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M25 Widening Junctions 16 to 23

Environmental Statement Volume 1

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Transport

Foreword

In November 2002, the London Orbital Multi-Modal Study (ORBIT MMS) made recommendations for a long-term strategy to address congestion and traffic growth on the M25. The study among other things recommended improvement works to the M25 including widening parts of the motorway between Junctions 16 and 30, between Junction 1b and 3, and between Junctions 5 and 7. This includes widening between Junctions 16 and Junctions 23, referred to as Section 1 (The Scheme).

The widening schemes including Section 1 entered the Highways Agency's (HA) Targeted Programme of Improvements (TPI) following the Ministerial announcement in April 2004.

The Scheme provides a symmetrical widening from dual 3 motorway to dual 4 motorway. The Scheme does not involve the purchase of any land but would be constructed entirely within the existing Secretary of State owned land.

An Environmental Impact Assessment of the Scheme has been undertaken. This is a means of drawing together, in a systematic way, an assessment of the Scheme's likely significant environmental effects.

The main aim of the process is to ensure that the Authority giving the consent for the Scheme (i.e. the Secretary of State) makes its decision in the knowledge of any likely significant effects on the environment. This Environmental Statement (ES) contains information regarding the likely main environmental effects of the proposed widening between Junctions 16 to 23. It is intended to allow an understanding of the predicted effects of the Scheme and the proposed mitigation measures.

The final ES has been published as:

- Non-Technical Summary (NTS)
- Environmental Statement (ES) Volume 1
- Environmental Statement (ES) Figures Volume 1A

Technical reports have been produced for each specialist environmental topic. These are not part of the main ES but have been referred to in the ES as a source of further information where necessary.

The ES will be available for review at deposit locations. The Non-Technical Summary will be available free of charge at deposit locations, has been posted to all residents within 500 metres of the Scheme and will be available on the M25 website (www.highways.gov.uk/roads/projects/5747.aspx). Following deposit of this ES, public exhibitions will be held as detailed in the Non-Technical Summary. Members of the public are invited to comment on the environmental effects of the Scheme. These will be considered in the Secretary of State's decision.

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1 Introduction

1.1 The Scheme

- 1.1.1.1 The Highways Agency (HA) is proposing to provide an additional lane clockwise and anti-clockwise on a 35.6 kilometre stretch of the M25 motorway between Junctions 16 to 23 in Buckinghamshire and Hertfordshire. The Scheme has been designed to improve journey time reliability on the M25. The widening would be undertaken within existing Secretary of State land and is expected to be operational by 2012.
- 1.1.1.2 This report comprises the Environmental Statement (ES) that reports the findings of the Environmental Impact Assessment for the Scheme. This ES describes the Scheme, the baseline environment and the significant environmental effects after mitigation. The purpose of the ES is to ensure that the likely effects of the Scheme on the environment are fully understood and taken into account before any decision by the Secretary of State is taken to go ahead with the Scheme.

1.2 Scheme Background and Context

- 1.2.1.1 The M25 was constructed between 1973 and 1986 and Junctions 16 to 23 were constructed between 1976 and 1986. The motorway construction included the compulsory purchase of additional parcels of land for landscaping and planting to mitigate adverse effects. Between 1995 and 2000 the M25 was widened within the Secretary of State land from three to four lanes between Junctions 6 and 16. Further widening, to five lanes on each carriageway between Junctions 12 and 14, and six lanes between Junction 14 and Junction 15 was completed in December 2005.
- 1.2.1.2 The existing motorway between Junctions 16 and 23 comprises dual three lane carriageways with hard shoulders in both directions, reducing to two lanes between Junctions 21 and 21a. New climbing lanes were constructed along the clockwise carriageway of this section between autumn 2000 and summer 2001.
- 1.2.1.3 In May 1989 the Roads for Prosperity White Paper¹ set out the Government's policy for road improvements and included the widening of the M25. In response to this, an Environmental Statement² was published in February 1994 by the Department of Transport for proposals to widen the M25 to four lanes in each direction between Junction 16 (M40) and Junction 19 (Hunton Bridge spur). A Public Exhibition and Public Inquiry were held. A separate Environmental Statement³ was published in November 1995 for widening of the motorway between Junctions 19 to 23. Both these schemes were generally within Secretary of State owned land and did not require Compulsory Purchase Orders. These Schemes were not progressed following the roads review of trunk roads⁴ in 1998.
- 1.2.1.4 More recently in 2002 the London Orbital Multi-Modal Study referred to as ORBIT MMS⁵, was completed on behalf of the Government Office for the South East. The aim of ORBIT MMS was to develop a long-term multi-modal strategy for the sustainable management of the M25 orbital motorway and more generally for the transport corridor around London.

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1.2.1.5 On 9 July 2003 the Secretary of State responded to the ORBIT MMS by accepting the recommendation to widen the M25 to four lanes in each direction between Junctions 16 and 30, between Junction 1b and 3, and between Junctions 5 and 7. Following the Secretary of State's decision, the Highways Agency progressed with development of widening the M25 within the Secretary of State owned land, and in April 2004 the following five schemes entered the Government's Targeted Programme of Improvements (TPI):

Section 1 Junctions 16 to 23 (approximately 35.6 kilometres)

Section 2 Junctions 5 to 6/7 (approximately 16.7 kilometres)

Section 3 Junctions 1B to 3 (approximately 4.9 kilometres)

Section 4 Junctions 27 to 30 (approximately 25.5 kilometres)

Section 5 Junctions 23 to 27 (approximately 25.6 kilometres)

1.2.1.6 These schemes are shown in Figure 1.1.

1.2.1.7 Following TPI entry, the HA reviewed the buildability and deliverability of the five widening schemes and developed possible implementation programmes. This included development of illustrative engineering and environmental designs.

1.2.1.8 Scheme Section 3 is being taken forward by Early Contract Involvement (ECI) contract together with the A2 / A282 Dartford Improvement Scheme. The ES for this Scheme was published in November 2006. In December 2004 the Highways Agency made an announcement to progress the other widening schemes under a Design Build Finance Operate (DBFO) contract. A Contract Notice was published for the M25 DBFO project in November 2005.

1.2.1.9 This Scheme (as shown on Figure 1.2) will be part of the DBFO contract. The DBFO Company will be responsible for delivering this Scheme.

1.3 Integrated Demand Management (IDM)

1.3.1.1 ORBIT MMS also identified that an essential part of the sustained success of the widening schemes would be the management of traffic demand through the use of a suitable traffic demand and control strategy. These Integrated Demand Management (IDM) measures should provide some constraints on induced traffic and lock in benefits from widening. By managing the volume of traffic using the widened motorway, IDM seeks to reinforce the approach advocated in 1998 in A New Deal for Transport⁴ and A New Deal for Trunk Roads in England⁶ to the effect that simply predicting future traffic levels and building new roads to accommodate traffic growth is not a solution. A more managed approach to efficient use of road space was provided in the 2004 White Paper The Future of Transport⁷ – in effect a move to “predict and manage” rather than “predict and provide”.

1.3.1.2 In his response to the ORBIT MMS recommendation, the Secretary of State further accepted that IDM measures should be considered in parallel with the proposals to widen the M25. As such IDM is not part of this Scheme or the ES. The Highways Agency's work on IDM has progressed to the stage at which there is a need to develop and discuss options with Local Authorities, since there is no doubt that better management of the M25 will also need to include the local authority roads as well as

other trunk routes and motorways. In July 2006 Ministerial approval was given to discussions taking place with the local authorities and these have now commenced.

1.4 Legal Basis of Environmental Statement

- 1.4.1.1 The EIA regime in Europe is governed by European Council Directive No 85/337/EEC, as amended by Council Directive No 97/11/EC⁸ and Council Directive No 2003/35/EC⁹ of the European Parliament and Council. These European Council Directives are currently implemented for Highways Act schemes in England and Wales by Section 105A of the Highways Act 1980, as amended by The Highways (Assessment of Environmental Effects) Regulations 1999 and the Highways (Environmental Impact Assessment) Regulations 2007 (Statutory Instrument 2007 No. 1062)¹⁰.
- 1.4.1.2 In accordance with these requirements the Secretary of State has determined for each of the five widening schemes that an Environmental Impact Assessment will be undertaken leading to the publication of separate ESs. This ES relates to widening between Junctions 16 and 23 only and meets the above, requirements for projects likely to have significant effects on the environment.
- 1.4.1.3 The purpose of the ES is to ensure that the Secretary of State makes a decision in the knowledge of any likely significant effects on the environment. The main aims of the ES are:
- to provide a description of the Scheme
 - to provide detailed information regarding the likely main environmental effects of the Scheme having taken into account the measures proposed to avoid, reduce and if possible remedy any predicted significant adverse effects on the environment or to enhance the beneficial effects of the Scheme
 - to provide a forum for the public and consultees to express an opinion before the Secretary of State makes a decision on whether or not to proceed with the Scheme
 - to provide an outline of the main alternatives studied by the Highways Agency and an indication of the main reasons for the choice, taking into account the environmental effects
- 1.4.1.4 Methods used in the preparation of this ES follow those set out in official guidance published by the Government in the Design Manual for Roads and Bridges (DMRB) Volume 11¹¹ as supplemented by Interim Advice Notes¹².

1.5 Structure of the Environmental Statement

- 1.5.1.1 The ES is published as follows:
- Volume 1 (this volume) explains the purpose of the Scheme (Chapter 2), describes the proposals (Chapter 3), summarises alternatives considered (Chapter 4) and the overall approach to the environmental assessment (Chapter 5). It presents the mitigation measures and draws together the significant environmental effects after mitigation for each environmental topic in

Chapters 6 to 16. Cumulative effects are presented in Chapter 17 and the conclusions are given in Chapter 18.

- Volume 1A contains the ES figures referred to in Volumes 1 ES main text.
- The Non-Technical Summary (NTS) summarises the principle sections of the ES in non-technical language to make it readily understandable by members of the public. The NTS is available as a separate leaflet and is also included as text in Appendix A.

1.5.1.2 In addition, ten technical reports have been prepared. These provide further technical detail on baseline surveys and data and the assessment of environmental effects on a Junction by Junction basis. These are referred to as necessary in the ES.

- Part 1: Landscape Effects
- Part 2: Ecology and Nature Conservation
- Part 3: Water Quality and Drainage
- Part 4: Traffic Noise and Vibration
- Part 5: Air Quality
- Part 6: Geology and Soils
- Part 7: Cultural Heritage
- Part 8: Vehicle Travellers
- Part 9: Policies and Plans
- Part 10: Pedestrians, Cyclists, Equestrians and Community Effects

1.6 Availability and Observations of the Environmental Statement

1.6.1.1 A full copy of the Environmental Statement is available to view at the following deposit locations from the 23rd August 2007 to the 15th November 2007:

- Slough Central Library
- Central Library, High Street, Uxbridge
- South Buckinghamshire District Council Offices
- Three Rivers District Council Offices
- Rickmansworth Library
- Chiltern District Council Offices
- Watford Central Library
- Abbots Langley Parish Council
- Hemel Hempstead Library
- St Albans Library
- Borehamwood Library

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- Hertsmere Borough Council Offices
- Chipping Barnet Library
- Highways Agency Dorking Office - Federated House, London Road, Dorking, RH4 1SZ
- Highways Agency Bedford Office - Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW
- Highways Agency Birmingham Office - Broadway, 5 Broadway, Broad Street, Birmingham, B15 1BL

1.6.1.2 Full details of deposit locations and public exhibition locations are provided in the Non-Technical Summary. The Non-Technical Summary can be viewed at the M25 Website (www.highways.gov.uk/roads/projects/5747.aspx), and is also available free of charge at the deposit locations, at the Public Exhibitions and from the Highways Agency at the address below.

1.6.1.3 Copies of the ES can be purchased from the Highways Agency at the address below.

M25 Section 1 Widening Project
Highways Agency
Broadway
5, Broadway
Broad Street
Birmingham
B15 1BL
Contact: Graham Thomas 01216 788261

1.6.1.4 The ES is priced as follows:

- Volume 1 - £100.00
- Volume1A Figures - £185.00
- A CD of the full Environmental Statement may be ordered at a cost of £2.00.
- Technical Reports can be purchased on CD at a cost of £2.00.

