockham Park and Painshill with some receptors being more affected by others where screening vegetation is limited or would be removed. To the south of junction 10 there are few properties and most are set back from the A3 so the widening and loss of vegetation would have limited affect. To the north of the M25 there are more properties closer to the A3 and loss of screening vegetation could expose views of the A3 leading to significant visual impacts paerticularly in combination with the access arrangements on either side of the trunk road noted below

Access to Painshill properties

9.5.15 The reconfiguration of existing and the introduction of proposed access roads to service the Painshill properties, together with the removal of vegetation will result in landscape impacts due to the increased presence of the local road network.

9.5.16 Visual impacts will occur where the removal of vegetation and the introduction of associated carriageway infrastructure including the new bridge over the A3 becomes more apparent to the adjacent sensitive receptors. The Gothic Tower in

Painshill Park, Court Close Farm, Heyswood Guides Camp and New Farm are likely to be affected.

Access to Seven Hills Road, west of the A3

9.5.17 The reconfiguration of the existing and the introduction of the proposed access link to provide access to Seven Hills Road, together with the removal of vegetation will result in landscape impacts due to the increased presence of the local road network.

9.5.18 Visual impacts will occur where the removal of vegetation and the introduction of associated carriageway infrastructure becomes more apparent to adjacent sensitive receptors.Foxwarren Cottage, Long Orchard Farm, Firtree Cottage and Bramley Hedge Farm could be affected by the access road and bridge over the A3.

Access via Cockrow Bridge

9.5.19 The introduction of the proposed overbridge will introduce a large component into the landscape but it replaces the existing bridge that will be demolished. This has been assessed within the context of the surrounding landscape character and results only in minor adverse landscape impacts.

9.5.20 Visual impacts will occur where the removal of vegetation and the introduction of the proposed overbridge and the introduction of associated earthworks and carriageway infrastructure becomes more apparent to adjacent sensitive receptors. The Ockham Bites café will be affected by the new bridge and earthworks to access it as these will be located within the existing car park.

Wisley Lane access

9.5.21 The introduction of the proposed overbridge will introduce a large new component into the landscape but it replaces the existing footbridge in this location which would be demolished. This has been assessed within the context of the surrounding landscape character resulting in minor adverse landscape impacts. The associated impacts will be assessed against the adjacent affected Ancient Woodland and its capacity to adopt change.

9.5.22 Visual impacts will occur where the removal of vegetation and the introduction of associated carriageway infrastructure is more apparent to adjacent sensitive receptors. The hamlet of Elm Corner would potentially be affected by this access road but there is substantial mature screening vegetation here which would limit the visual impact. There would also be effects on the edge of the RHS Wisley gardens but this would be in the contect of the existing footbridge and the adjacent A3 trunk road so the affects are likelty to be slight.

Elm Lane access

9.5.23 The reconfiguration and improvement of the existing byway requires only limited vegetation removal and will not result in adverse landscape impacts as a consequence of the proposed works not affecting the surrounding landscape character.

9.5.24 Visual impacts could occur where the removal of vegetation and the introduction of associated carriageway infrastructure is more apparent to adjacent sensitive

receptors.Properties in Elm Corner could be affected but the byway is surrounded by mature woodland so imapcts are likely to be minimal.

9.6 Potential mitigation measures

9.6.1 Currently, the assessment deals with the Scheme at preliminary design stage and therefore at this stage only preliminary environmental design or mitigation measures have been identified. The assessment takes into consideration the potential for reduction of adverse effects through the introduction of environmental design or mitigation measures. Below is a list of the potential mitigation measures that are proposed for the Scheme:

- Avoiding the unnecessary loss of trees and hedgerows through selection of options that would result in the minimal loss of trees and hedgerows of high quality;
- Where earth mounding or cuttings are proposed their profiles will be modelled to fit with the local landscape character. The shallow gradients of slopes and shallow crests of embankments and cuttings would be generally preferred;
- Including species appropriate to the locations favouring tree species that are suited to the local soil conditions;
- Considering the use of appropriate materials and the detailed design that fits the local vernacular; and
- Providing sensitive solutions to sensitive receptors such as the Listed Registered Parks and Gardens (Painshill and RHS Wisley), this will include, where appropriate, screening planting and/or environmental barriers.

9.6.2 The proposed mitigation for the Scheme has been illustrated on Figure 9.8 in Volume 3 Figures and will focus on the following points:

- To provide mitigation measures for screening, consisting of native planting which is characteristic of the local landscape;
- The introduction of new vegetation that will consist mainly of woodland planting, hedgerows with trees and standard hedgerows that will help to absorb the appearance of the junction into the landscape and provide wildlife corridors which link into the surrounding areas; and

9.7 Summary

9.7.1 The Scheme is set within the greenbelt and the Scheme is surrounded by areas of woodland, heathland and agricultural land. The published landscape character assessments by Guildford and Elmbridge reflect these features. The land around the scheme is designated as common or access land and so is well used by the public for informal recreation. There are two Registered Parks and Gardens at either end of the A3 at Painshill Park and RHS Wisley both of which attract many visitors.

9.7.2 The A3 and M25 are dominant elements in the landscape which detract from the attractiveness of the area. They create significant visual impact on the area, although this is ameliorated to some degree by the surrounding vegetation and the noise impacts also make the area less appealing for visitors and residents.

9.7.3 The Scheme would exacerbate the adverse impacts by increasing the size of the A3 and the junction 10 and increase the amount of related infrastructure such as lighting and gantries. Changes to side roads and bridges would also increase the scale of the highway infrastructure in the area. Although the changes associated with the scheme are kept in close proximity to the existing A3 and M25 the enlargement of the hifghway infrastructure would reinforce the impact on the local landscape character. Although mitigation proposals would be implemented if the scheme were built some impact on the local landscape would be unavoidable.

9.7.4 The Scheme is also likely to lead to increased visual impact for receptors around the junction, A3 and M25. Although the existing vegetation around the Scheme does much to limit views of the major roads and new planting would mitigate adverse effects over time there would be some visual impacts associated with the proposals. Users of the common and access land would be affected by the scheme and some residential properties particularly to the north of the M25 could be significantly affected.

10 Geology and Soils

10.1 Introduction

10.1.1 This chapter has been prepared to identify the likely significant effects on geology and soils resulting from the construction and operation of the Scheme.

10.1.2 This geology and soils chapter assesses the following topics:

- Direct impacts on mineral resource sterilisation;
- Direct impacts on controlled waters from land or groundwater contamination;
- Effects associated with pre-existing soil and groundwater contamination, for example mobilising contamination, introducing new or changing existing contamination migration pathways, or changing the types of contamination receptors;
- Physical effects such as changes in topography, aggressive ground and ground stability in the study area; and
- The expected significant effects arising from the vulnerability of the proposed development to major accidents or disasters relevant to the Scheme.

10.1.3 This chapter discusses hydrology and hydrogeology with respect to the potential contamination impacts of the Scheme on the water environment. Chapter 8 – Road Drainage and the Water Environment discusses the potential impacts of the Scheme on the water environment as a resource and considers the risks associated with potential flooding from groundwater and surface water.

10.1.4 For consideration of the reuse of soils and generation of waste soils see Chapter 12 - Materials and Waste.

10.1.5 For direct impacts on agricultural land, including loss of Best and Most Versatile (BMV), see Chapter 13 – People and Communities.

10.1.6 No Geological Sites of Special Scientific Interest (SSSIs) or Local Important Geological Sites (LIGSs) are present within the study area, as such consideration of direct impacts on such features was removed from the assessment at scoping stage and has not been considered further.

10.2 Study area

10.2.1 The assessment of geology and soils has considered a study area extending 500 m from the extent of the DCO boundary, herein referred to as the ‘study area’, as described in section 2.4. The study area of 500 m was chosen as it was deemed appropriate for a linear feature such as a highway and is considered sufficient to assess any impact to receptors from the proposed development. A plan of the study area is provided in Figures 10.1 and 10.2 in Volume 3.

10.2.2 For the purposes of this assessment, the identified potential sources, pathways, and receptors have been split into those within the Scheme and those within the wider study area outside of the Scheme. As such, ‘on site’ within this chapter refers to the extent of the Scheme within the DCO boundary and off site refers to locations within the study area but not within the extent of the DCO boundary.

10.3 Consultation

10.3.1 Consultations with the relevant statutory authorities (notably the Environment Agency Local Authorities, Mineral Planning Authority have commenced or are planned. Each relevant body will be consulted separately to discuss specific information, issues and concerns.

10.3.2 An initial meeting with the Environment Agency to discuss the scope of their input regarding the Scheme was carried out on the 28 June 2017 and a further meeting was held on 21 December 2017.

10.3.3 In addition, the Environment Agency will be consulted prior to undertaking the proposed ground investigation and following the development of relevant risk assessments to agree the most appropriate construction method to protect controlled waters.

10.3.4 Consultation with Natural England in relation to BMV land is not deemed necessary as the land affected by the Scheme is not considered to be of BMV quality.

10.4 Baseline conditions

10.4.1 This section provides a summary of the baseline soil and geology characteristics of the site and study area. Water features are further considered in Chapter 8 – Road Drainage and the Water Environment.

Current Site Setting

10.4.2 A description of the Scheme extent and study area is provided in section 2.4.

On site

10.4.3 Most of the on-site section of the assessment area is within and adjacent to the highway boundaries of the M25 (aligned north-west to south-east) and A3 (aligned north-east to south-west) but also includes various side roads and adjacent land.

10.4.4 The Scheme crosses a north-east/south-west trending rail line.

Off site

10.4.5 The wider study area comprises open space, agricultural fields and some mixed development including residential and commercial land uses.

10.4.6 A number of farms are present within the study area.

10.4.7 Individual and groups of residential properties are present within the study area with larger residential areas of Byfleet, West Byfleet, Cobham and Ripley nearby.

10.4.8 A variety of commercial activities are undertaken within the study area.

10.4.9 The River Mole lies to the east of the A3 between the M25 Junction 10/A3 Wisley Interchange and Painshill Junction, and north of the M25 between the M25 Junction 10/A3 Wisley Interchange and the eastern extent of the Scheme. It passes underneath the A3 north of Painshill Junction, and the A245 east of Painshill Junction. Three tributaries of the River Mole also cross the M25 immediately to the east of Ockham Lane, Hatchford Manor and Cobham Services respectively. Stratford Brook passes beneath the A3 at Ockham Park

Junction. The River Wey is located west of the A3, and crosses the M25 to the west of the Scheme. Other surface water features are present within the Scheme extents and illustrated in Figure 10.2 in Volume 3, including Bolder Mere lake, a pond at Pond Farm, Chatley Wood Pond, Manor Pond and The Lake.

Topography

10.4.10 Topography within the Scheme extents ranges from 25 m to 50 m above Ordnance Datum (aOD). Topographical highs of 50 m aOD are observed on the A3 adjacent to the Gothic Tower, and topographical lows of 25 m aOD are observed at Ockham Park Junction on the A3.

10.4.11 No significant topographical features were identified within the Scheme or the surrounding area. A topographical map of area is provided as Figure 10.3 in Volume 3.

Site History

10.4.12 Atkins undertook a review of historical maps and other historical land use information during earlier stages of the project [34 and 35]. A summary of the findings of the Envirocheck report [36] dated from 1871 to 2016 is detailed below. It should be noted that locations of any military camps, strategic sites or security sites were either removed or replaced by fake fields or clouds between 1878 and 1981. Therefore, these features, typically associated with the presence of UXO, are generally not available on publically sourced aerial photographs.

On site

10.4.13 The earliest available maps (1871-1872) show the study area to contain an unnamed road mapped in a generally south-west to north-east orientation in the same location as the existing A3, between the existing Ockham Park Junction and Painshill Junction only. The A3 aligned road terminates 2 km north-east of the present day M25 Junction 10/A3 Wisley Interchange at the existing Painshill Junction. Road alignments within the Scheme extents remain largely unchanged between 1871 and 1989, however the A3 aligned unnamed road is mapped as Portsmouth Road on the 1972 to 1974 maps.

10.4.14 The 1896-1897 map shows a railway running (similar to present-day alignment) north-east to south-west. at the south-eastern extent of the M25 within the Scheme.

10.4.15 Between 1989 to 1992 the M25 and M25 Junction 10/A3 Wisley Interchange have been constructed. Painshill Junction has been developed to its current configuration 2 km north-east of the existing M25 Junction 10/A3 Wisley Interchange. The M25, A3 and A245 within the vicinity of the site are mapped as per their current configuration. Significant earthworks have been carried out to accommodate the new road construction. Overbridges connecting various tracks, paths and roads within the surrounding woodland and heathland are mapped over the M25 and A3, 1.2 km west, 600 m west, 400 m south, 1.6 km south-west, and 1.2 km south-east of the current M25 Junction 10/A3 Wisley Interchange[37].

[34] Atkins (2016) Road Investment Strategy M25 J10/A3 Wisley Interchange Improvements Environmental Study Report. Rev.2.0
[35] Atkins (2017) Road Investment Strategy M25 J10/A3 Wisley Interchange Improvements Environmental Assessment Report. Rev.2.0
[36] Landmark Information Group (2017) Site specific Envirocheck report. Purchased 5 Dec 2017.
[37] Environment Agency (2017a) What's In Your Backyard (WIYBY) Interactive Map Viewer (Online). Accessed from http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e on 08 Mar 2017.

Off site

10.4.16 The 1871 to 1872 mapping shows the wider study area to comprise large areas of woodland, heathland, rough pasture and intersecting small tracks. Small residential developments are mapped within close proximity to the Scheme including: Foxwarren, Elm Corner and Street Cobham.

10.4.17 There are several historical farms located within the study area from 1871 to present.

10.4.18 In the 1914 to 1920 maps a sewage works is mapped adjacent to the gasworks at Street Cobham, 2.3 km north-east of the existing M25 Junction 10/A3 Wisley Interchange. A tank and a well are mapped immediately west of the sewage works. By 1931 the gasworks near Street Cobham is no longer present.

10.4.19 Expansion of urban area around Byfleet is shown between 1934 and 1935.

10.4.20 Byfleet and Pyrford Sewage Works is mapped from 1939 to present, at Muddy Lane, west of the M25 Junction 10/A3 Wisley Interchange and south of the M25.

10.4.21 In 1964 Wisley Airfield and four associated structures, assumed to be aircraft hangers (three within the north and one within the south), were present east of the existing Ockham Park Junction.

10.4.22 Expansion of urban area around Byfleet is shown to extend into the study area between 1973 and 1977.

10.4.23 In 1977 Wisley Airfield is labelled as disused. A pipeline and an electrical substation is mapped within Wisley Airfield 200 m and 500 m south-east of the existing A3, respectively in the 1975 to 1977 maps. However, in the 1989 to 1992 maps, the pipeline, electrical substation and three associated structures within the disused Wisley Airfield are no longer mapped. The fourth associated structure in the south of the disused Wisley Airfield is no longer present in the 1999 map.

Unexploded Ordnance (UXO)

10.4.24 A UXO Pre-Desk Study Assessment (PDSA)[38] has been carried out by Zetica. The PDSA identified that at least two World War II bombs and several other bombs have fallen in close proximity to the study area. The former (now disused) military airfield Wisley Airfield is located to the east of the A3.

10.4.25 In addition, the Zetica unexploded bomb risk map classifies the Scheme extents as holding a low to moderate risk of encountering unexploded bombs[39].

10.4.26 Historic England's PastScape database[40] and Airfields of Britain Conservation Trust Airfield Finder[41] also recorded the presence of a Second World War bombing decoy site at Wisley (Civil Bombing Decoy C41A). The full extent of this decoy site is not currently known but it was located approximately 750 m north-west of Ockham Park Junction.

[38] Zetica (n.d.) Regional Unexploded Bomb Risk Map – Surrey. Obtained from http://www.zetica.com/uxb_downloads.htm
[39] Zetica. (2017a). Preliminary Risk Assessment (Online). http://zeticauxo.com/risk-assessment/preliminary-risk-assessment/. Accessed on 08 February 2017.
[40] Historic England. (2017b). PastScape (Online), http://www.pastscape.org.uk, 2017. Accessed 31 January 2017.
[41] Airfields of Britain Conservation Trust (2017) Airfield Finder (Online), http://www.abct.org.uk/airfields/airfield-finder/, Accessed 6 December 2017.

Geology

Historical exploratory hole records

10.4.27 Approxmatly 500 No. historical exploratory hole records are known to be located within the Scheme extents, with a high density around the existing M25 Junction J10/A3 Interchange. The historical exploratory hole records from the BGS Borehole Scans, HAGDMS reports and BGS mapping have been used to to summarise the anticipated geological sequence present within the study area.

Structural geology

10.4.28 The Scheme is located within the London Basin, with the north-east to south-west trending axial trace of the London Basin Syncline located approximately within 10 km to the north of the M25 Junction 10/A3 Wisley Interchange[42].

10.4.29 Information taken from the BGS GeoIndex[43] suggests the closest inferred faulting to the Scheme is 12 km to the south-west in Guilford. However, Royse et al.[42] suggest faulting is more extensive than shown on previous BGS data and maps, and that the London Basin bedrock is more structurally complex than originally thought; this theory is now widely accepted within the UK. This should be taken into consideration when determining if faulting is present at in the area around the Scheme and during ground investigation and construction.

Artificial deposits

10.4.30 Although not indicated on the geological maps[44], Made Ground is expected to be present associated with the original construction of the M25, A3, A245 Byfleet Road, local access roads, RHS Garden Wisley, Wisley Airfield, San Dominico site, Feltonfleet School. Landfill material and waste associated with the original construction or widening of the M25 and A3 may be expected at land east of Buxton Wood, land at Pond Farm, and Old Rectory Farm historical landfill sites[45]. This is further supported by the evidence that Balfour Beatty is the environmental permit holder for land east of Buxton Wood and land at pond farm landfills, and that the deposited waste is recorded as inert waste.

10.4.31 The sources of Made Ground/infill materials are unknown and it is therefore considered that contamination may be encountered within these materials.

10.4.32 In addition to the historical maps in the Envirocheck reports[36], the Envirocheck datasheets have confirmed potentially infilled land at four locations and infilled water bodies were identified at ten locations within the study area.

Superficial deposits

10.4.33 Superficial deposits are not expected over the majority of the M25 and A3 carriageways in the Scheme extents, however Head, Alluvium, River Terrace Deposits (undifferentiated), Kempton Park Gravel Member, Taplow Gravel Member and Lynch Hill Gravel Member are anticipated to cover the M25

[42] Royse, K.R., de Freitas, M., Burgess, W.G., Cosgrove, J., Ghail, R.C., Gibbard, P., King, C., Lawrence, U., Mortimore, R.N., Owen, H., Skipper, J. (2012) Geology of London, UK. Proceedings of the Geologists' Association. doi:10.1016/j.pgeola.2011.07.005
[43] British Geological Survey (BGS) (2017a) Onshore GeoIndex (Online). Accessed from http://mapapps2.bgs.ac.uk/geoindex/home.html on 21 Mar 2013.
[44] BGS. (2017b). Geology of Britain Viewer (Online). http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html. Accessed on 21 March 2017.
[45] WSP (2014). Wisley Airfield: Environmental Interpretative Report, Wisley Property Investments Limited, June 27, 2014.

carriageway in the far north-western and western extents of the Scheme and parts of the A3 in the northern extent at Painshill Junction and southern extent at Ockham Park Junction[36].

Bedrock geology

10.4.34 The bedrock geology is anticipated to comprise the Bagshot Formation, Claygate Member and London Clay Formation. The Bagshot Formation, and underlying thin band of Claygate Member, is anticipated to underlie the majority of the Scheme. London Clay Formaiton subcrops./outcrops beneath the superficial deposits at Ockham Junction and in the eastern extent of the Scheme. The London Clay Formation underlies the Claygate Member.

Soils

10.4.35 There is no detailed published soil map of the land around the Scheme. The only available map is the 1:250,000 soil map of South East England published by the Soil Survey of England and Wales in 1983.

10.4.36 The majority of the Scheme is comprised of grazed heathland and meadow, underlain by the Holidays Hill association of acid and infertile sandy soils with a high water table caused by a clay subsoil. Surface horizons are peaty where the soils are under heath.

10.4.37 The site compound to the west of the A3 at Ockham Junction is on the Hucklesbrook association of well drained sandy and light loamy soils over gravel.

Mining activity and quarrying

10.4.38 Based upon a review of the Coal Authority Interactive Map viewer[46] and Non-coal Mining Plans[46] the Scheme is located in an area that is not affected by mining. However the the BGS Mineral Resources Map[47] identifies that the Scheme is situated within sand and gravel mineral resource zones (sub-alluvial inferred resources and River Terrace Deposits) associated with the River Wey and River Mole.

10.4.39 Six mineral workings are recorded within the study area[36] , four of the mineral sites are associated with infilled land. A further ten infilled ponds have been identified in the study area, potentially associated with historial mineral workings (refer to Figure 10.1 in Volume 3 for Locations). The recordered mineral workings are summarised below:

- Ockham Common Sand Pit (mapped as Sand Pit Hill throughout the historical maps), located immediately east of the present day A3, 200 m south of the M25 Junction 10/A3 Wisley Interchange;
- Trotlands Brick Field, to the south of the M25 and east of Ockham Lane;
- Red Hill Gravel Pit, mapped to the north west of the M25 Junction 10/A3 Wisley Interchange;

[46] BGS (2017c) Coal Authority Interactive Map (Online), http://mapapps2.bgs.ac.uk/coalauthority/home.html, 2017e. Accessed 21 March 2017
[47] Bloodworth, A.J., Cameron, D.G., Lott, G.K., Evans, D.J., Wood, S.E, Simpson, C., Highley, D.E., 2003. Mineral Resource Information in Support of National, Regional and Local Planning: Surrey (comprising Surry and the London Boroughs of Croydon, Hounslow, Kingston upon Thames, Richmond upon Thames and Sutton), BGS Commissioned Report CR/03/073N, 2003

- Two Red Hill Sand Pit, located north-east of M25 Junction 10/A3 Wisley Interchange; and
- Sandway Sand Pit, located to the north of the M25 near the western extent of the study area.

10.4.40 The Elmbridge Borough Council Planning Policy Map[48] identifies one mineral safeguard zone on site, located south-east of the M25 Junction 10/A3 Wisley Interchange within replacement land. Further, two mineral safeguard zones are present within the study area.

Ground Stability Hazards

10.4.41 The potential for ground stability hazards within the Scheme extents, as taken from the 1:50,000 ground stability data provided within the Envirocheck report[36], and preseted in Figure 10.2 In Volume 3 are as follows:

- Compressible ground: Moderate where Alluvium is anticipated, and very low where landfill material and Made Ground are anticipated;
- Collapsible ground: Very low throughout the Scheme;
- Landslide: Low adjacent to the River Mole approx. 1 km north-east of the M25 Junction 10/A3 Wisley Interchange, and very low throughout the remainder of the Scheme;
- Running sands: Low where Alluvium and Bagshot Formation are anticipated, and very low where Kempton Park Gravel Member and Lynch Hill Gravel Member are anticipated;
- Shrinking or swelling clay: Low where London Clay Formation is anticipated at or near the bedrock surface, and very low where Alluvium is anticipated; and
- The mineral resource areas may be at risk from unrecorded worked areas such as quarries and pits.

10.4.42 A preliminary engineering assessment has identified the following potential ground stability risks associated with the Scheme:

- Stability of earthworks due to groundwater ingress;
- Compressible and low strength material such as Made Ground, Infilled Ground, Head and Alluvium deposits as well as cohesive elements of superficial deposits may cause settlement after construction. Compressible land may require excavation and replacement, or use of foundations, depending on loading;
- Weathering, fissuring and fracturing of bedrock is likely to reduce its strength;
- Made Ground or Infilled Ground may not have been adequately compacted during construction and may be at risk of collapsing;
- The risk of landslides can be increased by removing of the toe or increasing the load at the crest of existing embankments. Construction works within Claygate Member and London Clay Formation have the potential to activate

[48] Elmbridge Borough Council, Planning Policy Map, accessed 22/11/2017 http://emaps.elmbridge.gov.uk/ebc_simple.aspx?requesttype=parseTemplate&template=PlanningPolicy.tmplt

pre-existing share surfaces, or where slopes are not adequality battered, create new slip surfaces; and

- The Claygate Member and London Clay Formation are susceptible to shrink-swell, volume changes may cause differential settlement.

Chemical Attack on Concrete

10.4.43 Made Ground, Alluvium, Claygate Member and London Clay Formation are expected to have elevated concentrations of pyrite, sulphate and sulphides which can have detrimental impacts on concrete structures. Chemical testing will therefore be included in the ground investigation scope and an assessment of the aggressivity of the ground and groundwater conditions will be undertaken, in accordance with BRE Special Digest 1[49].

Hydrogeology

Aquifer Designations

10.4.44 The Environment Agency[37] aquifer designations for superficial deposits and bedrock formations are presented in Table 10.1.

Table 10.1: Aquifer Designations

Unit	BGS (2017b) Designation	Environment Agency (2016) Designation
Head	Variable	No designation/Unproductive Strata
Alluvium	Variable	Secondary A - Superficial
River Terrace Deposits (Undifferentiated)	Variable	Secondary A - Superficial
Kempton Park Gravel Member	Variable	Principal - Superficial
Taplow Gravel Member	Variable	Principal - Superficial
Lynch Hill Gravel Member	Variable	Secondary A - Superficial
Bagshot Formation	Moderately productive aquifer	Secondary A - Bedrock
Claygate Member	Rock with essentially no groundwater	Secondary A - Bedrock
London Clay Formation	Rock with essentially no groundwater	No designation/Unproductive Strata

Notes
Principal Aquifer (superficial and bedrock): “these are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale. In most cases, principal aquifers are aquifers previously designated as major aquifer”.
Secondary A Aquifer (superficial and bedrock): “permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers”.
Unproductive Strata: “rock layers or drift deposits with low permeability that have negligible significance for water supply or river base flow”.

[49] British Research Establishment (BRE). (2005). Special Digest 1:2005 Concrete in aggressive ground, third edition. BRE Bookshop, Watford, United Kingdom.

Groundwater

10.4.45 Groundwater information within the Scheme extents is limited. The available groundwater level information from the Highways Agency Geotechnical Data Management System (HAGDMS) is recorded to be as follows:

- Groundwater strike recorded at 9.5 m bgl at Ockham Common in the Bagshot Formation[50]; and
- Groundwater strike recorded at 8.5 m bgl on the southbound side of the A3 at Painshill Park in the Bagshot Formation[50].

10.4.46 Further information on groundwater strikes has been collected from publicly available exploratory hole records[50].The data collected identifies a wide range of groundwater strike depths, recorded to be between 0.8 m bgl to 13 m bgl. All of the strikes recorded are in the granular superficial deposits, River Terrace, Deposits, or the sand layers of the Bagshot Formation.

10.4.47 The site is not subject to tidal influence.

Groundwater Abstraction

10.4.48 A number of abstraction licences are listed within the study area further information is presented in Chapter 8 – Road Drainage and the Water Environment.

Source Protection Zones

10.4.49 According to the Environment Agency[37], no Groundwater SPZs are located within 500 m of the Scheme.

Groundwater Vulnerability Zones

10.4.50 Groundwater Vulnerability Zones (GVZs), are classified by the Environment Agency[37]. The Environment Agency are in the process of updating their guidance with regard to GVZs, however, they are currently allocated as follows:

- Major Aquifer High - A3; at northern extent of the Scheme, north of Painshill Junction. M25; at western extent of the Scheme;
- Major Aquifer Intermediate – M25; at the north-western Scheme extent, at Painshill Junction;
- Minor Aquifer High - A3; from Ockham Park Junction to the Bolder Mere lake. M25; intermittently east and west of the M25 Junction 10/A3 Wisley Interchange;
- Minor Aquifer Intermediate - A3; from the Bolder Mere lake to Painshill Junction. M25; intermittently east and west of the M25 Junction 10/A3 Wisley Interchange; and
- Minor Aquifer Low – M25; at the south-eastern Scheme extent, in the locality of Ockham Lane.

10.4.51 Potential flooding from groundwater is further discussed in Chapter 8 – Road Drainage and the Water Environment.

[50] Balfour Beatty Civil Engineering Ltd. (1995). M25 Widening Junction 8 – 10, Maintenance Manual, Supplementary Site Investigation. Report 7958/1. HAGDMS report 12666.

Hydrology

Surface water

10.4.52 A number of surface water courses are located within the study area and cross the M25 and A3, the main surface water bodies are listed below, for further details refer to Section 8 Road Drainage and the Water Environment:

- The River Mole crosses the A3 north Painshill Junction;
- Stratford Brook passes beneath the Ockham Park Junction on the A3;
- Guileshill Brook crosses the A3 south of Ockham Park Junction;
- The River Wey crosses the M25 to the west of the Scheme;
- Bolder Mere (lake), situated in the nature reserve at Ockham Common to the south-west of the M25 Junction 10/A3 Wisley Interchange;
- Pond Farm, situated to the south-west of the M25 Junction 10/A3 Wisley Interchange;
- Chatley Wood (pond), situated to the south east of the M25 Junction 10/A3 Wisley Interchange;
- Manor Pond, situated adjacent to Byfleet Road, to the north-east of the M25 Junction 10/A3 Wisley Interchange; and
- The Lake, situated adjacent to Painshill Park, north-east of the M25 Junction 10/A3 Wisley Interchange.

Surface water abstractions

10.4.53 A review of the Envirocheck Report[36] has identified several surface water abstractions within the study area. These are discussed in Chapter 8 – Road Drainage and the Water Environment.

Ecology

10.4.54 A number of ecologically important sites are located within the study area these include Thames Basin Heath SPA, Ockham Common and Wisley Common SSSIs, Ockham and Wisley LNRs and Ancient Woodland, refer to Chapter 7 Biodiversity for further information.

Land contamination

Landfill and waste management sites

10.4.55 The Environment Agency[37] 'What's In Your Backyard' website and Envirocheck report[36] identify nine historical landfill sites within the study area. No authorised (active) landfill sites are located within the study area for the Scheme. A summary of the identified records is presented in Table 10.2.

Table 10.2: Historical landfill sites within 500 m of the Scheme

Name	Licence Holder	Waste Importedl	Received waste
On site			
Old Rectory Farm	Unknown	Unknown	Not Supplied
Land at East of Buxton Wood	Balfour Beatty Construction Limited	31 Dec 1981 to 31 Dec 1984	Deposited Waste included Inert Waste
Off site			
Cobham Bridge	Steven Lucas	31 Dec 1986 to 18 Aug 1987	Deposited Waste included Inert Waste
Land at Pond Farm	Balfour Beatty	31 Dec 1981 to 31 Dec 1982	Deposited Waste included Inert Waste
Pointers Farm	Balfour Beatty Construction Limited	30 Sep 1981 to 31 Dec 1983	Deposited Waste included Inert Waste
New Barn East	Balfour Beatty	31 Dec 1996 to 31 Dec 1996	Deposited Waste included Inert Waste
Chatley Farm	Balfour Beatty Construction Limited	31 July 1982 to 31 Dec 1983	Deposited Waste included Inert Waste
Silvermere Pet Cemetery	Mrs Pamela Ann Thompson	Unknown	Not Supplied
Dunsborough Farm	Unknown	31 Oct 1973 to 9 Jan 1975	Inert

Industrial and other potentially contaminative land uses

10.4.56 A wide variety of commercial activities and landuses are undertaken within the wider study area. Some potentially contaminative activities include: vehicle service garages, fuelling stations, waste disposal, sewage treatment, handling and transport services, clay brick and tile manufacture, rubber and plastic manufacturing, foam product suppliers, railway line, gas manufacture and distribution, electrical production and distribution and french polishing services.

10.4.57 A list of trade directory entries (both active and inactive) and potential contaminative land uses within the study area is presented in Volume 2 Appendix F.3 which involve or have involved potentially contaminative activities.

Pollution Incidents

10.4.58 The Envirocheck[36] report details that there has been a total of 20 pollution incidents within the study area. Three of these incidents are located on-site.

10.4.59 A summary of the incidents is provided in Table 10.3.

Table 10.3: Pollution incidents to controlled waters

Class	Severity	Pollutant	Comments	Date
On-Site				
Pollution Incident: Sewage Pollutants	Category 3 - Minor Incident	Unknown Sewage		14/12/1998

Class	Severity	Pollutant	Comments	Date
Pollution Incident: Miscellaneous Pollutants	Category 3 - Minor Incident	Miscellaneous - Unknown	Confirmed as a pollution incident	26/08/1993
Pollution Incident: Oil Pollutants	Category 3 - Minor Incident	Oils - Unknown	No pollution found	03/09/1998
Off-site				
Pollution Incident: Chemical Pollutants	Category 3 - Minor Incident	Chemicals - Unknown	Confirmed as a pollution incident	17/06/1990
Pollution Incident: Agricultural (General) Pollutants	Category 3 - Minor Incident	Agricultural: General	Confirmed as a pollution incident	12/03/1990
Pollution Incident: Oil Pollutants	Category 3 - Minor Incident	Oils - Unknown	Confirmed as a pollution incident	15/02/1991
Pollution Incident: Sewage Pollutants	Category 3 - Minor Incident	Unknown Sewage	Confirmed as a pollution incident	08/05/1993
Pollution Incident: Oil Pollutants	Category 3 - Minor Incident	Oils - Unknown	Confirmed as a pollution incident	01/09/1994
Pollution Incident: Oil Pollutants	Category 3 - Minor Incident	Oils - Unknown	Confirmed as a pollution incident	31/10/1994
Pollution Incident: Miscellaneous Pollutants	Category 3 - Minor Incident	Miscellaneous - Unknown	Yes	04/11/1994
Pollution Incident: Chemical Pollutants	Category 3 - Minor Incident	Chemicals - Unknown	Confirmed as a pollution incident	06/11/1995
Pollution Incident: Oil Pollutants	Category 3 - Minor Incident	Oils - Unknown		21/08/1996
Pollution Incident: Oil Pollutants	Category 3 - Minor Incident	Oils - Unknown		24/05/1996
Pollution Incident: Oil Pollutants	Category 3 - Minor Incident	Oils - Unknown		18/03/1996
Pollution Incident: Miscellaneous Pollutants	Category 3 - Minor Incident	Miscellaneous - Natural		25/09/1997
Pollution Incident: Oil Pollutants	Category 3 - Minor Incident	Oils - Unknown		30/04/1997
Pollution Incident: Miscellaneous Pollutants	Category 2 - Significant Incident	Unknown		03/06/1997
Pollution Incident: Sewage Pollutants	Category 3 - Minor Incident	Unknown Sewage		09/03/1997
Pollution Incident: Miscellaneous Pollutants	Category 3 - Minor Incident	General	No pollution found	22/04/1998

Class	Severity	Pollutant	Comments	Date
Pollution Incident: Miscellaneous Pollutants	Category 3 - Minor Incident	Miscellaneous - Unknown		

Potential sources of contamination

10.4.60 In addition to activities associated with the construction and maintenance of the M25, A3, A245 and local access roads, other potentially contaminative current and historical activities in the study area were identified in the Envirocheck[2], and historical reports.