1.6.1.5 Public Exhibitions will be held as follows:

Event	Date (2007)	Venue
Event 1 Public Exhibition	Fri / Sat 14/15 Sept	London Colney Community Centre
Event 2 Public Exhibition	Fri / Sat 21/22 Sept	Henderson Hall, Abbots Langley
Event 3 Public Exhibition	Fri / Sat 5/6 Oct	Henderson Hall, Abbots Langley
Event 4 Public Exhibition	Fri / Sat 12/13 Oct	Higher Denham Community Centre

1.6.1.6 All interested parties are invited to comment on the ES, not later than 15 November 2007, in writing to the Highways Agency at the address shown above.

2 The Purpose of The Scheme

2.1 Need for the Scheme

2.1.1 National Context

- 2.1.1.1 The 1998 White Paper A New Deal for Transport: Better for Everyone¹ set out the Government's plans for a transport system that is safe, efficient, clean and fair. The White Paper recognised that building new roads alone will not solve the problem of congestion. The White Paper and the associated Roads Review: A New Deal for Trunk Roads in England² identified five investment criteria for the Highways Agency in its management of England's core network of trunk roads, namely: environment, safety, economy, accessibility and integration.
- 2.1.1.2 Following the Roads Review, a series of multi-modal studies were undertaken to examine the most severe congestion problems in the UK. The ORBIT MMS³ was commissioned to develop a long-term multi-modal strategy for the sustainable management of the M25 and more generally for the transport corridor around London.
- 2.1.1.3 The M25 is the strategic hub of the UK's motorway network. In addition to acting as an orbital route around London, it provides a link between radial motorways and other trunk roads that connect the south east with the rest of the country. With some 20% of UK road freight either starting or ending in the South East, the M25 plays a pivotal role in the economy of the South East and a significant role in the economy of the country as a whole.

2.1.2 The ORBIT Multi-Modal Study

- 2.1.2.1 ORBIT MMS identified the factors that are leading to increasing congestion on the M25 which include:
- about 50% of the traffic is generated by commuters driving to and from work
 - the M25 is used for a small part of many long journeys (reinforcing the linking role of the motorway in connecting between radial corridors)
 - average occupancies of vehicles are low
 - origins and destinations are widely dispersed and difficult to serve by existing public transport
 - there are no alternative orbital road routes and no orbital public transport services
- 2.1.2.2 ORBIT MMS reported that in the twelve years from 1986 (when the M25 was completed) to 1998 traffic flows, measured in vehicle-kilometres, increased by about 57%. This represented an average growth rate of 6.1% per year. By 1998, the busiest section of the M25 was carrying 186,000 vehicles per day (two-way flow), with this rising to above 200,000 vehicles on the busiest days of the year. Many of the journeys made using the M25 were medium to long distance trips (30 kilometres to 100 kilometres and above) but

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typically these only used the M25 for fairly short distances. In addition 40-50% of all trips on the M25 passed only one or two intermediate Junctions.

- 2.1.2.3 ORBIT MMS noted that this high volume of traffic led to travellers experiencing frequent congestion, because traffic demand exceeded the capacity of the motorway and its junctions. The problem was often exacerbated by accidents, which reduced capacity further, or caused the M25 to be closed completely. The congestion, or anticipation thereof, was found to cause some drivers to select alternative routes on the local road network.
- 2.1.2.4 ORBIT MMS concluded that if current trends continue, traffic levels will increase and all users, including those essential to the economy, will suffer increasing congestion and unreliable journey times.
- 2.1.2.5 This Scheme will address capacity levels on the M25 and improve journey time reliability.

2.2 Scheme Objectives

- 2.2.1.1 The Transport Secretary announced on 9 July 2003 that further development work should be undertaken on widening of the M25 between Junctions 16 and 30/31, Junction 1b to 3, Junctions 5 to 7 and Junction 5 Improvements. A further announcement was made on 14 April 2004, regarding entry of these schemes into the Targeted Programme of Improvements (TPI). This Scheme is the development of the TPI entry. The objectives for the Scheme, which were established by the Highways Agency at TPI entry, are:
- to deliver the trunk road improvements accepted by the Secretary of State following the recommendations of the ORBIT MMS
 - to improve journey time reliability and safety on the M25
 - to ensure no worsening of the Appraisal Summary Table (AST) sub-criteria assessment results and improve on them where possible
- 2.2.1.2 The current Scheme meets these objectives.

3 Scheme Description

3.1 Scheme Context

3.1.1 General

3.1.1.1 The Scheme context along a 500 metre study corridor is shown in Figure 3.1. The surrounding area is rural in character, with land use balanced between broadleaf woodland, agriculture and settlements, with the exception of a wedge of industrial development at Frogmore and some large urban areas especially around Junction 18. The topography is to an extent dictated by the main watercourses that intersect this area - the Alder Bourne, River Misbourne, River Chess, the River Gade/Grand Union Canal, River Ver and River Colne. In general, the land varies from approximately 40 metres Above Ordnance Datum (AOD) at Junction 16, to a peak of 128 metres AOD at Junctions 20 and 21. Thereafter, the land decreases to approximately 60 metres AOD as the motorway passes over the River Ver and the River Colne in an area of alluvium deposits. The motorway undulates up to a peak of approximately 120 metres AOD approximately 2.5 kilometres from Junction 23 and then declines to approximately 50 metres AOD at Junction 23.

3.1.1.2 The M25 crosses a number of roads and railway lines as it passes between Junctions 16 and 23 as follows:

- Junctions 16 to 17: M40, A40 and A413 carriageways and London Northwestern railway line
- Junctions 17 to 18: A412 carriageway and London Underground Metropolitan Line
- Junctions 18 to 19: A404 carriageway
- Junctions 19 to 20: no crossings
- Junctions 20 to 21: A41 (T) carriageway and Euston – Rugby TV Junction railway line
- Junctions 21 to 22: M1 and A405 (T) carriageways and Midland Mainline railway line
- Junctions 22 to 23: A1081 and A1 carriageways

3.1.2 Landscape Designations

3.1.2.1 Much of this part of the M25 is subject to local landscape designations and the key statutory constraint is the Chilterns Area of Outstanding Natural Beauty (AONB). This runs from the Thames at Goring Gap northeast to Hitchin and is located between Junctions 18 and 19. An AONB is a nationally protected landscape valuable for its distinctive character and natural beauty. Colne Valley Park and Watling Chase Community Forest are also notable landscape areas. Landscape designations are illustrated on Figures 3.1 and 6.1.

3.1.3 Pedestrians and Others

- 3.1.3.1 There are a number of Public Rights of Way (PRoW) crossing the motorway between Junctions 16 to 23. There are also PRoWs running adjacent to the motorway. These are shown on Figure 15.1.

3.1.4 Ecology and Nature Conservation

- 3.1.4.1 There are no Special Areas for Conservation (SAC), Special Protection Areas (SPA) and RAMSAR sites within 2.5 kilometres from the Scheme. Kingcup Meadows and Oldhouse Wood Site of Special Scientific Interest (SSSI) is the closest SSSI to the Scheme located approximately 200 metres southeast of Junction 16. It lies downstream and adjacent to the Alder Bourne (a tributary of the Thames), which runs through Junction 16. There are 37 sites of district and county importance for nature conservation within a 500 metre radius of the motorway. Many of these are ancient woodland and are immediately adjacent to the motorway. Ecological designations are illustrated on Figure 3.1 and Figure 7.1.

3.1.5 Water Environment

- 3.1.5.1 The M25 crosses nine watercourses between Junctions 16 and 23 (Figure 3.1). Junction 16 intersects the River Alder Bourne, whilst the River Misbourne is crossed south of Gerrards Cross, where the London Northwestern Railway Line passes over the motorway. The River Chess is crossed approximately 850 metres north of Junction 18, and the River Gade/Grand Union Canal is crossed between approximately 250 – 400 metres northeast of Junction 20. Hanstead's Ditch lies approximately 1.9 kilometres east of Junction 21a and the River Ver is crossed approximately 2.5 kilometres east of Junction 21a. Approximately 2.5 kilometres west of Junction 22 lies the River Colne. Finally, Catharine Bourne is crossed approximately 1.5 kilometres northwest of Junction 23 and Mimms Brook passes directly beneath Junction 23. The majority of this section of motorway is within groundwater aquifers, including Inner, Outer and Total Catchment Source Protection Zones (SPZ). The Inner Zones (SPZ1s) are located upstream of the Misbourne and Chess, at the River Gade upstream and downstream of M25, and are located where the Rivers Ver, Colne and Catharine Bourne cross the motorway.

3.1.6 Air Quality

- 3.1.6.1 At the time of publication, seven Air Quality Management Areas (AQMA) had been declared by the Local Authorities within the vicinity of the Scheme. The motorway passes through five AQMA for Nitrogen Dioxide (NO₂) in the South Buckinghamshire and Three Rivers District areas within the vicinities of Junctions 16, 17, 18, 19 and 20. The motorway continues through a sixth AQMA for NO₂ in St Albans between Junctions 21a and 22, in the Frogmore area. Further east, the motorway runs through a seventh AQMA for NO₂ in South Mimms in Hertsmere by Junction 23. AQMA are shown on Figure 10.8.

3.1.7 Geology and Soils

- 3.1.7.1 The geology varies over the length of the Scheme although the near surface geology consists predominantly of sands and gravels of fluvial or glacial origin underlain by

Upper Chalk Formation from the Cretaceous period. The geology within a 500 metre study corridor is shown on Figure 11.1. Seventeen operating and former landfills are found within 500 metres of the motorway, some of these are immediately adjacent or crossed by the motorway. The local authorities have also indicated a number of potentially contaminated sites that relate to previous quarrying activities and borrow pits that have been subsequently backfilled with unknown materials. These are predominately found between Junctions 16 to 17, Junction 21 and between Junctions 22 and 23. These areas of potentially contaminated land are identified on Figure 11.2.

3.1.8 Cultural Heritage

- 3.1.8.1 The Scheme is surrounded by a number of Conservation Areas. A Scheduled Monument lies approximately 250 metres north of Junction 20, and another lies approximately 470 metres north of the M25 near All Saints Pastoral Centre, London Colney. There are also a number of Listed Buildings, unlisted built heritage features and archaeological notification areas within 500 metres of the Scheme. These are shown on Figure 3.1 and Figure 12.1.

3.2 Existing Motorway

3.2.1 General

- 3.2.1.1 The M25 was constructed between 1973 and 1986 and Junctions 16 to 23 were constructed between 1976 and 1986. The existing motorway between Junctions 16 and 23 comprises generally dual three lane carriageways with hard shoulders in both directions, reducing to two lanes between Junctions 21 and 21a. Climbing lanes have been installed since the initial construction at three locations on the clockwise carriageway. Climbing lane 1 (0.8 kilometre length) comprised an upgrade of the on-slip road from Junction 16. Climbing lane 2 (1.6 kilometre length) provided a fourth lane between Chalfont Viaduct and Slade Oak underbridge. These were both constructed in Spring/Summer 2001. Climbing lane 3 (1.8 kilometre length) provided a fourth lane between Solesbridge Lane Overbridge and east of Micklefield Green Overbridge, and was constructed in Autumn/Winter 2000.
- 3.2.1.2 Approximately 60% of the total length of the motorway between Junctions 16 to 23, is constructed in open cut, while fill embankments support about 32% of the motorway (Figure 3.1). The remainder is a combination of motorway at ground level, motorway on viaduct or areas where the motorway traverses a slope (with a cutting on one carriageway and embankment on the other). The cross-section of the motorway typically comprises a central reserve 4.0 metres wide, two carriageways each 14.3 metres wide and outer verges each 1.5 metres wide. The 14.3 metres carriageway is made up of three traffic lanes (totalling 11.0 metres) and a hard shoulder (3.3 metres). Where the carriageway is 4-lane or 2-lane it is approximately 3.7 metres wider or narrower. Outside of the verges are the cutting or embankment slopes. The angle of the slopes varies depending on the soil type but is frequently 1:3 (vertical:horizontal). Some cuttings in chalk are steeper at up to 1:1.5. Between Junctions 16 and 17 there are some relatively shallow slopes (1:7) in London Clay Formation. Figure 3.3 shows the existing and proposed lane widths.