10.4.61 Nine historical landfills were located within the study area, with Old Rectory Farm and the unnamed landfill referred to as Land at East of Buxton Wood present on site. Other sources of potential contamination include the presence of Made Ground associated with the construction of the M25 and A3 carriageways, A245 Byfleet Road, local access roads, the construction of Wisley Airfield and Battleston Hill, RHS Garden Wisley, San Dominico site, Feltonfleet School and with the infilling of ponds, gravel and sand pits. The Made Ground is of unknown provenance and therefore contamination may be encountered within and in proximity to these materials.

10.4.62 Landfills and Made Ground pose a number of potential risks including the generation of ground gas (which may accumulate in confined spaces), and leachate generation and contamination of groundwater with potential migration to surface water via groundwater.

10.4.63 Potentially contaminative land uses (current and historical) within the study area include: vehicle service garages, fuelling stations, waste disposal, sewage treatment, handling and transport services, clay brick and tile manufacture, rubber and plastic manufacturing foam product suppliers, railway line, gas manufacture and distribution, electrical production and distribution and french polishing service.

10.4.64 The Envirocheck[36] report details that there has been a total of 20 pollution incidents within the study area. Three of these incidents are located on-site.

10.4.65 Insufficient historical contamination testing is available to characterise the site. Two soil samples from the north-eastern extent of the site have been screened against generic assessment criteria. Results show concentrations of polyaromatic hydrocarbons (PAHs) and chromium to pose a risk to human health. These contaminants will therefore be tested as part of further ground investigation.

10.4.66 Potential contaminants of concern which are associated with identified land uses include the following:

- inorganics (including metals, ammonia, nitrates, sulphur and cyanide);
- organics (including benzene, toluene, ethylbenzene and xylene, phenols, polyaromatic hydrocarbons, chlorinated solvents and polychlorinated biphenyls);
- pesticides; and
- asbestos.

Potential receptors

10.4.67 Potential contamination receptors have been categorised relating to human health, controlled waters and structural receptors within the study area. The receptors identified as part of the baseline assessment relate to the current use of the study area only.

10.4.68 Potential human health receptors include:

- on-site construction workers and site workers;
- on-site and off-site members of the public using public rights of way (non-motorised users);
- off-site local residents;
- off-site school children and staff (Feltonfleet school); and
- off-site workers and visitors commercial premises and recreational facilities.

10.4.69 It is considered that exposure to members of the public using the highways from potential sources of contamination will be of limited frequency and duration. As such, they have not been considered further as receptors in identified PCLs.

10.4.70 Potential controlled waters receptors include:

- Migration of dissolved contaminants from a source to the superficial Secondary A and superficial Principal Aquifers to the west, east and south of the junction and the bedrock Secondary A Aquifer beneath the majority of the proposed works; and
- Surface water, which include Stratford Brook, River Mole, River Wey, Bolder Mere, Pond Farm Pond, Manor Pond, drains, ditches and ponds.

10.4.71 Potential ecological receptors include:

- Thames Basin Heath SPA;
- Ockham Common and Wisley Common SSSI;
- Ockham and Wisley LNR; and
- Ancient Woodland.

10.4.72 Potential structural receptors include:

- piles and foundations;
- underground services;
- off-site property (including residential, commercial and industrial); and
- off-site historic features (Roman and listed buildings).

Potential pathways

10.4.73 Subject to the findings of the ground investigation and based on the identified potential sources (paragraph 10.4.60) and human receptors (paragraph 10.4.67), plausible exposure pathways for the identified human health receptors may include but are not limited to:

- Inhalation, ingestion and dermal contact with contaminants in soil and soil-derived dust/fibres;

- Inhalation, ingestion and dermal contact with contaminants within perched water and shallow groundwater;
- Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion; and
- Inhalation of vapours.

10.4.74 Again, subject to the findings of the ground investigation, potential pathways to the identified controlled waters receptors may include but are not limited to:

- Leaching/vertical migration of contaminants in soils to underlying groundwater;
- Vertical migration of contaminants via preferential pathways such as via piles to deeper groundwater;
- Lateral migration of contamination in groundwater;
- Migration of contaminants entrained in surface water run-off; and
- Migration of contamination via surface waters.

10.4.75 Further to the above, it should be noted that lateral migration of contamination in groundwater may be exacerbated as a result of any dewatering processes should they be implemented.

10.4.76 Potential pathways to the identified structural receptors include but are not limited to:

- Chemical attack from aggressive chemical constituents in soil or groundwater; and
- Migration of ground gases or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points.

10.5 Potential Impacts

Proposed Development

10.5.1 The proposed development comprises works to improve the M25 Junction 10/A3 Wisley Interchange and widen the M25 and A3 carriageways, as well as construction of new access roads and the improvement of existing ones. It is envisaged that, with to respect to intrusive ground works, this work will comprise, but not be limited to, piling, cuttings, temporary stock piling and the construction of embankments, retaining walls, underpasses, soakaways and attenuation ponds.

Stage 1: Land Contamination Risk Assessment

10.5.2 A desk study review of available documentary information has been undertaken to develop a Preliminary Conceptual Site Model (PCSM). In order to inform the Stage 2 land contamination impact assessment, the PCLs and assessed risks have been identified for each development phase.

10.5.3 Details of the construction methods are not yet available but the construction phase will potentially introduce new sources of contamination and disturb and mobilise existing sources of contamination. Construction activities may also

introduce new pathways for migration of existing contamination such as excavation and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off, groundwater and ground gas. The following construction phase activities may contribute to the creation of new PCLs:

- Potential introduction of new sources of contamination associated with the accidental loss/spillage of fuels and oils;
- Potential disturbance and mobilisation of existing sources of contamination;
- Introduction of additional receptors on site including construction workers, future site workers and foundations;
- Creation of confined spaces, such as manholes and service chambers/ducts, within which ground gas has the potential to accumulate;
- New piling or excavation during construction could create new pathways between any contaminated soils and the underlying groundwater; and
- Any dewatering activities have the potential to mobilise contaminated groundwater and enhance lateral migration of contamination within the superficial and bedrock aquifers and potentially into surface watercourses.

10.5.4 During the operational phase, it is anticipated that no new pathways will be created however accidents/incidents have the potential to introduce new sources. It is anticipated that an Construction Environmental Management Plan (CEMP) for the Scheme will address how these incidents will be managed and detail the emergency management procedures to be implemented in such an event.

10.5.5 As PCLs have been identified, there is a theoretical risk to receptors from contamination which requires further consideration and assessment. The ground investigation will be undertaken to characterise ground conditions and to provide data to inform a generic quantitative risk assessment (GQRA) and any further assessments as necessary to assess these PCLs.

10.5.6 At this stage, there has been no opportunity for an intrusive ground investigation, and historical reports lack sufficient data to inform a GQRA. The assessment undertaken for the purposes of this report, were therefore qualitative in nature.

10.5.7 The PCSM, which also presents the assessed classification of risk for each development phase, is presented in Table F.7 in Volume 2.

Stage 2: Impact Assessment

Effects Associated with Land Contamination

10.5.8 The land contamination impact assessment has been completed based on comparison of the baseline risk classification with the anticipated construction phase and the operational phase risk classifications, as assessed in Volume 2 Appendix F.1, summarised in Table F.7 in Volume 2 and discussed in paragraphs 10.5.2 to 10.5.7. This approach has enabled the changes in the risks to the identified receptors during the construction and operational phases to be captured and an assessment made of the potential impacts of the Scheme. The land contamination impact assessment is presented in Table 10.4 and summarised below.

Construction Phase

10.5.9 As noted in paragraph 10.5.3, construction phase activities may contribute to the creation of new PCLs, involving the potential introduction of new sources of contamination and potentially disturbing and mobilising existing sources of contamination. Construction activities may introduce new pathways for the migration of existing contamination, such as excavation and exposure of contaminated soil, remobilisation of contaminants through soil disturbance and the creation of preferential pathways for surface water run-off, ground gas migration pathways and the vertical migration of contamination.

10.5.10 If no mitigation measures are implemented the construction phase impacts associated with potential on-site sources have been typically assessed as *minor to moderate adverse* effects. Assessment has also identified *negligible* effects, which are typically associated with risks from potential off-site sources as these will remain unchanged in the absence of mitigation. All of the assessed effects are considered likely to be permanent. The anticipated *minor adverse or negligible* effects are considered to be *not significant*. However, the predicted *moderate* adverse effects are considered *significant*. Consequently, mitigation measures are required to reduce the assessed impacts associated the Scheme.

10.5.11 With the implementation of mitigation measures through design and through the construction phase, as set out in the CEMP, risks identified to human health, controlled waters, ecological and property receptors during construction have been assessed as very low to moderate. Compared to the existing baseline, the level of risk to receptors is expected to remain generally the same or improve due to the mitigation measures for the prevention of impacts from contamination. The effect is therefore *negligible to minor beneficial*. For the most part, the predicted effects on are considered likely to be permanent. However, subject to the findings of the ground investigation and subsequent risk assessments, some effects on controlled waters receptors could be temporary depending on the mitigation measures and/or construction methods implemented. The overall *negligible to minor beneficial* effect of the construction phase of the Scheme with the implementation of mitigation measures is considered to be *not significant*.

Operational Phase

10.5.12 The operational phase will potentially introduce new sources of contamination. Spillages and leaks may occur along the Scheme. In addition, below ground services could create additional potential pathways for the migration of potential contamination which were not present at baseline. However, it is assumed that the Scheme will be operated in accordance with the relevant regulations and best practice guidance in applying Best Available Techniques and pollution prevention.

10.5.13 With mitigation measures incorporated within the design, there will be an overall betterment of the land during the operational phase. An overall *negligible to moderate beneficial* effect is anticipated, associated with the removal/mitigation of on-site contamination sources and mitigation of off-site contamination sources, if quantitative risk assessments undertaken as part of detailed design determine this to be necessary. All effects are considered permanent. The anticipated *negligible and minor beneficial* effects are considered to be *not significant,* whilst the predicted *moderate beneficial* effects are considered *significant*.

Table 10.4: Land Contamination Impact Assessment

Source	Receptor	Pathway	Baseline	Construction Without Mitigation		Mitigation Measures	Construction with Mitigation		Operation	
			Classification of Risk	Classification of Risk	Assessed Impact		Classification of Risk	Assessed Impact	Classification of Risk	Assessed Impact
Potential contaminants in soil/ groundwater and gases/vapours associated with the following **on-site** sources: • Made Ground of unknown provenance associated with the construction of the M25, A3, A245, local access roads, Wisley Airfield and San Dominico sites. • Historical Landfills (Old Rectory Farm and Land at East of Buxton Wood) • Pollution incidents (notably oils and chemicals). • Potentially contaminative activities associated with the former Wisley Airfield. • Agricultural activities within the DCO boundary. (*Potential contaminants of concern include a range of inorganic and organic contaminants including heavy metals, hydrocarbons, fuels/ oil, Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), solvents, asbestos, Polychlorinated Biphenyls (PCBs), herbicides and pesticides*).	Human Health (on-site) Construction workers and site workers	Inhalation, ingestion and dermal contact with contaminants in soil and soil-derived dust/fibres	Moderate Risk	High Risk	**Minor Adverse Effect**	Ground investigation and risk assessment as necessary to define risk. Remediation/ removal of existing contamination if risk assessments deem necessary. Implementation of measures in the Construction Environmental Management Plan (CEMP) such as good management of stockpiles in accordance with DEFRA and the Environment Agency's Pollution Prevention Guidance, implementation of pollution incident control e.g. plant drip trays and spill kits. Implementation of dust management systems. RAMS to be completed prior to construction and risk management with appropriate personal protective equipment (PPE). Additional monitoring and risk assessment if required to determine mitigation measures that may need to be incorporated into design of structures and services.	Moderate/ Low Risk	**Minor beneficial effect**	Low Risk	**Moderate beneficial effect**
		Inhalation, ingestion and dermal contact with contaminants within perched water and shallow groundwater	Moderate/ Low Risk	High Risk	**Moderate Adverse Effect**		Moderate/ Low Risk	**Negligible effect**	Low Risk	**Minor beneficial effect**
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	Moderate Risk	High Risk	**Minor Adverse Effect**		Moderate Risk	**Negligible effect**	Moderate/ Low Risk	**Minor beneficial effect**
		Inhalation of vapours from soil and/or groundwater	Moderate/ Low Risk	High Risk	**Moderate Adverse Effect**		Moderate/ Low Risk	**Negligible effect**	Low Risk	**Minor beneficial effect**
	Human Health (on-site) Members of the public using public rights of way (non-motorised users)	Inhalation, ingestion and dermal contact with contaminants in soil and soil-derived dust/fibres	Moderate Risk	Receptor not present on-site during construction phase		-	Receptor not present on-site during construction phase		Low Risk	**Moderate beneficial effect**
		Ingestion and dermal contact with contaminants within perched water and shallow groundwater	Low Risk						Low Risk	**Negligible effect**
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	Moderate Risk						Moderate/ Low Risk	**Minor beneficial effect**
		Inhalation of vapours from soil and/or groundwater	Moderate/ Low Risk						Low Risk	**Minor beneficial effect**
	Human Health (off-site) Local residents School children and staff (Feltonfleet School) Workers and visitors at nearby commercial premises and recreational facilities	Inhalation, ingestion and dermal contact with contaminants in windblown soil-derived dust/fibres	Moderate/ Low Risk	High Risk	**Moderate Adverse Effect**		Moderate/ Low Risk	**Negligible effect**	Low Risk	**Minor beneficial effect**
		Ingestion and dermal contact with contaminants within perched water and shallow groundwater	Moderate/ Low Risk	Moderate/ Low Risk	**Negligible effect**		Moderate/ Low Risk	**Negligible effect**	Low Risk	**Minor beneficial effect**
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	Moderate Risk	High Risk	**Minor Adverse Effect**		Moderate/ Low Risk	**Minor beneficial effect**	Moderate/ Low Risk	**Minor beneficial effect**
		Inhalation of vapours from soil and/or groundwater	Moderate/ Low Risk	Moderate Risk	**Minor Adverse Effect**		Moderate/ Low Risk	**Negligible effect**	Low Risk	**Minor beneficial effect**

Source	Receptor	Pathway	Baseline	Construction Without Mitigation		Mitigation Measures	Construction with Mitigation		Operation	
			Classification of Risk	Classification of Risk	Assessed Impact		Classification of Risk	Assessed Impact	Classification of Risk	Assessed Impact
	Members of the public using public rights of way (non-motorised users)									
	<u>Controlled Waters (on-site)</u> Groundwater (superficial Principal and Secondary A Aquifers, bedrock Secondary A Aquifer). Surface water (Stratford Brook, River Mole, Bolder Mere, Manor Pond, drains and ditches).	Leaching/ vertical migration of contaminants in soils to underlying groundwater	Moderate Risk	High Risk	**Minor Adverse Effect**	Ground investigation and risk assessment as necessary to define risk. Remediation/ removal of existing contamination if risk assessments deem necessary. Controlled Waters piling risk assessments. Dewatering risk assessment if dewatering processes are to be implemented. Implementation of measures in the CEMP such as good management of stockpiles in accordance with DEFRA and the Environment Agency's Pollution Prevention Guidance, implementation of pollution incident control e.g. plant drip trays and spill kits. Control of run off and implementation of dust management systems.	Moderate/ Low Risk	**Minor beneficial effect**	Low Risk	**Moderate beneficial effect**
		Vertical migration of contaminants via preferential pathways such as via piles to deeper groundwater	Moderate/ Low Risk	High Risk	**Moderate Adverse Effect**		Low Risk	**Minor beneficial effect**	Low Risk	**Minor beneficial effect**
		Lateral migration of contamination in groundwater	Moderate Risk	High Risk	**Minor Adverse Effect**		Moderate/ Low Risk	**Minor beneficial effect**	Low Risk	**Moderate beneficial effect**
		Migration of contaminants entrained in surface water run-off	Moderate/ Low Risk	High Risk	**Moderate Adverse Effect**		Moderate/ Low Risk	**Negligible effect**	Low Risk	**Minor beneficial effect**
		Migration of contamination via surface waters	Moderate/ Low Risk	High Risk	**Moderate Adverse Effect**		Moderate/ Low Risk	**Negligible effect**	Low Risk	**Minor beneficial effect**
	<u>Controlled Waters (off-site)</u> Groundwater (Superficial Principal and Secondary A Aquifers, bedrock Secondary A Aquifer). Surface water (Stratford Brook, River Mole, River Wey, Bolder Mere, Pond Farm Pond, Manor Pond, drains, ditches and ponds).	Leaching/ vertical migration of contaminants in soils to underlying groundwater	Moderate Risk	High Risk	**Minor Adverse Effect**		Moderate/ Low Risk	**Minor beneficial effect**	Low Risk	**Moderate beneficial effect**
		Lateral migration of contamination in groundwater	Moderate Risk	High Risk	**Minor Adverse Effect**		Moderate/ Low Risk	**Minor beneficial effect**	Low Risk	**Moderate beneficial effect**
		Migration of contaminants entrained in surface water run-off	Moderate/ Low Risk	High Risk	**Moderate Adverse Effect**		Moderate/ Low Risk	**Negligible effect**	Low Risk	**Minor beneficial effect**
		Migration of contamination via surface waters	Moderate Risk	High Risk	**Minor Adverse Effect**		Moderate/ Low Risk	**Minor beneficial effect**	Low Risk	**Moderate beneficial effect**
	<u>Ecology</u> Thames Basin Heath SPA,	Lateral migration of contamination in shallow groundwater	Moderate Risk	High Risk	**Minor Adverse Effect**	Ground investigation and risk assessment as necessary to define risk.	Moderate/ Low Risk	**Minor beneficial effect**	Low Risk	**Moderate beneficial effect**

Source	Receptor	Pathway	Baseline	Construction Without Mitigation		Mitigation Measures	Construction with Mitigation		Operation	
			Classification of Risk	Classification of Risk	Assessed Impact		Classification of Risk	Assessed Impact	Classification of Risk	Assessed Impact
	Ockham Common and Wisley Common SSSI, Ockham and Wisley LNR and Ancient Woodland.	Migration of contaminants entrained in surface water run-off	Moderate/ Low Risk	High Risk	**Moderate Adverse Effect**	Remediation/ removal of existing contamination if risk assessments deem necessary. Dewatering risk assessment if dewatering processes are to be implemented. Implementation of measures in the CEMP such as good management of stockpiles in accordance with DEFRA and the Environment Agency's Pollution Prevention Guidance, implementation of pollution incident control e.g. plant drip trays and spill kits. Control of run off and implementation of dust management systems.	Moderate/ Low Risk	**Negligible effect**	Low Risk	**Minor beneficial effect**
	Property (on-site) Piles and other foundations Underground services.	Chemical attack from aggressive chemical constituents in soil or groundwater	Low Risk	Moderate Risk	**Moderate Adverse Effect**	Ground investigation and risk assessment as necessary to define risks. Remediation/ removal of existing contamination if risk assessments deem necessary. Appropriate assessment and design of services resistant to chemical attack if risk assessments deem necessary. Additional monitoring and risk assessment if required to determine mitigation measures that may need to be incorporated into design of structures and services.	Very Low Risk	**Minor beneficial effect**	Very Low Risk	**Minor beneficial effect**
		Migration of ground gases or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	Moderate Risk	High Risk	**Minor Adverse Effect**		Moderate Risk	**Negligible effect**	Moderate/ Low Risk	**Minor beneficial effect**
	Property (off-site) Residential, commercial and industrial properties Underground services Historic features (Roman and listed buildings)	Chemical attack from aggressive chemical constituents in soil or groundwater	Low Risk	Moderate Risk	**Moderate Adverse Effect**		Low Risk	**Negligible effect**	Very Low Risk	**Minor beneficial effect**
		Migration of ground gases or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	Moderate Risk	High Risk	**Minor Adverse Effect**		Moderate Risk	**Negligible effect**	Moderate/ Low Risk	**Minor beneficial effect**
Potential contaminants in soil/groundwater and gases/vapours associated with the following **off-site** sources: • Made Ground of unknown provenance associated with the construction of local roads, Wisley Airfield, Battleston	Human Health (on-site) Construction workers and site workers	Inhalation, ingestion and dermal contact with contaminants in windblown soil-derived dust/fibres	Moderate/ Low Risk	Moderate Risk	**Minor Adverse Effect**	Ground investigation and risk assessment as necessary to define risks. RAMS to be completed prior to construction and risk management with appropriate personal protective equipment (PPE). Additional monitoring and risk assessment if required to determine mitigation measures that may need to be incorporated into design of structures and services.	Moderate/ Low Risk	**Negligible effect**	Moderate/ Low Risk	**Negligible effect**
		Ingestion and dermal contact with contaminants within perched water and shallow groundwater	Moderate/ Low Risk	Moderate/ Low Risk	**Negligible effect**		Moderate/ Low Risk	**Negligible effect**	Low Risk	**Minor beneficial effect**
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	Moderate Risk	Moderate Risk	**Negligible effect**		Moderate/ Low Risk	**Minor beneficial effect**	Moderate/ Low Risk	**Minor beneficial effect**
		Inhalation of vapours in the soil and/or groundwater	Moderate/ Low Risk	Moderate/ Low Risk	**Negligible effect**		Moderate/ Low Risk	**Negligible effect**	Low Risk	**Minor beneficial effect**

Source	Receptor	Pathway	Baseline	Construction Without Mitigation		Mitigation Measures	Construction with Mitigation		Operation	
			Classification of Risk	Classification of Risk	Assessed Impact		Classification of Risk	Assessed Impact	Classification of Risk	Assessed Impact
Hill, RHS Wisley and Feltonfleet School and the infilling of ponds and gravel/sand pits. • Historical Landfills (Cobham Bridge, Land at Pond Farm, Pointer's Farm, New Barn East, Camphill Tip, Silvermere Pet Cemetery and Dunsborough Farm)	<u>Human Health (on-site)</u> Members of the public using public rights of way (non-motorised users)	Inhalation, ingestion and dermal contact with contaminants in windblown soil-derived dust/fibres	Moderate/ Low Risk	Receptor not present on-site during construction phase			Receptor not present on-site during construction phase		Moderate/ Low Risk	**Negligible effect**
		Ingestion and dermal contact with contaminants within perched water and shallow groundwater	Moderate/ Low Risk						Low Risk	**Moderate beneficial effect**
		Migration and accumulation of ground gases followed by inhalation or ignition causing asphyxiation and/or explosion	Moderate Risk						Moderate/ Low Risk	**Minor beneficial effect**
		Inhalation of vapours in the soil and/or groundwater	Moderate/ Low Risk						Low Risk	**Minor beneficial effect**
• Pollution incidents (notably oils and chemicals). • Current and historical potentially contaminative activities within the study area (includingvehicle service garages, fuelling stations, waste disposal, sewage treatment, handling and transport services, clay bricks and tile manufacture, rubber and plastic manufacturing, foam product suppliers, railway line, gas manufacture and distribution, electrical production and distribution and french polishing services). • Agricultural activities in the surrounding area. • Fuelling station and electrical sub-station. *(Potential contaminants of*	<u>Controlled Waters (on-site)</u> Groundwater (superficial Principal and Secondary A Aquifers, bedrock Secondary A Aquifer). Surface water (Stratford Brook, River Mole, Bolder Mere, Manor Pond, drains and ditches).	Lateral migration of contamination in groundwater	Moderate Risk	Moderate Risk	**Negligible effect**	Ground investigation and risk assessment as necessary to define risks. Dewatering risk assessment if dewatering processes are to be implemented. Additional monitoring and risk assessment if required to determine control measures that may need to be implemented if risk assessments deem necessary.	Moderate/ Low Risk	**Minor beneficial effect**	Low Risk	**Moderate beneficial effect**
		Migration of contaminants entrained in surface water run-off	Moderate/ Low Risk	Moderate/ Low Risk	**Negligible effect**		Moderate/ Low Risk	**Negligible effect**	Low Risk	**Minor beneficial effect**
		Migration of contamination via surface waters	Moderate Risk	Moderate Risk	**Negligible effect**		Moderate/ Low Risk	**Minor beneficial effect**	Low Risk	**Moderate beneficial effect**
	<u>Property (on-site)</u> Piles and other foundations Underground services.	Chemical attack from aggressive chemical constituents in soil or groundwater	Low Risk	Low Risk	**Negligible effect**	Ground investigation and risk assessment as necessary to define risks. Dewatering risk assessment if dewatering processes are to be implemented. Additional monitoring and risk assessment if required to determine mitigation measures that may need to be incorporated into design of structures and services.	Low Risk	**Negligible effect**	Very Low Risk	**Minor beneficial effect**
		Migration of ground gases or vapours along preferential pathways including permeable ground, services trenches and service entry points and accumulation in enclosed spaces such as services ducts or access points	Moderate Risk	Moderate Risk	**Negligible effect**		Moderate Risk	**Negligible effect**	Moderate/ Low Risk	**Minor beneficial effect**

Source	Receptor	Pathway	Baseline	Construction Without Mitigation		Mitigation Measures	Construction with Mitigation		Operation	
			Classification of Risk	Classification of Risk	Assessed Impact		Classification of Risk	Assessed Impact	Classification of Risk	Assessed Impact
concern include a range of inorganic and organic contaminants including heavy metals, hydrocarbons, fuels/oil, Polycyclic Aromatic Hydrocarbons (PAH), Total Petroleum Hydrocarbons (TPH), solvents, asbestos, Polychlorinated Biphenyls (PCBs), herbicides and pesticides).										

Effects on Geology and Geomorphology

10.5.14 A qualitative approach has been taken to assess the potential effects of the Scheme on topography, physical properties/ground stability and mineral resources which have all been assigned a low value based on the rationale presented in Table F.4 in Volume 2. This assessment is summarised in Table 10.5 below and further discussed in paragraphs 10.5.15 to 10.5.19.

Table 10.5: Geology and Geomorphology Impact Assessment

Topic	Feature	Value	Construction with Mitigation		Operation	
			Magnitude of Impact	Classification of Significance of Effect	Magnitude of Effect	Classification of Significance of Effect
Topography	-	Low	Low	Minor Adverse Effect	Negligible	Negligible
Changes in Physical Properties and Ground Stability	Soil Erosion	Low	Low	Minor Adverse Effect	Negligible	Negligible Effect
	Compressible Ground	Low	Low	Minor Adverse Effect	Negligible	Negligible Effect
	Collapsible Ground; Landslides; Running Sands; Aggressive Ground; Shrinking or Swelling Clay.	Low	Negligible	Negligible Effect	Negligible	Negligible Effect
Geology as a Valuable Resource	Mineral Resources	Medium	Low	Minor/ Moderate Adverse Effect	Negligible	Minor Adverse Effect

Construction Phase

10.5.15 The Scheme is likely to impact the topography of the study area as the construction works will involve earthworks and the construction of new infrastructure associated with the construction of new side roads/slip roads, upgrading of local roads, the development of an NMU route and the installation of new or upgrade of existing overbridges and drainage systems.

10.5.16 Topography is considered to be of low value as the “attribute within the study area only possesses characteristics which are locally significant” and “has tolerance for change”. The mitigation measures proposed for the construction works will reduce potential impacts to topography. Further, the magnitude of

impact that construction will have on topography is considered low as there will be only minor topographical changes compared to baseline. The effects on topography as a result of the development are considered to be permanent, although temporary effects are anticipated associated with the creation of temporary stockpiles, which will likely be required for waste and materials management through the construction phase. The effect on topography is considered to be *minor adverse* and *not significant*.

10.5.17 Changes in physical properties or ground stability as a result of the Scheme have been assessed and are discussed below. Physical geological features have been assessed as having a low value as the attributes only possess characteristics which are locally significant.

- Soil erosion – there is likely to be an increase in soil erosion as a result of the stripping of topsoil, vegetation clearance, earthworks, temporary stockpiling and the movement of heavy plant. There is also potential for increased runoff during earthworks with a high sediment load to impact surface water receptors. However, mitigation measures such as outlined in paragraph 10.6.5 will reduce the potential for soil erosion. Areas required for temporary works will be reinstated. Consequently, the effect on soil erosion is considered to be temporary minor adverse and not significant;
- Compressible Ground - It is anticipated that, where compressible ground is identified to present a geotechnical hazard within the footprint of the Scheme following the ground investigation, risk to proposed engineered structures will be mitigated by design (likely either excavation and replacement with more competent material or the use of foundations). Should ground instability be identified as a geotechnical hazard beneath existing structures following the ground investigation as a result of changes in horizontal or vertical forces through the construction phase, risk will be mitigated by design. Consequently, the effect on compressible ground are considered permanent minor adverse and not significant; and
- The Envirocheck report indicates a low or very low potential for collapsible ground, landslides, running sands, aggressive ground and shrinking or swelling clay. Consequently, the potential physical change to these features has been considered *negligible,* the significance of the effect is also considered to be *negligible* and *not significant.*

10.5.18 Mineral resources are present in the vicinity of the new road development at Ockham Junction and Painshill Junction, the new slip road and overbridge in proximity to Redhill Road as well as temporary site compounds. A mineral safeguard zone is located within replacement land located to the south-east of the M25 Junction 10/A3 Wisley Interchange. The mineral resource areas and mineral safeguard zone have been assigned a medium value as they have a moderately economic value. However, the effect on the identified mineral resources during the construction phase is considered to be *low* as the characteristics of the mineral resource will largely still be present, albeit temporarily unavailable through the construction phase, and there will be no material change to the resources within the mineral safeguard zone. The effects on the identified mineral resources in areas to be used as site compounds are therefore considered temporary. The effects on mineral resources underlying the new road development at Ockham Junction and Redhill Road and the effects on the mineral safeguard zone within the replacement land are considered

permanent. Where mineral resources are to be sterilised/removed through road construction, these will be earmarked for reuse within the Scheme. The effect on identified mineral resources and the mineral safeguard zone is considered to be *minor/moderate adverse*. However, as the mineral resource will be largely unchanged and still accessible following development or extracted and reused within the development, this effect is considered *not significant*.

Operational Phase

10.5.19 Potential effects associated with the operation of the Scheme compared to baseline have been assessed. Suitable design and subsequent construction works will minimise soil erosion and it is assumed that the Scheme will be operated in accordance with the relevant regulations and best practice guidance in applying Best Available Techniques. This will therefore further reduce soil erosion, and any further impacts to physical properties and ground instability. Consequently, the overall effect of the Scheme during the operational phase is considered *permanent* and *negligible*.

Agricultural soils impact assessment

Construction phase

10.5.20 In the construction phase the following areas of non BMV soils will be taken out of agricultural use:

- Agricultural land taken for permanent engineering use (the Scheme footprint): 9.4 ha;
- Agricultural land taken for temporary engineering use (site compounds): 21.7 ha; and
- Replacement land on farmland: 42.0 ha.

10.5.21 A minor construction impact may be interference to local field drainage systems on the surrounding land.

Operational phase

10.5.22 There should be no additional impacts during the operational phase. Land temporarily acquired will be returned to the owners.

10.5.23 Agricultural land in ALC Grades 1, 2 and 3a is considered to be of high sensitivity, agricultural land in ALC Subgrade 3b is considered to be of medium sensitivity and land in ALC Grades 4 and 5 is considered to be of low sensitivity.

10.5.24 Therefore, the soils affected by the Junction 10 improvements are receptors of mainly low sensitivity, except around Ockham Junction and the replacement land to the north east of the junction where some of the land is likely to be of medium sensitivity.

10.5.25 The magnitude of all impacts associated with the Scheme are negligible as no BMV land will be lost.

10.5.26 The consideration of the relationship between the sensitivity and the magnitude of change defines the effect of the Scheme on agricultural soils in the construction phase. The significance of this effect is shown in Table 10.6.

10.5.27 The amount of land take is only small and none is of BMV quality and so the significance of effect is assessed as only neutral or slight adverse.

Table 10.6: Agricultural Soils Impact Assessment in construction phase

Receptor	Sensitivity of receptor	Magnitude of impact	Significance of impact
Agricultural soils taken for permanent engineering land take	Low	Negligible	Neutral or slight adverse
Agricultural soils taken for temporary engineering use	Low and medium	Negligible	Neutral or slight adverse
Agricultural soils on replacement land	Low and medium	Negligible	Neutral or slight adverse

10.6 Potential mitigation measures

Design measures

10.6.1 Based on information available to date, assessment of potential risks/impacts/ effects associated with the proposed Scheme have been largely evaluated qualitatively, with only limited ground investigation data to assess ground conditions on-site. It is therefore required that a phase of pre-construction intrusive ground investigation is undertaken to inform the design and confirm the appropriate mitigation measures. At this stage it is envisaged that the ground investigation will include:

- targeting areas of identified potential contamination sources or junction reconfiguration (including but not limited to bridges and earthworks);
- providing an assessment of geological boundaries and thickness of stratum;
- providing an assessment of the groundwater regime at the site;
- determining the extent and nature of fill materials associated with Wisley Airfield and historic landfills/infilling and gas monitoring;
- determining the nature and potential contamination of Made Ground associated with the M25 and A3 carriageways (including embankments), A245 Byfleet Road, local access roads, the construction of Wisley Airfield and Battleston Hill, RHS Garden Wisley, San Dominico site, Feltonfleet School, the infilling of ponds and the potential infilling of gravel and sand pits within the Scheme extent;
- determining the aggressivity of the ground towards buried concrete; and
- analysing surface water samples from identified potential surface water receptors for hardness, pH, calcium, and dissolved organic carbon concentrations to enable determination of pragmatic environmental quality standards.

10.6.2 The data gathered from the ground investigation on the condition of soils at the site will also help inform an appropriate Materials Management Plan (MMP) and Site Waste Management Plan (SWMP). Further information can be found in Chapter 12 Materials and Waste.

10.6.3 Piling risk assessments will likely be required, particularly where structures are to be piled and are located in the vicinity of Secondary A and Principal aquifers to assess where preferential pathways might be created that allow the migration of landfill/soil gas or vapours or risks to controlled waters. Piling risk assessments will be subject to agreement by the Environment Agency.

10.6.4 Geotechnical risk will be managed in accordance with HD 22/08 and sufficient ground investigation will be carried out to ensure that the potential for ground collapse or settlement is understood, and adequate foundation solutions designed. Following ground investigation, a Ground Investigation Report (GIR) will be produced and used to inform the Geotechnical Design Report (GDR). The GDR will include stability analyses and design calculations for new and modified earthworks and structures, ensuring their short and long-term stability.

Mitigation measures

10.6.5 Beyond completion of the ground investigation and those risk assessments appropriate to the Scheme, such as human health, controlled waters, piling and ground gas risk, Mitigation measures to be incorporated into the construction process are likely to include (but are not limited to):

- health and safety risk assessments, method statements (RAMS) and appropriate Personal Protective Equipment (PPE) for the protection of construction workers in accordance with the Control of Substances Hazardous to Health (COSHH) Regulations[51];
- implementation of appropriate dust suppression measures to prevent migration of contaminated dust and fibres as appropriate, as set out in Chapter 5 Air Quality;
- working methods during construction to manage groundwater and surface water appropriately and ensure that there is no run-off from the works, any material/waste stockpiles, and storage containers into adjacent surface watercourses; in accordance with DEFRA and the Environment Agency's Pollution Prevention Guidance[33];
- stockpile management (such as water spraying and avoiding over stockpiling to reduce compaction of soil and loss of integrity) and timely removal of stockpiled soil to prevent windblown dust and surface water run-off;
- implementation of an appropriate Materials Management Plan (MMP) and Site Waste Management Plan (SWMP). Further information can be found in Chapter 12 Materials and Waste;
- limiting the area of earthworks at any one time to reduce temporary effects on topography, soil compaction and erosion;
- limiting the duration of soil exposure and timely reinstatement of vegetation or hardstanding to prevent soil erosion;
- prioritising the reuse of mineral resources (sand and gravel) within the Scheme;
- implementing appropriate pollution incident control e.g. plant drip trays and spill kits;

[51] Health and Safety Executive. Control of Substances Hazardous to Health. Sixth Edition. 2013.

- implementing appropriate and safe storage of fuel, oils and equipment during construction;
- if unexpected contamination is encountered during proposed earthworks, further assessment will be required. Following assessment further mitigation measures such as remediation or removal of contamination may be required;
- implementation of measures in the Construction Environmental Management Plan (CEMP) such as good management of stockpiles in accordance with DEFRA and the Environment Agency's Pollution Prevention Guidance[33], implementation of pollution incident control e.g. plant drip trays and spill kits;
- further monitoring to inform risk assessments and to further define mitigation measures which may need to be incorporated into design; and
- Completion of a detailed desk study to further assess the UXO hazard level within the Scheme, and the completion of a UXO survey prior to any intrusive ground investigation works if required.

10.6.6 It has also been assumed that hardstanding will be placed across the majority of the proposed works associated with the carriageway, except for soft landscaping along embankments and cuttings, will minimise the generation of dust, direct contact and ingestion pathways and minimise infiltration during the operational phase. If soil contamination is identified, laying of a clean capping layer may be required in areas of proposed soft landscaping. Drainage design will consider the risks from any residual contamination and designers may be required to use lined drainage systems in areas of contamination that may be left in situ. If soil and/or groundwater contamination is identified during the ground investigation which poses a risk to sensitive receptors, appropriate remediation will be undertaken.

10.6.7 It is assumed that the Scheme will be operated in accordance with the relevant regulations and best practice guidance in applying Best Available Techniques and pollution prevention.

10.6.8 Furthermore, pollution prevention measures incorporated within drainage design will mitigate the risk of contamination to controlled waters. The principles of drainage design for the proposed development are summarised in Chapter 8 Road Drainage and the Water Environment.

Monitoring

10.6.9 Limited ground investigation information is currently available for the Scheme and assessment of potential impacts associated with the Scheme to date have been qualitative.

10.6.10 A ground investigation is required for the Scheme to inform the Scheme design and appropriate mitigation measures. A ground investigation specification has been drafted which allows for the installation of groundwater and ground gas monitoring wells and a subsequent preliminary monitoring programme to establish baseline conditions. The requirement for further monitoring will be reviewed upon completion of the assessments detailed in paragraph 10.6.1.

Agricultural soils

Mitigation Measures

10.6.11 Land occupied or disturbed during the construction process that is not permanently acquired for engineering and landscaping will be restored to a condition equivalent to its original.

10.6.12 The quality and quantity of soil on site will be maintained by implementing appropriate techniques for stripping, stockpiling and reinstatement.

10.6.13 This approach will be adopted in a Soil Handling and Management Strategy (SHMS), which will in due course form part of the Construction Environmental Management Plan (CEMP). A qualified soil scientist will supervise all aspects of this work.

Monitoring

10.6.14 Any disturbed land restored to farming will be subject to a five-year aftercare period, during which time any problems with settlement, drainage and noxious weeds will need to be rectified.

10.7 Summary

10.7.1 This chapter has considered the effects of the Scheme on geology and soils in accordance with the regulatory policy framework presented in section F.1 Planning and policy context in Volume 2.

10.7.2 With respect to land contamination, the assessment of baseline conditions, and the magnitude of the potential impact (change) of the scheme has been assessed as significant. However, with the application of appropriate mitigation measures during the construction phase, the impact of the Scheme on land contamination has been assessed as not significant (*negligible to minor beneficial)*. The operational phase has been assessed as having a permanent negligible to moderately beneficial effect and has therefore been assessed as being not significant (beneficial).

10.7.3 With respect to geology/geomorphology, the assessment indicated that the construction phase and the operational phase will have a will have a *minor/moderate adverse to negligible* effect which has been assessed as not significant.

10.7.4 With respect to agricultural land, the assessment indicated that the construction phase will have a neutral or slight adverse effect and has been assessed as not significant. There should be no additional impacts during the operational phase. Land temporarily acquired will be returned to the owners.

10.7.5 Events constituting potential major accident or natural disaster have been identified during both the construction and operational phases of the Scheme. However, the embedded mitigation through construction and operation is considered sufficient to address the potential risks arising from such events and reduce the risks as low as reasonably practicable (ALARP).

11 Cultural Heritage

11.1 Introduction

11.1.1 This chapter presents the known historic environment baseline within the Scheme boundary and its wider study area. The cultural heritage resource encompasses historic and designed landscapes, historic buildings and buried archaeology. The term 'Cultural Heritage' is used throughout the DMRB (Highways Agency 2007). Contemporary guidance refers to the 'historic environment'. The terms are analogous. 'Cultural Heritage' is used here as per DMRB's guidance.

11.1.2 This chapter assesses both the construction and operational impacts and effects of the Scheme options on the cultural heritage resource. The known cultural heritage resource, both designated and non–designated, has been identified within both the Scheme boundary and study area in order to allow for an assessment of the potential impacts of the Scheme and to help inform the potential for the survival of hitherto unidentified archaeological remains. A gazetteer of all cultural heritage assets is appended in Volume 2 Appendix G, together with figures (Figures 11.1 to 11.2 in Volume 3) showing their locations within the study area.

11.1.3 The assessment of potential impacts upon this resource is presented in section 11.5.

11.2 Study area

11.2.1 A 500 m study area surrounding the Scheme has been applied and can be seen in Figures 11.1 and 11.2 in Volume 3. This distance was established by relevant guidance, in particular guidance recommended by the DMRB Volume 11, Section 3, Part 2 HA 208/07 Cultural Heritage and professional judgement.

11.3 Consultation

11.3.1 Non statutory consultation was carried out in the previous stage of the project between December 2016 – January 2017 the outcomes of which can be found in the consultation report. Statutory Consultation will be undertaken in February and March 2018.

11.3.2 Ongoing consultation is underway with Cultural Heritage specific stakeholders including Historic England and the Archaeological Officers at Surrey County Council, in order to assist and inform the Preliminary Design Stage design proposals and need for mitigation.

11.3.3 A summary of this consultation will be provided in the forthcoming ES, following additional assessments and preliminary on–site investigations. Consultation will be taken forward to inform the next stages of the EIA process.

11.4 Baseline conditions

Topographical and geological conditions

11.4.1 A desk–based assessment, undertaken to inform this project, has provided brief summaries of topographical and geological conditions, a precis of which is presented below.

11.4.2 The topography of the Scheme boundary is variable ranging generally between 25 m AOD and 55 m AOD. Areas of high ground exist to the south of Junction 10 at Oakham Common and to the north of the Junction around Foxwarren Park. Land to the east and west of the Junction, in the region of Painshill Park and Wisley Common respectively, is lower lying.

11.4.3 The bedrock geology of the study area is dominated by the Bagshot Formation, a sedimentary bedrock composed of sands formed approximately 48 to 56 million years ago. This bedrock is indicative of a local environment dominated by shallow seas during the Palaeogene Period. At the junction between the A3 and the B2039, in the south west area of the Scheme boundary the British Geological Survey (BGS) records the presence of a thin strand of the London Clay Formation, composed of clay, silt and sand. This bedrock is the predominant bedrock to the south of the Scheme boundary. The London Clay Formation was formed approximately 56 million years ago and is also indicative of an area dominated by shallow seas.

11.4.4 The BGS does not record superficial deposits along the length of the Scheme boundary, although patches of the Lynch Hill Gravel Member, a deposit composed of sand and gravel formed up to 2 million years ago in the Quaternary Period are recorded along the line of the A3 and within the 500 m study area. The deposit is indicative of a river setting.

11.4.5 Heritage assets are identified by a unique ID, and these are provided in the gazetteer in Volume 2 Appendix G. Designated assets are referred to by their National Heritage List Entry numbers where relevant. Non–designated assets are referred to by their Surrey HER numbers (MSE)

11.4.6 The study area contains fifty–five designated heritage assets. These comprise:

- Four Scheduled Monuments;
- One Grade I registered park and garden;
- One Grade II* registered park and garden;
- One Grade I listed building;
- Five Grade II* listed buildings;
- Forty–one Grade II listed buildings; and
- Two Conservation Areas.

11.4.7 Following the scoping assessment and site visits undertaken during the Option Selection Stage, twelve designated assets within the study area have been scoped out of further impact assessments. These assets include one Grade I Listed Building and eleven Grade II Listed Buildings, and are sufficiently screened from setting impacts due to distance, intervening vegetation, and

relationships with surrounding landscape. The updated gazetteer is listed in Volume 2 Appendix G.

11.4.8 Eighty non–designated heritage assets have been identified within the study area. These assets include possible prehistoric earthworks, the London to Winchester Roman Road, medieval or post–medieval enclosures, parish boundaries and earthworks, as well as post–medieval domestic, agricultural and industrial buildings, and post–medieval and modern gardens and parkland.

Prehistoric Evidence (–AD 43)

11.4.9 Non–designated heritage assets within the study area provide evidence for the occupation of the area as far back as the Palaeolithic period, with two Palaeolithic hand axes (MSE746) recovered from the study area.

11.4.10 There are three Scheduled Monuments dating to the prehistoric period are located within the study area. A Neolithic Hengi–form monument (1007905), is located 103 m to the north east of the Scheme boundary. There is also the Bell barrow (1012204) at Cockcrow Hill, which lies 3 m west of the Scheme boundary, and the Bowl barrow (1012205) which lies to the c. 275 m west of the Scheme at Junction 10, both of which are likely to be Bronze Age in date.

11.4.11 A Mesolithic site, comprising evidence of a primitive flint industry, is recorded on Ockham Common (MSE503) to the south west of the Scheme boundary; whilst a flint core (MSE3502) of this date was also recovered from within the study area. Flakes (MSE3270) of this period were recovered from the western edge of Cobham within the study area, to the south of the A3, as were prehistoric pottery sherds (MSE3269).

11.4.12 Further prehistoric remains include a Neolithic flint scraper (MSE3182) at Cobham, Bronze Age pottery and flintwork recovered from Nutberry Farm (MSE13861), and a possible Bronze Age bowl barrow at Foxwarren (MSE488), located c. 116 m to the north of the Scheme and within the study area.

11.4.13 There is little evidence of Iron Age occupation in the area, though an Iron Age date has been suggested for the linear earthwork remains at Red Hill (MSE14793) within the study area.

Roman Evidence (AD 43 – AD 410)

11.4.14 The Scheduled Roman bath house at Chatley Farm (1005923) is located within the Scheme boundary, in the area of Replacement Land at Chatley Wood. A possible Roman quarrying site (MSE3310) is located c. 66 m to the south of the Scheme boundary at Red Hill and is thought to have been an ironstone quarry possibly associated with the Roman occupation site at Chatley Farm.

11.4.15 The Surrey HER has identified a conjectural route of the London to Winchester Roman Road, which crosses the Scheme in four locations: it crosses the Replacement Land at Wisley Common; it crosses the M25 to the north west of Junction 10; it crosses an area of land to the north of the A3 across from Painshill Park and associated with the SAN03 upgrades; and it crosses Byfleet Road to the north of its junction with the A3. No physical evidence of the road has been found in these locations, but the area is considered sensitive to such remains.

11.4.16 To the north of the Scheme at Ashstead Common (MSE13733), within the study area, a survey of the historic landscape identified earthworks and features surrounding the site of a Roman villa. The villa appears to have adjoined a large–scale tile manufactory which is evinced through areas of quarrying and spoil heaps. Other evidence for Roman occupation in the area is limited to findspots (MSE3271), within the study area, on the north western edges of Cobham. Romano–British pottery has also been recovered from Cobham (MSE236) within the study area. Undated field boundaries and cropmarks may be of Roman date within the Scheme boundary (MSE14782 and MSE14787) and the study area (MSE14775); however, these features have yet to be dated.

Early Medieval (AD 410 – AD 1066)

11.4.17 Several banks and boundaries are recorded within the study area and it is possible that these may date to the Anglo–Saxon period (MSE13733; MSE18141). The old parish boundary at Ockham Heath (MSE14795), which extends within the Scheme, may be related to the early Saxon boundary called Fullingdic (MSE14795).

11.4.18 Domesday records three settlements within the study area and within the county of Surrey: Wisley to the east, Ockham to the south and Cobham to the north east. Recording of these settlements in Domesday may indicate that they have an Anglo–Saxon origin and given the evidence of boundaries/banks noted above, the Scheme boundary may have formed the agricultural hinterland. Cobham is noted as a very large settlement owned by the Abbey of Chertsey (St Peter), whilst Wisley and Ockham are recorded as smaller settlements belonging to Oswald, brother of Abbot Wulfwod and Richard, son of Count Gilbert, respectively. Wisley and Ockham are recorded as having mills in 1086.

11.4.19 A saucer brooch recovered from near Ockham Village Green (MSE19515), south west of the Scheme and within the study area, is undated in the Surrey HER though it could be early medieval in date.

Medieval Evidence (1066–AD 1500)

11.4.20 Within the Scheme boundary a boundary bank (MSE2812) along the Wisley/Ockham parish boundary is of probable medieval date, as is the Red Hill Road Holloway (MSE14774), the northern half of which extends into the Scheme boundary. The former location of a pond at Culverlake (MSE14771), also within the Scheme boundary, is thought to be late medieval in date. Medieval pot sherds (MSE3272) have also been recovered from within the study area at Cobham.

11.4.21 One Listed Building within the study area has its origins in the late medieval period. The Grade II Listed Chatley Farm House (1286910), east of the M25 and south of the A3, was constructed in the 16th century but has an 18th century front. The Grade II Listed Ockham Mill (1188416), located to the north west of the Scheme and within the study area, dates to the 19th century, but a mill is first recorded on the site in 1296 and medieval remains related to earlier mills may still exist at the location.

11.4.22 The Scheme is located between three medieval settlements and there are several boundary features (MSE2812; MSE13733; MSE18141) within the Scheme and study area which may be of medieval date and are indicative of the agricultural activities of the period.

Post–Medieval Evidence (AD 1500 – AD 1900)

11.4.23 Early historic maps are schematic in nature, although they can provide some idea of settlement patterns. Post–medieval mapping appears to show that the Scheme and its surroundings were rural in nature during this period, with small farms, and large estates located along the route of the historic A3.

11.4.24 Blaeu's map (1646) annotated Cobham, Ockham and Ripely and depicts two rivers in the vicinity of the Scheme, however, no further details are recorded by Blaeu. Bowen's 1749 map of Surrey annotates the settlements of Cobham (or Chobham) to the north east and Ripley to the south west of the Scheme. The historic A3 (London to Portsmouth Road) is not drawn, although there are other roads linking the settlements. The Scheme is located in open land between the two settlements.

11.4.25 A map by Stanley, dated 1804, shows the historic route of the A3 running between Ripley and Cobham. The route of the A3 lies between Ockham and Wisley Common in the south and Cobham Common and Painshill Park (1000125) in the north. The Scheme is occupied by low lying ground, with small ponds. Bolder Mere on the east side of the modern A3 is annotated Bolder Pond. In the wider area, agricultural farmland is depicted. The north eastern area of the Scheme is also located in low–lying ground, with a fish pond drawn in the vicinity. The historic route of the A3 turned east at Painshill Park (1000125). Whilst Andrew's 1806 map of the area does not show any detail about the landscape or the environment around the Scheme, it does show the route of the historic A3 between Ripley and Cobham, on the same alignment as the current A3 to Painshill Park (1000125).

11.4.26 The 1872 Ordnance Survey (OS) map depicts the Scheme along the historic route of the A3 which runs north east to south west through woodland and wetlands. Bolder Mere fish pond is annotated to the east. The north eastern portion of the Scheme is also shown to be located in woodland and wetland to the east of the River Mole, however the route of the A3 turned east at Cobham Bridge (1377488). There are no changes to the area of the Scheme illustrated on the 1896 OS map.

11.4.27 Post–medieval remains within the Scheme boundary include the northern boundary of the Grade I Registered Painshill Park (1000125) which is a landscaped pleasure grounds and park laid out between 1738 and 1773 by the Hon. Charles Hamilton. Associated with the park and within the study area are the Grade II* Listed Gothic Tower (1191694), the Grade II Listed Westwood House and West Lodge (1191810), and Belfry House, including the Stables and Cottage (1030133) A detailed assessment of the park and associated assets will be submitted as part of the EIA.

11.4.28 E.S. Feltonfleet School (1294963) and Lodge (1030254) are located immediately north of the Scheme, within the study area and to the north of the A3 near the junction with Byfleet Road. These Grade II Listed Buildings also date to c. 1860.

11.4.29 Other post–medieval Listed Buildings within the study area include the Grade II Listed Foxwarren Cottage (1030053), an estate cottage dating to c. 1860 and associated with the Grade II* Listed Foxwarren Park country house (1189110) and non–designated parkland of Foxwarren Park north of the Scheme and within the study area. Details of other post–medieval Listed Buildings within the study area are included in the gazetteer in Volume 2 Appendix G.

11.4.30 A non–designated post–medieval parish marker stone (MSE3464) is located within the Scheme boundary with an additional milestone (MSE16852) located within the wider study area. Post–medieval farms recorded in the study area include Long Orchard Farm (MSE22158), north of the Scheme and within the study area, and the site of Oldpond House (MSE14792) to the south of the Scheme.

11.4.31 Evidence of post–medieval landscaping is present throughout the study area. At Ockham Common where a mound and bank (MSE14769), possibly for ornamental tree planting, are recorded south of the Scheme and within the study area. An enclosure bank is recorded at Chatley Wood (MSE14785) and is located within the Scheme. A pond site is also located at Chately Wood (MSE14778) within the Scheme boundary and, while dry now, shows evidence of artificial construction. To the west of Junction 10, Lord King's ditch (MSE14783), the southern extent of which extends within the Scheme, was used to drain Wisley pond c. 1800 into Bolder Mere (MSE14767). Bolder Mere (MSE14767) is dammed (MSE14766) on its south west side and located within the Scheme boundary. A further pond is recorded at Wisley Common (MSE14776) within the Scheme. It was first recorded in 1590 and may have had two mills associated within. Originally extending to c. 50 acres. It was drained by Lord King in the early 19th century and converted to farmland.

11.4.32 A boundary bank, the south east extent of which lies within the Scheme boundary, is located around Ockham Village Common (MSE14789). A quarry and sand pit are recorded at Red Hill (MSE14784), within the study area.

11.4.33 Pointer's Road (MSE14791) is recorded as crossing the A3 perpendicularly to the north of the M25 and within the Scheme. The road was tarmacked and has been modernised but is considered to be located along an earlier alignment and to have once extended further to the west.

Modern Evidence (post 1900)

11.4.34 There are no changes recorded within the Scheme boundary on the OS maps of 1898 and 1935. The area around the Scheme is depicted similarly throughout the 20th century, as a predominantly rural landscape with the historic A3 running between Ripley and Cobham, through Wisley and Ockham Common, which were partially wooded, and on to Painshill Park (1000125). Wisley Airfield to the south of the Scheme was in operation from 1943 to the mid–1970s after which it is annotated as disused on maps. The Surrey HER does not assign the airfield a monument ID number but does record that three archaeological desk–based assessments have been undertaken for the site. The modern A3 and M25 were constructed in the 1980s and the 1989 map of the area depicts the current layout of the roads within the Scheme boundary. Foxwarren Park was largely destroyed by the route of the M25, although the park's Listed water tower (1377855) and cottage (1030053) are reminders of the 19th century estate which survive within the study area.

11.4.35 The Grade II* Registered RHS Gardens, Wisley (1000126) are located to the north of the A3 and the south east corner lies within the Scheme boundary. While originally laid out from 1878 to 1902, the gardens, as they exist today, largely date from the early 20th century. They were acquired by the RHS in 1903 and have since been enlarged and developed.

11.4.36 Second World War remains within the study area include an anti–aircraft battery site at Wisley Common (MSE21230) and an anti–aircraft gun emplacement (MSE6886) to the north of the M25.

11.4.37 Cartographic evidence suggests very little change to the landscape or use of the area in the early 20th century. The modern A3 and M25 were built in the late 20th century.

Undated Evidence

11.4.38 Undated circular and semi–circular cropmarks (MSE17075) are located at the A3/B2215/B2039 Junction and within the Scheme boundary. Cropmarks representing probable aggregate activity (MSE14725) are also recorded within the Scheme and the Surrey HER notes further cropmarks (MSE17084) at Chatley Wood within the Scheme but gives no details. Probable agricultural features of unknown date, including ridges, banks and possible quarrying earthworks (MSE3696) were encountered during the construction of the motorway and the Surrey HER places them under the current Junction 10 and within the Scheme boundary.

11.4.39 The Surrey HER also records two boundary features of unknown date within the Scheme boundary (MSE14782 and MSE14787). However, as noted above these could be as early as Roman or Anglo Saxon in date. Similar features (MSE14775) are located to the north of the Scheme boundary at Foxwarren Park.

11.5 Potential impacts

11.5.1 As per the DMRB methodology, potential impacts on the cultural heritage resource are defined as changes to the historic environment resource caused by the mitigated Scheme. The type of impacts that can occur include:

- Direct physical impacts, such as partial destruction or total loss of a heritage asset; and
- Settings impacts which include non–physical changes to the character and significance of assets arising from works such as alteration of lines of sights, removal of screening, air and noise pollution.

11.5.2 In accordance with the methodology outlined in section G.2 Methodology in Volume 2, the assessment of impacts upon known assets involves establishing the value of the affected heritage asset and the sensitivity of the asset to change. The magnitude of impact is then calculated based on those factors, and using the matrix set out in DMRB guidance together with professional judgement, the significance of effect on each heritage asset is determined.

11.5.3 The ES will include a full impact analysis of known heritage assets within the Scheme boundary and study area which will allow the significance of effect to be determined. It is anticipated that further detailed design and construction elements will be known at that stage. Assets identified in the Preliminary Design Stage Scoping Report (December 2018) have been included below.

11.5.4 For the purpose of this report, impacts have been split into construction and operation impacts.

Construction

11.5.5 During construction, direct physical impacts effects are likely to occur as a result of earthmoving operations, creation of site compounds, road formation/construction; and construction of proposed overbridges/structures. Setting impacts are likely occur due to of the introduction of construction machinery, compounds and vegetation removal with the potential to create new sightlines and views of the M25 Junction 10.

11.5.6 The potential effects of construction activities upon setting would be temporary, short term and reversible, however, direct physical impacts are usually permanent in nature.

11.5.7 Table 11.1 shows known heritage assets which will be affected by the construction of the Scheme.

Table 11.1: Construction impacts

Site Reference Number	Site Name	Significance	Impact	Impacted by/Nature of impact	Effect
1005923	Late Roman bath house at Chatley Farm (Scheduled Monument)	High	Minor Adverse	Permanent Physical and temporary setting impacts likely due to Chatley Wood Common Land replacement	Slight Adverse
1012204	Bell barrow on Cockcrow Hill (Scheduled Monument)	High	Minor Adverse	Temporary setting impacts during construction of junction elements	Moderate Adverse
1012205	Bowl barrow west of Cockcrow Hill (Scheduled Monument)	High	Minor Adverse	Temporary setting impacts during construction of junction elements	Slight Adverse
1007905	Red Hill hengi–form scheduled monument (Scheduled Monument)	High	Minor Adverse	Temporary setting impacts during construction of A3 Widening between Ockham and Painshill	Moderate Adverse
1000125	Painshill Park (Grade I Registered Park and Garden)	High	Minor Adverse	Temporary setting impacts during construction of access to Painshill properties and A3 Widening between Ockham and Painshill	Moderate Adverse
1000126	RHS Gardens, Wisley (Grade II* Registered Park and Garden)	High	Minor Adverse	Permanent Physical and temporary setting impacts likely due to Wisley Lane access and A3 Widening between Ockham and Painshill	Moderate Adverse
1191694	Gothic Tower (Grade II* Listed Building	High	Moderate Adverse	Temporary setting impacts during construction of A3 Widening between Ockham and Painshill	Moderate Adverse
1030053	Foxwarren Cottage (Grade II Listed Building)	Medium	Moderate Adverse	Temporary setting impacts during construction of A3 Widening between Ockham and Painshill	Moderate Adverse
MSE3464	Parish boundary stone, between Ockham and Wisley	Low	Major Adverse	Permanent physical impacts likely due to A3 Widening between Ockham and Painshill	Moderate Adverse
MSE14725	Cropmarks caused by aggregates work: non–antiquities, Ockham	None	Major Adverse	Permanent physical impacts likely due to Scheme works adjacent to Wisley	Slight Adverse
MSE14766	Dam, Bolder Mere, Ockham Common	Low	Minor Adverse	Permanent physical impacts likely due to A3 Widening between Ockham and Painshill	Slight Adverse
MSE14771	Pond site, Culverlake, Ockham	Low	Major Adverse	Permanent physical impacts likely due to Scheme works adjacent to M25 and Chatley Wood	Moderate Adverse
MSE14774	Red Hill Road Holloway or ditch feature, Wisley	Low	Minor Adverse	Permanent physical impacts likely due to A3 Widening between Ockham and Painshill	Slight Adverse

Site Reference Number	Site Name	Significance	Impact	Impacted by/Nature of impact	Effect
MSE14776	Dam and pond site, Wisley Pond	Low	Major Adverse	Permanent physical impacts likely due to works associated with Pond Farm Common Land replacement	Moderate Adverse
MSE14778	Pond site, Chatley Wood, Cobham	Low	Major Adverse	Permanent physical impacts likely due to works associated with Chatley Wood Common Land replacement	Moderate Adverse
MSE14782	Boundary bank, Clearmount, Wisley	Low	Negligible	No/limited physical impacts likely due to works at Park Barn Farm Common Land replacement	Neutral
MSE14783	Lord King's ditch, Pond Farm, Wisley	Low	Negligible	No/limited physical impacts likely due to Scheme works adjacent to A3 at Wisley Common	Neutral
MSE14787	Enclosure bank, Red Hill, Wisley	Low	Negligible	No/limited physical impacts likely due to A3 Widening between Ockham and Painshill	Neutral
MSE14789	Enclosure bank, Ockham Village Green	Low	Negligible	No/limited physical impacts likely due to Elm Lane access	Neutral
MSE14791	Road, Pointer's Road, Cobham and Ockham	Negligible	Minor Adverse	Permanent physical impacts during construction of Scheme elements	Slight Adverse
MSE14795	Parish boundary bank, Ockham Heath	Low	Negligible	Permanent physical impacts during construction of Scheme elements	Slight Adverse
MSE14796	Quarry pit, Chatley Wood Quarry, Cobham	Low	Major Adverse	Permanent physical impacts during construction of Chatley Wood Common Land replacement	Moderate Adverse
MSE17075	Cropmarks	Low	Major Adverse	Permanent physical impacts during construction of Scheme works adjacent to Wisley	Moderate Adverse
MSE17084	Cropmarks	Low	Major Adverse	Permanent physical impacts during works associated with Chatley Wood Common Land replacement	Moderate Adverse
SMR4619	London to Winchester Roman Road	Medium	Moderate Adverse	Permanent physical impacts during construction of Scheme and works associated with Pond Farm Common Land replacement	Moderate Adverse
MSE14785	Bank at Chatley Wood	Low	Minor Adverse	Permanent physical impacts during works associated with Chatley Wood Common Land replacement	Neutral

11.5.8 Furthermore, there is potential for hitherto undiscovered archaeological remains to be encountered during construction. Whilst further assessment is required in order to establish the location, extent, condition and significance of any such remains, at present it is not felt that these remains would be demonstrably of equivalent significance to assets of International or National importance, and as such large effects are not anticipated.

11.5.9 A programme of archaeological evaluation is currently being devised to appropriately deal with the potential buried archaeological remains which are likely to be affected by the Scheme.

Operation

11.5.10 During operation, the Scheme will have no further physical effects on buried archaeological remains, as these effects will have been removed during construction.

11.5.11 Operational effects are long term and permanent and the following impact assessment. is given as worst–case scenario prior to mitigation. It is however, expected that an extensive programme of mitigation will take place where impacts on setting are anticipated. Mitigation could include planting which will mature gradually following construction. Preliminary Environmental Design drawings are shown on Figure 9.8 in Volume 3. Where possible the Scheme will aim to introduce design measures to remove these impacts and/or mitigation measures to help reduce the effects providing enhancements where possible. A re–assessment of these impacts will be required for the ES, following the submission of detailed mitigation design measures.

11.5.12 The following known heritage assets will be affected by the operation of the Scheme.

Table 11.2: Operation impacts

Site Reference Number	Site Name	Significance	Impact	Impacted by/Nature of impact	Effect
1005923	Late Roman bath house at Chatley Farm (Scheduled Monument)	High	Negligible	Permanent changes to the setting likely due to Chatley Wood Common Land replacement. The rural setting of the monument would largely be retained, with works anticipated to result in an increase in footfall during operation. At present this impact is not felt to significantly affect the setting.	Slight
1012204	Bell barrow on Cockcrow Hill (Scheduled Monument)	High	Moderate Adverse	Permanent changes to the setting of the barrow due to the operation of junction elements at a decreased distance to the monument. This would result in an increase in auditory and visual intrusions into the monument.	Large Adverse
1007905	Red Hill hengi–form scheduled monument (Scheduled Monument)	High	Minor Adverse	Permanent changes to the setting of the barrow due to the operation of junction elements at a decreased distance to the monument. This would result in an increase in auditory and visual intrusions into the monument.	Slight Adverse
1000125	Painshill Park (Grade I Registered Park and Garden)	High	Moderate Adverse	Permanent setting impacts due to the operation of Scheme elements adjacent to and partially within the boundaries of the asset.	Moderate Adverse
1000126	RHS Gardens, Wisley (Grade II* Registered Park and Garden)	High	Moderate Adverse	Permanent setting impacts due to the operation of Scheme elements adjacent to and partially within the boundaries of the asset.	Moderate Adverse
1191694	Gothic Tower (Grade II* Listed Building	High	Moderate Adverse	Permanent setting impacts due to the operation of Scheme elements adjacent to the asset resulting in an increase in auditory and possible visual intrusions into the monument.	Moderate Adverse
1030053	Foxwarren Cottage (Grade II Listed Building)	Medium	Minor Adverse	Permanent setting impacts due to the operation of Scheme elements adjacent to the asset resulting in an increase in auditory and possible visual intrusions into the monument.	Slight Adverse

11.5.13 In relation to this Scheme and the construction impacts outlined in Table 11.1, where buried archaeological remains are directly impacted by construction, and subsequently excavated and recorded, there should be no residual impacts as these will be have been mitigated through a programme of archaeological fieldwork.

11.5.14 In operation, the Scheme should have reduced significant residual impacts on heritage assets or their settings when compared to those set out in Table 11.2. At present four potentially significant effects have been identified as a result of the Scheme's operation. However, as previously discussed this impact assessment is given as a worst–case scenario prior to mitigation and the detailed mitigation design measures should where possible seek to reduce or remove these impacts. It is anticipated that these significant effects will be either reduced or possibly even removed following assessment of these mitigation measures. This reassessment should also take into account the forthcoming statements of significance, which will be undertaken for the Registered Parks and Gardens of Wisley and Painshill and forthcoming mitigation design proposals.