3.2.2 Bridges and Culverts

- 3.2.2.1 There are 71 bridge and culvert structures including highway, railway, pedestrian bridges and drainage structures larger than 2 metres in diameter. These comprise of 4 culverts, 37 overbridges, 7 footbridges/bridleway bridges, 22 underbridges and 1 subway.
- 3.2.2.2 The most significant bridges on this section of motorway are Chalfont Railway Viaduct, Berry Lane Viaduct and Gade Valley Viaduct.
- Chalfont Railway Viaduct is a brick arch viaduct built around 1903 to carry the Northolt to Gerrards Cross railway. The bridge lies approximately 3 kilometres north of Junction 16. It has five spans and, although the approach embankments are up to 15 metres high, the top of the bridge is 12 metres above the level of the motorway. The motorway was constructed with 3-lane carriageways through two of the middle arches. The River Misbourne passes in a culvert through another arch.
 - Berry Lane Viaduct, immediately south of Junction 18, is a 7-span pre-stressed concrete beam viaduct built to carry the motorway over the London Underground Metropolitan Line (which is above ground here) and Berry Lane, a local road. The bridge is 236 metres long and rises to a maximum of 20 metres above Berry Lane.
 - Gade Valley Viaduct is a 483 metres long 11-span viaduct immediately east of Junction 20. It is a composite steel box girder / reinforced concrete deck viaduct carrying the motorway up to 15 metres above the River Gade Valley. The viaduct crosses the Grand Union Canal (which carries the River Gade here), Mill Stream and the West Coast Mainline railway. At the western end, the slip roads from Junction 20 taper into the carriageway on the viaduct.

3.2.3 Communications and Signage

- 3.2.3.1 The existing motorway has large direction and information signs, located mostly in the verge on the approach to Junctions. There is also signage on slip roads. There are currently 6 cantilever and 18 portal (full carriageway span) gantries along the clockwise and anti-clockwise carriageways for this part of the motorway.

3.2.4 Lighting

- 3.2.4.1 The motorway main carriageway (mainline) is currently lit in the following areas:
- Junction 16 to the end of the eastern slip roads, approximately 150 metres north of the A40 Tatling End overbridge

The M25 mainline is lit from the central reservation by 15 metre twin-arm columns with 400 watt high pressure sodium (SON-T) full cut-off (FCO) lanterns.
 - North of Berry Lane Viaduct through Junction 18 to immediately east of Junction 21a

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From north of Berry Lane viaduct to Roundwood Accommodation overbridge (east of Gade Valley viaduct) in the central reservation by 15 metre twin-arm columns with 400 watt SON-T FCO lanterns.

From Roundwood Accommodation overbridge to Ovaltine Footbridge, where the separation between the clockwise and anticlockwise carriageways increases and the carriageways are at different levels, lighting is provided by two rows of single-arm 15 metre columns with SON-T FCO lanterns located in the central reservation.

From Ovaltine Footbridge to Tenements Farm overbridge (west of Junction 21) in the central reservation by 15 metre twin-arm columns with 400 watt SON-T FCO lanterns.

From Tenements Farm overbridge the M25 mainline lighting changes to a central arrangement of 12 metre twin-arm columns with 180 watt low pressure sodium (SOX) cut-off lanterns with prismatic bowls which continues through Junctions 21 / 21a and ends approximately 250 metres east of Lye Lane.

- through Junction 23

Through Junction 23 from Blanche Lane to Charleston Paddocks the mainline is lit by 12 metre twin-arm columns with 131 watt SOX lanterns located on the central reservation.

3.2.4.2 The motorway Junctions are currently lit in the following areas:

- at Junction 16 slip roads with verge mounted 12 metre single arm columns with 250 watt SON-T FCO lanterns
- at Junction 17 the roundabout and slip roads 100 metres beyond are lit by 12 metre single arm columns with 250 watt SON-T FCO lanterns, placed in the verge
- at Junction 18 the slip roads are lit by 12 metre single arm columns with 250 watt SON-T FCO lanterns, placed in the verge while at the on-slip merge with the clockwise carriageway, short columns are mounted above the retaining wall to give an effective mounting height of 12 metres
- at Junction 19 the slip roads are lit by 12 metre single arm columns with 250 watt SON-T FCO lanterns, placed in the verge
- at Junction 20 the roundabout and slip roads are lit by 12 metre single arm columns with 250 watt SON-T FCO lanterns, placed in the verge
- at Junction 21 the slip roads are lit by 12 metre columns with 180 watt SOX lanterns, placed in the verge
- at Junction 22 the roundabouts and slip roads are lit by 12 metre columns with 131 watt SOX lanterns, placed in the verge
- at Junction 23 the roundabout and slip roads are lit by 12 metre columns with 131 watt SOX lanterns, placed in the verge

3.2.5 Drainage

- 3.2.5.1 Records suggest the majority of the drainage serving the motorway is as originally constructed. The existing highway drainage system is based on standards at the time of construction and generally consists of surface water and groundwater filter drains (French drains), discharging directly into watercourses or soakaways. Outfalls between Junctions 16 and 19 are predominantly soakaway discharges to groundwater. There are two storage ponds located within Junction 16 and infiltration basins at Junctions 20 and 21. To limit the rate of discharge to main rivers, storage of the runoff in concrete lined lagoons or long wide ditches is provided at some outfalls. In general, there are only limited or no pollution control measures at outfalls and most highway drainage discharges directly into receiving waters. The existing drainage is illustrated in Figure 8.3 in the road drainage and water environment chapter 8.

3.2.6 Carriageway Surface

- 3.2.6.1 The carriageway is currently surfaced with a combination of Hot Rolled Asphalt (HRA) and Low Noise Surfacing (LNS) materials. As part of the HA's ongoing maintenance programme resurfacing with LNS has been undertaken. To date sixty nine and fifty six percent of the clockwise and anti-clockwise carriageways have been surfaced with LNS respectively. This is shown on the noise baseline Figure 9.1.

3.2.7 Environmental Design

- 3.2.7.1 There are currently sixteen constructed environmental bunds which offer landscape and noise mitigation along this section. These are located within and outside the current highway fence and are made up of a combination of earth mounds and engineered false cuttings. Environmental barriers were installed during the initial construction and during subsequent improvement works. Barriers currently exist on the anti-clockwise carriageway at Tattling End and on the clockwise carriageway south of Chalfont Viaduct shielding Gerrards Cross and further along protecting Coldharbour Farm. Denham Green and Mill End are shielded by Environmental Barriers on the anti-clockwise carriageway. Both sides of the motorway from Berry Lane Viaduct through Junction 18 to Solesbridge Lane Overbridge have Environmental Barriers shielding Rickmansworth and Chorleywood. Environmental Barriers benefit residents near White Shack and Chandlers Lane and its surrounds. Frogmore, Colney Street and South Mimms residential areas also benefit from environmental barriers along the motorway. Barriers are constructed mostly of wood, are between 2 to 2.5 metres in height and are in various states of repair. Details of existing Environmental Barriers and bunds are presented in Chapter 9 and locations are shown on Figure 9.1.
- 3.2.7.2 In addition to the land purchased for the construction of the motorway, additional parcels of land were acquired mainly for landscaping and planting to mitigate adverse effects of the original scheme.
- 3.2.7.3 The current soft estate extends from the edge of the hard shoulder to the highway boundary fence. The structure and diversity of each area of soft estate varies due to factors such as geology, aspect, drainage and management. Vegetation is composed of mainly common species, limited to coarse grassland communities, landscape planting, tall ruderal communities, woodland edge and colonising scrub. There are some areas of local nature conservation interest for their floristic diversity and affinity to calcareous grassland communities, in particular at Junction 20. The quality of the highway

landscape planting varies greatly from successful planting that performs a primary screening function such as that located immediately north of the Slade Oak Underbridge to sparse planting that has only a limited landscape integration value such as the embankment plantings near Salisbury Hall (Junction 22).

3.3 Existing Traffic Flows

3.3.1.1 Table 3.1 shows Base year (2004) traffic flows as Average Annual Daily Traffic (AADT) extracted from the Highway Agency’s Traffic Flow Database System (TRADS) website. Where there is no TRADS data available, the traffic flows have been derived from the M25 North of Thames SATURN Local Area Traffic Model, a computerised mathematical traffic model developed for use on the M25 Widening schemes. The modelled data are shown in brackets.

Table 3.1: Existing Traffic Flows

	Anti-Clockwise	Clockwise	Two-Way Flows
Junction 16			
AADT	67000	71500	138500
Monday – Friday (M-F) Speeds (mph)*	37-53	42-62	
Travel Time (minutes)	5	5½	
Junction 17			
AADT	70500	73000	143500
M-F Speeds (mph)	(48-62)	38-60	
Travel Time (minutes)	1¼	1¼	
Junction 18			
AADT	74000	78500	152500
M-F Speeds (mph)	(51-60)	(58-65)	
Travel Time (minutes)	3½	3	
Junction 19			
AADT	61000	66000	127000
M-F Speeds (mph)	(53-61)	(56-63)	
Travel Time (minutes)	1¼	1½	
Junction 20			
AADT	63000	66000	129000

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	Anti-Clockwise	Clockwise	Two-Way Flows
M-F Speeds (mph)	(51-62)	49-60	
Travel Time (minutes)	2¾	2½	
Junction 21			
AADT	(34500)	42500	(77000)
M-F Speeds (mph)	(56-62)	(55-62)	
Travel Time (minutes)	½	½	
Junction 21a			
AADT	(62500)	64500	(12700)
M-F Speeds (mph)	(51-61)	(50-62)	
Travel Time (minutes)	4½	4½	
Junction 22			
AADT	63500	67500	131000
M-F Speeds (mph)	(54-64)	46-60	
Travel Time (minutes)	2¾	3	
Junction 23			
Notes:			
AADT volumes have been rounded to the nearest 500 vehicles (Source: HA TRADS website and M25 LATM)			
* Monday to Friday speeds average hourly daytime (peak hour and typical off-peak) (Source: HA TRADS website and M25 LATM).			
Travel times are median times between end of on slip and start of off slip road based 39 Monday to Friday runs (12 peak, 12 Inter Peak, 12 PM recorded in autumn 2004).			
Flows in brackets are derived from the M25 LATM (observed is not available).			

3.4 Do Minimum Forecast Scenarios

- 3.4.1.1 The Do Minimum case is that which would pertain in 2012 (opening year) and 2027 (design year i.e. fifteen years after opening) and forecast traffic years (2015, 2021, 2027 and 2030) should the Scheme not be constructed.

3.4.2 Predicted Traffic Flows

- 3.4.2.1 Traffic forecasts have been produced using the M25 North of Thames SATURN Local Area Model (LAM), which is a 'compressed' version of the NAOMI strategic model, the

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Highways Agency's road traffic assignment model using the SATURN suite of programmes.

- 3.4.2.2 NAOMI v5.5 has a network represented by a simulation area, buffer area and a skeletal network, which covers the whole of Great Britain. The area covered by the SATURN simulation network includes the entire area within the M25 and an area roughly bounded by Luton, Reading, Guildford, Crawley, Maidstone, Chelmsford and Stansted. Inside the simulation area, all motorways, A and B roads, as well as important unclassified roads, have been included in the modelled network.
- 3.4.2.3 Forecasting was carried out in accordance with WebTAG¹, applying variable demand modelling.
- 3.4.2.4 Trip ends for the base and forecast years were carried out using the National Car Ownership Model (NCOM) and National Trip End Model (NTEM). National Road Traffic Forecasts (NRTF97) growth factors were used to provide forecast for goods vehicle trips.
- 3.4.2.5 Table 3.2 shows the predicted traffic flows in the Do Minimum scenarios, which are the traffic flows if the Scheme were not implemented.

Table 3.2: Do Minimum Traffic Flows

Link	Traffic Flows (2-Way AADT)				
	2012	2015	2021	2027	2030
M25 Junction 16-17	150714	153289	155994	156172	156119
M25 Junction 17-18	152710	155181	157082	156709	156381
M25 Junction 18-19	165244	167244	167773	166607	165850
M25 Junction 19-20	134391	136516	139495	139632	139569
M25 Junction 20-21	139033	141405	144744	145528	145757
M25 Junction 21-21a	112618	114216	118976	120318	121097
M25 Junction 21a-22	137541	139788	144931	146410	147136
M25 Junction 22-23	137032	138967	143280	144042	144524

3.4.3 Lighting

- 3.4.3.1 In the absence of the Scheme, it has been assumed that the unlit stretches of the motorway would still not be lit in 2012 and 2027.
- 3.4.3.2 Currently this section is a mixture of 12 and 15 metre column central reservation mounted lighting and 12 metre column verge mounted lighting. Both low (SOX) and high pressure (SON-T) sodium lighting exists. As part of the HA maintenance programme all existing low pressure sodium lighting would have been replaced with high pressure sodium lighting by 2012 and 2027. This is because the low sodium lighting columns would be beyond their design life. A dual three motorway would require 12 metre high columns.

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- 3.4.3.3 The Do Minimum in 2012 and 2027 therefore assumes that all columns would be the same height as they are now but with high pressure sodium lighting. However there would be fewer columns partly as a result of high pressure sodium being more efficient.