11.6 Potential mitigation measures

11.6.1 The planning policies and guidance as set out in section G.1 Planning and policy context in Volume 2, require a mitigation response to potential impacts upon the historic environment in order to avoid, minimise or offset such impacts as appropriate.

11.6.2 Recommended potential mitigation measures are as follows:

- The Scheme shall seek to avoid direct impacts on known heritage assets during enabling and construction works. This can be achieved through careful design in order to site works away from heritage assets;
- A programme of archaeological investigation should be undertaken in areas affected by the Scheme where there is considered to be potential for significant archaeological remains to survive. The scope and extent of such investigations should be developed in consultation with Historic England and the Surrey County Council's Archaeological Officer and subject to a Written Scheme of Investigation for their approval. This work will comprise geophysical survey in the first instance; and
- Construction areas; to include all compounds and temporary routes, should erect protective fencing prior to site works in order to bar incursion into the Scheduled Bell barrow on Cockcrow Hill [1012204] enabling continued protection during construction.

11.7 Summary

11.7.1 The PEIR has shown that there is potential for adverse effects on designated and non–designated heritage assets within the Scheme boundary and study area. These effects include a total of sixteen potentially significant effects during construction, comprising one large effect and fifteen moderate effects. Five significant effects have been identified during operation, including one large effect and four moderate effects. A detailed impact assessment will be carried out as part of the EIA alongside a review and input into the mitigation design

proposals to reduce or possibly even remove these significant effects where possible.

11.7.2 Consultations with the LPA and Historic England are necessary to further inform the understanding of the heritage assets and the Scheme effects. Once the impact assessment and consultation have been completed, a programme of mitigation can be developed as required.

12 Materials and Waste

12.1 Introduction

12.1.1 This chapter outlines the assessment and identification of the likely impacts on material resources and waste associated with the Scheme during construction, demolition and excavation (CD&E) and operation. Although potential mitigation measures have been identified it should be noted that insufficient design and construction detail was available to undertake an assessment at the time of writing and hence the full assessment will be undertaken as part of the ES.

12.2 Study area

12.2.1 With regards to material resources and waste, the study area extends outside of the Scheme area. For material resources, the study area includes the demand for key construction materials nationally and it is acknowledged that the impacts may occur outside of the national study area. However, as per IAN 153/11, this is considered outside of the assessment scope. For waste, the study area includes the waste arisings and waste infrastructure capacity within the county of Surrey (with the exception of hazardous waste which is considered at a national level).

12.3 Consultation

12.3.1 It is proposed that Surrey County Council, as the author/owner of the Surrey Waste Plan 2008 (as amended in 2009) will be consulted on the proposed assessment methodology.

12.4 Baseline conditions

12.4.1 The PEIR has been written in accordance with IAN 153/11 which provides guidance on the identification and assessment of impacts associated with the use of material resources and waste arisings for construction and improvement schemes.

12.4.2 The Scheme will aim to prioritise waste prevention, followed by preparing for re–use, recycling and recovery and lastly disposal to landfill as per the internationally recognised waste hierarchy, as shown in Figure H.1 Waste Hierarchy in Volume 2.

12.4.3 Desk based information has been gathered in order to identify the existing baselines that may be affected by the use of material resources and the generation of waste from the Scheme.

12.4.4 With regards to material resources associated with CD&E, no baseline is available for material resources use on a regional level. As such, national demand for key construction materials has been collated which will be used as part of the EIA process to assess at a high–level, the impact of the Scheme on the national baseline.

12.4.5 With regards to CD&E waste associated with the Scheme, this will be primarily non–hazardous and inert, with small quantities of hazardous waste (e.g. associated with sealants, paints, solvents and contaminated soil). The baseline has been collated from regional data relating to the amount of waste that is

produced/is estimated to be produced on a regional level. Surrey County Council issued a Scoping Statement in September 2016, which demonstrates their intent to calculate waste infrastructure capacity. This calculated capacity will be included as part of the baseline, if available, at the time of assessment. As hazardous waste is often treated outside of the region within which it is produced, the baseline has been collated from data at a national level. Both the baseline for waste that is produced/is estimated to be produced and the baseline for waste infrastructure capacity will be used as part of the EIA process to assess the impact of the Scheme.

12.4.6 Less impact is envisaged during the operational stage of the Scheme due to minimal material resources use (associated with planned/unplanned maintenance) and waste generation (through littering and planned/unplanned maintenance). Most of these wastes would likely be non–hazardous municipal type wastes (e.g. litter (paper, food, packaging, etc.) and non–hazardous/inert and hazardous wastes from planned/unplanned maintenance (concrete, bituminous materials, waste electrical and electronic equipment (WEEE), oils, etc.). Data related to operational material resources use and waste generated by highway schemes is not readily available, and as such will not be assessed as part of the EIA process.

12.4.7 The baseline for material resources and waste are presented below in paragraphs 12.4.8 and 12.4.13.

Material resources baseline

12.4.8 The national demand (baseline) will be estimated for the key construction materials associated with the development. Both the key construction materials and the national demand are shown below in Table 12.1. The national baseline has been sourced from data published by the Mineral Products Association, UK Steel and the Forestry Commission.

12.4.9 The key construction materials identified in the table are based on the main construction materials identified in the Bill of Quantities (or equivalent) from previous road improvement Schemes. National demand data is drawn from data for both 2014 and 2015 (most readily available data). Note, given that the number, type and size of construction developments varies from year to year, the demands for construction materials also fluctuate. As such, this data should be considered representative.

Table 12.1: National material resources baseline

Construction material	National Baseline
	Tonnes per Annum (tpa)
Aggregate	225,000,000
Asphalt	24,000,000
Cement	13,000,000
Concrete*	81,000,000
Steel	10,448,200
Timber**	3,225,920

* – Sum of concrete and other concrete related products
** – Converted from cubic meters (9,488,000 m^3) using a conversion rate of 1 m^3 to 0.34 tonnes

Waste baseline

12.4.10 The amount of CD&E and hazardous waste arisings for Surrey will fluctuate year on year based on the number, type and size of construction projects underway. This in turn is heavily influenced by factors such as the economic situation, investment levels and legislative and policy variations. Thus, the representative baseline for CD&E waste arisings for the Scheme's construction period (2020 to 2022) has been calculated based on the estimated regional waste airings for 2015 (most recent available data), as shown in Table 12.2. The estimated regional waste arisings are presented in the Surrey County Council Planning Service: Annual Monitoring Report 2015/16.

12.4.11 The national baseline for hazardous waste arisings is taken from the Environment Agency Waste Integrator Tool (2017) filtered by hazardous construction waste. As with the non-hazardous/inert CD&E baseline this will fluctuate year on year based on the number, type and size of construction projects underway.

Table 12.2: Waste arisings baseline

Waste Stream	Tonnes per Annum (tpa)
CD&E (regional)	1,972,000
Hazardous (national)	197,710

Waste infrastructure baseline

12.4.12 As aforementioned, Surrey County Council have demonstrated their intent to calculate CD&E waste infrastructure capacity within the county. Once issued this will be included as part of the baseline, if available at the time of assessment.

12.4.13 The national hazardous waste infrastructure capacity, interpreted from the Environment Agency list of permitted facilities (2015), is presented in Table 12.3. It should be acknowledged that the hazardous waste infrastructure capacity baseline is not specifically for CD&E waste, as the facilities are likely to receive hazardous waste from multiple streams (i.e. municipal, commercial and industrial etc.) and therefore it is not possible to delineate this data further.

Table 12.3: National hazardous waste infrastructure baseline

Waste Stream	Tonnes per Annum (tpa)
Hazardous	9,521,042*

* Hazardous landfill capacity has been interpreted from the total capacity of permitted hazardous waste facilities nationally.

12.5 Potential impacts

12.5.1 Potential impacts are related to the potential impacts on the existing baseline (see section 12.4).

12.5.2 Receptors which have the potential to be impacted, with regards to material resources and waste, are defined as:

- The market for key construction materials, which are to be used throughout the Scheme, as shown in Table 12.1;

- The waste arisings baseline – the amount of waste that is predicted to be produced during the CD&E phases of the Scheme, shown in Table 12.2; and
- The predicted capacity of waste infrastructure – essentially the capacity of sites receiving, placing, treating, recycling, recovering and/or disposing of waste both regionally (non–hazardous and inert) and nationally (hazardous) which are anticipated to arise from the Scheme during the construction phase. As aforementioned, Surrey County Council issued a Scoping Statement in September 2016 which demonstrates their intent to calculate CD&E waste infrastructure capacity. Once issued this will be included as part of the baseline. The hazardous waste infrastructure capacity is shown in Table 12.3.

12.5.3 As noted above, less impact is envisaged during the operational stage of the Scheme (see paragraph 12.4.6).

12.6 Potential mitigation measures

12.6.1 Although every effort will be made (through the design process) to maximise resource efficiency, it is inevitable that waste will be generated during each phase of the Scheme. This will have an impact on the regional waste infrastructure and the regional quantity of waste arisings.

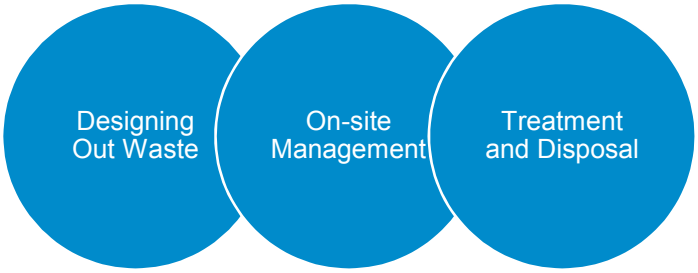
12.6.2 Mitigation measures are necessary in order to reduce the environmental effects of both the CD&E and operational phases of the Scheme. The following sections detail the mitigation measures that should be implemented. Where applicable, design and enhancement measures have also been included. Many of the measures outlined in both the CD&E and operational sections are also mitigation measures for material resources, and as such a separate section has not been provided.

12.6.3 In light of an assessment not being undertaken at this stage, mitigation measures have been included as examples of best practice.

CD&E

12.6.4 There are a number of different design, mitigation and enhancement measures that can be utilised for waste management holistically throughout the CD&E phases as outlined in Figure 12.1 and detailed below.

Figure 12.1: CD&E Mitigation Measures



Designing Out Waste

12.6.5 Waste should be designed out at the early project stages or as early as is practicable to ensure materials used:

- Are to industry standard specifications;

- Are locally sourced, where practicable;
- Are reused/reclaimed (potentially from excavation and/or demolition), where practicable; and/or
- Are recycled or reclaimed, where practicable.

12.6.6 The UK's Waste Resources Action Programme (WRAP) has produced guidelines for design teams under the following headings:

- Re–use and recovery;
- Off–site construction;
- Materials optimisation;
- Waste efficient procurement; and
- Deconstruction and flexibility.

12.6.7 In addition, it is recommended that efforts are made both by the designer and the contractor(s) to reduce the wastage rates of the construction waste streams which arise in the greatest quantities (e.g. inert materials and concrete).

12.6.8 All of these factors should be considered and implemented in the design of the Scheme to improve the sustainability of the Scheme, including minimising waste to landfill.

On–site Management of CD&E Waste

12.6.9 Best practice waste management on CD&E schemes, which should be applied to the Scheme include:

- Designing out waste at the initial stage of the Scheme through utilising standardised sizes and materials where possible and engaging with the design team on the importance of this. This should include working to reduce the wastage rates of the construction materials that constitute the waste streams which arise in the greatest quantities;
- Setting targets for waste recovery and recycling, communicating these to those working on the Scheme with a clear understanding of what is expected;
- Preparation and maintenance of a Materials Management Plan (MMP) (if applicable), CEMP and a SWMP so that waste generation and management can be logged and audited;
- Using precast concrete and other materials that can be prepared off–site to minimise waste generation on–site;
- Not over ordering materials and using materials brought to site as efficiently as possible;
- Organising deliveries so materials arrive on–site as they are needed to reduce the possibility of damage and wastage occurring;
- Having clearly defined and separated skips on–site and a clearly demarked waste area(s); and
- Training staff to understand how they should sort any waste material and providing regular reminders and updates.

12.6.10 Best practice waste management not only reduces the environmental effects of a development through reducing waste to landfill or incineration, but also offers cost benefits, as the cost of disposal to landfill or incineration is not needed.

Treatment and Disposal

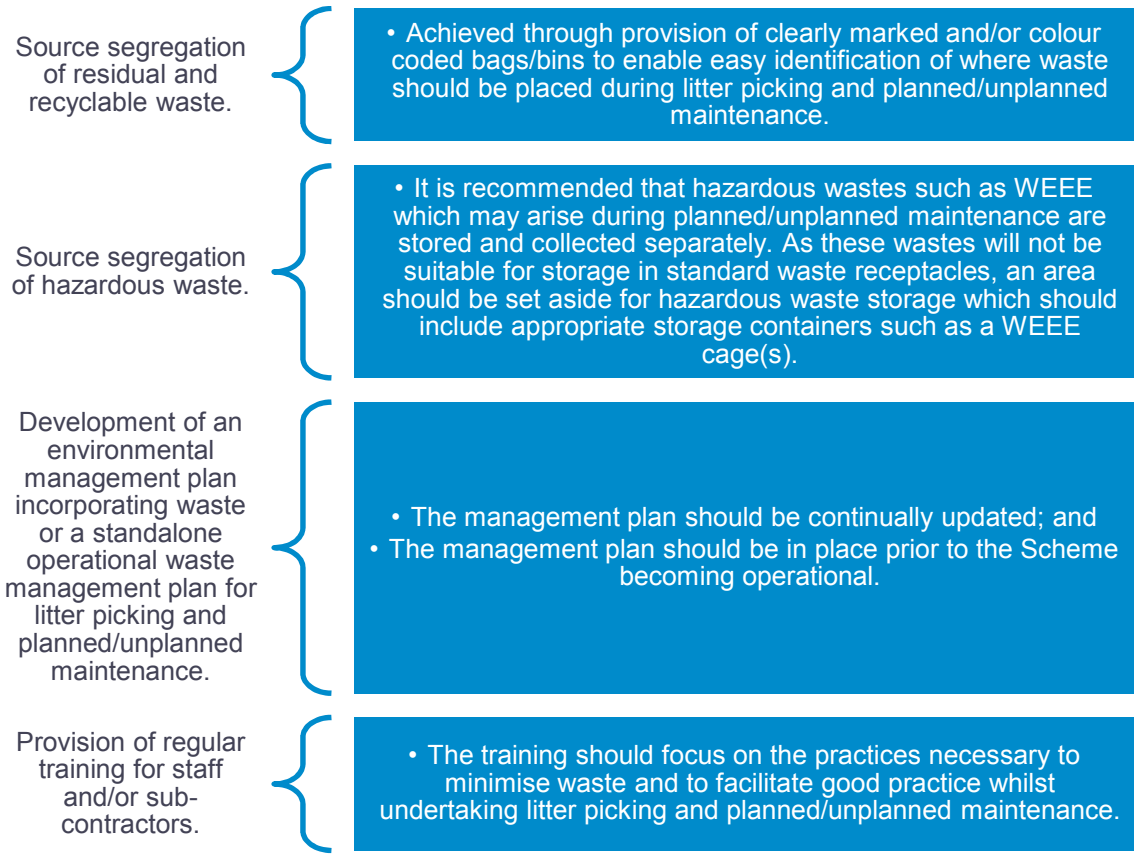
12.6.11 The Scheme should be committed to achieving a high recycling and recovery rate for all CD&E waste generated on–site. This can be achieved by arranging for the source segregation of recyclable materials and the provision of appropriate recycling facilities. Achieving a high recycling rate will minimise the environmental burden in terms of pollution, energy consumption, the carbon impact and the emission of large quantities of CO_2 equivalent associated with the production of products from virgin material. Further details on this can be found in section 14.6 of Chapter 14 Climate Change and Disaster Prevention.

12.6.12 Across the country there are a number of waste collection and disposal companies. The developer must select waste contractor(s) who are registered with the Environment Agency as a waste carrier for all CD&E waste to be transported, including hazardous waste. The contractor should be able to undertake daily collections which will be required during CD&E phases. Completed waste transfer notes and/or hazardous waste consignment notes must be provided by the contractor. These should be kept for a minimum of two and three years respectively. Any site that waste is transferred to must also have either a permit or exemption that allows it to receive and manage the waste being transferred.

Operation

12.6.13 The operational mitigation measures that should be implemented are detailed in Figure 12.2.

Figure 12.2: Operational Mitigation Measures



12.7 Summary

12.7.1 Table 12.4 below outlines the potential issues likely to occur as a result of the Scheme during the construction and operational phases for each topic. As aforementioned, less impact is envisaged during the operational stage of the Scheme due to minimal material resources use (associated with planned/unplanned maintenance) and waste generation (through littering and planned/unplanned maintenance) and as such it will not be assessed as part of the EIA process.

Table 12.4: Potential Issues

Effects	Construction	Operation	Comments
Waste	✓	×	Design to ensure wastage is minimised throughout lifecycle. Waste to be used as a resource where practicable and designed out where possible.
Material resources	✓	×	Assessment to identify and evaluate the impacts of the Scheme against national demand for key construction materials and raw material resources.

Key: ✓ = potential impact likely; × = no potential impact likely

13 People and Communities

13.1 Introduction

13.1.1 This chapter has been prepared to describe the likely impact of construction and operation of the Scheme on people and communities known at the time of writing of the PEIR.

13.1.2 The assessment topics and methodology followed is in accordance with the guidance provided in the DMRB Volume 11 and IAN 125/15.

13.2 Study area

13.2.1 The People and Communities Chapter will assess the Scheme's likely impact upon:

- Private dwellings;
- Community assets;
- Local businesses;
- Agricultural land;
- Development land;
- Non-motorised users (NMU) - pedestrians, cyclists and equestrians; and
- Vehicle travellers (VT) - drivers and passengers of both public and private vehicles.

13.2.2 Drawings showing these resources are in Figures 13.1 and 13.2 in Volume 3.

13.2.3 In the absence of prescriptive guidance for People and Communities assessments, it is proposed to assess likely effects within a study area comprising land within the Scheme DCO Boundary plus a 500 m buffer extending beyond this boundary, with the exception of agricultural land, where study area is limited to agricultural land required either temporarily or permanently by the Scheme.

13.2.4 Using professional judgement and knowledge of the scheme, this threshold is considered likely to capture all relevant effects resulting from the scheme. However, the extent of this study area may be increased during the assessment process subject to its findings and the findings of other environmental assessment topics which may inform the People and Communities assessment, such as landscape and visual impact, transport, noise and vibration and air quality.

13.3 Consultation

13.3.1 In accordance with DMRB Volume 11, Section 3 guidance, consultation has been ongoing with the Local Authorities (EBC, GBC, WBC, Mole Valley District Council and Surrey County Council), business owners (including agricultural tenants) and managers of community facilities likely to be affected by the Scheme, including RHS Wisley and Painshill Park.

13.3.2 Consultation will also be undertaken with the British Horse Society, Open Space Society and NMUs at a workshop targeted to include groups that use this land for leisure or as part of their business or charitable function. NMUs were interviewed during the Common Land and Access Land site surveys in September 2017.

13.3.3 The aim of this consultation will be to confirm the community and private assets identified within the study area baseline, to ascertain their level of usage by members of the community and obtain more information on anticipated impacts of the Scheme.

13.4 Baseline conditions

Private dwellings

13.4.1 In the vicinity of the Scheme, private dwellings are found in the main settlements of Cobham and Byfleet and in the smaller hamlets of Elm Corner, Hatchford, Ockham, Ripley, Downside, and Wisley. In addition, there are a number of isolated properties and farms within 500 m of the Scheme, including within Wisley Common, along Redhill Road, and to either side of the A3 north of the M25.

Community assets

13.4.2 Within the study area there are community assets, including the following:

- Ockham and Wisley Commons;
- Open Access Land;
- Painshill Park (Grade I Listed);
- RHS Wisley Gardens (Grade II* Listed);
- Heyswood Girl Guide campsite;
- Birchmere Scout campsite;
- Feltonfleet School;
- RHS Wisley Research Facility;
- Woking Archery Club;
- Walton Firs Adventure Camp;
- St George's Nursing Home; and
- Ripley and Ockham Village Greens.

Local Businesses

13.4.3 Initial desk based research has identified the following potential business receptors. This list is not intended to be exhaustive and will be refined as part of the assessment process:

- Surrey Wildlife Trust, Pond Farm;
- Ockham Bites Café;

- Holly Bush Stables;
- Silvermere Equestrian Centre;
- Katz Castle;
- Cobham Hilton;
- Cobham Services;
- Black Swan Public House;
- Sainsburys Supermarket; and
- Bramley Hedge Farm Industrial Estate.

13.4.4 A range of organisations, institutions or charities with operational nature similar to that of businesses are known to operate in the area around the Scheme, including:

- Heyswood Girl Guide Campsite;
- Birchmere Scout campsite;
- Painshill Park;
- RHS Gardens Wisley;
- RHS Wisley Research Facility; and
- Feltonfleet School.

13.4.5 These facilities are in private ownership but are operated as charities. The principle function is to provide a public service and they are not for profit and therefore, they will be considered under the Community Assets assessment section.

13.4.6 It is also recognised that a number of farms which operate as businesses are located in the study area. Potential impact on these will be assessed within the Agricultural Land assessment section.

Agricultural Land

Best and most versatile agricultural land (BMV)

13.4.7 There is no detailed published soil map of the land around Junction 10. The only available map is the 1:250,000 soil map of South East England published by the Soil Survey of England and Wales in 1983[52].

Agricultural soils in areas of permanent engineering land take

13.4.8 Grazed heathland of Wisley and Ockham Commons and the meadow between the M25 and Pointers Road are underlain by the Holidays Hill association of acid and infertile sandy soils with a high water table caused by a clay subsoil. Surface horizons are peaty where the soils are under heath.

[52] Soil Survey of England and Wales (1983). 1:250,000 scale Soil Map of South East England. Rothamsted Experimental Station, Harpenden.

Agricultural soils in areas of temporary engineering land take

13.4.9 Two site compounds are on agricultural land. In the south west quadrant of J10 there is a proposed compound on grazed heathland of Wisley Common where the soils are the Holidays Hill association.

13.4.10 The site compound to the west of the A3 at Ockham Junction (known as Nutberry Fruit Farm) is on the Hucklesbrook association of well drained sandy and light loamy soils over gravel.

Agricultural soils in areas of replacement land

13.4.11 N1 (9.9 ha): Field south of Park Barn Farm: Sandy and gravelly soils on the boundary of the Hucklesbrook and Holidays Hill association.

13.4.12 N2 (4.9 ha): Field north of Buxton Wood: Sandy and gravelly soils of the Hucklesbrook association and wet clayey alluvium of the Fladbury association.

13.4.13 E3 (8.1 ha): Field north east of Chatley Wood: Part Holidays Hill association and part Fladbury association.

13.4.14 S1 (2.8 ha): Fields at Hatchford End: Swanwick association of low-lying, wet sandy soils, often with a peaty surface.

13.4.15 S2 (2.7 ha): Fields and woodland at Hatchford End: Swanwick association.

13.4.16 W1 (12.8 ha): Pond Farm pastures: Swanwick association.

Agricultural Land Classification of affected land

13.4.17 Best and Most Versatile (BMV) land is in MAFF's Agricultural Land Classification (ALC) Grades 1, 2 and Subgrade 3a , as defined in paragraph 112 and Annex 2 of the National Planning Policy Framework (2012) and Natural England's Technical Information Note 049 (2012).

13.4.18 The published Ministry of Agriculture, Fisheries and Food (MAFF) 1:250,000 Provisional ALC Map (available on the government's MAGIC website http://magic.defra.gov.uk/ (accessed March 2017) provides only a broad indication of land quality and should not be used definitively on specific sites smaller than 80 ha in size. Moreover, the published map does not subdivide Grade 3 into Subgrades 3a and 3b and so cannot be used definitively in areas that are marginal to BMV. The land between Ockham Junction and Cobham is shown as Grade 3 (good to moderate quality) and Grade 4 (poor quality); the heaths and woodlands being classed as non-agricultural.

13.4.19 There are more detailed ALC surveys of the area on Natural England's MAGIC website, dividing Grade 3 into Subgrades 3a and 3b. However, it is possible to apply the ALC classification to the published soil information. Holidays Hill soils are likely to be in Grades 4 or 5 because of their wetness and acidity. Swanwick and Fladbury soils are likely to be in Grade 4 because of wetness. Hucklesbrook soils are in Grade 3b or 4 because of droughtiness.

13.4.20 Thus, none of the affected land is likely to be of BMV quality.

Agricultural land holdings

13.4.21 Some of the land described below is not currently managed as farmland. However, it has not undergone any change of use that is incompatible with it being returned to farming in the future and so is included in this assessment.

13.4.22 No agricultural buildings will be demolished by the Scheme.

Farmland to be lost to permanent engineering land take

13.4.23 **Wisley and Ockham Commons**: Heathland of Wisley and Ockham Commons is grazed by the Surrey Wildlife Trust from their farm base at Pond Farm. The cattle, sheep and goats are primarily for conservation grazing, but the meat commands premium prices and is a significant source of income for the Trust. Livestock are transferred between the two Commons via the bridge across the M25.

13.4.24 **Poynters Farm:** A 0.7 ha grass field between Pointers Road and the M25, just west of the bridge leading to Hatchford Wood, belongs to Poynters Farm, a nearby equestrian establishment.

Farmland subject to temporary engineering land take

13.4.25 **Wisley Common**: In the south west quadrant of Junction 10 there is a proposed site compound on grazed heathland of Wisley Common, managed by Surrey Wildlife Trust.

13.4.26 **Smallholding west of Ockham Junction (Nutberry Fruit Farm):** The proposed site compound to the west of the A3 at Ockham Junction is a 15 ha smallholding that is grazed by horses and formerly included a market garden for soft fruit. The northern part site is sublet on 25 days a year for car boot sales.

Farmland to be acquired as replacement land

13.4.27 **Park Barn Farm (N1 and N2):** This is a 40 ha farm of mainly permanent grass with some woodland. The land is currently ungrazed and managed by mowing, but could easily be restocked with livestock. The replacement land required from this holding comprises 14.8 ha.

13.4.28 **Chatley Wood Farm (E3)** – Chatley Wood Farm no longer operates as one farming unit and the agricultural land is let on a short-term tenancies. It is an 8.1 ha field in mixed grass and arable rotations.

13.4.29 **Field at Hatchford End (S1):** This is a 1.1 ha field of ungrazed rough grass reverting to scrub. The owner is unknown.

13.4.30 **Poynters Farm (S2):** This comprises 5.2 ha of grass managed for equestrian purposes. The adjoining stabling is unaffected.

13.4.31 **Pond Farm (W1):** This 12.8 ha area of grassland which, with its adjacent (unaffected) farm buildings, is the main base for the livestock grazing operations of the Surrey Wildlife Trust. Calving and lambing take place here and the land is grazed and cut for hay. It is also serves as a quarantine facility for newly acquired or diseased livestock.

Development Land

Guildford Borough Council

13.4.32 Junction 10 is located within the Borough of Guildford, which extends to the south and west. Within the study area there is a relevant site allocation from the Submission Local Plan Strategy and Sites (December 2017) (Examination in Public will be held in Spring/Summer 2018) and development currently at appeal, and two planning consents at the RHS Wisley site as part of their Major Investment Programme. Details are provided in Table 13.1.

Table 13.1: Guildford Borough Council Development Land

Application location and reference	Description of proposed development
Land at former Wisley Airfield (Site allocation A35 in the Submission Local Plan: strategy and sites 2017) A planning application was submitted for a development of this size (Planning ref. 15/P/00012) and refused on 8th April 2016. This application is currently at appeal and due to be determined in early 2018.	This is a residential led mixed use development, allocated for: Approximately 2000 homes (C3), including some specialist housing and self-build plots, approximately 100 sheltered/extra care homes (C3 use), 8 Traveller pitches, approximately 1,800 m2 of employment floor space (B1a), approximately 2,500 m2 of employment floor space (B2/B8), approximately 500 m2 of comparison retail (A1), approximately 600 m2 of convenience retail (A1), approximately 550 m2 services in a new local centre (A2 -A5), approximately 500 m2 of community uses in a new local centre (D1), a two form entry primary school (D1), and a secondary school (D1) (four form entry, of which two forms are needed for the housing on the site and two for the wider area).
Royal Horticultural Society Gardens, Wisley Lane, Wisley, Woking, GU23 6QS Planning ref. 16/P/01080, granted 30 September 2016	Erection of new part single-storey part two-storey building accommodating retail, entrance and visitor facilities and alterations to the car parking and hard and soft landscaping and following the demolition of the existing plant centre, the extensions to the Laboratory building, toilet blocks, Aberconway Cottage and part of Aberconway House.
Royal Horticultural Society Gardens, Wisley Lane, Wisley, Woking, GU23 6QS Planning ref. 16/P/000976, granted 30 September 2016	Demolition of existing buildings and erection of a two-storey building accommodating science, education, research and restaurant facilities, associated landscaping including a landscape bund and other works associated with the development.

Elmbridge Borough Council

13.4.33 The area to the north, east and south of Junction 10 is within the Elmbridge Borough Council administrative area. Within Elmbridge there are some relevant planning applications and a planning consents and a site identified in a site allocation document in an emerging Local Plan which has not been formally adopted. This adoption is likely to be in September 2018. Details are provided below in Table 13.2.

Table 13.2: Elmbridge Borough Council Development Land

Application location and reference	Description of proposed development
Former San Domenico Restaurant Planning Ref. 2017/0524 (validated 21st March 2017)	Demolition of existing main building and the construction of the new petrol filling station (Sui Generis) with ancillary convenience store (Use A1) and food to go outlet (Use Class A5), 4 no. pump islands, canopy, underground tanks, revisions to vehicular access, parking and circulation arrangements, landscaping and associated works.
Former San Domenico Restaurant Planning Ref. 2014/4612 (approved 19 January 2015)	Revisions to vehicular access and parking arrangements associated with the existing coach house (Use Class A3) and external alterations to facilitate a drive thru café.
Painshill Farm, Portsmouth Road, Cobham Surrey KT11 1DN Planning Ref. 2016/4204 (validated 27th February 2017)	Redevelopment of the site to provide a 70 bed care home with integrated communal and support facilities, landscaped residents' gardens, staff areas, refuse storage and parking following demolition of existing houses.
Land alongside A3 adjacent to Sainsbury Car Park Site allocation DEV/COB9	A largely level vacant site between a housing development/supermarket car park and the A3. Potential to develop up to 70 homes

13.4.34 This list of Development Land will be updated as part of the environmental assessment and reported in the ES. It will also include Development Lane in Woking Borough Council to the north west and Mole Valley District Council to the south east if applicable..

Non–Motorised Users

13.4.35 Non-Motorised Users (NMUs) include pedestrians, cyclists, and equestrians. There are numerous existing PRoW and permissive or informal NMU routes within 1 km radius of Junction 10, some of which cross or interact with the A3 and M25 corridors. In addition, people have the right to roam on the Common Land and Access Land. The impact assessment will consider likely effects on formal PRoW identified within the Surrey County Council Rights of Way interactive map.

13.4.36 See Figure 13.2 for locations of public access and Rights of Way.

Community Severance for Non-Motorised Users

13.4.37 Several existing PRoW have crossing points via pedestrian overbridges that span the A3 and the M25. However, the A3 and the M25 are barriers to movement for NMUs and local journeys and as a result, severance issues are currently experienced. These include NMU routes on the junction 10 gyratory itself and the crossing of the A3 just to the north of the junction both which are unattractive for users. To the east of the junction the next crossing of the M25 is some way distant which deters people from accessing PROW and land on either side of the motorway.

Vehicle Travellers: View from the road

13.4.38 The M25 Junction 10/A3 Interchange Improvements are located within the Wisley and Ockham Commons, and are located close to the Grade I Listed Painshill and the Grade II* Listed RHS Wisley Registered Parks and Gardens.

13.4.39 The study area contains varying degrees of screening elements along the M25 and A3 that obscure or block the views completely, with Junction 10 surrounded by mature vegetation consisting of heathland, scrub, hedgerows, trees and woodlands.

Vehicle Travellers: Driver stress

13.4.40 There are also two Strategic Roads in the vicinity of the Scheme: the A3 and the M25.

13.4.41 The M25 provides a continuous orbital route around Greater London. It carries high volumes of traffic which can cause disruption and delays to the surrounding road network particularly when emergency closures and lane closures are imposed. The south-west quadrant of the M25 is one of the busiest sections of the motorway network and regularly experiences severe congestion.

13.4.42 The probability of experiencing congestion in the peak period is more than 80% in the south-west quadrant of the M25. Average speed at peak times on the M25 is as low as 31-40 mph west of Junction 10 and 41-50 mph to the east. The south-west quadrant is in the top 10 percent nationally in terms of vehicle hour delay.

13.4.43 The A3 also supports a bus route and bus stops. The 715 Stagecoach bus route travels from Kingston to Guildford via Wisley, hourly, Monday–Saturday. On Sundays and public holidays the service run every 90 minutes.

13.4.44 There are a number of local roads in the vicinity of the Scheme, including but not limited to:

- Portsmouth Road;
- Ripley High Street;
- Ockham Road;
- Wisley Lane;
- Elm Lane;
- Hatch Lane;
- Old Lane;
- Pointers Road;
- Redhill Road;
- Byfleet Road; and
- A245.

13.5 Potential impacts

Private Dwellings: Land Take and Severance

Construction

13.5.1 Construction of the Scheme may result in temporary and/or permanent direct physical impact upon private dwellings through alterations to access. No demolition of a private dwelling or land take from a private dwelling or its curtilage expected.

13.5.2 The Scheme is likely to result in access alterations for:

- Properties at Elm Corner;
- Wilderness Cottage;
- Long Orchard Farm;
- Firtree Cottage;
- Long Orchard House;
- Pond Farm;
- Caretakers cottage, Heyswood Girl Guides;
- Court Close Farm;
- New Farm; and
- Hut Hill Cottage.