3.4.4 Drainage

- 3.4.4.1 It has been assumed that the drainage facilities in 2012 and 2027 would be maintained as they are now.

3.4.5 Carriageway Surface

- 3.4.5.1 It has been assumed that the extent of Low Noise Surfacing (LNS) on both carriageways in 2012 would be the same as it is in the base year (2004). However it has been assumed that all of the surface would consist of LNS by 2027 in the absence of the Scheme.

3.4.6 Environmental Barriers

- 3.4.6.1 The number, length and type of Environmental Barriers in 2012 and 2027 has been assumed to be the same as current.

3.4.7 Central Reserve Barriers

- 3.4.7.1 At present there is generally no concrete barrier in the central reserve except between Junctions 16 to 17 and Junctions 18 to 19 where a 900 millimetre concrete barrier exists. The Do Minimum assumes that the extent of central reserve barriers in 2012 will be the same as in 2004 but all of the motorway would have a central reserve concrete barrier by 2027.

3.4.8 Bridges and Culverts

- 3.4.8.1 Berry Lane Viaduct parapets would have been replaced to meet current standards by 2012. It has been assumed that no other new structures or culverts would be installed between now and 2012 or 2027.

3.4.9 Communications and Signage

- 3.4.9.1 It has been assumed that no significant increase in gantries would occur in the absence of the Scheme.

3.5 The Scheme

3.5.1 General

- 3.5.1.1 The Scheme has been designed in accordance with DMRB. Geometric design standards adopted for the Scheme are as set out in DMRB Volume 6, Section 1, Part 1². A design speed of 120 km/hr has been adopted. Distances along the route are referred to as Chainage (Ch.), which is the distance in metres from a notional start point (Ch. 0).

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3.5.1.2 The overall length of the Scheme is 35.6 kilometres. Details of the Scheme and Scheme Boundary are shown in Figure 3.2. The Scheme Boundary defines the area of land required to deliver the Scheme including mitigation areas used to reduce adverse environmental effects. It includes land within the existing highway boundary fence and land outside but owned by the Secretary of State. The Scheme Boundary does not include construction compounds or access roads which the DBFO Contractor may locate outside Secretary of State owned land in agreement with landowners and the local planning authority.

3.5.1.3 The Scheme would involve:

- widening of both motorway carriageways to provide four lanes except that three lanes would be provided through some Junctions
- earthworks with retaining walls at certain locations to limit the extent of earthworks disturbance and vegetation clearance
- keeping existing bridges other than Park Avenue Footbridge at Junction 18, which is to be replaced in its original position
- widening of the existing Berry Lane Viaduct, west of Junction 18
- no works at the Junctions except at slip roads where works would be required in order to adjust the alignment to suit the additional lanes and cross-section requirements
- lighting of the unlit sections of the motorway from Junctions 16 to 18 and from Junctions 21a to 23. It is proposed that mainline lighting would be located in the verge where practicable and would be at an effective height above the carriageway of 15 metres with full cut off sodium lanterns
- installing LNS on the new carriageway and resurfacing all existing HRA carriageways with LNS
- a new communication system to meet the requirements for the widened motorway with gantry provision to facilitate controlled motorway operation
- a new drainage system
- Environmental Barriers to mitigate adverse noise and landscape effects of the Scheme on groups of residential properties
- new planting

3.5.2 Traffic Flows (Do Something)

3.5.2.1 The predicted traffic flows for the Do Something have also been produced using the M25 North of Thames SATURN Local Area Model (LAM). The base year for the traffic assessment is 2004.

3.5.2.2 The forecast years are opening year (2012), 15 years after the opening of the Scheme (2027), 15 years after opening of all widened Sections (2030) and two intermediate years (2015 and 2021). In general, the Scheme would result in higher traffic flows than if widening wasn't carried out. These flows would increase over time. Traffic flows would also increase if the Scheme wasn't implemented, but because of network capacity

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constraints, the total flows would be less. Traffic speeds would also improve along the Scheme. However, as traffic flow increases, speeds would eventually reduce over time. Traffic speeds without the widening would continue to deteriorate as traffic flows generally increase.

3.5.2.3 The forecast flows are shown in Tables 3.3 and 3.4.

Table 3.3: Do Something (excluding the widening of Sections 4 and 5)

Link	Traffic Flows (2-Way AADT)				
	2012	2015	2021	2027	2030
M25 Junction 16-17	173906	177144	184068	186828	187715
M25 Junction 17-18	179735	183057	189676	192544	193375
M25 Junction 18-19	194386	197503	203768	206413	207084
M25 Junction 19-20	155919	158806	164704	167006	167499
M25 Junction 20-21	160814	164008	169611	172044	172475
M25 Junction 21-21a	131381	134142	140973	143014	143490
M25 Junction 21a-22	157241	160614	168121	170594	171281
M25 Junction 22-23	150194	152805	159854	161893	162542

Table 3.4 Do Something (including the widening of Sections 4 and 5)

Link	Traffic Flows (2-Way AADT)				
	2012	2015	2021	2027	2030
M25 Junction 16-17	173739	177919	184886	187580	188539
M25 Junction 17-18	179625	183849	190504	193270	194077
M25 Junction 18-19	194243	198174	204471	206920	207607
M25 Junction 19-20	155738	159639	165603	167946	168529
M25 Junction 20-21	160602	165444	170798	173420	173789
M25 Junction 21-21a	131183	139970	146081	148516	148637
M25 Junction 21a-22	157142	167213	174141	177126	177529
M25 Junction 22-23	150062	162446	169506	172242	172824

3.5.2.4 In general the traffic flows towards the western section of the Scheme increase if Sections 4 and 5 are also widened.

3.5.3 Carriageway Design

- 3.5.3.1 The horizontal and vertical alignment of the existing M25 would be largely kept by the widening. The existing three lanes would be kept through Junction 16 but the mainline would be widened to dual four-lane motorway between Junctions 16 and 20. The section through Junctions 17, 18, 19 would be increased to four lanes. Through Junction 20 the motorway would remain dual three-lane and the mainline between Junctions 20 and 21/21a would be widened to dual four-lane motorway. The existing dual two-lane motorway section through Junction 21/21a (the combined M1/A405 interchange) would be widened to dual three-lane motorway. From Junctions 21a to J23 the mainline would be widened to dual four-lane motorway. Through Junction 23 the existing dual three-lane carriageways would be kept. The existing four-lane climbing lane sections would be incorporated into the widening without the addition of another lane.
- 3.5.3.2 Typical layouts with the proposed additional lane are shown in Figure 3.3. The existing hardshoulder would become the additional fourth lane and a new hardshoulder would be built next to it. A new verge would also be built adjacent to the new hardshoulder. The standard width of the additional lane would be 3.7 metres and the new verge would be 2.0 metres. The width of the central reservation would be reduced generally by 0.6 metres relative to the existing. The overall width of the standard dual four-lane motorway would be 43.4 metres compared to the 35.6 metre normal width of the existing dual three-lane cross-section.
- 3.5.3.3 Much of M25 has sufficient space within the existing Secretary of State land to achieve full dual four-lane motorway standard plus hardshoulders and verge with reconstruction of side-slopes. However, most of the existing structures were built to accommodate dual three-lane motorway plus hardshoulders and are not wide enough for full dual four-lane plus hardshoulders. At these locations and at boundary constrained areas, carriageway narrowing techniques would be used to provide four running lanes. The narrowing techniques would consist of the following:
- reduced verge widths
 - reduced central reservation width
 - reduced setback to vehicle restraint systems (safety barriers or “crash barriers”)
 - reduced width hard shoulders
 - reduced width lanes
- 3.5.3.4 Where it has been necessary to reduce the width of the hardshoulder to below three metres, it is restricted (discontinued) for public use, by hatching out with road markings, and is termed an Emergency Access Route (EAR). Discontinuous hardshoulder would be approximately 200 metres long. However at the following locations lengths of discontinuity greater than 300 metres would occur:
- Long Lane South and North Underbridges at Junction 17 (320 metres length)
 - Chorleywood Retaining Wall at Junction 18 (310 metres)
 - Gade Valley Viaduct east of Junction 20 (590 metres)
 - Smug Oak Lane Footbridge and River Ver Underbridge (415 metres)

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3.5.3.5 Between River Colne Flood Arch Underbridge and Colne Valley Access (360 metres), the carriageway lanes widths would be reduced below 3.7 metres at a number of locations particularly at underbridges. Reduced width lanes would be required through the constrained section between Chalfont Viaduct and Slade Oak Underbridge (Junctions 16 to 17) and Gade Valley Viaduct.

3.5.4 Earthworks and Retaining Structures

3.5.4.1 A series of typical geotechnical cross-sections are presented in Figure 3.4 (Sheets 1 – 13). These cross-sections would vary at different locations depending on the local soil conditions, geology, existing slope angle and availability of land. Other factors considered include the working space affected during construction and the space occupied by the finished asset; retention of existing ecology; potential for re-planting; and appearance. The environmental impacts were considered for each geotechnical solution.

3.5.4.2 The widening would require three typical geotechnical engineering solutions:

- earthwork solutions comprising regrade/fill extension and granular toe replacement. In general these would be adopted except where environmental constraints or the stability of the ground necessitates the use of vertical walls
- soft structural solutions involving soil nailing and reinforced soil
- hard structural solutions requiring retaining walls

3.5.4.3 There are also sections of the motorway which are at grade, on structure or which do not require widening, and no geotechnical solutions are proposed at these locations.

3.5.4.4 Due to the engineering characteristics of the geological materials comprising the Lambeth Group, soft and hard structural solutions dominate in this area. In the upper and lower chalk, widening would generally be achieved by earthworks cutting back the existing slope to a steeper angle except where available ground information indicated that chalk quality or cuttings would require soft and hard structural solutions. In glacial deposit environments, earthwork solutions would generally be employed but hard structural solutions would be utilised where contaminated land occurs or due to previous instability within cut slopes.

3.5.4.5 Hard solutions such as retaining walls would also be utilised where land space is limited, in areas of contaminated ground or in areas where vegetation retention is necessary to reduce adverse environmental impacts.

3.5.4.6 In areas where there is slope instability, drainage would be installed to the slope to improve the stability. This is proposed in predominantly London Clay Formation and Reading Formation cuttings. Vegetation removal would be required in these instances.

3.5.4.7 In areas of shallow embankments, granular fill extension and reinforced soil solutions would be adopted where sufficient land is available. Retaining walls at embankment crests would be adopted where existing stability issues exist and fill extension or reinforced soil solutions are not practical. This also facilitates the provision of bio-treatment drainage works, which would be provided in the verge, subject to the provision of an adequate liner around the drainage system.

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- 3.5.4.8 At proposed gantry locations, a geotechnical solution adjacent to the gantries would be applied where practical, otherwise a retaining wall would be proposed.
- 3.5.4.9 Sheet 1 of Figure 3.4 illustrates the design at Chainage 3,150 where a granular toe replacement with narrowing of the central reserve is proposed. The Environmental Barrier and bund would be retained at this location.
- 3.5.4.10 The proposed design through Chalfont Viaduct (Chainage 4,220) is shown on Sheet 2 of Figure 3.4 where, due to the structure's dimensions and limited land available, reduced lane widths would be required. To ensure the emergency services can pass through this structure, an EAR would be required adjacent to the anti-clockwise carriageway.
- 3.5.4.11 Sheet 3 of Figure 3.4 illustrates Chainage 5,225 where a retaining wall and narrowing of the central reserve would occur. A signals gantry and its associated communications cabinets would be provided on the clockwise carriageway at this location, along with a retained Environmental Barrier on the anti-clockwise verge.
- 3.5.4.12 Sheet 4 of Figure 3.4 illustrates the proposed design at Chainage 5,980. A retaining wall on the clockwise carriageway would be provided to accommodate the signal gantry and a fill extension on the anti-clockwise carriageway is proposed. These solutions would be combined with narrowing of the central reserve.
- 3.5.4.13 At Chainage 7,010 (Sheet 5 of Figure 3.4) a regraded cutting on both carriageways would be provided along with a narrowing of the central reserve. The two existing soakaways that would be retained near this location are shown for illustrative purposes.
- 3.5.4.14 The retaining walls along both carriageways and narrowing of the central reserve proposed at Chainage 8,000 are shown on Sheet 6 of Figure 3.4. A signals gantry and associated maintenance hardstanding would be provided on the anti-clockwise carriageway. The widening would also affect the Environmental Bund at this location, as shown.
- 3.5.4.15 Sheet 7 of Figure 3.4 illustrates Chainage 9,240 where the proposed solutions would be a retaining wall on the clockwise carriageway and a fill extension on the anti-clockwise carriageway, combined with a narrowing of the central reserve. A soakaway would be installed at the bottom of the fill extension to discharge motorway runoff.
- 3.5.4.16 The design to widen Berry Lane Viaduct (Chainage 12,325) by four metres on both sides is shown on Sheet 8 of Figure 3.4. This would involve infilling the gap between the two decks and installation of additional columns. The viaduct would be lit from the central reserve and existing 2 metre and 2.5 metre high Environmental Barriers (on the clockwise and anti-clockwise carriageways, respectively) would be re-installed along the edge of the viaduct.
- 3.5.4.17 Sheet 9 of Figure 3.4 illustrates the proposed design at Chainage 26,050 where a retaining wall on the clockwise carriageway and a regrade on the anti-clockwise carriageway along with narrowing of the central reserve is proposed. The design would reduce the height and width of the Environmental Bund that exists adjacent to the anti-clockwise carriageway. A 3 metre high Environmental Barrier and dense scrub and tree planting is proposed to mitigate the effects of reducing the existing bund.
- 3.5.4.18 Sheet 10 of Figure 3.4 shows the motorway at Chainage 28,360 where a regraded cutting is proposed on both carriageways combined with a narrowing of the central reserve. The design would remove the environmental bund that exists adjacent to the

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clockwise carriageway although the existing 2 metre high Environmental Barrier would be increased to 2.5 metres near to Moor Hill Lane. The Environmental Barrier that exists along the anti-clockwise carriageway would be replaced in the new widened position. A drainage treatment and attenuation pond would be provided adjacent to the anti-clockwise carriageway between the M25 and Smug Oak Lane.

3.5.4.19 Sheet 11 of Figure 3.4 illustrates Chainage 30,500 where the proposed geotechnical solutions would be a retaining wall on the clockwise carriageway to accommodate a signal gantry and a regraded cutting on the anti-clockwise carriageway, combined with narrowing of the central reserve. This would require a reduction in the height and width of the existing Environmental Bund adjacent to the anti-clockwise carriageway.

3.5.4.20 At Chainage 34,000 (Sheet 12 of Figure 3.4) narrowing on the central reserve is proposed with soil nailing on the clockwise carriageway and a regraded cutting on the anti-clockwise carriageway. Due to the size of the existing cutting and slope stability issues along the clockwise carriageway side, a series of stone-filled filter drains (counterfort drains) would be constructed into the existing cutting slope at 7 metre intervals, resulting in the temporary removal of most of the vegetation on this slope. The lower two thirds of the slope would be replanted with a wildflower seed mix and the upper third with trees to provide a buffer between the motorway and the adjacent land.

3.5.4.21 Sheet 13 of Figure 3.4 illustrates the proposed design at Chainage 34,100 where a granular toe replacement on the clockwise carriageway and soil nailing on the anti-clockwise carriageway is proposed along with a narrowing of the central reserve. Counterfort drains would also be installed in the slopes at this location.

3.5.5 Bridges and Culverts

3.5.5.1 No bridges or culverts would be removed as part of the Scheme and no new bridges or culverts are proposed. The widening would require modification to existing structures as follows:

- strengthening of overbridge support piers so they meet current requirements to withstand a vehicle impact on the M40 overbridge, Denham Marsh footbridge, Pheasants Wood footbridge, Solesbridge Lane overbridge, Blunts Wood overbridge, Micklefield Farm accommodation, Micklefield Green Road overbridge, Chandlers Lane overbridge, Ovaltine Farm footbridge, Smug Oak Lane overbridge and the Blind Lane bridleway
- replacement or strengthening of substandard parapets and parapet supports on the A413 Amersham Road, Slade Oak Lane and Shepherds Lane underbridges.
- replacement of substandard central reserve barrier with necessary modifications to the existing deck slab would be required on the following underbridges: A413 Amersham Road, Slade Oak Lane, Chalfont Road, Long Lane South, Long Lane North, Shepherds Lane, Eastbound Link, A41 Interchange South, A41 Interchange North, Gade Valley Viaduct, River Ver, River Colne, Catharine Bourne and South Mimms Interchange West
- structural provision for new and replacement Environmental Barriers would be required on the River Misbourne Culvert, Slade Oak Lane underbridge, and the Berry Lane Viaduct

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- provision of Emergency Access Routes (EARs) would be required on the Chalfont Railway Viaduct, Chalfont Lane overbridge, Pheasants Wood footbridge, Blunts Wood overbridge, Micklefield Farm Accommodation, Micklefield Green Road overbridge, Chandlers Lane overbridge, Model Farm overbridge, Bedmond Road overbridge, Lye Lane overbridge, Smug Oak Lane overbridge and Old Parkbury overbridge
- 3.5.5.2 Chalfont Railway Viaduct, a brick arch viaduct constructed prior to the motorway would be maintained with four reduced width lanes and 0.8 metre wide discontinued hardshoulders passing through the existing arches. To fit an additional lane through each arch, the existing steel safety barriers would be replaced with rigid concrete safety barriers close to, but separate from, the piers. An EAR would be installed through the arch adjacent to the anti-clockwise carriageway. The bridge itself would not be modified.
- 3.5.5.3 Berry Lane Viaduct, a 7-span prestressed concrete beam viaduct would be widened to accommodate four full lanes and hard shoulder in both directions.
- 3.5.5.4 Park Avenue footbridge is a single-span reinforced concrete overbridge spanning the Junction 18 west-facing slip road which cannot accommodate the clearance envelope for the widened motorway. The bridge would be replaced on-line in the same location as the existing bridge and at a similar level. The footbridge would be temporarily closed and the footpath diverted in order to build the replacement footbridge.

3.5.6 Communications and Signage

- 3.5.6.1 The existing communications infrastructure would be replaced and new infrastructure would be provided.
- 3.5.6.2 Up to 115 new gantries would be installed at approximately 500-900 metre spacing along the mainline and at approaches to Junctions. These would replace the 21 existing gantries within Scheme Boundary. Gantries would be provided in line with the DMRB Volume 9³ requirements for communications systems, direction signing and for lane-gain/lane-drop situations.
- 3.5.6.3 The gantries would consist of two main design types:
- standard portal gantries carrying signal indicators and fixed direction signage, which may span over one or both carriageways and/or slip roads at junctions. The Signal Indicators, which as well as being able to display advisory speed limits can also display a series of arrows and crosses for lane control purposes. Figure 3.2 illustrates these as three different height types, representing single, double and triple layer portal gantries
 - cantilever (“hockey stick”) gantries carrying Variable Message Signs (VMS) providing tactical and strategic driver information on queuing or other conditions ahead
- 3.5.6.4 Traffic detection and monitoring equipment, incorporating Motorway Incident Detection and Automatic Signalling (MIDAS) equipment would be installed along the carriageways, typically at intervals of 500 metres depending on signal gantry locations.
- 3.5.6.5 Existing verge mounted direction signage along the main line would be removed and replaced with signs mounted on the gantries. Other signs in the existing verge would be

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removed and signs in the new verge would comprise of route/distance confirmation signs after Junctions and brown tourist attraction signs.

- 3.5.6.6 Closed circuit television (CCTV) and communication equipment would be replaced. Additional monitoring equipment (e.g. fog and ice monitoring) would be installed within the carriageway verge. The existing emergency roadside telephones would be replaced by new telephones located within the road verge at maximum spacing of one kilometre.
- 3.5.6.7 A cabling network in buried ducts would be installed within the verge to form part of the National Road Telecommunications Service to establish communications from the roadside infrastructure to the Regional Control Centre. Above-ground cabinets associated with the cabling and infrastructure would be visible in the road verge.
- 3.5.6.8 The widening works would not affect the location or infrastructure of existing Transmission Station buildings located in the road verge. New cabinets may be required.
- 3.5.6.9 The proposed Signal Indicators would also be able to provide for a mandatory red ring to allow the display of Variable Speed Limits which may be enforced to provide greater traffic control. Additional enforcement cameras housed on the new gantries over the carriageway would also be installed adjacent to the indicators on the gantry above the carriageway.

3.5.7 Lighting

- 3.5.7.1 New lighting would be provided in the unlit sections and the existing lighting would be replaced with new equipment suitable for lighting a dual four-lane motorway. The lighting between Junctions 18 and 20 on the existing climbing lane is already suitable for this however construction works in the central reserve would require this to be removed and replaced on the verge.
- 3.5.7.2 The new lighting along the mainline would be 12 or 15 metre columns generally erected in both verges. The columns would be at typical spacings of approximately 35 and 50 metres for 12 metre and 15 metre columns respectively, verge mounted with SON-T high pressure sodium lamps and full cut-off lanterns. Where necessary, localised retaining structures would be provided to accommodate the lighting column foundation.
- 3.5.7.3 Existing lighting on slip roads would be replaced by 12 metre high verge mounted columns that meet the current lighting requirements.
- 3.5.7.4 Additional electrical supplies would be provided to serve the new lighting.

3.5.8 Facilities and Public Utilities

- 3.5.8.1 No new facilities are proposed as part of the Scheme.
- 3.5.8.2 No utility diversion works are proposed.

3.5.9 Drainage Design

- 3.5.9.1 New drainage systems would be provided as part of the Scheme to accommodate the increased flows resulting from the widened carriageway. Drainage systems would include facilities to control flows into existing outfalls at current rates and, where practical, reduce current rates. Facilities to provide treatment of routine runoff would also be provided so that there is no overall detriment to the existing water environment,

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after the motorway is widened. This part of the M25 motorway relies, in part, on the use of soakaways for the disposal of surface water. Where required existing soakaway capacity would be increased to cater for additional flows from the widened carriageways. A number of existing soakaways are located in Source Protection Zones (SPZ) and at these locations, additional pollution control measures would be incorporated into the drainage systems. The principles of the drainage design are:

- flooding in receiving watercourses would not be exacerbated in that outflow rates would be maintained at existing rates or, where possible, made lower
- balancing ponds required to control flows into watercourses have been designed to accommodate a 1 in 100 year rainfall event, including an additional 20% to allow for the possible effects of climate change
- attenuation facilities in the form of oversized pipes within the drainage networks have been designed to accommodate a minimum of a 1 in 30 year storm without any flooding to the road surface.
- existing points of discharge to watercourses would be retained
- one new point of discharge with additional treatment in the form of bio-retention has been agreed with the Environment Agency at the Catharine Bourne to avoid continuing to discharge to the soakaway into an SPZ1 at that location
- additional soakaways would be provided to reinforce existing soakaways where required to serve the additional catchments created by the widened carriageway
- where practical, soakaways located in SPZ1 would be relocated to less sensitive locations to reduce the risk to groundwater
- as far as practical natural catchment water would be kept separate from the road system
- spillage containment and pollution interception devices would be provided at all outfalls including special measures at sensitive locations
- treatment of runoff would be provided by various vegetative measures, such as reed beds, bio-retention or linear vegetation channels

3.5.9.2 Traditional balancing ponds and infiltration basins are tried and tested methods to limit the rates of discharge and would be the preferred measure for attenuation of increased rates of runoff. However, limited areas of land are available for the construction of balancing ponds within existing Secretary of State owned land. Locations and the extent of the motorway that can be drained using conventional systems outfalling via balancing ponds and then into watercourses are presented in Table 3.5.