13.5.3 In all cases where the Scheme affects a dwelling's access, an alternative access will be provided. It is assumed that continuous access, whether via the dwelling's original access, a temporary access, or a revised permanent access arrangement, will be possible throughout the construction period.

13.5.4 The sensitivity of all residential receptors, including their access, is considered to be high.

13.5.5 The magnitude of impact on residential and private property is calculated according to the number of properties affected and the degree to which access to these properties is affected, ranging from a minor alteration in access along a similar alignment without a substantial change in journey distance to a considerable change in access which substantially increases journey length. As stated above, no complete loss of access is expected.

Table 13.3: Effects on private property during construction

Receptor (sensitivity)	Effect Description	Effect Grading/ Magnitude	Significance
5+ properties at Elm corner (high)	Re–provided safer but less advantageous access. Access will no longer be achieved from the A3 via Elm Lane. Elm Lane to be improved allowing passage from Old Lane.	Moderate	Moderate adverse: Locally significant

Receptor (sensitivity)	Effect Description	Effect Grading/ Magnitude	Significance
Two properties north of the A3 and south of the M25, comprising: Hut Hill Cottage and Pond Farm (high)	Revised safer access arrangements.	Minor	Slight adverse: Not significant
Five properties north of the A3, east of the M25, comprising: Dwellings at Long Orchard Farm, Firtree Cottage, Long Orchard Cottage, and Long Acre (high)	Properties at Long Orchard Farm and Firtree Cottage will benefit from re–provided safer access via a single lane access (with passing points) road between Redhill Road and Severn Hills Road. This access is expected to be similarly advantageous to current access arrangements. Long Orchard and Long Acre, which are currently accessed via a private driveway opening directly onto the A3, will have their access significantly altered. New access will be provided via the access track described above. This will lead to extended journey distance from the south, reduced journey distance from the north, and improved highway safety.	Moderate	Moderate adverse: Locally significant
Wilderness Cottage (high)	Broadly similar re–provided safer access for one dwelling. Works affecting Old Lane and the Elm Lane from junction with Old Lane.	Minor	Slight adverse: Not significant
Court Close Farm, caretaker's cottage (Heyswood Girl Guides site), and New Farm (high)	Re–provided safer but less advantageous access.	Minor	Slight adverse: Not significant

Operation

13.5.6 No direct physical impact is expected upon residential or private property during operation. Any land take required by the Scheme will occur during the Scheme's construction phase, but access changes continue, albeit the same, during operation.

13.5.7 The following private dwellings have also been identified and will be assessed in the ES:

- Properties in Wisley;
- Properties in Hatchford;
- Properties in Cobham;
- Deers Farm Close;

- Wren's Next;
- The Coach House, Long Orchard;
- Redhill Road properties;
- Seven Hills Road properties;
- Byfleet Road properties;
- Park Barn Farm;
- Wardens Cottage, Heyswood Girl Guides;
- West Lodge;
- East Lodge;
- Painshill Farm;
- Pains Hill Bungalow;
- Stables Cottage;
- The Belfry House;
- The Clock House; and
- Chatley Farm.

Private Dwellings: Amenity

13.5.8 At the time of writing, detailed assessment findings relating to visual, traffic, air quality, and noise effects on specific receptors are not available.

13.5.9 The People and Communities chapter of the ES will assess the impact of the Scheme for residents and the local community, at isolated properties or larger settlements, that are likely to receive a combination of two or more significant traffic or amenity effects.

13.5.10 Effects may arise form activities and Scheme elements such as:

- Earthmoving operations;
- The formation of temporary spoil areas;
- Road formation/construction;
- The creation of new earthworks;
- Creation of site compounds; and
- Proposed overbridges/structures.

Community Assets: Land Take and Severance

Construction

13.5.11 Community Land is required to construct the Scheme. This will directly affect Ockham Common, Wisley Common, and other 'Open Access Land', where the public benefit from right of access by virtue of The Countryside and Rights of Way Act 2000 which permitted access to land mapped as 'open country' (mountain, moor, heath and down) or Registered Common Land.

13.5.12 The Scheme will also affect Painshill Park and RHS Gardens Wisley. Both of these facilities are in private ownership and are operated as charities open to the public during set times. Despite their private ownership, it is considered appropriate to include assessment of potential impacts on these receptors under the Community Land subheading due to the nature of these facilities, which are both visited by many members of the public annually. The effects on community assets during construction is set out in Table 13.4.

Table 13.4: Effects on Community Assets During Construction

Receptor	Effect Description	Sensitivity	Effect Grading/ Magnitude	Significance
Ockham Common	A proportion of this receptor is required permanently to accommodate the Scheme. This loss is irreversible. In addition, a further amount of this receptor is likely to be required to facilitate construction of the Scheme.	High	Moderate	Moderate or large adverse
Wisley Common	A proportion of this receptor is required permanently to accommodate the Scheme. This loss is irreversible. In addition, a further amount of this receptor is likely to be required to facilitate construction of the Scheme.	High	Moderate	Moderate or large adverse
Open Access Land	A proportion of this receptor is required permanently to accommodate the Scheme. This loss is irreversible. In addition, a further amount of this receptor is likely to be required to facilitate construction of the Scheme.	High	Moderate	Moderate or large adverse
Painshill Park	Potential for small portion of this receptor to be required to accommodate the Scheme adjacent to the A3. In addition, a further amount of this receptor is likely to be required to facilitate construction of the Scheme. The likely duration of these effects is not yet clear. Primary access unlikely to be affected.	High	Moderate	Moderate or large adverse
RHS Gardens Wisley	The Scheme includes extensively revised access arrangement to Wisley Garden, comprising a new overbridge for Wisley Lane over the A3 and new access road south	High	Moderate	Moderate or large adverse

Receptor	Effect Description	Sensitivity	Effect Grading/ Magnitude	Significance
	of the A3 linking to the Ockham Interchange. This arrangement is likely to be less convenient for visitors approaching from the south west on the A3, who would be obliged to exit the A3 earlier and approach via Portsmouth Road or continue past the gardens and switch back at J10 and again at Ockham junction. However, these arrangements will be much safer and less stressful for visitors to RHS Wisley The proposed overbridge and associated embankment may result in some loss of land from the south-eastern extent of this receptor. The area of land lost and duration of loss is not yet certain.			

13.5.13 Note that the preliminary assessment set out above does not account for potential mitigation, particularly in the form of Replacement Land.

13.5.14 The following Community Assets have also be identified and effects will be assessed and presented in the ES:

- RHS Wisley Research Facility;
- Feltonfleet School;
- Walton Firs Adventure Camp;
- St George's Nursing Home; and
- Ripley and Ockham Village Greens.

13.5.15 Potential alterations to the 715 bus route or its stopping places may adversely affect the ability of members of the public to access community assets during construction. Re-provided bus routes and/or stopping points may be less advantageous by virtue of increased journey time for those visiting assets. The revision of routes and/or stopping places may either be temporary, during construction, or permanent alterations occurring during construction. Access to RHS Wisley Gardens, which benefits at present from a dedicated stopping point, may in particular be affected. This will be considered within the main ES.

Operation

13.5.16 No direct physical impact is expected upon community land during operation. Any land take required by the Scheme will occur during the Scheme's construction phase.

Community Assets: Amenity

13.5.17 Users of community facilities within the study area may experience changes in amenity as a result of construction and operation of the Scheme. Amenity related effects include air quality, visual, traffic and noise effects. At the time of

authorship of this Chapter, detailed assessment findings relating to amenity effects are not available.

13.5.18 The People and Communities chapter of the ES will qualitatively assess the impact of the Scheme on users of Community Assets where they experience a combination of two or more significant traffic or amenity effects that results in a cumulative deterioration in amenity beyond the findings of traffic, air quality, noise, vibration and visual impact assessments. The significance of in-combination amenity effects will be judged based upon the number of people affected and the degree to which they are affected, including the magnitude of changes in amenity and their sensitivity to that change.

13.5.19 Assets potentially affected include 'users' of:

- Ockham and Wisley Commons;
- Open Access Land;
- Painshill Park (Grade I Listed);
- RHS Wisley Gardens (Grade II* Listed);
- RHS Wisley Research Facility;
- Woking Archery Club;
- Heyswood Girl Guide campsite;
- Birchmere Scout campsite;
- Feltonfleet School;
- Walton Firs Adventure Camp;
- St George's Nursing Home; and
- Ripley and Ockham Village Greens.

13.5.20 Most users of outdoor resources such as Common Land and Access Land may be expected to be 'transitory', not exposed to altered amenity for prolonged lengths of time. These users are likely to be less sensitive to changes in amenity. However, some outdoor users undertaking activities such as camping in the Heyswood Girl Guide campsite or Birchmere Scout campsite may experience changes in amenity for sustained periods and a key element in the enjoyment of Parks and Gardens may relate to the relative amenity of those spaces. Schools may be particularly sensitive to change in amenity, particularly relating to air quality, noise and vibration.

Local Businesses

13.5.21 A range of business uses have been identified within 500 m of the Scheme. Ockham Bites Café, which operates inside the Scheme boundary. Silvermere Equestrian Centre and Holy Bush Stables make use of land within the Scheme boundary and study area.

13.5.22 Further consultation with the operators of these businesses is required to more fully understand the Scheme's potential impact upon them and this will be undertaken during public consultation. However, preliminary desk based

assessment, without an assignment of significance of effect, suggests the following:

Table 13.5: Effects on Local Businesses During Construction

Receptor	Effect Description	Sensitivity	Effect Grading/ Magnitude
Silvermere Equestrian	Some Common and Access Land will be required both temporarily and permanently during construction and bridgeways are likely to be affected. This will reduce the land available for equestrian pursuits. Temporary closure and reconstruction of M25 overbridges may result in significant temporary loss of available land.	Medium	Minor
Ockham Bites	Works in very close proximity to the café and temporary closure of the Ockham car park may substantially alter trading conditions during construction.	High	Moderate
Holly Bush Stables	Some Common and Access Land will be required both temporarily and permanently during construction and bridgeways are likely to be affected. This will reduce the land available for equestrian pursuits. Temporary closure and reconstruction of M25 overbridges may result in significant temporary loss of available land.	Medium	Minor

Table 13.6: Effects on Local Businesses During Operation

Receptor	Effect Description	Sensitivity	Effect Grading/ Magnitude
Silvermere Equestrian	Potential loss of previously used Common Land or Access Land, offset by provision of Replacement Land. Equally advantageous or improved overbridge crossing facilities.	Medium	Negligible
Ockham Bites	Alterations to car parking arrangements in vicinity of the café. No net loss of spaces anticipated.	High	Negligible
Holly Bush Stables	Potential loss of previously used Common Land or Access Land, offset by provision of Replacement Land. Equally advantageous or improved overbridge crossing facilities.	Medium	Negligible

13.5.23 Effects on the various not for profit organisations that are identified with the baseline are considered in the Community Assets section and identified agricultural businesses are considered within the Agricultural Land section.

13.5.24 The following local businesses have also be identified and effects will be assessed and presented in the ES:

- Katz Castle;
- Cobham Hilton;
- Cobham Services;
- Black Swan Public House;

- Sainsburys Supermarket; and
- Bramley Hedge Farm Industrial Estate.

Agricultural Land

Best and most versatile agricultural land (BMV)

Construction phase

13.5.25 In the construction phase the following areas of non BMV soils will be taken out of agricultural use:

- Agricultural land taken for permanent engineering use (the Scheme footprint): 9.4 ha
- Agricultural land taken for temporary engineering use (site compounds): 21.7 ha
- Exchange land on farmland: 42.0 ha

13.5.26 A minor construction impact may be interference to local field drainage systems on the surrounding land.

Operational phase

13.5.27 There should be no additional impacts during the operational phase. Land temporarily acquired will be returned to the owners.

Agricultural land holdings

13.5.28 On agricultural land the key receptors are the farms and fields affected by land take and severance and the associated impacts on items of farm infrastructure such as trackways, hedgerows and water supplies.

Table 13.7: Sensitivity of affected agricultural land

Land take type	Holding	Sensitivity	Comment
Permanent engineering land take	Wisley and Ockham Commons	Low	Low density conservation grazing
	Poynters Farm small grass field	Low	Isolated field with no equestrian infrastructure
Temporary engineering land take	Smallholding west of Ockham Junction (Nutberry Fruit Farm)	High	Smallholding with no alternative land
	Wisley Common	Low	Low density conservation grazing
Replacement Land	Park Barn Farm (N1 and N2)	Low to medium	Currently low (ungrazed) but potentially medium if restocked
	Chatley Wood Farm (E3)	Medium	Fields let on short term tenancies
	Poynters Farm. Land at Hatchford End (S2)	High	Equestrian enterprise with stabling and associated exercise areas
	Field at Hatchford End (S1)	Negligible	Unmanaged rough grassland reverting to scrub
	Pond Farm (W1)	High	Strategic centre for Surrey Wildlife Trust grazing management

Construction

13.5.29 In the construction phase the following areas farmland will be taken out of agricultural use:

- Agricultural land taken for permanent engineering use (the Scheme footprint): 9.4 ha;
- Agricultural land taken for temporary engineering use (site compounds): 21.7 ha; and
- Replacement land on farmland: 42.0 ha.

13.5.30 Potential impacts on individual land holdings are summarised in Table 13.8 and all scheme effects are considered to be adverse.

Table 13.8: Potential construction phase impacts – Agricultural land

Land take type	Holding	Potential impacts
Permanent engineering land take	Wisley and Ockham Commons	• Loss of 8.7 ha of heathland grazing; • Temporary severance while new bridge is constructed; and • Noise and dust on surrounding land.
	Poynters Farm small grass field	• Loss of 0.7 ha of grazing; and • Noise and dust on surrounding land.
Temporary engineering land take	Smallholding west of Ockham Junction (Nutberry Fruit Farm)	• Loss of 15 ha of grazing and a car boot sale ground; and • Noise and dust on surrounding land.

Land take type	Holding	Potential impacts
	Wisley Common	• Loss of 6.7 ha of heathland grazing; and • Noise and dust on surrounding land.
Replacement Land	Park Barn Farm (N1 and N2)	• Loss of 14.8 ha of grassland.
	Chatley Wood Farm (E3)	• Loss of 8.1 ha of rotational arable and grass land.
	Poynters Farm. Land at Hatchford End (S2)	• Loss of 5.2 ha field used for equestrianism; and • Possible disruption to local field drainage system if ditches not maintained.
	Field at Hatchford End (S1)	• Loss 1.1 ha of unmanaged rough grassland.
	Pond Farm (W1)	• Loss of 12.8 ha of grazing; and • Possible disruption to local field drainage system if ditches not maintained.

Operation

13.5.31 There will be no additional impacts during the operational phase. The only impact which will continue into this phase is permanent loss of agricultural land to the Scheme footprint and replacement land. Land acquired temporarily for site compounds will have been returned to their owners in a condition equivalent to the original.

13.5.32 Magnitude of impact of the Junction 10 improvement on affected agricultural land is assessed on the following scale, based on the likely impact on farm viability.

13.5.33 The magnitude of impact, without mitigation, on each affected holding is assessed in Table 13.9.

Table 13.9: Magnitude of impact, without mitigation, on affected holdings

Land take type	Holding	Magnitude	Comment
Permanent engineering land take	Wisley and Ockham Commons	Negligible	Low density conservation grazing
	Poynters Farm small grass field	Minor	Isolated field with no equestrian infrastructure
Temporary engineering land take	Smallholding west of Ockham Junction	Major	Smallholding with no alternative land
	Wisley Common	Negligible	Low density conservation grazing
Replacement Land	Park Barn Farm (N1 and N2)	Negligible or major	Currently not managed as farmland (therefore negligible) but loss of 14.8 ha (37%) potentially major if it is taken back into farming
	Chatley Wood Farm (E3)	Minor	Fields let on short term tenancies
	Poynters Farm. Land at Hatchford End (S2)	Moderate	This land is an important part of the Poynters Farm equestrian enterprise

Land take type	Holding	Magnitude	Comment
			with fixed infrastructure and associated exercise areas
	Field at Hatchford End (S1)	Negligible	Unmanaged rough grassland
	Pond Farm (W1)	Major	Strategic centre for Surrey Wildlife Trust's grazing management

13.5.34 The magnitude of residual impact on each affected holding, following the application of potential mitigation, is assessed in Table 13.9 and all effects are considered to be adverse.

Table 13.10: Agricultural land – Operational phase residual impact significance

Land take type	Holding	Potential Impact	Mitigation Measures	Residual Impact Significance
Permanent engineering land take	Wisley and Ockham Commons	Loss of 8.7 ha of heathland grazing.	None, apart from five year aftercare period for any adjoining disturbed land restored to grazed heathland.	Neutral or slight
	Poynters Farm small grass field	Loss of 0.7 ha of grazing land.	None. Isolated field taken in its entirety.	Neutral or slight
Temporary engineering land take	Smallholding west of Ockham Junction (Nutberry Fruit Farm)	None	Land to be returned to owner in a condition equivalent to its original, with a five year aftercare period.	Neutral
	Wisley Common	None	Land to be returned to owner in a condition equivalent to its original, with a five year aftercare period.	Neutral
Replacement Land	Park Barn Farm (N1 and N2)	Loss of 14.8 ha of grassland.	None	Neutral or slight, or moderate or large (depending on whether the farm is restocked with livestock before commencement of the Scheme).
	Chatley Wood Farm (E3)	Loss of 8.1 ha of rotational arable and grass land.	None	Slight
	Poynters Farm. Land at Hatchford End (S2)	Loss of 5.2 ha field used for equestrianism. Possible disruption to	None Monitor for an agreed number of years.	Moderate or large

Land take type	Holding	Potential Impact	Mitigation Measures	Residual Impact Significance
		local field drainage system if ditches not maintained.		
	Field at Hatchford End (S1)	Loss 1.1 ha of unmanaged rough grassland.	None	Neutral
	Pond Farm (W1)	Loss of 12.8 ha of grazing. Possible disruption to local field drainage system if ditches not maintained.	None Monitor for an agreed number of years.	Large or very large

Significance of effects (construction phase)

13.5.35 The consideration of the relationship between the sensitivity and the magnitude of change without mitigation, defines the effect of the Scheme on agriculture. The significance of this effect is shown in Table 13.11 and all scheme effects are considered to be adverse.

Table 13.11: Potential significant agricultural soil effects in construction phase

Land take type	Holding	Sensitivity	Magnitude	Significance
Permanent engineering land take	Wisley and Ockham Commons	Low	Negligible	Neutral or slight adverse
	Poynters Farm small grass field	Low	Minor	Neutral or slight adverse
Temporary engineering land take	Smallholding west of Ockham Junction	High	Major	Large or very large adverse
	Wisley Common	Low	Negligible	Neutral or slight adverse
Replacement Land	Park Barn Farm (N1 and N2)	Low Potentially medium	Negligible or major	Neutral or slight, or moderate or large adverse
	Chatley Wood Farm (E3)	Medium	Minor	Slight adverse
	Poynters Farm. Land at Hatchford End (S2)	High	Moderate	Moderate or large adverse
	Field at Hatchford End (S1)	Negligible	Negligible	Neutral
	Pond Farm (W1)	High	Major	Large or very large adverse

13.5.36 The Scheme will result in the permanent loss of 9.4 ha of land in agricultural use, the great majority of which is grazed heathland on Wisley and Ockham Commons. The residual effect of this is assessed as neutral or slight adverse.

13.5.37 Two site compounds on agricultural land totalling 21.7 ha will be acquired temporarily and returned to the owners in a condition equivalent to the original. The residual effect is neutral.

13.5.38 Replacement land will take a further 42 ha of land out of agriculture and the residual effect on individual holdings ranges from neutral or slight to large or very large adverse.

13.5.39 This preliminary assessment of the impacts on individual holdings is based on introductory meetings with land owners and managers. More detailed interviews, with management questionnaires, are required before preparation of the ES.

Development Land

13.5.40 Preliminary investigation has identified a number of potential development sites within 500 m of the Scheme boundary, which may be affected by the Scheme. These are set out in Table 13.12 below with a preliminary assessment of potential effects.

Table 13.12: Development Land within 500 m

Site	Distance from DCO boundary	Land take (ha)	Assessment Score	Comments
Guildford Borough Council				
The former Wisley Airfield Site Allocation A35 in the Proposed Submission Local Plan: strategy and sites 2016	Partially within the DCO	2 ha	Adverse	Significant land take from the former Wisley Airfield site. The Wisley Airfield Masterplan Landuse Parameter Plan, ref 1715/P/002 Rev P2, indicates this would affect land identified for employment uses, open space and green infrastructure and potentially a location for a pumping station. A new access road into the site would be proposed adjacent to that for the Scheme off Ockham Park Junction.
RHS Gardens, Wisley Lane, Wisley, Woking, GU23 6QS Planning permissions references 16/P/000976 and 16/P/01080	Parts of the RHS site are within the DCO boundary	0.13 ha permanent land take 0.08 ha temporary land take	Adverse	There will be land take from RHS Wisley, including from the entrance on Wisley Lane to enable the construction of the new over bridge. However, this is unlikely to prohibit implementation of existing consents. During operation, the access for RHS Wisley is likely to be improved in terms of highway safety. However, access may be less convenient, particularly for visitors approaching from the south along the A3.
Elmbridge Borough Council				
Former San Domenico Restaurant Planning application reference 2017/0524	Within the DCO boundary	0.2 ha	Significant adverse	The proposed development cannot go ahead until the Scheme is complete. The site is currently disused but there is an application pending (since May 2017) for its reuse as a new petrol station with associated convenience store and vehicular access. The land take for use as a site compound would include part of the sites vehicle circulation area/hard standing and landscaped area. There is also an approved scheme for a drive thru restaurant on the site which would be affected in a similar way.
Painshill Farm, Painshill Farm, Portsmouth Road, Cobham Surrey KT11 1DN Planning application reference 2016/4204	Partly within the DCO boundary	1.2 ha	Significant adverse	Drainage balancing pond and access are proposed on the site which would need to be integrated into the Painshill Farm design. The development cannot go ahead until the Scheme is complete.

Non–Motorised Users: Journey Length & Local Travel Patterns

13.5.41 The Scheme has potential to temporarily or permanently affect a range of Common Land and Access land where members of the public are free to roam, and a number of Public Rights of Way, including existing crossings points over the A3 and M25, and footpaths associated with local roads.

Construction

13.5.42 Existing routes, including formal Rights of Way and informal pathways within Common Land and Access Land, may be subject to land take, resulting in temporary and/or permanent closure or diversion but these are not known at this time.

13.5.43 In the wider study area, construction traffic associated with the Scheme has the potential to increase traffic volume, particularly HGV trip numbers, in the surrounding local highway network. This has potential to make road crossing more time consuming for NMUs.

13.5.44 Changes in journey time and journey distance resulting from closure and/or diversion of routes and increased difficulty in road crossing, either temporarily or permanently, may result in changes to travel patterns for NMUs.

13.5.45 Affected Rights of Way and paths are, due to their 'off road' nature, unlikely to be highly utilised by vulnerable groups.

13.5.46 Observations undertaken within the Study Area suggest that Rights of Way and paths in the Common Land and Access Land are well used.

13.5.47 Closure of routes, diversion of routes, and increased difficulty in road crossing may lead to increased journey length and journey time as a result of the Scheme. However, the majority of NMU trips in the study area are associated with recreation. Recreational trips are generally considered less sensitive to changes in journey length in that users are not necessarily seeking the fastest or most direct route from their location to a specific destination. A variety of alternate recreational routes that will not be directly affected by the Scheme are available in the locality.

Operation

13.5.48 Temporarily affected routes may return to their original use after construction of the Scheme is complete. Where the Scheme requires permanent alteration of such routes they are expected to be re–provided in a similar location. These routes are likely to be similarly advantageous to current routes. These routes are predominantly used for recreation and users are less sensitive to diversion.

13.5.49 Usage of the proposed Redhill Road overbridge will improve connectivity over the A3 as will the proposed new M25 NMU overbridge to the east of the junction.

13.5.50 It is currently assumed that replacement bridges at Buxton Wood footbridge, Clearmount footbridge and Hatchford Park footbridge will have a neutral impact on NMUs during operation, though design details for these Scheme elements are not yet known.

Non-motorised users: Changes in Amenity

Construction

13.5.51 NMUs within the study area may be affected by traffic, noise, air quality and the visual intrusion of the road network within the wider environment as a result of construction activities, giving rise to changes in amenity.

13.5.52 In the wider study area, construction traffic associated with the Scheme has the potential to increase traffic volume, particularly HGV trip numbers, in the surrounding local highway network. This has potential to make road crossing more difficult, dangerous, intimidating, or time consuming for NMUs.

13.5.53 The likely changes in amenity and number of people expected to be affected will be descried in more detail within the main ES.

Operation

13.5.54 Generally, it is anticipated that journey amenity will be broadly similar for NMUs during operation. The distance between the operational carriageway and some established paths may decrease, though it is expected that should a path particularly close to the revised road layout become less pleasant then alternate routes may be established, or alternative existing routes will become better used.

13.5.55 During operation, NMUs and vehicular traffic will share crossing facilities at the Cockrow overbridge and Wisley Lane overbridge. Currently the Wisley Lane overbridge is for NMUs only and Cockrow Bridge is for NMUs plus vehicles accessing the SWT land. Traffic on the new bridges will be segregated from NMUs and vehicle movement numbers are likely to be low and therefore this is not likely to result in a significant deterioration in amenity.

13.5.56 Re–provided access arrangements proposed for Felton Fleet School may result in a minor improvement in amenity for NMU traffic by moving access away from the A245 dual carriageway.

Non-motorised users: Severance

13.5.57 Changes in journey length or journey time and changes in amenity for pedestrians and others may be such that they affect the degree to which a locality is subject to ‘community severance’.

Construction

13.5.58 Details of construction activity are not known at this time but construction traffic directly associated with the Scheme has the potential to increase traffic volume, particularly HGV trip numbers, in the surrounding local highway network. This has potential to make road crossing more difficult, dangerous, intimidating, or time consuming. This could introduce a temporary isolation effect.

13.5.59 Due to the availability of alternate routes and lack of set destinations, it is considered that NMUs are unlikely to experience significant changes to journey distance or journey time during construction. Temporary closure of crossings over the A3 or M25 may however result in more substantial changes to journey distance and journey time.

13.5.60 Changes in amenity at NMU routes are likely to experienced only in areas closest to construction. Baseline amenity conditions are considered poor for

some routes closest to existing highway due to issues such as air quality and noise. It is expected that alternate routes less affected by changes in amenity will continue to be available throughout construction.

13.5.61 On balance, it is expected that construction will have a slight or moderate adverse severance effect on NMUs within the study area during construction.

Operation

13.5.62 Usage of the proposed Redhill Road overbridge will improve connectivity over the A3, reducing existing severance, as will the proposed new M25 NMU overbridge to the east of the junction.

13.5.63 It is anticipated that the majority of affected journeys are likely to be those associated with recreational use rather than routes in regular use by members of the community to access services and facilities. Temporary or permanent closure or diversion of footpaths and other established routes within Common Land and Access Land is unlikely to sever communities from services and facilities.

13.5.64 Generally, during operation journey distance, journey time, and journey amenity are expected to be broadly similar to that found prior to development. No significant NMU severance is therefore expected to result from the Scheme during operation.

Vehicle Travellers: Views from the road

13.5.65 The Scheme is likely to noticeably alter the views experienced by users of the Junction 10 junction, slip roads, M25, A3, A245 and local roads. The magnitude of change will depend on final Scheme alignments, elevations, and structure types. Road users are generally considered to have low sensitivity to changes in views as their views are focused mainly on the road corridor whilst views into adjacent landscape are usually transient and glimpsed.

13.5.66 Existing views from the road are generally restricted, due to trees along the roadside, with some glimpsed views through the trees of surrounding landscape features and properties. Junction 10 surrounded by mature vegetation consisting of heathland, scrub, hedgerows, trees and woodlands.

13.5.67 The Scheme will alter the views experienced by Vehicle Travellers using Junction 10, the M25, A3, the slip roads, the A245 and local roads, due to the new elongated roundabout proposed at the junction, removal of vegetation, proposed bridges, new lanes and slip roads.

13.5.68 The extent to which travellers may be able to view landscape is considered according to the categories set out in section I.2 Methodology in Volume 2 (No View, Restricted View, Intermittent View, or Open View).

Table 13.13: Vehicle Travellers: Views from the road

Road	View by Phase		
	Existing	Construction (Impact Category)	Operational (Impact Category)
M25 East	Intermittent and restricted views	Intermittent and restricted views, with visual horizontal and linear intrusion of construction works of new slip roads, the new elongated	Intermittent and restricted views, with visual horizontal and linear intrusion of new slip roads, the new elongated

Road	View by Phase		
	Existing	Construction (Impact Category)	Operational (Impact Category)
		roundabout and associated structures including replacement overbridges. Major earthworks and vegetation removal. (Adverse)	roundabout and associated structures including the replacement overbridges. (Neutral)
M25 West	Intermittent and restricted views	Intermittent and restricted views, with visual horizontal and linear intrusion of construction works of new slip roads, the new elongated roundabout and associated structures including replacement overbridges. Major earthworks and vegetation removal. (Adverse)	Intermittent and restricted views, with visual horizontal and linear intrusion of new slip roads, the new elongated roundabout and associated structures including the replacement overbridges. (Neutral)
A3 North	Intermittent and restricted views	Intermittent and restricted views, with visual horizontal and linear intrusion of construction works of new elongated roundabout, new traffic lanes, construction of a new Redhill overbridge and new local access road connecting Seven Hills Road and Redhill Road. Major earthworks and vegetation removal. Linear intrusion of construction compound at the former San Domenico restaurant. (Adverse)	Intermittent and restricted views, with visual horizontal and linear intrusion of the elongated roundabout, new traffic lanes and associated structures. New visual horizontal intrusion of a new Redhill overbridge. From the A3 the new access road connecting Seven Hills Road and Redhill Road will be visible. (Neutral)
A3 South	Intermittent and restricted views	Intermittent and restricted views, with horizontal and linear intrusion of the new elongated roundabout, new traffic lanes and associated structures, including the replacement of Cockrow and Wisley Lane bridges. Major earthworks and vegetation removal. From Ockham Park Junction, there would be visual horizontal and linear intrusion to the south of the construction of the access to the new two-way local road and linear intrusion of construction compound to the north of Ockham Park Junction. (Adverse)	Intermittent and restricted views, with visual horizontal and linear intrusion of the new elongated roundabout, new traffic lanes and associated structures and new Cockrow Bridge and Wisley Lane Bridge. (Neutral)

Vehicle Travellers: Driver Stress

13.5.69 High level expectations for Driver Stress are set out below. Detailed assessment for this topic will be provided within the ES, based upon traffic data that was not finalised at the time of writing.

Construction

13.5.70 During construction of the Scheme, driver stress is anticipated to be temporarily adversely affected, due to traffic management, changed road alignments and temporary signs and lanes. These factors would bring about increased: driver frustration due to reduced speeds; driver fear linked to reduced lane width and presence of other vehicles; and route uncertainty associated with temporary road layouts and signage.

13.5.71 The Driver Stress assessment will be produced for the ES using up to date Traffic Model data.

Operation

13.5.72 Once operational, driver stress is expected to reduce through a more efficient road network, reduced queueing, congestion and risk of conflicts and collisions.

13.5.73 In the longer term, the trend for increased vehicle flows means that driver stress is expected to have increased to high levels by 2037. However, if the Scheme were not to take place it would be expected that driver stress in the context of future traffic scenarios would be greater than with the Scheme.

13.6 Potential mitigation measures

13.6.1 The Scheme design includes a range of built in mitigation, for example ensuring that overbridges that cross the A3 and M25 are upgraded or replaced and the provision of alternate access to property. See Figure 13.2 which provides details of public access and rights of way, including proposed and replacement NMU facilities, upgrades to Bridleway and new footpaths.

13.6.2 In addition to mitigation that is part of the Scheme design, additional mitigation will be implemented where significant adverse effects are identified. The nature of mitigation is likely to be informed by consultation with landowners and other stakeholders, in which the potential impacts of the Scheme and appropriate mitigation will be discussed. If adequate mitigation cannot be provided, compensation measures may be appropriate in some instances, for example relating to instances of land take or where business viability is significantly affected.

13.6.3 In accordance with The Common Act 2006, it is proposed to provide suitable equally advantageous “replacement land” to mitigate for land take from areas of Common Land. Further detail is given in the Replacement Land Report which is an addendum to the Scheme Assessment Report.

13.6.4 There is no environmental mitigation for permanent land take. Financial compensation is a matter for the District Valuer and is outside the scope of this report.

13.6.5 Accommodation works, temporary access arrangements, livestock fencing and other mitigation of Scheme impacts will be identified through consultation with landowners.

13.6.6 Land occupied or disturbed during the construction process, such as site compounds, that is not permanently acquired for engineering and landscaping, will be restored to a condition equivalent to its original, with a five year aftercare period.

13.6.7 The quality and quantity of soil on site will be maintained by implementing appropriate techniques for stripping, stockpiling and reinstatement.

13.6.8 This approach will be adopted in a Soil Handling and Management Strategy (SHMS), which will in due course form part of the Construction Environmental Management Plan (CEMP). A qualified soil scientist will supervise all aspects of this work.

13.6.9 Damage to surrounding field drainage systems will be rectified through the diversion or repair of drains.

13.6.10 Noise and dust control is covered in Chapters 5 (Air Quality) and 6 (Noise and Vibration).

13.6.11 In areas of wet soils, particularly at Pond Farm, care will be taken not to disrupt field drainage systems in areas outside the Scheme land take. Any disturbed drains will be repaired or diverted.