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Table 3.5: Locations of New Balancing Ponds and Infiltration Basins

Location of Pond		Clockwise Carriageway		Anti-Clockwise Carriageway		Watercourse
		From	To	From	To	
(Chainage)	Mile Post	(Chainage)	(Chainage)	(Chainage)	(Chainage)	
1,600	102/3	1,580	3,100	1,580	3,100	Alder Bourne
3,650	104/3	3,100	3,620	3,100	3,620	Misbourne
10,700	110/5	10,280	11,400	10,700	11,400	R Colne
12,950	112/5	12,700	13,000	12,700	13,000	Infiltration basin
17,750	116/6	16,100	17,750	16,100	17,750	Infiltration basin
19900	118/7	19,100	19,850	19,100	19,850	Infiltration basin
21,800	120/3	21,260	22,650	21,400	22,720	R Gade / Millstream
24,500	22/7	22,700	24,600	22,780	24,600	Pumping to soakaway
28,360	126/1	28,150	29,520	28,150	29,500	R Ver
29,530	127/1	29,530	29,750	29,500	29,750	R Colne
30,900	128/3	30,940	31,700	30,940	31,670	R Colne
32,450	129/7	32,800	34,350	32,800	34,340	R Colne
34,800	131/7	34,400	34,750	34,400	34,750	Soakaway
35,450	132/3	34,350	35,420	34,340	35,420	Soakaway
37,300	134/0	36,880	37,230	36,880	37,230	Mimmshall Brook
37,430	134/4	37,230	37,680	37,230	37,480	Mimmshall Brook

3.5.9.3 In locations where balancing ponds cannot be provided, due to constraints on available land, the following alternative options would be used:

- linear oversized pipes as part of the drainage network
- linear open channels along the base of embankments (linear open channels in cuttings are deemed inappropriate on geotechnical grounds)
- open 'U' shaped reinforced concrete channels along the base of embankments or in cuttings
- underground tanks below the verge, embankment, cutting or edge of carriageway

3.5.9.4 New soakaways for groundwater disposal are proposed in the general location of the existing soakaways, however the number, size and configuration of boreholes would change in some locations particularly in sensitive SPZs. For example to remove the current discharge to the critical SPZ1 at Junction 21, a new pumping station would be

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provided to pump water to new soakaways located within a SPZ3. Existing infiltration ponds would be converted to treatment ponds for pollution control.

3.5.9.5 The Scheme aims to maintain or reduce the current impact of highway drainage on the water quality of receiving waters including groundwater. Alternative treatment systems would be used depending on location and availability of land. Systems used would be:

- wetlands associated with balancing ponds or in linear channels along the base of embankments or cuttings, where geotechnical solutions can create the necessary land
- grassed infiltration basins
- grass lined channels
- bio-retention
- filter Drains
- reedbeds
- full retention oil interceptors

3.5.9.6 The drainage design has evolved through detailed discussions and agreements with the Environment Agency (Appendix B). An overview of the drainage design is shown on Figure 3.2. More detailed drainage information is provided in the Road Drainage and Water Environment chapter drawings (Figure 8.4).

3.5.10 Carriageway Surface

3.5.10.1 The new carriageway surface (including hardshoulder) from Junctions 16 to 23 would consist of fully flexible, composite or pavement quality concrete with a noise reducing surface referred to as Low Noise Surfacing (LNS).

3.5.10.2 Any surfaces from the existing carriageway which were not LNS would be replaced with LNS as part of the Scheme.

3.5.11 Safety Features

3.5.11.1 Safety fencing would be provided to protect persons from falling from height and to protect vehicles from colliding with hazards.

3.5.11.2 Pedestrian fencing or handrails would be provided where there is a risk of stranded road users or maintenance workers falling more than 1.5 metres from retaining walls or reinforced soil retaining structures.

3.5.11.3 Vehicle restraint systems would be provided throughout the central reserve in the form of a rigid concrete barrier. At intervals of no more than 3 kilometres, the barrier would have a short removable section for use in major incidents.

3.5.11.4 Vehicle restraint systems would also be provided in the verges where a hazard is located within 4.5 metres of the hardshoulder. Such hazards include lighting columns, road signs, gantries, equipment cabinets, drops (from retaining walls and down steep slopes), reinforced soil and soil-nailed retaining faces and bridge piers. The majority of

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both verges would have vehicle restraint systems, which could be either steel deformable barriers or rigid concrete.

3.5.12 Environmental Design

3.5.12.1 Existing Environmental Barriers that would need to be relocated as a result of construction activities would be replaced. In addition some existing barriers would be upgraded to mitigate increases in traffic noise from the Scheme. Details of these are presented in Table 3.6.

Table 3.6: Existing Environmental Barriers to be Replaced

Locations and Height	Reason
Anti-clockwise: 3,000 – 3,325. Height 2 metres	Environmental Barrier protecting properties in Tatling End is located on top of a cutting, approximately 2 metres from the carriageway, so widening would affect this location.
Clockwise: 3,880 – 4,220. Height 2 metres	Environmental Barrier is at motorway level, on an embankment which needs to be widened. This protects properties along Amersham Road in eastern Gerrards Cross.
Clockwise: 5,395 – 5,675. Height to be raised to 3 metres (existing height is 2 metres)	Environmental Barrier slightly above motorway level, protects Coldharbour Farm Cottages and Coldharbour Farm. It is between 3 – 5 metres from the motorway which is being widened.
Anti-clockwise: 5,150 – 6,170. Height 2 metres	Environmental Barrier is at motorway level, on an embankment which needs to be widened. It protects properties along Slade Oak Lane.
Anti-clockwise: 11,430 – 11,970. Height to be raised to 3 metres (existing height is 2 metres)	Environmental Barrier is at motorway level, on an embankment which needs to be widened, and Barrier height will be raised by 1 metre. It shields properties in Rickmansworth, along The Queens Drive.
Clockwise: 12,230 – 13,000. Height 2 metres	Environmental Barrier is at motorway level along Berry Lane Viaduct and protects properties on the eastern edge of Chorleywood.
Anti-clockwise: 12,150 – 12,975. Height 2.5 metres	Environmental Barrier is at motorway level along Berry Lane Viaduct and protects properties in Loudwater.
Anti-clockwise: 13,185 – 13,850. Height 2 metres	Environmental Barrier is at motorway level, which needs to be widened. It shields properties located along the Chess Valley.
Clockwise: 13,170 – 13,850. Height varies 1 – 4 metres	Environmental Barrier is on top of a retaining wall, which will be affected by the widening. It shields properties in Chorleywood, to the north of Rickmansworth Road.
Clockwise: 16,840 – 17,070 Height 2 metres	Environmental Barrier is on top of the cutting. Widening has the potential to affect the structure of the Barrier. It shields properties to the north of Chandlers Lane and off Templepan Lane.

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Locations and Height	Reason
Anti-clockwise: 16,770 – 17,055 Height 2.5 metres	Environmental Barrier is at motorway level and would be affected by widening. It protects properties in Chandlers Cross.
Anti-clockwise: 20,175 – 20,875. Height 2 metres, then 3 metres from 20,525 – 20,875	Environmental Barrier is a bridge parapet at motorway level that helps protect properties in Abbots Langley. Would be affected by widening.
Clockwise: 20,240 – 20,725. Height 2 metres	Environmental Barrier is a bridge parapet at motorway level that helps shield properties off Watford Road. Would be affected by widening.
Anti-clockwise: 27,900 – 28,400. Height 2 metres, with height to be raised to 2.5 metres between Chainage 28,100 – 28,200	Environmental Barrier is at motorway level adjacent to the carriageway, which is being widened. It protects properties along the River Ver and Moor Mill Lane.
Clockwise: 27,900 – 28,470. Height 2 – 2.5 metres, with height to be raised to 2.5 metres between Chainage 28,200 – 28,470	Environmental Barrier is at motorway levels between 27,900 – 28,275, which would be affected by widening. It then proceeds to the top of a cutting to the bridge for Radlett Road. It protects properties of Colney Street in Frogmore, and the River Ver valley.
Anti-clockwise: 31,930 – 32,200. Height 2 metres	Environmental Barrier is at road level where the slip merges onto the motorway, within the scope of widening. It shields Salisbury Hall Farm Cottages and the University College and Hospital Sports Ground.
Anti-clockwise: 36,650 – 36,750. Height 2 metres	Environmental Barrier is located 1 metre from the carriageway in places, which would be within the widening. This protects properties along Blanche Lane adjacent to the anti-clockwise carriageway.
Clockwise: 36,600 – 36,640. Height 2 metres	Environmental Barrier is located 1 metre from the carriageway in places, which would be within the widening. It shields properties along Blanche Lane adjacent to the clockwise carriageway.

3.5.12.2 New Environmental Barriers would be provided in locations where the impact on noise levels from the Scheme would trigger the Noise Insulation Regulations⁴ where there are groups of more than 25 properties. New Environmental Barriers are detailed in Table 3.7.

Table 3.7: Proposed Environmental Barriers – Noise Barriers

Locations and Height	Reason
Clockwise: 3,250 – 3,500. Proposed height 2 metres with gap for A40 Oxford Road.	To shield properties along A40 Oxford Road from an increase in traffic noise generated as a result of the Scheme.
Clockwise: 5,300 – 5,395. Proposed height 2.5 metres.	Adjoins an existing Environmental Barrier and is an extension of the existing Environmental Barrier which shields Coldharbour Farm Cottages from traffic noise.

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Anti-clockwise: 8,200 – 8,900. Proposed height 2.5 metres.	To shield properties in Maple Cross from an increase in traffic noise generated as a result of the Scheme.
Anti-clockwise: 11,970 – 12,050. Proposed height 3 metres.	To shield properties along Berry Lane and The Queen's Drive in Rickmansworth from an increase in traffic noise generated as a result of the Scheme.
Clockwise: 13,120 – 13,170. Proposed height 1 metre.	To shield properties on Wyatt's Close. Proposed Environmental Barrier would be on top of an existing retaining structure (4 metres in height), and would link up with an existing Environmental Barrier (Chainage 13,170 – 13,850).

3.5.12.3 New Environmental Barriers would generally be made of wood and vary between 2 and 3 metres in height. The locations of new and existing (retained and replaced) barriers are presented in Figure 3.2.

3.5.12.4 Noise Insulation is proposed for two isolated properties: Alderbourne Cottage and Bircham Cottages.

3.5.12.5 Environmental Barriers have also been proposed to mitigate significant adverse landscape effects on sensitive receptors. The location of these are shown in Figure 3.2. Details are provided in Table 3.8.

Table 3.8: Proposed Environmental Barriers – Visual Screens

Locations	Reason
Chainage 6,170 – 6,350 anti-clockwise Carriageway. Proposed height 2 metres	Extension of an existing Environmental Barrier to provide landscape amenity screen for properties in West Hyde, in an area with limited space to provide planting
Chainage 11,300 – 11,430 anti-clockwise Carriageway. Proposed height 2 metres	Extension of an existing Environmental Barrier to provide landscape amenity screen for properties along Shepherds Lane and in southern Rickmansworth, in an area that is elevated and exposed
Chainage 35,300 – 35,670 clockwise Carriageway. Proposed height 2 metres	To provide some landscape amenity (car headlights) screening to South Mimms Conservation Area

3.5.12.6 In addition to the provision of Environmental Barriers the environmental design would include the retention of areas of vegetation within Secretary of State land, and proposed areas of new planting (both to replace lost vegetation and to provide enhancement of the existing vegetation where possible). The engineering solutions were developed to minimise disturbance to the soft estate and vegetation clearance. The Scheme has, wherever possible retained a strip of vegetation within Secretary of State land adjacent to designated sites and ancient woodland to provide a buffer zone to minimise adverse effects on these areas. These locations are described in Table 3.9. Areas of Secretary of State land suitable for ecological mitigation would be used to recreate, where possible, semi-natural habitat lost as a result of the Scheme as described in Chapter 7 Ecology and Nature Conservation.

Table 3.9: Vegetation Protection Through Engineering Design

Location	Treatment	Reason
Chainage 4,950 – 5,220 anti-clockwise	A combination of soil nailing, a small regrade and the installation of a retaining wall.	To allow a vegetation buffer to be retained for Denham Marsh Wood Local Wildlife Site and areas of Ancient Woodland.
Chainage 10,170 – 10,350 anti-clockwise.	A regrade in chalk.	To allow a vegetation buffer to be retained for Ladywalk Wood Local Wildlife Site and areas of Ancient Woodland.
Chainage 11,800 – 12,180 both sides.	A combination of soil nailing and a regrade in chalk.	To allow a vegetation buffer to be retained for Pheasants Wood Local Wildlife Site and areas of Ancient Woodland.
Chainage 21,300 – 21,450 clockwise	Soil nailing.	To allow a vegetation buffer to be retained for Long Wood Local Wildlife Site, areas of Ancient Woodland and protected species.
Chainage 26,440 – 26,870 both sides	A combination of soil nailing and the installation of a retaining wall.	To allow a vegetation buffer to be retained for Black Green Wood and pond Local Wildlife Site and areas of Ancient Woodland.
Chainage 27,000 – 27,430 clockwise	The installation of a retaining wall.	To allow a vegetation buffer to be retained for Moor Mill and Park Street Pits Local Wildlife Site.

3.6 Construction Strategy

3.6.1 General

- 3.6.1.1 The actual construction methods and equipment, locations of compounds and access roads would be developed by the contractor appointed by the DBFO Company. All works outside of the Secretary of State land would be agreed with the local planning authority.
- 3.6.1.2 The key construction activities are described in Chapter 16, Disruption due to Construction, together with an assessment of the potential disruption likely to be caused during construction.
- 3.6.1.3 All works on site would be undertaken in compliance with the Contractor’s Construction Environmental Management Plan (CEMP). An outline of the CEMP is contained in Chapter 16.

3.6.2 Construction Programme

- 3.6.2.1 Construction would be phased. Construction is planned to commence in 2009 and the entire section would be constructed by 2012 (the opening year for the Scheme).
- 3.6.2.2 The basic construction sequence would be determined by the Contractor but is likely to follow the following sequence:
- advance works to safeguard reptiles, great crested newts, badgers, breeding birds, water voles and amphibians
 - site clearance and topsoil stripping
 - earthworks
 - construction of the treatment and attenuation ponds and drainage infrastructure
 - installation of gantries
 - roadworks
 - surfacing
 - installation of safety fences, signs, street lighting and road markings
 - central reserve works
 - landscape and ecological enhancement
 - landscape planting

3.6.3 Temporary Compounds and Facilities

- 3.6.3.1 The location of site compounds, access roads, batching plants, storage areas, workforce encampments are not known at this time. However no site compounds and associated facilities would be located within any of the following areas adjacent to the Scheme, that have been identified in this Environmental Statement:
- statutory designated sites
 - ancient woodlands
 - county wildlife sites
 - areas of archaeological significance
 - areas where visual effects and nuisance would be significant
- 3.6.3.2 All works areas, compounds, temporary storage areas and other related facilities outside of the Secretary of State land would be agreed with the local planning authority by the Contractor prior to commencement of works. Waste produced from site compound works and temporary roads and access routes cannot be assessed at this time, however, minimising waste and recycling would be encouraged where possible. It would be expected that up to 5 construction compounds could be required for the Scheme, covering approximately 5 hectares each. There could be smaller satellite compounds, approximately 1 hectare in size, located beyond the main compounds.

3.7 Maintenance

3.7.1.1 Documentation relevant to operation and maintenance would be prepared by the Contractor. This would define ongoing maintenance requirements for all the facilities provided as part of the Scheme, and details of how to maintain these facilities to ensure they operate within the required parameters.

3.7.1.2 Items that would be included are:

- treatment and attenuation ponds
- highway drainage network
- landscape maintenance
- management and monitoring of ecological improvement / enhancement areas

4 Alternatives Considered

4.1.1.1 This chapter summarises the main alternatives considered during the development of the Scheme. This considers the evolution of the Scheme from the time when the need to improve journey time reliability on the M25 was recognised to the current illustrative design for the Scheme. The reasons for the choice of the current Scheme, taking into account environmental effects, are presented.

4.2 ORBIT MMS Options

4.2.1.1 The ORBIT MMS¹ considered the following options to improve journey time reliability on the M25 through increasing capacity of the main road system:

1. A new orbital route inside of the M25
2. A new orbital route outside of the M25
3. Widening the existing M25 to dual five or six lane standards in order to provide for future traffic growth (i.e. a “predict and provide” approach)
4. Widening the existing M25 to generally four lane standards, together with measures to manage the future demand of traffic

4.2.1.2 ORBIT MMS provided the following principle reasons for rejecting the first three options:

1. construction of a new orbital route inside the M25 would be likely to cause severe adverse effects and require extensive demolition of properties, generating very substantial opposition from people living in the affected areas
2. construction of a new orbital route outside the M25 would only cater for up to 40% of current users, and would encourage further unsustainable dispersal of activity and travel patterns, as well as causing severe adverse environmental effects and generating strong local opposition
3. widening the existing M25 to dual five or six lane standards would encourage the development of even more dispersed patterns of long-distance commuting by car, would lead to pressure for even more road capacity in the future, and would be more expensive and have generally greater environmental effects than a dual four lane widening option

4.2.1.3 ORBIT MMS recommended that increasing congestion levels on the M25 should be addressed through widening generally to dual four lanes, which in most cases could be accommodated within existing Secretary of State land. This was the option that was progressed and the basis to this Scheme. Furthermore the Secretary of State also undertook to consider, in parallel, measures to manage the future demand of traffic.

4.3 Dual Four Lane Standard Motorway Options

4.3.1.1 As part of the design development process, including the need for approval of the necessary departures from standards, a number of alternative options were considered. These were:

- limited landtake to avoid any engineering departures from highway standards
- permanent four lanes (P4L)
- continuous reduced width lanes
- current Scheme

4.3.2 Limited Landtake Option to Avoid Departures from Standards

4.3.2.1 Four limited landtake sub-options that avoided the need for significant departures from highway standards were assessed. These would have required the use of adjacent land outside the Secretary of State land. The locations of additional land were as follows:

- Chalfont Viaduct (Chainage 3,050 – 4,500)
- Junction 17 – Junction 18, including Berry Lane Viaduct (Chainage 11,050 – 13,800)
- Junction 20 and Gade Valley Viaduct (Chainage 18,950 – 22,600)
- Junction 21 – Junction 21A (Chainage 23,400 – 26,800)

4.3.2.2 Whilst generally complying with geometric design standards, each area would:

- require the replacement or widening of a significant number of existing structures
- lead to increased cost and reduced economic benefits
- lead to programme delay due to the need for compulsory purchase of land outside the Secretary of State land
- result in increased delay and disruption during construction

4.3.2.3 The overall assessment of environmental, engineering and economic factors of these options compared to the Scheme is shown in Table 4.1. The four limited landtake sub-options were rejected on this basis.

Table 4.1: Impact of Limited Landtake Options Compared with the Scheme

Location Description	Overall Engineering Effects (all four locations combined)	Environmental Impact	Overall Economics (all four locations combined)
Option A Chalfont Viaduct	Design generally complies with standards, with only limited need for departures.	Slight Improvement	Additional cost £135m (2001 Q3)
Option B Junction 17 to 18	Additional land required (not in HA ownership) Significant number of structures need replacement and widening.	Slight Deterioration	
Option C Junction 20 /Gade Valley Viaduct	Programme delay due to the need for Orders and longer construction period.	No Change	
Option D Junction 21 to 21a	Increased delay / disruption during construction.	Slight Deterioration	

4.3.3 Permanent Four Lane Operation (P4L)

4.3.3.1 The carriageway cross-section for this option would comprise four reduced lane widths of 3.5 metre wide, together with a 2.5 metre wide Emergency Access Route (EAR), in lieu of a hardshoulder. The EAR is made up of a 1 metre wide hardstrip and a 1.5 metre wide hardened verge.

4.3.3.2 The key considerations in the assessment of this option were:

- the continuous 2.5 metre wide EAR would likely have adverse operational effects on the M25, including increased incident response times and reductions in journey time reliability
- the provision of a 1 metre hardstrip would have a significant adverse impact on major maintenance activities. Only 3 lanes would be available during contraflow operations, which will lead to severe congestion and reduction in economic benefits
- the adoption of continuous reduced width lanes may lead to an increased risk of accidents. The safety of P4L has not yet been proven, and research is currently being undertaken by the Highways Agency
- as P4L represents a significant reduction in cross-section standards, a departure from the standard P4L section of no greater than 10% would be permitted. This means that P4L would require the widening of a number of structures, which in turn would involve land-take, additional cost and programme delay

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- P4L would provide environmental and sustainability benefits, compared to the Scheme, including reduced loss of soft estate, reduced impact on ecology, and reduction in use of natural resources and waste

4.3.3.3 Whilst P4L would provide some environmental and sustainability benefits, this option was rejected due to the substantial adverse operational, maintenance and economic impacts, together with the uncertain impacts on safety.

4.3.4 Continuous Reduced Width Lanes

4.3.4.1 HA Departmental Standard TD27/05 (Part 2) states "Driving on narrow lanes for long distances requires considerable levels of concentration, as there is very little margin for error when steering a vehicle, particularly where numbers of large goods vehicles are high. Driving for long distances for this type of layout would increase driver stress, possibly resulting in judgement errors and an increase in the risk of accidents. It is not envisaged that reduced lane widths would be continued over long lengths." The safety case for continuous reduced width lanes on motorways has not yet been proven, although research is currently being undertaken as part of the P4L assessment.

4.3.4.2 Whilst there are some benefits of continuous reduced width lanes, including environmental and sustainability benefits and a cost reduction, this sub-option was rejected due to the requirements of current standards, together with the uncertain impacts on safety.

4.3.5 Active Traffic Management Alternative (ATM)

4.3.5.1 Active Traffic Management (ATM) involves the use of the hardshoulder by traffic during periods of high traffic flow. During hardshoulder running, speeds are reduced to 50mph, through the use of mandatory variable speed controls. An ATM pilot is now operational on the M42, between Junction 3A and Junction 7.

4.3.5.2 Following an initial assessment of the results from the M42 pilot, which were available in early 2007, ATM was considered as an alternative to the widening of Section 1. The ATM alternative was rejected for the following reasons:

- ATM is unproven technology although early indications are that the M42 pilot is giving very positive results using a 50mph speed limit. However, for M25, the economic return while running at 50mph is considerably inferior to that which is achieved by widening
- in order to consider the ATM alternative further, a detailed assessment of the engineering, traffic, economic and environmental impacts of the option would be required. This detailed assessment would lead to long delays to the procurement process and the overall scheme programme, which would in turn lead to significantly increased costs, and reduced economic benefits, due to delayed opening of the Scheme
- currently the maximum flow level above which ATM is not considered to operate effectively is 6,800 vehicles/hour. Forecast flows on some lengths of Section 1 are predicted to exceed this flow
- ATM is not considered to operate effectively where junctions are spaced at less than 3 kilometre intervals. There are several link lengths on Section 1 where

junctions are closer than 3 kilometres (Junctions 17 to 18, Junctions 19 to 20, and Junctions 21 to 21A)

4.3.6 Current Scheme

4.3.6.1 Based on the above the current Scheme described in Chapter 3 was chosen.

4.4 Design Solutions

4.4.1.1 Alternative design solutions were also considered as part of the preferred Scheme.

4.4.2 Lighting only at Junctions

4.4.2.1 In lieu of full lighting throughout the entire length of the Scheme, an alternative was considered, in which lighting was only provided at Junctions on the M25. The key impacts relating to this option would be:

- the Scheme includes a substantial number of geometric departures from standards, including discontinuous hardshoulders, intermittent reduced width lanes, reduced stopping sight distances, reductions in merge and diverge arrangements, and reductions in clearances to vehicle restraint barriers. The incorporation of full lighting standards is an essential part of the Scheme, in order to mitigate the impacts of these reductions in standards. This accords with the guidance provided in IAN 89/07³ that for four lane carriageways and where there are departures from standards, lighting, in conjunction with other measures, may be required in the interests of road safety
- the provision of full lighting would provide substantial safety benefits to operatives during maintenance works
- the economic benefits of providing full lighting outweighs the additional costs
- full lighting would have greater adverse environmental and sustainability effects than lighting only of junctions. These effects include visual, ecological, setting and increased energy use

4.4.2.2 The safety and economic benefits of the Scheme compared to this solution were considered to outweigh the adverse environmental and sustainability effects and therefore this solution was rejected.

4.4.3 Drainage

4.4.3.1 The aim of the drainage design was to develop an overall approach that results in no overall detriment to the existing water environment, after the motorway is widened. Flooding should not be exacerbated and outflow rates in watercourses should be maintained or, where feasible, reduced below existing flow rates. The design of the drainage system should ensure that runoff from highways into 'controlled waters' would not cause pollution. The drainage design included a clear strategy with respect to discharges to ground and in particular Source Protection Zones (SPZ), which was agreed with the Environment Agency. In general the existing drainage systems do not have facilities to attenuate flows or treat routine runoff and hence new facilities would be required. The primary constraint in developing the drainage design would be to build the

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Scheme within the Secretary of State's land. This made the provision of facilities such as balancing ponds that take up significant areas of land very difficult.