13.7 Summary

13.7.1 The Scheme is likely to affect a range of People and Communities receptors. In lieu of a full assessment to support the forthcoming ES, it is anticipated that the Scheme will:

- Result in altered access arrangements to a number of residential properties, which may in some cases be locally significant;
- Require Common Land and Access Land, for which replacement land will be provided in compensation;
- Require a small amount of land from RHS Wisley and Painshill Park, which are both important facilities widely used by the public;
- Give rise to a combination of two or more amenity related effects for some receptors;
- Impact on agricultural land – BMV land and agricultural land holdings;
- Impact on other businesses;
- Inhibit, to varying extents, the implementation of development at several identified ‘Development Land’ sites, including the former Wisley Airfield, RHS Wisley, and the site of the former San Domenico restaurant;
- Alter connectivity and public access both temporarily and permanently, to varying extents, in the vicinity of the Scheme;
- Have potential to cause delays or diversions that may have a temporary isolating effect; and

- On balance, improve accessibility, driver stress and connectivity during operation.

14 Climate Change

14.1 Introduction

14.1.1 This chapter outlines the methodology that will be used to identify and assess the likely effects of the Scheme on climate change and the vulnerability of the Scheme to climate change, during construction and operation.

14.1.2 This chapter been divided into two sections in order to address the climate change requirements outlined in The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (SI 2015/517) (herein referred to as the 'EIA Regulations 2017'), which states that the assessment should consider both:

- The potential effects of the Scheme on climate, in particular, the magnitude of greenhouse gases emissions emitted during both construction and operation; and
- The vulnerability of the Scheme to climate change, in particular, the impacts of extreme weather scenarios on the Scheme during operation.

14.2 Study area

Effects of the Scheme on climate change

14.2.1 The study area is defined in terms of lifecycle stages, as detailed in Section 7 of PAS 2080:2016. In summary, it is anticipated that the Scheme specific study area will cover:

- Products and materials (A1-3), i.e. use of materials for temporary and permanent construction activities;
- Transport to works site (A4), i.e. transportation of construction materials to site;
- Construction/installation processes (A5), i.e. construction plant use, construction use of mains water, construction waste transportation and construction waste off-site processing;
- Maintenance, repair, replacement and refurbishment (B2-5), i.e. replacement cycles;
- Operational energy use (B6), i.e. operational energy and fuel use;
- User utilisation of infrastructure (B9), i.e. in use traffic; and
- Benefits and loads beyond the system boundary (D), i.e. predicted effects on traffic on the surrounding road network.

14.2.2 It is anticipated that the following PAS 2080:2016 lifecycle stages will be excluded from the above study area, on the basis that either the associated emissions are likely to be minimal/negligible, or the lifecycle stage is not applicable to the Scheme:

- A0. Preliminary studies and consultations;
- B1. Use (e.g. direct operational emissions);
- B7. Operational water use;

- B8. Other operational processes; and
- C1-4. End of life stages (e.g. deconstruction, transport, waste processing for recovery and disposal).

14.2.3 Table 14.1 further details the lifecycle stages, the anticipated Scheme specific study area and the emissions scope that will be included within the Scheme specific assessment. The scope of the assessment of the Scheme, as set out by the study area, is dependent upon the availability of design, construction and operational data. If such data is not available, part or all of the affected lifecycles stages will be excluded from the assessment.

Table 14.1: Effect on Climate study area

Lifecycle Scope	Study area		Emissions scope
A1-3. Products and materials.	The study area will cover the use of temporary and permanent construction materials within the construction site boundary and the supply chains associated with these. Consumables are excluded as they are small, and plant is excluded on the basis of shared use across schemes. Where suitable the quantifications undertaken as part of the materials assessment will be used (Chapter 12).		The emissions scope will account for primary raw material extraction, manufacturing, and intra-manufacturing transportation, as captured in the relevant emissions factor values.
A4. Transport to works site.	The study area will cover transportation of the temporary and permanent construction materials and the distances travelled from the primary site of manufacturing, not the supply depot, including international freight transportation, where relevant. The primary site of manufacturing is used because transportation from a local supply depot does not represent the realistic transportation emissions, so can lead to significant under reporting.		The emissions scope will consider both the direct vehicle/freight emission and fuel supply chain (well-to-tank) emissions.
A5. Construction/ installation process.	Construction plant use.	The study area for quantification of emissions for construction plant will consider the same plant quantities, sizes and operating hours as that to be used for the noise assessment (Chapter 6).	The emissions scope will consider only the direct plant emission, where only plant specification data is available. If direct fuel consumption data is available, the emissions scope will consider direct plant emissions, but also the fuel supply chain emissions (well-to-tank).
	Construction water use.	This study area cover will cover mains water use only within the construction site boundary.	The emissions scope will consider emissions from all activities for the supply of water.
	Construction waste transportation.	The study area will cover transportation of bulk construction waste and the distances travelled from the construction site to the primary processing site.	The emissions scope will consider both the direct vehicle/freight emission, but also the fuel supply chain (well-to-tank) emissions.

Lifecycle Scope	Study area		Emissions scope
	Construction waste off-site processing.	The study area will cover primary processing of bulk construction waste as available and quantified and in the waste assessment (Chapter 12).	The emissions scope will consider emissions from all activities for waste processing.
B2-5. Maintenance, repair, replacement and refurbishment.	The study area will include the inspection works and planned replacement cycles of bulk items (e.g. road surface replacement) over the planned operational life-time of the project, within the DCO boundary for the Scheme.		The emissions scope will consider materials use, transportation, and construction works, as defined by A1-5 above.
B6. Operational energy use.	The study area for operational energy will include the electricity and direct fossil fuel consumption for operation of the infrastructure within the DCO boundary for the Scheme, over the planned operational life-time of the Scheme.		The emissions scope will cover direct emissions from consumption of fossil fuels, and supply chain emissions from primary electricity generation, fuel and electricity supply chain (well-to-tank), and transmission and distribution losses for electricity and fuels.
B9. Users utilisation of infrastructure.	The study area will include traffic use of the infrastructure within the DCO boundary for the Scheme.		The emission scope will cover direct exhaust emissions from vehicles.
D. Benefits and loads beyond the system boundary.	The study area will include traffic use of the wider road network as determined by the traffic reliability area, as outlined in the air quality assessment (Chapter 5).		The emission scope will cover direct exhaust emissions from vehicles.

Table Source: Interpreted from PAS 2080:2016.

Vulnerability of the Scheme to climate change

14.2.4 The Scheme is described in Chapter 2 of this document. Figure 14.1 shows the location of the Scheme alongside the Met Office UK Climate Projections 25 km gridded data (grid ID: 1666), which is the source of climate change information used in this chapter. Figure 14.2 shows the location of the scheme within the broader context of the Thames river basin as the site may be at risk of localised fluvial flooding.

Figure 14.1: Location of 25 km grid box (ID: 1666)

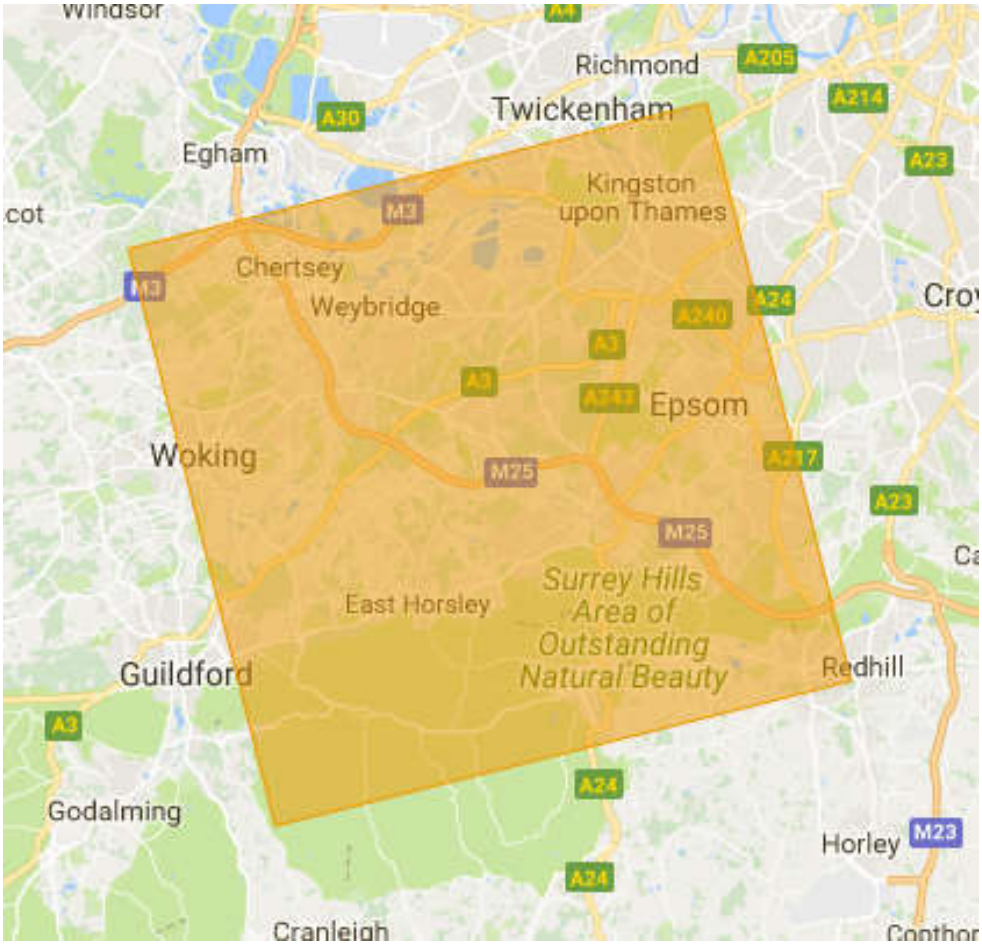


Figure 14.2: Location of Thames river basin

14.3 Consultation

Effects of the Scheme on climate change

14.3.1 It is proposed that Surrey County Council, as the author/owner of the Surrey Carbon and Energy Policy 2015 to 2019 and the Surrey Transport Plan: Climate Change Strategy will be consulted on the proposed assessment methodology post submission of the PEIR.

Vulnerability of the Scheme to climate change

14.3.2 In identifying receptors with High or Medium vulnerabilities to climate change and extreme weather, we will seek technical advice from relevant Highways England staff (i.e. local route managers or similar), local authority and the EA flood officer to inform the vulnerability assessment and to seek their advice as to the development of appropriate mitigation measures.

14.4 Baseline conditions

Effects of the Scheme on climate change

14.4.1 The baseline conditions for the effects on climate are defined by the total background emissions, i.e. all emissions, and the total emissions occurring from the current traffic and operational activities related to the Scheme. These are explained in the following sub-sections. Information is also present on the emissions from other similar road improvement schemes, for the purposes of proxy emissions quantification and assessment.

UK baseline emissions

14.4.2 Background emissions concerning all emissions, i.e. the global total, is approximately 50 billion tonnes of CO_2e. The total background UK emissions for 2015 (the last reported year at the time of preparing this chapter) is 495.7 million tonnes of CO_2e. The breakdown of this figure by sector is shown below in Table 14.2. The emissions from any UK infrastructure scheme compared against the global or UK total will always be negligible.

Table 14.2: UK Emissions Baseline

Sector (by final user)	GHG Emissions (Million tonnes of CO_2e)	Percentage of total
Business	147	29.66%
Transport	134.9	27.21%
Public	14.6	2.95%
Residential	112.1	22.61%
Agriculture	51.1	10.31%
Industrial processes	13.3	2.68%
Land use, land use change and forestry	-7.4	-1.49%
Waste management	18.2	3.67%

Sector (by final user)	GHG Emissions (Million tonnes of CO_2e)	Percentage of total
Exports	12.1	2.44%
Grand Total	495.7	100.04%

Table Source: Final UK greenhouse gas emissions national statistics: 1990-2015 (2017)

Highways scheme baseline emissions

14.4.3 Emissions baselines from other similar highways schemes are set out in Table 14.3. This provides appropriate emissions data to assist in establishing the proxy baseline for the Scheme. These have been obtained from the M4 Corridor around Newport, Environmental Statement (2016) as the best available source of such baseline data.

Table 14.3: Highways Scheme Emissions Baseline

Carbon Footprint Lifecycle Stages	Project/Length and width Component							
	M4CaN	A14	A465	HA project A	HA project B	HA project C	HA project D	HA Project E
	23 km New relief road	37 km improvement scheme	7.8 km embankment section	26.6 km widening of A road	6.5 km single to 2 lane dual carriageway	4 km upgrade of existing junction	0.7 km Refurbished existing viaduct	22.1 km Upgrade from dual to 3 lanes
CapCO_2e (tCO_2e)								
Material	436,600	740,100	44,300	74,500	77,300	36,100	5,800	213,700
Labour + Plant	42,800	243,800	5,800	38,500	27,500	8,200	4,000	20,900
Earthworks	43,200	n/a	2,500	n/a	n/a	n/a	n/a	n/a
Construction tCO_2e/km	21,800	26,600	6,700	4,300	16,100	11,100	13,900	10,600
OpCO_2e (tCO_2e)								
Operation + Maintenance/ annum	1,600	2,400	2,600	n/a	n/a	n/a	n/a	n/a
UseCO_2e (tCO_2e)								
Use/annum	2,268,700	4,386,400	882,000	n/a	n/a	n/a	n/a	n/a

Table Source: Welsh Government (2016). M4 Corridor around Newport, Environmental Statement: Volume 3, Appendix 2.4 Carbon Report

M25 Junction 10 baseline emissions

14.4.4 The baseline emissions for the proposed Scheme cover the PAS 2080:2016 Use activities of the do-minimum scenario, which includes:

- Operational energy use (B6) and replacement works (B2-5) within the boundary of the construction site of the Proposed Scheme; and
- The current traffic (B9 and D) as defined by the do-minimum air quality assessment for M25 J10 stage 2 EAR.

14.4.5 Only these lifecycle stages are included as they are the only stages relevant to and an operational highway.

14.4.6 The in-use traffic emissions for the do minimum scenario are 435,598 tCO_2e/year, as quantified by the Stage 2 EAR air quality assessment, as assessed at the option selection stage.

14.4.7 There is no operational energy use or replacement works data available for the Scheme (B6 and B2-5), so the emissions cannot be quantified using the methodology set out in Volume 2. However, the emissions can be considered to be proportionally similar to the $OpCO_2e$ levels defined in Table 14.3 on the basis that operation, maintenance and use of highways is sufficiently consistent across the UK road network. The Scheme emissions have therefore quantified on this basis.

14.4.8 The $OpCO_2e$ levels defined in Table 14.3 show that proportionally emissions for operational energy use and replacement works equate to 0.05 - 0.29% of in-use traffic emissions, as follows:

- (Operation + Maintenance per Annum)/Use per Annum = Operational Proportion (%):
  - M4CaN: (1,600/2,268,700) x 100 = 0.07%;
  - A14: (2,400/4,386,400) x 100 = 0.05%; and
  - A465: (2,600/882,000) x 100 = 0.29%.

14.4.9 On the basis of these percentages, for M25 J10 GHG emissions for operational energy use and replacement works equate 218 - 1,263 tCO_2e/year, as follows:

- In-use Traffic Emissions * Operational Proportion (%) = Operational Energy Use and Replacement Works per Annum (tCO_2e):
  - M4CaN: 435,598 x 0.07% = 435,598 x (0.07/100) = 305 tCO_2e;
  - A14: 435,598 x 0.05% = 435,598 x (0.05/100) = 218 tCO_2e; and
  - A465: 435,598 x 0.29% = 435,598 x (0.29/100) = 1,263 tCO_2e.

14.4.10 Based on the addition of the above, the total Scheme baseline emissions are estimated to be approximately 436,861 tCO_2e/annum, assuming the worst-case performance for operational energy use, and replacement works.

Vulnerability of the Scheme to climate change

14.4.11 This section describes the baseline conditions, including a description of current local climate, past extreme weather events and projected changes in climate. In the detailed assessment phase, a comprehensive data and literature review will

be produced that takes account of the latest science and evidence to capture recent and projected changes in climate and evidence of recent impacts related to extreme weather events.

14.4.12 Table 14.4 provides a summary the local climate, whilst Table 14.5 provides a summary of weather extreme records for Southeast and Central Southern England.

Table 14.4: Wisley climate (1981 to 2010)

Season	Average Maximum Temperature (°C)	Average Minimum Temperature (°C)	Days of air frost (days)	Sunshine (hours)	Seasonal Rainfall (mm)	Days of rainfall >= 1 mm (days)	Monthly mean wind speed at 10 m (knots)
Winter	8	2	29	174	171	31	6
Spring	14	5	10	465	143	28	5
Summer	22	12	0	602	144	23	4
Autumn	15	7	8	323	200	31	5
Annual	15	7	48	1564	657	112	5

Table Source: https://www.metoffice.gov.uk/public/weather/climate . Winter is defined as December to February, Spring is March to May, Summer is June to August and Winter is September to November.

Table 14.5: Weather extreme records: Southeast and Central Southern England

Season	Average Maximum Temperature (°C)	Average Minimum Temperature (°C)	Days of air frost (days)	Sunshine (hours)	Seasonal Rainfall (mm)	Days of rainfall >= 1 mm (days)	Monthly mean wind speed at 10 m (knots)
Winter	8	2	29	174	171	31	6
Spring	14	5	10	465	143	28	5
Summer	22	12	0	602	144	23	4
Autumn	15	7	8	323	200	31	5
Annual	15	7	48	1564	657	112	5

Table Source: https://www.metoffice.gov.uk/public/weather/climate-extremes/#?tab=climateExtremes

14.4.13 The UK Climate Projections 2009 summarises the projected changes in climate for London by the 2050s for the high emissions scenario as described below:

- The central estimate of increase in winter mean temperature is 2.5ºC; it is very unlikely to be less than 1.4ºC and is very unlikely to be more than 3.8ºC. A wider range of uncertainty is from 0.9ºC to 3.8ºC;
- The central estimate of increase in summer mean temperature is 3.1ºC; it is very unlikely to be less than 1.4ºC and is very unlikely to be more than 5.2ºC. A wider range of uncertainty is from 1.1ºC to 5.2ºC;

- The central estimate of increase in summer mean daily maximum temperature is 4.3ºC; it is very unlikely to be less than 1.7ºC and is very unlikely to be more than 7.4ºC. A wider range of uncertainty is from 1.2ºC to 7.4ºC;
- The central estimate of increase in summer mean daily minimum temperature is 3.3ºC; it is very unlikely to be less than 1.6ºC and is very unlikely to be more than 5.7ºC. A wider range of uncertainty is from 1.2ºC to 5.7ºC;
- The central estimate of change in annual mean precipitation is 0%; it is very unlikely to be less than -5% and is very unlikely to be more than 5%. A wider range of uncertainty is from -5% to 5%;
- The central estimate of change in winter mean precipitation is 16%; it is very unlikely to be less than 2% and is very unlikely to be more than 35%. A wider range of uncertainty is from 0% to 35%; and
- The central estimate of change in summer mean precipitation is -19%; it is very unlikely to be less than -43% and is very unlikely to be more than 9%. A wider range of uncertainty is from -43% to 16%.

14.4.14 In the detailed assessment phase UKCP09 gridded data relevant to the study area will be presented.

14.5 Potential impacts

Effects of the Scheme on climate change

14.5.1 The headline potential impacts of the Scheme are defined by the total emissions occurring across the defined lifecycle stages for the do-something scenario. The lifecycle stages currently quantified for this are in-use traffic (B9 and D), as defined by the Stage 2 EAR air quality assessment. This assessment estimates that in-use emissions are 440,889 tCO_2e/annum.

14.5.2 The emissions for the unquantified lifecycle stages have been determined using the same proportional calculation methodology applied to the unquantified lifecycles for the baseline emissions. These are calculated at headline lifecycle scale, as there is insufficient data to determine emissions by PAS 2080:2016 lifecycle stages.

14.5.3 The emissions were calculated for construction as follows:

- (Sum of Materials, Labour + Plant, Earthworks)/Use per Annum) = Construction Proportion (%):
  - M4CaN: (522,600/2,268,700) x 100 = 23%;
  - A14: (983,900/4,386,400) x 100 = 22%; and
  - A465: (52,600/882,000) x 100 = 6%.
- In-use Traffic Emissions * Construction Proportion (%) = Construction tCO_2e:
  - M4CaN: 440,889 x 23% = 440,889 x (23/100) = 101,404 tCO_2e;
  - A14: 440,889 x 22% = 440,889 x (22/100) = 96,996 tCO_2e; and
  - A465: 440,889 x 6% = 440,889 x (6/100) = 26,453 tCO_2e.

14.5.4 The emissions for operational energy use and replacement works were calculated, as per the proportional calculation defined in paragraphs 14.4.8 and 14.4.9, as follows:

- In-use Traffic Emissions * Operational Proportion (%) = Operational Energy Use and Replacement Works per Annum (tCO2e):
  - M4CaN: 440,889 x 0.07% = 440,889 x (0.07/100) = 309 tCO_2e;
  - A14: 440,889 x 0.05% = 440,889 x (0.05/100) = 220 tCO_2e; and
  - A465: 440,889 x 0.29% = 440,889 x (0.29/100) = 1,279 tCO_2e.

14.5.5 Based on the above and assuming the worst-case performance for operational energy use, and replacement works, the total proxy emissions for the proposed Scheme are estimated to be approximately as follows:

- Construction (A1- A5): 101,404 tCO_2e;
- Operation (B2 - 5, and B6): 1,279 tCO_2e;
- In-use traffic (B9): 440,889 tCO_2e; and
- Total for construction and first year of operation: 543,572 tCO_2e.

14.5.6 Construction has a one-off impact of 23% in comparison to one year of in-use emissions for the do-something scenario. Operation has an on-going annual impact of 0.29% in comparison to one year of in-use emissions based on the first year of the scheme being operational. In-use traffic emissions as the largest aspect, show a 1.2% increase for the proposed Scheme over the do-minimum scenario. These are calculated as follows:

- Construction: (101,404/440,889) x 100 = 23%;
- Operation: (1,279/440,889) x 100 = 0.29%; and
- In-use traffic: ((440,889 - 435,598)/435,598) x 100 = 1.2%.

14.5.7 These initial findings are based on the limited data available and should be considered as proxy/indicative only.

Significance

14.5.8 The scope of assessment for effects on climate comprises the study area as defined in section 14.2.

14.5.9 In the absence of suitable guidance for EIA assessment of emissions, using DMRB terminology, a ‘simple’ assessment of the Scheme’s effects on climate will be undertaken. This will be done using a desk based assessment to quantify the magnitude of emissions, evaluate changes to the road network, and determine the significance of effects of the Scheme. This will be used to determine whether the effects are positive or negative and major, moderate, minor, negligible or no change, as shown in the matrix Table 4.1 and defined in Table 4.2. The level of detail will be determined by the data available to inform the assessment.

14.5.10 It is acknowledged that revision to the guidance on determining significance is currently underway and this will be reviewed, addressed and updated in the ES, if available with the timeframes of the assessment.

Vulnerability of the Scheme to climate change

Receptors

14.5.11 The potential impacts of changes in different climate variables (and impacts associated with extreme weather) on the Scheme receptors are identified in this section. Receptors may be summarised as roads and supporting infrastructure, including bridges, embankments, earthworks and drainage.

Potential impacts of climate on road infrastructure

14.5.12 As summarised in Table 14.6, these receptors are all susceptible to damage or disruption from climate-related hazards. However, not all climate-related impacts are threats and there are also likely to be opportunities brought about by climate change. This section describes the likely potential impacts (and opportunities) of climate change and extreme weather events on road infrastructure using relevant literature and expert opinion.

14.5.13 The weather can have a significant negative impact on the road network, which can often be running close to or at capacity in parts of the UK. In addition to landslips, the key impacts are associated with surface water and river flooding (see Chapter 8) as well as increased thermal loadings on roads and control equipment.

14.5.14 Currently 6,600 km of the road network is located in areas susceptible to flooding (ASC, 2016b). The cost of disruption from widespread flooding in 2007 was £200 million and a flood event of this disruptive scale could be possible on an annual basis by the 2080s (Chatterton et al., 2011).

14.5.15 Warmer summer temperatures will increase thermal loading on bridges and pavements causing expansion, bleeding and rutting which will need repairing. Repairs cannot be performed until temperatures reduce. The 2003 and 2006 heatwaves provide a useful temporal analogue of this impact (Willway et al., 2008; Defra, 2012b). Cold weather (including snow and ice) is currently a major cause of damage and disruption, causing 16% of all weather-related delays to the strategic road network in England between 2006 and 2014 (ASC, 2014). This is likely to reduce in the future, along with reduced winter maintenance costs (Arvidsson and Chapman, 2011).

14.5.16 Wind effects road operations as high sided vehicles can become unstable in gusts of wind over 45 mph, this is particularly significant on exposed sites such as bridges (ASC, 2016b). High winds can also damage roadside furniture, such as traffic signs, and blow nearby vegetation onto the road. There is no evidence for increased incidence (due to climate change) and most failures of objects (such as road signs) are considered to be due to inadequate foundations (Galbraith et al., 2005).

Table 14.6: Typical climate impacts on road infrastructure

Aspect	Impact: Precipitation (high and increasing)	Impact: Precipitation (low and decreasing)	Impact: Temperature (high and increasing)	Impact: Wind
Roads	Flooding Loss of strength of layer materials Damage to structure and surfaces Erosion of unpaved shoulders Traffic disruption and congestion	Damage to thin surfaces and asphalt More rapid binder deterioration	Ageing of bituminous binders Softening, deformation and damage to bitumen in asphalt Expansion and buckling of concrete roads and structures Reduced visibility and operational disruption (fires)	Accumulation of debris Wind-loading of structures
Bridges and culverts	Increased river scour		Expansion and buckling of concrete roads and structures	Wind-loading of structures
Earthworks	Increased slope instability Soil saturation Erosion of surface Undercutting Excessive vegetation growth	Earthworks failure due to desiccation Damage to vegetation and more difficult to establish erosion protection measure		Erosion
Subgrade soils	Soil softening, erosion collapse and settlement Deformation of rigid structures	Shrinkage and cracking		
Drainage	Blockages Water accumulation Erosion and scour of structures and	Erosion, silting and sedimentation	Expansion, cracking and erosion Loss of vegetation	

Aspect	Impact: Precipitation (high and increasing)	Impact: Precipitation (low and decreasing)	Impact: Temperature (high and increasing)	Impact: Wind
	surfaces Softening of subsurface materials			
Construction	Difficult working conditions Excessive moisture in materials Reduced working periods and increased delays Water damage	More dust Evaporation of construction water	Enhanced reactions when cement Stabilising and drying of concrete Difficult working conditions Damage and disruption (fires)	Difficult working conditions More dust Evaporation of construction water
Operation and maintenance	Additional damage and maintenance requirement Reduced opportunities maintenance Operational disruption			

Climate vulnerability assessment

14.5.17 This section presents the findings of the scoping phase (Table 14.7). The sector (road infrastructure) sensitivity and the regional (London) geographic exposure to extreme weather and climate change has been appraised to determine the level of climate vulnerability in this scoping phase. This assessment is based on a review of supporting literature and expert review.

Table 14.7: Climate vulnerability assessment: Road infrastructure, London

Climate variable/hazard	Regional exposure	Sector sensitivity	Climate vulnerability
Average (air) temperature change (annual, seasonal, monthly)	High	Low	Low
Extreme (air) temperature (frequency and magnitude)	High	Moderate	Moderate
Average precipitation (annual, seasonal, monthly)	High	Low	Low
Extreme rainfall (frequency and magnitude)	High	High	High
Average wind speed change (annual, seasonal, monthly)	Moderate	Low	Low
Gales and extreme winds (frequency and magnitude)	Moderate	High	Moderate

Climate variable/hazard	Regional exposure	Sector sensitivity	Climate vulnerability
Humidity	Moderate	Low	Low
Solar radiation	Moderate	High	Moderate
Sea level rise (plus local land movements), storm surge/tide	Low	High	Low
Water availability/drought	High	Low	Low
Flood (coastal and fluvial)	High	High	High
Subsidence and ground stability	Moderate	High	Moderate
Fog	Moderate	Moderate	Moderate
Storms (tracks and intensity), including storm surge	Low	High	Low
Snow, ice and hail	Moderate	High	Moderate
Storms and lightning	Moderate	Moderate	Moderate

Vulnerability to major accidents and disasters

14.5.18 The risk of major accidents and disasters is greater during cold extremes, precipitation events and warmer temperatures. This is due reduced visibility, more difficult braking and an influence on the mode, frequency, and types of trips that individuals take. Increasing temperatures and changes in precipitation patterns has the potential to exacerbate road safety issues further.

14.5.19 Moreover, extreme events (such as heavy precipitation, drought and/or storms) may further exacerbate risks during major accidents and/or disasters.

14.6 Potential mitigation measures

Effects of the Scheme on climate change

14.6.1 Mitigation measures for effects on climate consist of strategic approaches that drive reduction across all lifecycle stages, and those specific to the separate lifecycles stages.

14.6.2 Strategically, emissions are mitigated by applying the carbon reduction hierarchy specified in PAS 2080:2016, covering:

- **Build nothing** - challenge the root cause of the need; explore alternative approaches to achieve the desired outcome;
- **Build less** - maximise the use of existing assets; optimise asset operation and management to reduce the extent of new construction required;
- **Build clever** - design in the use of low carbon materials, streamline delivery processes, minimise resource consumption; and
- **Build efficiently** - embrace new construction technologies; eliminate waste.

14.6.3 It is recommended the carbon reduction hierarchy is covered both at a Scheme level and at a structures and equipment level within the Scheme. It should also

be acknowledged that the application of the hierarchy is likely to be, in some instances, an inherent outcome of good design practice and cost efficiencies.

14.6.4 Potential mitigation measures for the specific lifecycle stage are provided in Table 14.8. These currently only include the main strategic mitigation measures, these will be expanded as necessary based on the outcome of the assessment undertaken and presented in the ES.

Table 14.8: Emissions Mitigation Measures

Scheme Specific Lifecycle Scope		Mitigation Measures
A1-3. Temporary and permanent construction materials.		Reduction of materials consumption will be carried out in accordance with the mitigation measures outlined in the Waste and Materials Chapter (Chapter 12). In addition, consideration will be given to alternative low carbon materials.
A4. Materials transport to works site.		Materials transportation distances will be avoided by minimising the quantity of materials required, as per A1-3 above. Additionally, where possible designs will be specified to minimise the necessity to source materials from long distances.
A5. Construction/ installation process.	Construction plant use.	Construction plant emissions will be minimised by designing for efficient construction processes as part of design development. During construction plant emissions will be managed via the Construction Environmental Management Plan (CEMP), which should specify plant operator efficiency requirements.
	Construction water use.	Construction water consumption will be minimised by designing for efficient construction processes as part of design development. During construction mains water consumption will be managed via the CEMP, which should specify reduction and reuse measures, and rain water harvesting.
	Construction waste transportation.	Reduction of waste generation will be carried out in accordance with the mitigation measures outlined in the Waste and Materials Chapter (Chapter 12).
	Construction waste off-site processing.	Suitable/appropriate waste treatment/disposal will be carried out in accordance with the mitigation measures outlined in the Waste and Materials Chapter (Chapter 12).
B2-5. Replacement.		Replacement cycles will be mitigated through design by designing for long-life, ease of deconstruction and suitability for reuse/ recycling etc.
B6. Operational energy use.		Operational energy use will be minimised by designing for use of low energy lighting and traffic management systems, and specification on controls that minimise on-time, where practicable.
B9. In-use Traffic on the Scheme.		Mitigation of in-use emissions will be explored based on examination of traffic management scenarios over the network.
D. In-Use Traffic on wider network.		

Table Source: Interpreted from PAS 2080:2016

Vulnerability of the Scheme to climate change

14.6.5 Table 14.9 summarises some potential mitigation measures for reducing vulnerability of road infrastructure receptors to climate impacts. During the detailed assessment phase (input into the ES) we will engage with the project teams, including engineers, to identify the provision of appropriate mitigation measures for High (and selected Medium) impacts.

Table 14.9: Selected impact mitigation measures for roads

Aspect	Proposed measure(s)
Roads and supporting infrastructure	Higher degree of compaction Appropriate structural designs, surfaces and construction Use different (harder) binders in asphalt Changes to concrete mixes and reinforcing Raise riding surface and appropriate drainage Accounting for climate risks in maintenance regimes Use of heat resistant surfacing materials Replacement of bridge expansion joints Provide shade for roads, footpaths and cycleways
Earthworks	Higher degree of compaction Appropriate drainage Appropriate structural design Maintenance Slope stabilisation measures Green infrastructure (deep-rooted, drought resistant vegetation) Isolation of susceptible soils Construct at in-service moisture conditions
Drainage	Appropriate structural design and construction Strengthen embankments and cuttings Modify extreme rainfall return periods in design Maintenance Increase culvert and bridge openings Concrete and reinforcement Green/blue infrastructure
Construction	More night-time construction to avoid undue heat stress for construction workers Construct in dry season Greater use of unslaked lime Modified and innovative construction techniques Water efficiency measures Dust management plan
Operation and maintenance	Adequate resources and capacity in place Local community maintenance programmes More regular maintenance and preventative action Underpinning the efficiency and effectiveness of incorporated climate change adaptation measures Emergency planning for climate impacts

Aspect	Proposed measure(s)
	Early warning systems and evacuation routes Monitoring and evaluation of asset resilience to inform climate change adaptation decision-making The incorporation of adaptation measures to existing assets during planned maintenance and repairs Water efficiency measures

14.7 Summary

Effects of the Scheme on climate change

14.7.1 The Scheme specific emissions cannot be quantified due to insufficient data, but the above proxy assessment estimates that for construction and one year of operation, maintenance and in-use activities the emissions are 543,572 tCO_2e.

14.7.2 In order to quantify and assess the emissions from the Scheme necessary data will be gathered from the appropriate personnel (e.g. the design team, the contractor(s) and the environmental assessment team).

14.7.3 The emissions will be calculated in the CKB and using the methodology specified for air quality. The resulting model/footprint will be used to assess the emissions against the Government's emissions reduction targets. The model/footprint will also be used to identify the further mitigation measures that are required.

Vulnerability of the Scheme to climate change

14.7.4 Table 14.10 outlines the findings from the climate vulnerability assessment. The following wing climate variables/hazards have been identified as High or Medium vulnerabilities for road infrastructure in London:

- Extreme (air) temperature (frequency and magnitude);
- Extreme rainfall (frequency and magnitude);
- Gales and extreme winds (frequency and magnitude);
- Solar radiation;
- Flood (coastal and fluvial);
- Subsidence and ground stability;
- Fog;
- Snow, ice and hail; and
- Storms and lightning.

Table 14.10: Findings of the scoping phase: climate vulnerability

Effects	Scoped in/out		Comment/Justification
	Construction	Operation	
Average (air) temperature change (annual, seasonal, monthly)	×	×	Low climate vulnerability
Extreme (air) temperature (frequency and magnitude)	✓	✓	Moderate climate vulnerability
Average precipitation (annual, seasonal, monthly)	×	×	Low climate vulnerability
Extreme rainfall (frequency and magnitude)	✓	✓	High climate vulnerability
Average wind speed change (annual, seasonal, monthly)	×	×	Low climate vulnerability
Gales and extreme winds (frequency and magnitude)	✓	✓	Moderate climate vulnerability
Humidity	×	×	Low climate vulnerability
Solar radiation	✓	✓	Moderate climate vulnerability
Sea level rise (plus local land movements), storm surge/tide	×	×	Low climate vulnerability
Water availability/drought	×	×	Low climate vulnerability
Flood (coastal and fluvial)	✓	✓	High climate vulnerability
Subsidence and ground stability	✓	✓	Moderate climate vulnerability
Fog	✓	✓	Moderate climate vulnerability
Storms (tracks and intensity), including storm surge	×	×	Low climate vulnerability
Snow, ice and hail	✓	✓	Moderate climate vulnerability
Storms and lightning	✓	✓	Moderate climate vulnerability

14.7.5 The High and Medium climate vulnerabilities identified above will be assessed in more detail in the detailed assessment (Environmental Statement) phase. Our approach will build on the work of other teams (for example, but not limited to, Water and Drainage, Landscape, Geology and Soils) and seek to mitigate these effects through appropriate adaptation measures and strategies, where appropriate.

15 Assessment of Cumulative Effects

15.1 Introduction

15.1.1 Without prejudice to the findings of the forthcoming EIA, the cumulative effects chapter of the PEIR brings together the initial findings of each of the environmental topic areas, identifying and assessing the cumulative effects of the Scheme.

15.1.2 This assessment draws upon the guidance provided within the DMRB Volume 11, Section 2, Part 5: Assessment and Management of Environmental Effects' and the Planning Inspectorate (PINS) 'Advice Note Seventeen: Cumulative Effects Assessment' (December 2015).

15.1.3 Combined and cumulative effects result from multiple actions on receptors over time and are generally additive or interactive (synergistic) in nature. They can also be considered as effects resulting from incremental changes caused by other past, present or reasonably foreseeable actions together with the project.

15.1.4 Cumulative effects can be identified as:

- Combined effects from a single project (the inter-relationship between different environmental factors); and
- Cumulative effects from different projects (with the project being assessed).

15.2 Methodology

Combined Effects

15.2.1 The assessment methodology for combined effects requires the identification of impact interactions associated with the Scheme upon separate environmental receptors.

15.2.2 The significance of construction and operational environmental effects from the topic chapters will be reported in matrices to provide an overview of the potential effects on individual receptors and their significance. Professional judgement will also be used.

Cumulative Effects

15.2.3 The assessment methodology for cumulative effects involves the identification of changes likely to be caused by ‘other developments’ together with the Scheme.

15.2.4 In order to carry out the assessment it is necessary to define the location and timing of nearby potential developments. This follows the methodology provided in the PINS Advice Note Seventeen; Cumulative Effects Assessment (December 2015) which proposed four stages of assessment:

- Stage 1 – Establish the ZoI and a Long List of ‘Other Development’
- Stage 2 – Identify a Short List of ‘Other Development’ for assessment
- Stage 3 – Information Gathering
- Stage 4 - Assessment

15.2.5 The following criteria is being used to identify and determine 'other development'. They have been selected because it is considered that they will capture the types of 'other development' that are in the vicinity of the Scheme:

- Trunk road and motorway projects which have been confirmed (i.e. gone through the statutory processes);
- Development projects with valid planning permissions as granted by the LPA, and for which formal EIA is a requirement or for which non–statutory EIA has been undertaken;
- Applications for consent which have been made, but which have not yet been determined;
- Allocated sites in emerging or adopted Local Plans; and
- Other types of application which could have implications for the Scheme.

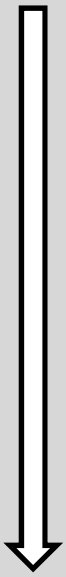
15.2.6 The delivery of development in the above categories is considered to be 'reasonably foreseeable' and 'committed', in line with the advice in the DMRB Volume 11, Section 2, Part 5 HA 205/08.

15.2.7 The PINS Advice Note Seventeen (December 2015) recommends grouping the 'other developments' into Tiers, reflecting the likely degree of certainty attached to each development, with Tier 1 being the most certain and Tier 3 being the least certain and most likely to have limited publically available information to guide the assessment. The 'Other Development' Tiers are presented in Table 15.1 below.

Table 15-1 'Other Development' for inclusion in the CEA

Tier	Likely Degree of Certainty
Tier 1	• Under construction* • Permitted application(s) whether under the Planning Act 2008 or other regimes but not yet implemented • Submitted application(s) whether under the Planning Act 2008 or other regimes but not yet determined
Tier 2	• Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has been submitted
Tier 3	• Projects on the Planning Inspectorate's Programme of Projects where a Scoping Report has not been submitted • Identified in the relevant Development Plan (and emerging Development Plans – with appropriate weight being given closer to adoption) recognising that information on any relevant proposals will be limited • Identified in other plans and programmes (as appropriate) which set the framework for future development consents/approvals where such development is reasonable likely to come forward

Decreasing level of detail likely to be available



* Where other projects are expected to be completed before construction of the proposed NSIP and the effects of these projects are fully determined, effects arising from them should be considered as part of the baseline and may be considered as part of the construction and operation assessment.

15.2.8 The following categories in Table 15-2, which are presented in the DMRB Volume 11, Section 2, Part 5 HA 205/08 will be used as a framework for determining the significance of cumulative effects.

Table 15-2: Determining Significance of 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 a 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 to absorb such change.

Table Source: DMRB Volume 11, Section 2, Part 5, HA 205/08, Table 2.6

15.2.9 The significance of effects within this cumulative effects assessment will be measured according to Table 4.1 in the upfront chapter of the PEIR.

15.3 Baseline and Study Area

Combined effects

15.3.1 The study area for the assessment of combined effects reflects the Zones of Influence/Study Areas which are identified in the proposed for each of the environmental topic areas is identified in topic chapters 5 to 14 and in Table 15.3 below. These are subject to change and will be confirmed in the ES.

Table 15-3: Zone of Influence/Study Area

Environmental topic	Zone of influence
Air Quality	Within 200 m of the construction site boundary.
Noise and Vibration	600 m from the carriageway edge of any proposed new routes or existing routes to be bypassed or improved, and 600 m from any other affected routes within 1 km of the proposed new routes or altered existing routes.
Biodiversity	• 2 km for statutory designated sites of nature conservation importance: SACs, SPAs, Ramsar sites, SSSIs, and NNRs and LNR; • 2 km for non–statutory SNCIs; • 30 km for SACs where bats are one of the qualifying species; • 5 km for bat records; • 1 km for notable habitats and notable or legally protected species; and • 1 km for ancient woodlands.
Road Drainage and the Water Environment	Within 1 km of the Scheme.
Landscape	• Visual effects within 1.5 km from the edge of the Scheme; and

Environmental topic	Zone of influence
	• Landscape effects within 1.5 km from the perimeter of the Scheme.
Geology and Soils	500 m from the extent of the DCO boundary
Cultural Heritage	500 m around the alignment of the Scheme.
Materials and Waste	• Material resources study area includes the demand for key construction materials nationally; and • Waste study area includes the waste arisings and waste infrastructure capacity within the county of Surrey.
People and Communities	• 500 m from the extent of the DCO boundary; and • Agricultural land is limited to that required either temporarily or permanently by the Scheme.
Climate change	• See section 14.2 for full details of the climate change study area.

Cumulative effects

15.3.2 The study area for the identification of 'other developments' for inclusion in the assessment of cumulative effects is based upon thresholds and spatial areas. These thresholds and spatial areas are considered to be appropriate, based upon professional judgement and taking into account the nature and location of the Scheme. They capture the topic ZoIs with the exception of the 30 km ZoI for SACs where bats are one of the qualifying species and the Materials and Waste ZoI which look nationally and within the county of Surrey.

15.3.3 It is not considered appropriate to align with the Transport Model for the Scheme which includes data from across the whole country, selected significant major developments within the whole of GBC, EBC and WBC as well as accounting for general growth.

15.3.4 The thresholds and spatial area are as follows:

- NSIPs – 10 km from the DCO boundary;
- Regionally Significant Projects – 3 km from the DCO boundary;
- Major development – within and 1.5 km from the DCO boundary; and
- Minor development – within the DCO boundary.

15.3.5 The definition of a Regionally Significant Project, is a significant major project where it is considered there could be cumulative effects with the Scheme. In some cases this will be a development that has been included in the Traffic Model.

15.3.6 The definition of Major development and Minor development will be according to article 2 of the Town and Country Planning Development Management Procedure (England) Order 2015.

Interaction with other developments

15.3.7 A list of provisional list of 'Other Development' was compiled through searches of local authority planning portals for planning applications and a review of allocated and proposed sites in local plans.

15.3.8 In line with DMRB HA 205/08, further liaison is currently taking place with the relevant LPAs, GBC, EBC,WBC and MVDC who are providing their assistance to determine and agree whether any other developments in the vicinity of the Scheme should be taken into consideration and when they believe these to be likely to come forward, so Stage 1 can be completed. The LPAs have provided a list of relevant developments which will be reviewed and included in the main ES. RBC will also be consulted on other developments.

15.3.9 The provisional list of developments to be considered in the cumulative effects assessment is presented in Appendix I in Volume 2 and it is considered this is at Stage 1 (PINS Advice Note 17, December 2015). The locations of the developments are shown on Figure 15.1 in Volume 3. The list of the provisional developments is provided in Table 15.4 below. The developments within MVDC and RBC will be included in the main ES.

Table 15-4: List of provisional developments

Development	Distance from site (closest point)	Application Reference
Highways England		
Junction 10 - 16 Smart Motorway Programme (SMP)	Partly within the red line	
Guildford Borough Council		
The former Wisley Airfield	Partly within the red line	Site allocation A35
Land to the East of South Cottage, White Horse Lane, Ripley, GU23 6BB	650 m approx.	16/P/00608
Royal Horticultural Society Gardens, Wisley Lane, Wisley, Woking, GU23 6QS	Parts of the RHS site are within the red line boundary	16/P/01080
Royal Horticultural Society Gardens, Wisley Lane, Wisley, Woking, GU23 6QS	Part of the RHS site are within the red line boundary	16/P/00976
Land adjacent to Waterloo Farm behind Ockham Road North, East Horsley (C14-a)	2.4 km approx.	975
Elmbridge Borough Council		
Former San Domenico Restaurant	Within the red line boundary	2017/0524
Former San Domenico Restaurant	Within the red line boundary	2014/4612
Painshill Farm, Portsmouth Road, Cobham Surrey KT11 1DN	Abutting the red line boundary	2016/4204
Site of 46 Portsmouth Road, Cobham, Surrey, KT11 1HY	600 m approx.	2015/0997
Holly Parade, High Street, Cobham, Surrey KT11 3EE	1 km approx.	2016/2185
Land alongside A3 adjacent to Sainsbury Car Park	450 m approx.	Site allocation DEV/COB9
Land at Chippings Farm, Portsmouth Road, Cobham, KT11 1EH	1.4 km approx.	Site allocation Land Parcel - no 20

Development	Distance from site (closest point)	Application Reference
Woking Borough Council		
Land rear of 79-95 Lovelace Drive, Teggs Lane, Pyrford	2.4 km approx.	Site allocation GB12
Land east of Upshott Lane and south of Aviary Road, Pyrford	2.2 km approx.	Site allocation GB13
Land surrounding West Hall, Parvis Road, West Byfleet	1.1 km approx.	Site allocation GB15
Broadoaks, Parvis Road, West Byfleet	1.4 km approx.	Site allocation GB16
Camphill Tip, Camphill Road, West Byfleet	2.3 km approx.	Site allocation UA49

15.4 Potential impacts

Combined effects

15.4.1 For the main ES in-combination effects will be reported when this information is available from the individual topic assessments following their assessments to inform the ES. The proposed mitigation for all environmental topic areas will be provided in the ES.

Construction

15.4.2 At the PEIR stage, it has been initially identified that there will be combined effects during construction and operation for landscape and visual. During construction, it is anticipated there will be adverse combined landscape and visual effects because of the interaction between the different elements of the Scheme - the widening of the A3 and the proposed works to provide accesses to the properties at Painshill, to Seven Hills Road west of the A3, the access via Cockrow Bridge and via Wisley Lane.

Operation

15.4.3 The proposed scale and length of A3 Widening between Ockham and Painshill may result in adverse cumulative landscape and visual effects as a consequence of the interaction with the associated works to provide access to Painshill properties, the access to Seven Hills Road west of the A3, the access via Cockrow Bridge and the Wisley Lane access.

Cumulative effects

15.4.4 Table 15.5 presents the preliminary cumulative effects assessments from the topic chapters of the PEIR. For the majority of the topics, the assessment of cumulative effects will be updated as part of the ES given the current stage in the scheme design.

Table 15-5: PEIR Cumulative effects summary

Topic	Construction cumulative effects	Operational cumulative effects	Potential mitigation
Air quality	During construction, four of these proposals: the M25 Junction 10 -16 Smart Motorway Programme; the former Wisley Airfield; and two proposals for the Royal Horticultural Society Gardens at Wisley could potentially affect receptors within the air quality study area for construction, if construction occurs over the same period.	At Option Selection Stage, specific committed developments were taken into account within the traffic modelling outputs for the air quality assessment, meaning that the air quality assessment during operation already takes into consideration cumulative effects. These will be included within the air quality assessment for the ES, as the findings are not yet available.	Mitigation will be identified in the ES.
Noise and vibration	Lower road traffic noise levels during the construction phase due to lower speed limits adjacent road works. Increased potential for noise and vibration effects during the construction phase of M25 J10 scheme, depending on how the phasing of construction works for both schemes.	The Smart Motorways scheme proposed for the M25 Junctions 10–16 may give rise to a cumulative effect at properties in proximity to both Schemes. As the Smart Motorways scheme proposes hard shoulder running, this increases the width of the operational motorway by one lane in each carriageway. The additional lanes move the traffic closer to receptors and the decreased distance may result in higher road traffic noise levels.	Low noise road surfacing on the A3 and Junction 10.
Biodiversity	The Smart Motorway scheme could potentially lead to increased levels of air pollution and/or noise within the SPA/SSSI/LNR when combined with the Scheme.	The Smart Motorway scheme could potentially lead to increased levels of air pollution and/or noise within the SPA/SSSI/LNR when combined with the Scheme. Should development proceed at the former Wisley Airfield, it could lead to increased recreational pressure on the SPA/SSSI/LNR, resulting in increased disturbance of wildlife, such as the SPA qualifying breeding bird population.	The provision of preferred paths around the SPA/SSSI/LNR and compensation will include the creation of new areas of connected heathland and woodland. This additional land and the addition of preferred routes should reduce levels of disturbance on other areas of the SPA/SSSI/LNR.
Road drainage and the water environment	The assessment of cumulative effects will be undertaken as part of the ES	The assessment of cumulative effects will be undertaken as part of the ES	Mitigation will be identified in the ES.
Landscape and visual	The cumulative impact on landscape and visual effects will be assessed and presented in the ES.	The cumulative impact on landscape and visual effects will be assessed and presented in the ES	Mitigation will be identified in the ES.

Topic	Construction cumulative effects	Operational cumulative effects	Potential mitigation
Geology and soils	The cumulative impact of soils and geology material resources and waste will be assessed as part of the ES process.	The cumulative impact of soils and geology material resources and waste will be assessed as part of the ES process.	Potential mitigation will be identified in the ES.
Cultural heritage	The assessment of cumulative effects will be undertaken as part of the ES, following a programme of archaeological evaluation of the Scheme, which will be implemented to further understand the impact of the Scheme.	The assessment of cumulative effects will be undertaken as part of the ES, following a programme of archaeological evaluation of the Scheme, which will be implemented to further understand the impact of the Scheme.	Mitigation will be identified in the ES.
Materials and waste	The cumulative impact of material resources and waste will be assessed for the ES.	The cumulative impact of material resources and waste will be assessed in the ES.	Mitigation will be identified in the ES.
People and communities	Cumulative impacts on people and communities will be assessed for the ES.	Cumulative impacts on people and communities will be assessed for the ES.	Mitigation, where required, will be identified in the ES.
Climate change	The assessment of cumulative effects will be undertaken as part of the ES	The assessment of cumulative effects will be undertaken as part of the ES	Mitigation will be identified in the ES.

15.5 Summary

15.5.1 Initial high-level analysis has shown that some receptors have the potential to experience effects from the Scheme relating to multiple environmental assessment areas. Many of the potential impacts will be minimised through a combination of best practice and mitigation measures which will be identified in the ES.

Construction

15.5.2 During construction, it is anticipated there will be adverse combined landscape and visual effects because of the interaction between the different elements of the Scheme.

15.5.3 Construction of the Scheme from over the two year period from 2020 is likely to overlap with other developments in the study area as identified in Volume 2 Appendix I and Figure 15.1 in Volume 3.

15.5.4 During construction the Smart Motorway Programme M25 Junctions 10 – 16 has the potential to cause adverse noise and vibration, air quality and biodiversity cumulative effects on for receptors if built during the same time period.

15.5.5 The plans for development at the RHS Wisley Gardens may also cause cumulative air quality effects for receptors (including the Gardens) if constructed at the same time.

Operation

15.5.6 It is anticipated that there will be adverse combination landscape and visual effects because of the interaction between the different elements of the Scheme once operational.

15.5.7 The Smart Motorway Programme M25 Junctions 10 – 16 has the potential to cause adverse noise and vibration, air quality and biodiversity cumulative effects on receptors once the Scheme is operational due to receptors being closer to traffic lanes.

15.5.8 Once operational, the former Wisley Airfield development has the potential to cause cumulative affects through increased recreational pressures on the SPA/SSSI/LNR because of new residents of the development.

15.5.9 This assessment will be updated for the ES and appropriate mitigation will be identified and secured.

References

Chapter 1 Introduction

DfT, 2008a. DMRB Volume 11 Environmental Assessment, Section 2, Part 1 HA 201/08 General Principles and Guidance of Environmental Impact Assessment

DfT, 2008b. DMRB Volume 11 Environmental Assessment, Section 2, Part 4 HA 204/08 Scoping of Environmental Impact Assessments

DfT, 2008c. DMRB Volume 11 Environmental Assessment, Section 2, Part 6 HD 48/08 Reporting of Environmental Impact Assessments

DfT, 2014. National Policy Statement for National Networks

DfT, 2015. IAN 125/15 Environmental Assessment Update

DfT, 2015. IAN 126/15 Environmental Assessment Screening and Determination

DfT and Highways Agency, 2015. Road Investment Strategy for the 2015/16 to 2019/20 Road Period

Elmbridge Borough Council, 2011. Elmbridge Core Strategy

Guildford Borough Council, 2003. Local Plan [Online]. [viewed 2017]. Available from: http://www.guildford.gov.uk/newlocalplan/CHttpHandler.ashx?id=1068&p=0

Highways England, 2014. Strategic Business Plan 2015 - 2020

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

The Planning Inspectorate, National Infrastructure Directorate, 2015. Advice Note 7: Environmental Impact Assessment: Preliminary Environmental Information, Screening and Scoping

Surrey County Council, 2017. Surrey Transport Plan (LTP3) [Online]. [viewed 2017]. Available from: https://www.surreycc.gov.uk/roads-and-transport/roads-and-transport-policies-plans-and-consultations/surrey-transport-plan

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017

Chapter 2 The Project

Highways England, 2017. Client Scheme Requirements Version 02

Chapter 3 Assessment of Alternatives

The Air Quality Standards Regulations 2010

The Conservation of Habitats and Species (Amendment) Regulations 2012

The Conservation of Habitats and Species Regulations 2010

Countryside and Rights of Way Act 2000

European Parliament, Council of the European Union, 1992. The European Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Flora and Fauna

European Parliament, Council of the European Union, 2000. The European Directive 2000/60/EC on Establishing a Framework for the Community Action in the Field of Water Policy

European Parliament, Council of the European Union, 2008a. The European Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe

European Parliament, Council of the European Union, 2008b. The European Directive 2009/147/EC on the Conservation of Wild Birds

Planning Act 2008

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003

Water Industry Act 1991 (Amendment) (England) Regulations 2009

Wildlife and Countryside Act 1981

Chapter 4 Environmental Assessment Methodology

DfT, 2008a. DMRB Volume 11 Environmental Assessment, Section 2, Part 1 HA 201/08 General Principles and Guidance on Environmental Impact Assessment

DfT, 2008b. DMRB Volume 11 Environmental Assessment, Section 2, Part 4 HA 204/08 Scoping of Environmental Impact Assessments

DfT, 2008c. DMRB Volume 11 Environmental Assessment, Section 2, Part 7 HA 218/08 Glossary of terms used in DMRB Volume 11, Sections 1 and 2

DfT, 2015. IAN 125/15 Environmental Assessment Update

European Parliament, Council of the European Union, 2014. The European Directive 2014/52/EU on the Assessment of the Effects of certain Public and Private Projects on the Environment

The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

The Planning Inspectorate, National Infrastructure Directorate, 2012. Advice Note 9: Rochdale Envelope

The Planning Inspectorate, National Infrastructure Directorate, 2016. Advice Note 10: Habitats Regulations Assessment relevant to nationally significant infrastructure projects

The Town and Country Planning (Environmental Impact Assessment) Regulations 2017

Chapter 5 Air Quality

Connect Plus Services, 2017. Maintenance and Operation Environmental Management Plan: Volume 2, Section 3, Part 1 Air Quality Management Plan

Defra, 2007. The Air Quality Strategy for England, Scotland, Wales and Northern Ireland [Online]. [viewed 2017]. Available from: https://www.gov.uk/government/publications/2010-to-2015-government-policy-environmental-quality/2010-to-2015-government-policy-environmental-quality#appendix-5-international-european-and-national-standards-for-air-quality

Defra, 2016. Local Air Quality Management Technical Guidance LAQM.TG(16) [Online]. [viewed 2017]. Available from: https://laqm.defra.gov.uk/documents/LAQM-TG16-April-16-v1.pdf

DCLG, 2012. National Planning Policy Framework [Online]. [viewed 2017]. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/6077/2116950.pdf

DfT, 2007. DMRB Volume 11 Environmental Assessment, Section 3, Part 1 HA 207/07 'Air Quality' [Online]. [viewed 2017]. Available from: http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf

DfT, 2013a. IAN 170/12 v3 Updated air quality advice on the assessment of future NO_X and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' [Online]. [viewed 2017]. Available from: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian170v3.pdf

DfT, 2013b. IAN 174/13 Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality (HA 207/07) [Online]. [viewed 2017]. Available from: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian174.pdf

DfT, 2013c. 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 (HA 207/07)

DfT, 2013d. Transport analysis guidance: WebTAG [Online]. [viewed 2017]. Available from: https://www.gov.uk/guidance/transport-analysis-guidance-webtag

DfT, 2014a Highways England Major Projects' Instructions MPI-28-082014 Determining the correct base year traffic model to support air quality assessments, August 2014

DfT, 2014b. National Policy Statement for National Networks [Online]. [viewed 2017]. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387223/npsnn-web.pdf

DfT, 2015a. 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 7 Noise [Online]. [viewed 2017]. Available from: http://www.standardsforhighways.co.uk/ha/standards/ians/pdfs/ian185.pdf

DfT and Highways Agency, 2015b. Road Investment Strategy for the 2015/16 to 2019/20 Road Period, March 2015 [Online]. [viewed 2017]. Available from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/408514/ris-for-2015-16-road-period-web-version.pdf

Elmbridge Borough Council, 2011. Air Quality Action Plan for Elmbridge Borough Council

Elmbridge Borough Council, 2016. Air Quality Annual Status Report

Guildford Borough Council, 2003. Local Plan. Retrieved 2017 [Online]. [viewed 2017]. Available from: http://www.guildford.gov.uk/newlocalplan/CHttpHandler.ashx?id=1068&p=0

Guildford Borough Council, 2016a. Air Quality Annual Status Report

Guildford Borough Council, 2016b. Transport Strategy 2016 [Online]. [viewed 2017]. Available from: http://www2.guildford.gov.uk/councilmeetings/documents/s4930/Item04-GuildfordBoroughTransportStrategy.pdf and https://www.guildford.gov.uk/media/21135/Guildford-Borough-Transport-Strategy-2016/pdf/Item_04_1_-_Guildford_Borough_Transport_Strategy_-_App_1_-_The_Strategy_April_2016.pdf

Highways England, 2013. Note on HA's interim Alternative Long Term Annual Projection Factors (LTTE6) for Annual Mean NO_2 and NO_X Concentrations between 2008 and 2030, draft

Highways England, 2015. Highways England Delivery Plan 2015 – 2020 [Online]. [viewed 2017]. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/424467/DSP2036-184_Highways_England_Delivery_Plan_FINAL_low_res_280415.pdf

Highways England, 2017. Highways England Delivery Plan 2017 – 2018 [Online]. [viewed 2017]. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/642750/Highways_England_Delivery_Plan_Update_2017-2018.pdf

Mole Valley Borough Council, 2016. Air Quality Annual Status Report

Natural England, 2016. MAGIC interactive mapping [Online]. [viewed November 2017]. Available from: http://magic.defra.gov.uk/

The National Archives, 2000. The Air Quality (England) Regulations 2000 [Online]. [viewed 2017]. Available from: http://www.legislation.gov.uk/uksi/2000/928/contents/made

The National Archives, 2002. The Air Quality (England) (Amended) Regulations 2002 [Online]. [viewed 2017]. Available from: http://www.legislation.gov.uk/uksi/2002/3043/contents

The National Archives (2010) The Air Quality Standards Regulations 2010 [Online]. [viewed 2017]. Available from: http://www.legislation.gov.uk/uksi/2010/1001/contents/made

Runnymede Borough Council, 2014. Air Quality Action Plan for Runnymede Borough Council

Runnymede Borough Council, 2016a. Air Quality Annual Status Report

Runnymede Borough Council, 2016b. Runnymede 2035 Local Development Scheme [Online]. [viewed 2017]. Available from: https://www.runnymede.gov.uk/CHttpHandler.ashx?id=16032&p=0

Surrey County Council, 2011. Surrey Transport Plan: Air Quality Strategy [Online]. [viewed 2017]. Available from: https://www.surreycc.gov.uk/__data/assets/pdf_file/0004/29974/Surrey-Transport-Plan-Air-Quality-Strategy.pdf

Surrey County Council, 2017. Surrey Transport Plan (LTP3) [Online]. [viewed 2017]. Available from: https://www.surreycc.gov.uk/roads-and-transport/roads-and-transport-policies-plans-and-consultations/surrey-transport-plan

Woking Borough Council, 2012. Woking Local Development Framework: Woking Core Strategy [Online]. [viewed 2017]. Available from: http://www.woking2027.info/corestrategy/adoptedcorestrategy.pdf

Woking Borough Council, 2017. Air Quality Annual Status Report

Chapter 6 Noise and Vibration

BSI, 2014. BS 5228:2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites, Part 1: Noise. London: BSI

BSI, 2014. BS 5228:2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites, Part 2: Vibration. London: BSI

The Control of Noise (Code of Practice for Construction and Open Sites) (England) Order 2015

Control of Pollution Act 1974

DCLG, 2012. National Planning Policy Framework. London: DCLG

DCLG, 2014. Planning Practice Guidance – Noise. London: DCLG

Defra, 2010. Noise Policy Statement for England. London: Defra

DfT, 2011. DMRB Volume 11, Section 3, Part 7 – Noise and Vibration. HD 213/11 Revision 1

DfT, 2014. National Policy Statement for National Networks

DfT and Highways Agency, 2015. Road Investment Strategy for the 2015/16 to 2019/20 Road Period

DfT, 2015. Transport Analysis Guidance Unit A3: Environmental Impact Appraisal

Environmental Noise (England) Regulations 2006

Environmental Protection Act 1990

European Parliament, Council of the European Union, 2002. Directive 2002/49/EC of the European Parliament and of the Council 25 June 2002 relating to the assessment and management of environmental noise

Extrium, 2015. Noise Map Viewer [Online]. [viewed November 2017]. Available from: http://extrium.co.uk/noiseviewer.html#

The Highways Noise Payments and Movable Homes (England) Regulations 2000

Land Compensation Act 1973

Natural England, 2016. MAGIC interactive mapping [Online]. [viewed November 2017]. Available from: http://magic.defra.gov.uk/

Noise Insulation Regulations 1975 (as amended)

World Health Organisation, 2000. Guidelines for Community Noise. Geneva: WHO

World Health Organisation Regional Office for Europe, 2009. Night Noise Guidelines for Europe. Copenhagen: WHO

Chapter 7 Biodiversity

Biggs, J., Ewald, N., Valentini, A., Gaboriaud, C., Griffiths, R.A., Foster, J., Wilkinson, J., Arnett, A., Williams, P. and Dunn, F., 2014. Technical Advice Note for Field and Laboratory Sampling of Great Crested Newt eDNA in Analytical and methodological development for improved surveillance of the Great Crested Newt. Defra Project WC1067. Appendix 5.

Bright, P.W., Morris, P.A. and Mitchell-Jones, A., 2006. Dormouse Conservation Handbook 2nd Edition. English Nature, Peterborough. CIEEM (2016) Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, freshwater and coastal (second edition)

CIEEM, 2012. Guidelines for Preliminary Ecological Assessment

Collins, J. (ed), 2016. Bat Surveys for Professional Ecologists. Good Practice Guidelines (3rd Edition)

Council of the European Union, 1992. Council Directive 92/43/EEC on the conservation of natural habitats and wild fauna and flora

The Countryside and Rights of Way Act 2000

DCLG, 2012. National Planning Policy Framework

DfT, 2008. DMRB Volume 11, Section 2, Part 1 HA 201/08 General Principles and Guidance of Environmental Impact Assessment

DfT, 2010. IAN 130/10 Ecology and Nature Conservation: Criteria for Impact Assessment

DfT, 2014. National Policy Statement for National Networks

Elmbridge Borough Council, 2011. Elmbridge Core Strategy

Elmbridge Borough Council, 2015. Elmbridge Local Plan: Development Management Plan

English Nature, 2001. Great Crested Newt Mitigation Guidelines

European Parliament, Council of the European Union, 2009. Directive 2009/147/EC on the conservation of wild birds (the codified version of Council Directive 79/409/EEC as amended)

Gent, T., Gibson, S., 2003. Herpetofauna Workers Manual

Gilbert, G., Gibbons, D.W. and Evans, J. (RSPB), 1998. Monitoring Methods. Royal Society for the Protection of Birds

Highways England, 2015. Our plan to protect and increase biodiversity

Joint Nature Conservation Committee, 2010. Handbook for Phase 1 habitat survey - a technique for environmental audit, ISBN 0 86139 636 7

National Parks and Access to the Countryside Act 1949

Natural England, 2013. The Mosaic Approach: Managing Habitats for Species (B2020-009) [Online]. [viewed November 2017]. Available from: http://publications.naturalengland.org.uk/publication/6415972705501184

Natural England, 2014. Environmental DNA (eDNA) detects the presence of great crested newts in water [Online]. [viewed September 2017]. Available from: http://webarchive.nationalarchives.gov.uk/20140605105717/http://www.naturalengland.org.uk/ourwork/regulation/wildlife/gcn-eDNA-feature.aspx

Natural Environment and Rural Communities (NERC) Act 2006

Oldham R.S., Keeble J., Swan M.J.S. and Jeffcote M., 2000. Evaluating the suitability of habitat for the Great Crested Newt (*Triturus cristatus*). Herpetological Journal 10 (4), 143-155

Ratcliffe, 1977. A Nature Conservation Review

Savills, 2015. Wisley Airfield: Environmental Statement: Appendix 8.8 Reptile survey results

Wildlife and Countryside Act 1981 (as amended)

Chapter 8 Road Drainage and the Water Environment

Data.gov.uk. Spatial Data Catalogue [Online]. [viewed 2017]. Available from: http://environment.data.gov.uk/ds/catalogue/#/catalogue

DCLG, 2012. National Planning Policy Framework

DCLG, 2014. Technical Guidance

Defra, 2016. Thames River Basin Management Plan [Online]. [viewed 2017]. Available from: https://www.gov.uk/government/collections/river-basin-management-plans-2015

DfT, 2009. DMRB Volume 11, Section 3, Part 10 HD 45/09 Road Drainage and the Water Environment

DfT, 2015. Transport Analysis Guidance Unit A3: Environmental Impact Appraisal

Environment Agency. What's In Your Backyard [Online]. [viewed August 2017]. Available from: http://apps.environment-agency.gov.uk/wiyby/default.aspx

Environment Agency, 2017. Environment Agency's 'Climate change allowances for planners' NPPF supporting guidance

Highways England, 2017. Regional Investment Strategy M25 Junction 10/A3 Wisley Interchange Improvements Environmental Assessment Report

Highways England, 2017. Regional Investment Strategy M25 Junction 10/A3 Wisley Interchange Improvements Environmental Study Scoping Report

Highways England, 2017. Regional Investment Strategy M25 Junction 10/A3 Wisley Interchange Improvements Water Framework Directive Assessment (Options Selection Stage)

The Planning Inspectorate, National Infrastructure Directorate, 2017. Advice Note 18: The Water Framework Directive

Chapter 9 Landscape

The Commons Act 2006

The Countryside and Rights of Way Act (CRoW) 2008

DCLG, 2012. National Planning Policy Framework

DfT, 2008. DMRB Volume 11, Section 2, Part 2 HA 202/08 Environmental Impact Assessment

DfT, 2010. IAN 135/10 Landscape and Visual Effects Assessment

Elmbridge Borough Council, 2011. The Elmbridge Core Strategy 2011

Guildford Borough Council, 2007. Guildford Borough Council saved policies Local Plan 2003

Landscape Institute, 2013. Guidelines for Landscape and Visual Impact Assessment (GLVIA) 3rd edition

Chapter 10 Geology and Soils

Airfields of Britain Conservation Trust (2017) Airfield Finder (Online), http://www.abct.org.uk/airfields/airfield-finder/, Accessed 6 December 2017

Atkins (2016) Road Investment Strategy M25 J10/A3 Wisley Interchange Improvements Environmental Study Report. Rev.2.0

Atkins (2017) Road Investment Strategy M25 J10/A3 Wisley Interchange Improvements Environmental Assessment Report. Rev.2.0

Atkins (2017) M25 J10/A3 Wisley Interchange Improvements Preliminary Sources Study Report (report number: 29525)

Balfour Beatty Civil Engineering Ltd. (1995). M25 Widening Junction 8 – 10, Maintenance Manual, Supplementary Site Investigation. Report 7958/1. HAGDMS report 12666

Bloodworth, A.J., Cameron, D.G., Lott, G.K., Evans, D.J., Wood, S.E, Simpson, C., Highley, D.E., 2003. Mineral Resource Information in Support of National, Regional and Local Planning: Surrey (comprising Surry and the London Boroughs of Croydon, Hounslow, Kingston upon Thames, Richmond upon Thames and Sutton), BGS Commissioned Report CR/03/073N, 2003

British Geological Survey (BGS) (2017a) Onshore GeoIndex (Online). Accessed from http://mapapps2.bgs.ac.uk/geoindex/home.html on 21 Mar 2013

BGS. (2017b). Geology of Britain Viewer (Online). http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html. Accessed on 21 March 2017

BGS (2017c) Coal Authority Interactive Map (Online), http://mapapps2.bgs.ac.uk/coalauthority/home.html, 2017e. Accessed 21 March 2017

British Research Establishment (BRE). (2005). Special Digest 1:2005 Concrete in aggressive ground, third edition. BRE Bookshop, Watford, United Kingdom

Department for Communities and Local Government, 2006. Environmental Impact Assessment: A guide to good practice and procedures. It should be noted that this document has been archived; however, it still constitutes good advice and should be referred to in the absence of alternative guidance documents. Document available at:

http://webarchive.nationalarchives.gov.uk/20120919132719/www.communities.gov.uk/documents/planningandbuilding/pdf/151087. Accessed September 2017

Department for Communities and Local Government (2012) National Planning Policy Framework

Department for Environment and Food and Rural Affairs & Environment Agency (2009) River Basin Management Plan - Thames River Basin District

Department for Environment, Food and Rural Affairs. (2012) Environmental Protection Act: Part 2A Contaminated land Statutory Guidance

Department for Transport (2014) National Networks National Policy Statement (NN NPS), Accessed from https://www.gov.uk/government/collections/national-networks-national-policy-statement

Elmbridge Borough Council, Planning Policy Map, accessed 22/11/2017 http://emaps.elmbridge.gov.uk/ebc_simple.aspx?requesttype=parseTemplate&template=PlanningPolicy.tmplt

Environment Agency (2004) The Model Procedures for the Management of Land Contamination (CLR 11)

Environment Agency (2008) Guidance for the Safe Development of Housing on Land Affected by Contamination

Environment Agency (2010) Guiding principles for land contamination (GPLC)

Environment Agency (2017) The Environment Agency's approach to groundwater protection (Online). Accessed from https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/620438/LIT_7660.pdf in July 2017

Environment Agency (2017) What's In Your Backyard (WIYBY) Interactive Map Viewer (Online). Accessed from http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e on 08 Mar 2017

European Parliament (2000) Water Framework Directive (Directive 2000/60/EC)

Guilford Borough (2003) Local Plan. http://www.guildford.gov.uk/newlocalplan/CHttpHandler.ashx?id=1068&p=0 (accessed April 2017)

Health and Safety Executive. Control of Substances Hazardous to Health. Sixth Edition. 2013

Historic England. (2017b). PastScape (Online), http://www.pastscape.org.uk, 2017. Accessed 31 January 2017

Landmark Information Group (2017) Site specific Envirocheck report. Purchased 5 Dec 2017

Royse, K.R., de Freitas, M., Burgess, W.G., Cosgrove, J., Ghail, R.C., Gibbard, P., King, C., Lawrence, U., Mortimore, R.N., Owen, H., Skipper, J. (2012) Geology of London, UK. Proceedings of the Geologists' Association. doi:10.1016/j.pgeola.2011.07.005

UK Government (1991) The Water Resources Act (Online). Accessed from http://www.legislation.gov.uk/ukpga/1991/57/contents

UK Parliament (1990) Environmental Protection Act

Zetica (n.d.) Regional Unexploded Bomb Risk Map – Surrey. Obtained from http://www.zetica.com/uxb_downloads.htm

Zetica. (2017a). Preliminary Risk Assessment (Online). http://zeticauxo.com/risk-assessment/preliminary-risk-assessment/. Accessed on 08 February 2017

Chapter 11 Cultural Heritage

AOC Archaeology Group, 2017. Proposed M25 Junction 10 to A3 Wisley Interchange Upgrade, Surrey: Archaeological Desk–Based Assessment. Project No. 24068

Chartered Institute for Archaeologists, 2014. Standards and guidance for historic environment desk–based assessment

DCLG, 2012. National Planning Policy Framework (NPPF) [Online]. [viewed 2017]. Available from: https://www.gov.uk/guidance/conserving–and–enhancing–the–historic–environment & https://www.gov.uk/guidance/conserving–and–enhancing–the–historic–environment

DfT, 2007. DMRB Volume 11 Environmental Assessment, Section 3, Part 2 HA 208/07 Cultural Heritage

DfT, 2008. DMRB Volume 11 Environmental Assessment, Section 1, Part 1 HA 200/08 Aims and Objectives of Environmental Assessment

DfT, 2014. National Policy Statement for National Networks [Online]. [viewed 2017]. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/387222/npsnn-print.pdf

Elmbridge Borough Council. Elmbridge Local Plan [Online]. [viewed 2017]. Available from: http://www.elmbridge.gov.uk/planning/local–plan/

Guildford Borough Council. Guildford Borough Local Plan [Online]. [viewed 2017]. Available from: http://www.guildford.gov.uk/newlocalplan/16116

Historic England, 2008. Conservation Principles, Policies and Guidance

Historic England, 2015. The Setting of Heritage Assets, Historic Environment Good Practice Advice in Planning

Chapter 12 Materials and Waste

BGS. Borehole Scans [Online]. [viewed August 2017]. Available from: http://www.bgs.ac.uk/data/boreholescans/home.html

BGS. Geology of Britain Viewer [Online]. [viewed August 2017]. Available from: http://www.bgs.ac.uk/discoveringGeology/geologyOfBritain/viewer.html

Defra, 2010. Construction Resources and Waste Platform

Defra, MAGIC interactive mapping [Online]. [viewed August 2017]. Available from: http://magic.defra.gov.uk/

DfT, 2011. IAN 153/11 Guidance on the Environmental Impact Assessment of Materials

Environment Agency, 2015. List of permitted sites in England

Environment Agency, 2017. Waste Interrogator 2016 Data [Online]. [viewed October 2017]. Available from: https://data.gov.uk/dataset/waste-data-interrogator-2016

Environment Agency. Waste Management for England 2015 [Online]. [viewed Auguste 2017]. Available from: https://www.gov.uk/government/statistics/waste-management-for-england-2015

Environment Agency. What's In Your Backyard [Online]. [viewed August 2017]. Available from: http://maps.environment-agency.gov.uk/wiyby/wiybyController?ep=maptopics&lang=_e

European Commission, 2017. Circular Economy Strategy [Online]. [viewed August 2017]. Available from: http://ec.europa.eu/environment/circular-economy/index_en.htm

Forestry Commission, 2015. Timber Utilisation Statistics 2015

Highways England. M25 Junction 10 - A3 Wisley Interchange RIS [Online]. [viewed August 2017]. Available from: http://www.highways.gov.uk/roads/road-projects/M25-Junction-10---A3-Wisley-Interchange-RIS

Mineral Products Association (MPA), 2016. The Mineral Products Industry at a Glance

Surrey County Council, Planning Service: Annual Monitoring Report 2015/16

Surrey County Council, 2008. Surrey Waste Plan (as amended in 2009)

Surrey County Council, 2016. Capacity Estimate Scoping Statement

UK Steel, 2016. Key Statistics 2016

Waste Resources Action Programme, 2010. Designing out Waste: A Design Team Guide

Chapter 13 People and Communities

DCLG, 2012. National Planning Policy Framework

DfT, 1993a. DMRB Volume 11 Environmental Assessment, Section 3, Part 8 Pedestrians, Cyclists, Equestrians and Community Effects

DfT, 1993b. DMBR Volume 11 Environmental Assessment, Section 3, Part 9 Vehicle Travellers

DfT, 2001a. DMRB Volume 11 Environmental Assessment, Section 3, Part 6 Land Use – amendment No. 1

DfT, 2001b. DMRB Volume 11, Section 3, Part 6, Chapter 5: Effects on Development Land

DfT, 2014. National Policy Statement for National Networks

Elmbridge Borough Council, 2011. Core Strategy

Elmbridge Borough Council, 2015. Elmbridge Local Plan Development Management Plan

Guildford Borough Council, 2003. Local Plan

Guildford Borough Council, 2017. Submission Local Plan; strategy and sites

Natural England, 2010. Agricultural Land Classification map of London and the South East (ALC007) [Online]. [viewed November 2016]. Available from: http://publications.naturalengland.org.uk/publication/141047?category=5954148537204736

Chapter 14 Climate Change and Disaster Prevention

ASC, 2016a. UK Climate Change Risk Assessment 2017 Synthesis Report: priorities for the next five years. Adaptation Sub-Committee of the Committee on Climate Change, London.

ASC, 2016b. UK Climate Change Risk Assessment 2017 Evidence Report – Summary for England. Adaptation Sub-Committee of the Committee on Climate Change, London.

Arvisson, A. and Chapman, L., 2011 The impact of climate change on winter road maintenance and traffic accidents in West Midlands, UK. Accident; analysis and prevention 43(1):284-9.

British Standards Institute (BSI), 2011. Climate change adaptation. Adapting to climate risks using ISO 9001, ISO 14001, BS 25999 and BS 31100. 118pp.

Chapman, L., 2012. LWEC Technical Papers: Climate Change Report Card for Infrastructure. 20pp.

Chatterton, J., Viavattene, C., Morris, J., Penning-Rowsell, E. and Tapsell, S., 2011. The costs of the summer 2007 floods in England. Available from: https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/291190/scho1109brja-e-e.pdf.

Committee on Climate Change, 2016. UK Climate Change Risk Assessment 2017 Synthesis Report.

Dawson, R.J., Thompson, D., Johns, D., Gosling, S., Chapman, L., Darch, G., Watson, G., Powrie, W., Bell, S., Paulson, K., Hughes, P., and Wood, R., 2016). UK Climate Change Risk Assessment Evidence Report: Chapter 4, Infrastructure. Report prepared for the Adaptation Sub-Committee of the Committee on Climate Change, London

Defra, 2012a. Climate Change Risk Assessment for the transport sector. Available from: http://randd.defra.gov.uk/Document.aspx?Document=CCRASummaryTransport.pdf

Defra, 2012b. Adapting to Climate Change: Helping Key Sectors to Adapt to Climate Change. Water Sector Summary Report for the Adaptation Reporting Power. Defra, London.

DfT, 2014a. Transport Resilience Review: A review of the resilience of the transport network to extreme weather events. DfT, London.

DfT, 2014b. Road Investment Strategy: Investment Plan. DfT, London.

Edwards, J., 2002. Motorway speeds in wet weather: the comparative influence of porous and conventional asphalt surfacing. Journal of Transport Geography 10:303 – 311.

EUFIWACC, 2016. Draft good practice guidance on integrating climate change adaptation into project development. 11pp. Available at: http://econadapt.eu/sites/default/files/2016-11/EUFIWACC_Adaptation_Note_Version_1.0_ENGLISH_FINAL_20160601%5B1%5D.pdf [accessed 4th October, 2017]

European Commission, 2013. Guidance on integrating climate change and biodiversity into Environmental Impact Assessment. 60pp.

European Commission, 2016a. Climate Change and Major Projects. 16pp.

European Commission, 2016b. Non-Paper Guidelines for Project Managers: Making vulnerable investments climate resilient. 76pp.

Galbraith, R. M., Price, D. J. and Shackman, L., 2005. Scottish road network climate change study. Scottish Executive.

Hall, D., 2010. Transport geography and new European realities: a critique. Journal of Transport Geography 18:1–13

Highways Agency, 2009. Climate Change Adaptation Strategy and Framework.

HM Government, 2013. The National Adaptation Programme: making the country resilient to a changing climate.

HM Government, 2016. The National Flood Risk Resilience Review.

IEMA, 2015. Environmental Impact Assessment Guide to Climate Change Resilience and Adaptation. 32pp.

IPCC, 2000. In: Nakicenovic, N., Swart, R. (Eds.), Special report on emissions scenarios. Cambridge University Press, Cambridge.

IPCC, 2014. Climate Change 2014: Impacts, Adaptation, and Vulnerability. Contribution of Working Group II to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change. Intergovernmental Panel on Climate Change.

Murphy, J.M., Sexton, D.M.H., Jenkins, G.J., Boorman, P.M., Booth, B.B.B., Brown, C.C., Clark, R.T., Collins, M., Harris, G.R., Kendon, E.J., Betts, R.A., Brown, S.J., Howard, T. P., Humphrey, K. A., McCarthy, M. P., McDonald, R. E., Stephens, A., Wallace, C., Warren, R., Wilby, R., Wood, R. A., 2009. UK Climate Projections Science Report: Climate change projections. Met Office Hadley Centre, Exeter

Thornes, J.E., 1992. The impact of weather and climate on transport in the UK. Progress in Physical Geography 16:187–208.

Wade, S., Sanderson, M., Golding, N., Lowe, J., Betts, R., Reynard, N., Kay, A., Stewart, L., Prudhomme, C., Shaffrey, L., Lloyd-Hughes, B., Harvey, B., 2015. Developing H++ climate change scenarios for heat waves, droughts, floods, windstorms and cold snaps. Met Office Hadley Centre, Exeter, UK. Crown copyright.

Willway, T., Baldachin, L., Reeves, S., Harding, M., McHale, M. and Nunn, M., 2008. The effects of climate change on highway pavements and how to minimise them. Available from: http://www.ukroadsliaisongroup.org/download.cfm/docid/6FBEB827-8EB0-4B15-A3B9B389E81796F3.

Chapter 15 Assessment of Cumulative Effects

DfT, 2008. DMRB Volume 11 Environmental Assessment, Section 2, Part 5 HA 205/08 Assessment and Management of Environmental Effects

European Commission, 1999. Guidelines for the Assessment of Indirect and Cumulative Impacts as well as Impact Interaction

Guildford Borough Council, 2016. Land Availability Assessment (LAA)

Guildford Borough Council, 2017. Land Availability Assessment (LAA) Addendum

The Planning Inspectorate, National Infrastructure Directorate, 2015. Advice Note 17 Cumulative effects assessment

Abbreviations and Glossary

Abbreviations

Abbreviation	Definition
AADT	Annual Average Daily Traffic
ALC	Agricultural Land Classification
AQAP	Air Quality Action Plan
AQMA	Air Quality Management Area
AQS	Air Quality Strategy
ARN	Affected Road Network
BAP	Biodiversity Action Plan
bgl	below ground level
BGS	British Geological Survey
BMV	Best and Most Versatile
BOAT	Byway Open to All Traffic
CD&E	Construction, Demolition and Excavation
CEMP	Construction Environmental Management Plan
CIEEM	Chartered Institute for Ecology and Environmental Management
CLR11	Contaminated Land Report 11
CMS	Continuous Monitoring Station
CO_2	Carbon Dioxide
COSHH	Control of Substances Hazardous to Health
CSM	Conceptual Site Model
CWS	County Wildlife Site
D3AP	Dual three lane All Purpose
D4AP	Dual four lane All Purpose
dB	Decibel
DCLG	Department for Communities and Local Government
DCO	Development Consent Order
Defra	Department for Environment, Food and Rural Affairs
DfT	Department for Transport
DM	Do–Minimum
DMRB	Design Manual for Roads and Bridges
DS	Do–Something
EBC	Elmbridge Borough Council
EIA	Environmental Impact Assessment

Abbreviation	Definition
ES	Environmental Statement
EU	European Union
EZoI	Ecological Zone of Influence
GBC	Guildford Borough Council
GLVIA	Guidelines for Landscape and Visual Impact Assessment
ha	hectare
HAGDMS	Highways Agency Geotechnical Data Management System
HDV	Heavy Duty Vehicle
HER	Historic Environment Record
HGV	Heavy Goods Vehicle
HPI	Habitats of Principal Importance
IAN	Interim Advice Note
LAQM.TG	Local Air Quality Management Technical Guidance
LGS	Local Geological Sites
LNR	Local Nature Reserve
LPA	Local Planning Authority
MAGIC	Multi–Agency Geographic Information for the Countryside
MCA	Mineral Consultation Area
MSA	Mineral Safeguarding Area
MVDC	Mole Valley District Council
NCA	National Character Area
NIA	Noise Important Area
NMU	Non–Motorised User
NPPF	National Planning Policy Framework
NPPG	National Planning Practice Guidance
NPSE	Noise Policy Statement for England
NPSNN	National Policy Statement for National Networks
NNR	National Nature Reserves
NO	Nitric Oxide
NO_2	Nitrogen Dioxide
NO_X	Nitrogen Oxide
NSIP	Nationally Significant Infrastructure Project
PCM	Pollution Climate Mapping
PEIR	Preliminary Environmental Information Report
PM_{10}	Particulate Matter with a diameter of 10 micrometres or less
PPG	Planning Practice Guidance

Abbreviation	Definition
PRoW	Public Rights of Way
PSSR	Preliminary Sources Study Report
RBC	Runnymede Borough Council
RBK	Royal Borough of Kingston upon Thames
RHS	Royal Horticultural Society
RIS	Road Investment Strategy
RSPB	Royal Society for the Protection of Birds
SAC	Special Area of Conservation
SARG	Surrey Amphibian and Reptile Group
SBIC	Surrey Biodiversity Information Centre
SNCI	Sites of Nature Conservation Interest
SPA	Special Protection Area
SPZ	Source Protection Zone
SRN	Strategic Road Network
SSSI	Sites of Special Scientific Interest
SWMP	Site Waste Management Plan
TAG	Transport Analysis Guidance
TPO	Tree Preservation Order
WBC	Woking Borough Council
WFD	Water Framework Directive

Glossary

Term	Description
Access Land	Open Access Land or Access Land is land you can access in England without having to use paths. Access Land includes mountains, moors, heaths and downs that are privately owned. It also includes Common Land registered with the local council and some land around the England Coast Path. Your right to access this land is called the 'right to roam', or 'freedom to roam'. Access Land can be used for walking, running, watching wildlife and climbing.
ADMS Roads	A comprehensive software tool for investigating air pollution problems due to networks of roads that may be in combination with industrial sites
Affected Road Network	The parts of the road network that would be affected by a change in traffic levels as the result of a transport scheme
Agricultural Land Classification	A framework for classifying land according to the extent to which its physical or chemical characteristics impose long term limitations on agricultural use. Agricultural land is classified into five categories according to versatility and suitability for growing crops. The top three grades, Grade 1, 2 and 3a, are referred to as 'Best and Most Versatile' land.
Air Quality Management Area	An area identified where the National Air Quality Objectives are not likely to be achieved. The Local Authority is required to produce a Local Air Quality Action Plan to plan how air quality in the area is to be improved.
Air Quality Strategy	The UK government's Air Quality Strategy sets air pollution standards and objectives to protect people's health and the environment.
Annual Average Daily Traffic	The number of vehicles travelling on a particular stretch of road on an average day.
Appraisal Summary Table	A table that appraises the performance of each option against economic, environmental, social and distributional sub–impacts and is used to directly inform the Value for Money assessment for the Economic Case.
Archaeological Priority Area	An area where there is significant known archaeological interest or potential for new discoveries. They are used to highlight where development may affect heritage assets.
At grade	On the same level, for example, an at grade junction is two or more roads meeting or crossing on the same level.
Best and Most Versatile	Defined as Grades 1, 2 and 3a of the Agricultural Land Classification as land which is most flexible, productive and efficient in response to inputs and which can best deliver future crops for food and non–food uses such as biomass, fibres and pharmaceuticals.
Biodiversity Action Plan	An internationally recognized program addressing threatened species and habitats and is designed to protect and restore biological systems. The original impetus for these plans derives from the 1992 Convention on Biological Diversity.
British Geological Survey	A partly publicly–funded body which aims to advance geoscientific knowledge of the United Kingdom landmass and its continental shelf by means of systematic surveying, monitoring and research.
Congestion Reference Flow	The maximum achievable hourly throughput of traffic on a particular stretch of road, expressed in terms of AADT.
Conservation Area	An area of special environmental or historic interest or importance, of which the character or appearance is protected by law against

Term	Description
	undesirable changes (Section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990).
Construction Environmental Management Plan	A plan by the contractor describing how the environmental impacts of construction activities of a project will be minimised and mitigated.
Contaminated Land Report 11	The Model Procedures for the Management of Land Contamination (CLR 11) have been developed to provide the technical framework for applying a risk management process when dealing with land affected by contamination. The process involves identifying, making decisions on, and taking appropriate action to deal with land contamination in a way that is consistent with government policies and legislation within the UK.
Continuous Monitoring Station	A monitoring site which measures air pollutant concentrations continuously using automatic analysers.
Control of Substances Hazardous to Health	Under the Control of Substances Hazardous to Health Regulations 2002, employers need to either prevent or reduce their workers' exposure to substances that are hazardous to their health.
County Wildlife Site	A non–statutory conservation designation in the UK which affirms a site's importance and value for wildlife in its county context. The designation is classified by Natural England as being a 'Local Site' designation, though sites can also be of a regional and national importance.
Defence Infrastructure Organisation	The arm of the Ministry of Defence (MoD) responsible for building, maintaining and servicing the MoD estate.
Defra	Defra is the government department responsible for environmental protection, food production and standards, agriculture, fisheries and rural communities in the United Kingdom of Great Britain and Northern Ireland. Defra is a ministerial department, supported by 33 agencies and public bodies.
Department for Transport	Government department responsible for the transport network in England, and for aspects of the transport network in the devolved administrations.
Design, Build, Finance and Operate	A single contractor is appointed to design and build a project and then to operate it for a period of time. The contractor finances the project and leases it to the client for an agreed period (perhaps 30 years) after which the development reverts to the client.
Design Manual for Roads and Bridges	A series of 15 volumes that provide standards, advice notes and other published documents relating to the design, assessment and operation of trunk roads, including motorways in the United Kingdom, and, with some amendments, the Republic of Ireland.
Development Consent Order	The means of applying for consent to undertake a Nationally Significant Infrastructure Project (NSIP). NSIPs include, for example, major energy and transport projects.
Early Assessment and Sifting Tool	A decision support tool that has been developed to quickly summarise and present evidence on options in a clear and consistent format. It provides decision makers with relevant, high level, information to help them form an early view of how options perform and compare. The tool itself does not make recommendations and is not intended to be used for making final funding decisions.
Ecological Zone of Influence	The area encompassing all the predicted adverse ecological effects of the Scheme, including those that would occur as a result of habitat loss, increased emissions, and those that would occur through disturbance, such as noise.

Term	Description
English Heritage	Charity that cares for the National Heritage Collection of state–owned historic sites and monuments across England, under licence from Historic England.
Environment Agency	A non–departmental public body with responsibilities relating to the protection and enhancement of the environment in England.
Expressway/Expressway Standard	A road with high quality performance and safety standards, as described in the July 2013 Action for Roads report.
Façade noise level	A noise level at one metre from a building façade, wall or solid structure
Free-field noise level	A noise level at least 3.5 m from a reflective surface other than the ground.
Habitats of Principal Importance	Under Section 41 of the Natural Environment and Rural Communities (NERC) Act, the Secretary of State is required to publish a list of habitats which are of principal importance for the conservation of biodiversity in England. Fifty–six habitats of principal importance are included on the S41 list. These are all the habitats in England that were identified as requiring action in the UK Biodiversity Action Plan and continue to be regarded as conservation priorities in the subsequent UK Post–2010 Biodiversity Framework.
Historic England	Publicly funded body that champions and protects England's historic places, including Stonehenge and Avebury; also known as the Historic Buildings and Monuments Commission for England.
Interim Advice Note	Issued by Highways England and contain specific guidance, which shall only be used in connection with works on motorways and trunk roads in England, subject to any specific implementation instructions contained within an IAN. While IANs must be read together with the DMRB and the Manual of Contract Documents for Highway Works (MCHW) for the above works, and may incorporate amendments or additions to documents in these publications, they are not part of the DMRB or MCHW.
Local Air Quality Management Technical Guidance	A technical guidance document designed to support local authorities in carrying out their duties under the Environment Act 1995 and subsequent Regulations. These duties require local authorities to review and assess air quality in their area from time to time.
Local Geological Site	Formally knowns as Regionally Important Geological Sites (RIGS). Sites within the county that are considered worthy of protection for their Earth Science or landscape importance, but are not already protected as SSSIs.
Local Nature Reserve	A statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949, and amended by Schedule 11 of the Natural Environment and Rural Communities Act 2006, by principal local authorities. A Local Nature Reserve must be of importance for wildlife, geology, education or public enjoyment.
Local Enterprise Partnership	A voluntary partnership set up between local authorities and businesses to drive local economic growth and job creation activities. There are 39 Local Enterprise Partnerships across England.
Mineral Consultation Area	An area identified in order to ensure consultation between the relevant minerals planning authority, the minerals industry and others before certain non–mineral planning applications made within the area are determined.

Term	Description
Mineral Safeguarding Area	An area designated by Minerals Planning Authorities which covers known deposits of minerals which are desired to be kept safeguarded from unnecessary sterilisation by non–mineral development.
Multi–Agency Geographic Information for the Countryside	A web–based interactive map to bring together information on key environmental schemes and designations in one place. Multi–Agency Geographic Information for the Countryside (MAGIC) is a partnership project involving six government organisations who have responsibilities for rural policy–making and management.
National Character Area	The subdivision of England into 159 distinct natural areas. Each area is defined by a unique combination of landscape, biodiversity, geodiversity, history, and cultural and economic activity. Their boundaries follow natural lines in the landscape rather than administrative boundaries.
National Infrastructure Plan	Document published by the UK Government, setting out its strategy for meeting the infrastructure needs of the UK economy.
National Nature Reserve	Reserves established to protect some of the most important habitats, species and geology in the United Kingdom, and to provide 'outdoor laboratories' for research. There are currently 224 NNRs in England with a total area of over 94,400 ha – approximately 0.7% of the country's land surface. Natural England manages about two thirds of England's NNRs. The remaining reserves are managed by organisations approved by Natural England, for example, the National Trust, Forestry Commission, RSPB, Wildlife Trusts and local authorities.
National Vegetation Classification	The National Vegetation Classification was commissioned in 1975 by the Nature Conservancy Council (NCC) to provide a comprehensive and systematic catalogue and description of the plant communities of Britain. It has now been accepted as a standard, not only by the nature conservation and countryside organisations, but also by forestry, agriculture and water agencies, local authorities, non-governmental organisations, major industries and universities.
Nationally Significant Infrastructure Project	A project of a type and scale defined under the Planning Act 2008 and by order of the Secretary of State relating to energy, transport, water, waste water and waste generally. These projects require a single development consent. Planning permission, listed building consent and scheduled monument consent amongst others are not required for Nationally Significant Infrastructure Projects.
National Trust	Charity that cares for historic houses, gardens, ancient monuments, countryside and other sites across England, Wales and Northern Ireland, including the Stonehenge landscape.
Natural England	Executive non–departmental public body responsible for the natural environment.
Non–Motorised User	Cyclists, pedestrians (including wheelchair users), and equestrians using the public highway.
Noise Important Area	Areas where the 1% of the population that are affected by the highest noise levels from major roads are located according to the results of Defra's strategic noise maps.
Pollution Climate Mapping	A collection of models designed to fulfil part of the United Kingdom's EU Directive (2008/50/EC) on ambient air quality and cleaner air for Europe, requirements to report on the concentrations of particular pollutants in the atmosphere. There is one model per pollutant, each with two parts: a base year model and a projections model. The Pollution Climate Mapping model provides outputs on a 1x1 km grid of background conditions plus around 9,000 representative road side values. The

Term	Description
	Mapping is also used for scenario assessment and population exposure calculations to assist policy developments and provides model runs to support the writing of Time Extension Notification applications for PM_{10} and NO_X.
Project Control Framework	A joint DfT and Highways England approach to managing major projects. The Framework comprises a standard project lifecycle; standard project deliverables; project control processes and governance arrangements.
Public Right of Way	A way over which the public have a right to pass and repass. The route may be used on foot, on (or leading) a horse, on a pedal cycle or with a motor vehicle, depending on its status. Although the land may be owned by a private individual, the public may still gain access across that land along a specific route. Public rights of way are all highways in law.
Publicly Funded Structure	A structure in which the initial capital costs of the scheme are (principally) met through sources from government funding.
Road Investment Strategy	The long–term strategy to improve England's motorways and major A roads. The first RIS (known as RIS1) was published in 2014 and covers the period 2015–2020. A second RIS (RIS2) was published in 2015, and covers the post–2020 period.
Royal Horticultural Society	The UK's leading gardening charity dedicated to advancing horticulture and promoting gardening.
Royal Society for the Protection of Birds	A charitable organisation that works to promote conservation and protection of birds and the wider environment through public awareness campaigns, petitions and through the operation of nature reserves throughout the UK.
Scheduled monument	A 'nationally important' archaeological site or historic building, given protection against unauthorised change and included in the Schedule of Monuments kept by the Secretary of State for Culture, Media and Sport. The protection given to scheduled monuments is given under the Ancient Monuments and Archaeological Areas Act 1979.
The Scheme	The M25 Junction 10 Improvements Scheme.
Sites of Nature Conservation Importance	Locally important sites of nature conservation adopted by local authorities for planning purposes.
Site of Special Scientific Interest	A conservation designation denoting to a protected area in the United Kingdom. The Sites are protected by law to conserve their wildlife or geology.
Site Waste Management Plan	A Site Waste Management Plan should describe how materials will be managed efficiently and disposed of legally during the construction of the works, explaining how the re–use and recycling of materials will be maximised. This involves estimating how much of each type of waste is likely to be produced and the proportion of this that will be re–used or recycled on site, or removed from the site for re–use, recycling, recovery or disposal. It is the joint responsibility of the client and the principal contractor to ensure that a Site Waste Management Plan is in place before construction begins and to ensure that it is enforced.
Source Protection Zone	Areas of land around over 2000 groundwater sources such as wells, boreholes and springs used for public drinking water supply. The zones show the risk of contamination from any activities that might cause pollution in the area. The closer the activity, the greater the risk. There are three main zones (inner, outer and total catchment) and a fourth zone of special interest, which is occasionally applied to a groundwater source. The zones are used in conjunction with the Groundwater

Term	Description
	Protection Policy to set up pollution prevention measures in areas which are at a higher risk, and to monitor the activities of potential polluters nearby.
Special Area of Conservation	Areas of strictly protected sites designated under the EC Habitats Directive (92/43/EEC) on the conservation of natural habitats and of wild fauna and flora. The listed habitat types and species are those considered to be most in need of conservation at a European level (excluding birds).
Special Protection Area	Areas of strictly protected sites classified in accordance with Article 4 of the EC Birds Directive (2009/147/EC) on the conservation of wild birds. They are classified for rare and vulnerable birds (as listed on Annex I of the Directive), and for regularly occurring migratory species.
Strategic Economic Plan	A document produced by a Local Enterprise Partnership setting out its plans for the future and the funding that will be required to deliver these plans.
Strategic Road Network	The network of approximately 4,300 miles of motorways and major 'trunk' A roads across England, managed by Highways England.
Transport Analysis Guidance	Guidance produced by DfT on the process of appraisal of transport interventions.
Tree Preservation Order	A Tree Preservation Order is made by a LPA to protect specific trees or a particular area, group or woodland from deliberate damage and destruction. TPOs can prevent the felling, lopping, topping, uprooting or otherwise wilful damaging of trees without the permission of the LPA.
Unexploded Ordnance	An explosive weapon (bombs, shells, grenades, land mines, naval mines, cluster munition, etc.) that did not explode when they were employed and still pose a risk of detonation, sometimes many decades after they were used or discarded.
Water Framework Directive	The Water Framework Directive (2000/60/EC) is a EU directive which aims to achieve good status of all water bodies (surface waters, groundwaters and the sites that depend on them, estuaries and near–shore coastal waters) and the prevent any deterioration. It has introduced a comprehensive river basin management planning system to protect and improve the ecological quality of the water environment. It is underpinned by the use of environmental standards.
World Heritage Site	A site listed by UNESCO because of its special natural or cultural value.
Zone of Theoretical Visibility	A map, usually digitally produced, showing areas of land within which a development is theoretically visible.

Printed on paper from well–managed forests and other controlled sources.

Registered office Bridge House, 1 Walnut Tree Close, Guildford GU1 4LZ
Highways England Company Limited registered in England and Wales number 09346363