- 4.4.3.2 A hierarchy of options was developed to provide attenuation and treatment of highway runoff. The assessment of options was made in the following order to develop the illustrative design:

Table 4.2 Hierarchy of Drainage Design Options

Preference	Attenuation	Treatment
Most Preferred	Conventional balancing ponds	Wetlands constructed within balancing ponds or in linear channels along the base of embankments or cuttings, where geotechnical solutions can create the necessary land
	Infiltration basins	Grassed infiltration basins
	Linear oversized pipes as part of the drainage network	Grass lined channels
	Linear open channels along the base of embankments (linear open channels in cuttings are deemed inappropriate on geotechnical grounds)	Bio-retention
	Open 'U' shaped reinforced concrete channels along the base of embankments or in cuttings	Filter Drains
Least Preferred	Underground tanks below the verge, embankment, cutting or edge of carriageway	Reed Beds

- 4.4.3.3 The drainage design process identified Secretary of State land for nine new ponds at outfalls to watercourses for attenuation and, by adding wetlands into the pond, also for treatment of routine runoff. Existing ponds at Junction 16 would be upgraded to include wetland treatment.
- 4.4.3.4 Where land for ponds was not available, assessment was made in conjunction with the geotechnical engineers to establish where verges could be widened to fit grass lined channels for treatment with oversized pipes below for attenuation of runoff.
- 4.4.3.5 A particular feature of the motorway in this area is that it relies, in part, on the use of soakaways for surface water disposal and some soakaways are located in sensitive SPZs. At these locations options were developed with the Environment Agency. An option to re-use and reinforce existing borehole soakaways into a SPZ1 at Junction 21 was discounted in liaison with the Environment Agency and a final option developed involving the use of a pumping station to pump flows to new soakaways approximately 2 kilometres to the west, located in SPZ3.
- 4.4.3.6 At the River Chess, existing drainage is via soakaways with an overflow to the river. Again an option to re-use and reinforce existing borehole soakaways into a SPZ1 was

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changed in liaison with the Environment Agency and a final option developed involving additional borehole soakaways located along the motorway, both eastwards and westwards, to reduce the overall volume of runoff likely to overflow into the River Chess.

- 4.4.3.7 The existing drainage uses borehole type soakaways adjacent to Catharine Bourne rather than discharging direct to this sensitive watercourse. The option to re-use and reinforce the existing soakaways was discounted in liaison with the Environment Agency in favour of a solution that involved a discharge to the Catharine Bourne.

4.5 Summary

- 4.5.1.1 The Scheme has been arrived at after consideration of alternatives and Value Management/Value Engineering workshops held on 23/24 June 2005 and 6/7 December 2005. The Scheme has been presented to Statutory Environmental Bodies at coordination and technical meetings during its development.

- 4.5.1.2 After considering technical, sustainability, environmental and economic factors, the preferred option for the widening is to avoid the need for additional land outside the Secretary of State land. This generally requires:

- the reduction of the existing width of the central reserve
- carriageway narrowing techniques and the adoption of retaining measures or steepened earthworks where necessary due to land or structures constraints
- reducing the amount of existing soft estate within the existing highway boundary
- the adoption of steepened earthworks and retaining measures to retain existing vegetation and habitats, where practical

- 4.5.1.3 This ES is based on a Scheme with these attributes.

5 Environmental Assessment Methods

5.1 Introduction

- 5.1.1.1 This ES presents the assessment of the environmental effects likely to result from the construction and operation (including maintenance) of the Scheme. The assessment considers the fact that the Scheme is an alteration to an existing motorway which already has effects on the environment. This chapter sets out the various stages of the Environmental Assessment and the methods used to assess the various environmental topics.

5.2 Department of Transport Guidance

- 5.2.1.1 The official guidance published by the Government for the preparation of Environmental Assessments of trunk road and motorway schemes is contained in the DMRB Volume 11 - Environmental Assessment published in 1993¹, with subsequent amendments. New Interim Advice Notes² were published in June 2006. These introduce the forthcoming amendments to Sections 1, 2 and 4 of DMRB Volume 11 which provides guidance on the procedures for environmental assessment of trunk road projects including reporting.
- 5.2.1.2 The DMRB sets out the process for Environmental Assessment and the methods for assessing individual environmental topics. It has been used in the preparation of this Environmental Statement. This Scheme has been developed using previous DMRB guidance particularly in relation to the three-stage approach to environmental assessment. However this ES has been prepared in compliance with the IAN 81/06 on assessment and management of environmental effects and IAN 82/06 on reporting. In accordance with the guidance the ES does not contain a Volume 2. A series of Technical Reports have been prepared which contrary to IAN 82/06 provide not only additional factual information but also provide detailed assessment of the Scheme on a Junction by Junction basis.
- 5.2.1.3 DMRB Section 3 provides guidance on the environmental assessment techniques to be followed and includes 'Parts' which set out assessment methods for each of the specific environmental topics to be covered by the ES. These have been used including the recently updated HA216/06 on Road Drainage and the Water Environment³, IAN92/07 Cultural Heritage⁴ and IAN94/07⁵ Air Quality.
- 5.2.1.4 A Stage 1 Environmental Assessment was undertaken in September 2003 prior to TPI entry in April 2004. This provided a sufficient assessment to identify the environmental advantages, disadvantages and constraints of a broadly defined Scheme. Since the Scheme is to be constructed within Secretary of State owned land, a detailed route option appraisal (Stage 2) was not required as part of the Scheme development. The assessment therefore progressed directly to a Stage 3 or detailed assessment as defined in IAN 76/06.
- 5.2.1.5 This Environmental Impact Assessment fully complies with the Government's current official guidance on Environmental Assessment as set out in DMRB Volume 11 and IANs. It has also, where appropriate and explained in each specialist section incorporated other good practice methodologies. Proven techniques have been used where possible to avoid developing unique and untested procedures. Detailed methodologies for both survey and assessment have been discussed with the relevant

statutory consultees, as part of the Scoping of the ES.

- 5.2.1.6 To help to clarify and quantify the effects, the assessment methodology has applied significance criteria set out in the IAN 81/06. Where it has not been possible to apply these criteria each relevant specialist chapter sets out the alternative methodology used.

5.3 Scoping of Environmental Topics

- 5.3.1.1 In accordance with current best practice (and IAN 80/06), a scoping exercise was undertaken and a Scoping Report was published in August 2004 by Hyder Consulting⁶. This identified that the Scheme could have significant effects on the following topic areas:

- Traffic Noise and Vibration
- Air Quality
- Landscape Effects
- Cultural Heritage
- Ecology and Nature Conservation
- Geology and Soils
- Road Drainage and the Water Environment
- Pedestrians, Cyclists, Equestrians and Community Effects
- Vehicle Travellers
- Disruption due to Construction
- Policies and Plans

- 5.3.1.2 Land use was not identified as a significant issue during the scoping and the Scoping Report confirmed that the extent of work required for this topic relied on further design details. The effects on community severance have been included in the Pedestrians, Cyclists, Equestrians and Community Effects chapter and effects on agricultural land have been dealt with in the Geology and Soils topic. Therefore a separate specialist section on land use has not been included in this ES.

- 5.3.1.3 Construction methods and logistics would be the responsibility of the contractor appointed by the DBFO Company. General construction details are presented in Section 3.16. Construction effects have been assessed within each environmental topic chapter. The Disruption due to Construction Chapter 16 assesses any additional potential disruption resulting from the construction phase of the Scheme that has not already been covered in the other chapters of this ES.

- 5.3.1.4 The Scoping Report provided an outline of the methodologies for surveys and for identifying potential adverse and beneficial effects. It was sent to the following statutory consultees and stakeholders for comment:

- Environment Agency: Thames Region North East

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- English Nature: Thames and Chilterns Team (Berkshire, Buckinghamshire and Oxfordshire) (now part of Natural England)
- English Nature: Essex, Hertfordshire and London team
- English Heritage: East of England Region (Hertfordshire and Essex)
- English Heritage: South East Region (Buckinghamshire, Kent and Surrey)
- Countryside Agency: East of England Region (Hertfordshire and Essex) (now part of Natural England)
- Countryside Agency: South East England (Bucks, Kent and Surrey)
- Buckinghamshire County Council
- South Buck District Council
- Chiltern District Council
- Dacorum Borough Council
- Hertsmere Borough Council
- Hertfordshire County Council
- Three Rivers District Council
- The City and District of St Albans Council
- Groundwork Hertfordshire
- Berkshire, Buckinghamshire and Oxfordshire Wildlife Trust (BBOWT)
- Hertfordshire and Middlesex Wildlife Trust

5.3.1.5 The scoping has evolved with the design and reflects the iterative nature of the consultation process. Thus, since the scoping was undertaken, the methodology has developed as the design progressed, through further discussion with the statutory bodies. The Scoping Report and responses are included in Appendix B.

5.4 Consultation

5.4.1.1 Environmental Workshops with Statutory Environmental Bodies and the stakeholders listed above were held on 22 September 2004 and 25th July 2005. In addition a number of specialist meetings and consultations were held during the preparation of the ES. These included:

- Countryside Agency (now part of Natural England) and Chilterns AONB officer on landscape issues
- Environment Agency ecologists, English Nature (now part of Natural England), Wildlife Trusts and Groundwork on ecological issues
- Environment Agency on drainage and water quality
- Local Authority environmental health officers on air quality

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- County archaeologists on cultural heritage
- Public Rights of Way Officers on pedestrians and others

5.4.1.2 A summary of these meetings is included in Appendix B.

5.4.1.3 The draft of this ES was issued to the following organisations for review in September 2006:

- Environment Agency: Thames Region North East
- Natural England
- English Heritage
- Buckinghamshire County Council
- South Buck District Council
- Chiltern District Council
- Dacorum Borough Council
- Hertsmere Borough Council
- Hertfordshire County Council
- Three Rivers District Council
- The City and District of St Albans Council
- Groundwork Hertfordshire

5.4.1.4 This was to ensure that their concerns were addressed where possible prior to publication of the final ES. A workshop on the draft ES was held on 12 October 2006. A summary of responses to the draft ES is provided in Appendix B. The issues raised have been incorporated into this ES where possible.

5.4.1.5 Meetings were undertaken with local Parish Councils (PC) where the Scheme passes through at the same time as the draft ES was issued to the statutory bodies and local authorities. The purpose of these meetings was to inform the Parish Councils of progress made on the development of the Scheme and to discuss the initial findings as they affect each Parish. The issues raised have been incorporated into this ES where possible. The following meetings took place:

- Sarrat PC – 19th September 2006
- Ridge PC – 22nd September 2006
- Abbots Langley and Kings Langley PC's (joint meeting) – 25th September 2006
- Chorleywood PC – 26th September
- Fulmer, Iver, Chalfont St Peter and Gerrards Cross PC's (joint meeting) - 3rd October 2006
- St Stephens PC – 5th October 2006

- London Colney PC – 6th October 2006
- Shenley PC – 10th October 2006

5.5 Environmental Assessment General Methodology

5.5.1 Introduction

5.5.1.1 As stated the environmental assessment has been undertaken in accordance with DMRB Volume 11 and recent Interim Advice Notes supplemented by current best practice. For each environmental topic, there is a detailed Technical Report that is summarised within the relevant chapter of this ES. Reporting of the assessment generally follows the structure set out below:

- Introduction
- Regulatory Framework
- Methodology
- Baseline Conditions
- Design and Mitigation
- Assessment of Effects
- Summary

5.5.2 Study Area

5.5.2.1 The study area for the environmental assessment has been defined for each topic in the relevant chapter. The definition covers both the spatial scope of the environmental assessment, i.e. its geographical extent, and the temporal scope, i.e. the time periods over which the assessment has been made. These are defined further below.

Spatial Scope

5.5.2.2 Spatial scope is defined as the geographical area over which changes to the environment are likely to occur as a result of the Scheme. A corridor wider than the limit of land to be used (Scheme Boundary) has been assessed, and varies depending on the environmental resource or receptor under consideration. Areas have been defined within each specialist chapter, to allow for assessment of indirect as well as direct effects.

Temporal Scope

5.5.2.3 The environmental assessment addressed effects arising from construction and operation of the Scheme. Construction extends from the commencement of site works to the date immediately prior to opening of the Scheme. Operation extends immediately after opening of the Scheme for the remainder of its life, and is covered as appropriate by each of the specialist chapters.

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5.5.2.4 The environmental effects are represented as the difference between the environmental characteristics with and without the Scheme. For most topics the future baseline was based on the baseline conditions reported in 2004-2006. For topics relying on traffic data (road drainage and the water environment, noise and vibration, air quality, vehicle travellers and partly pedestrians and others), the forecasts included data on the Do Minimum (the situation that would pertain in the absence of the Scheme).

5.5.2.5 The Do Something Scenarios included the opening year (2012) and the design year (2027) for most topics in accordance with DMRB. Additional years (2015 and 2021) were considered for environmental topics which related to traffic data. 2015 is the year when all the M25 widening schemes would be open and 2021 is a representative year between the opening and design years. These were considered so as to identify the worst years for these assessments. How these scenarios were used is explained further in the relevant topic chapter.

5.5.3 Regulatory Framework

5.5.3.1 Each specialist section refers to the international, national and local legislation relevant to that topic. More detail is provided in the Technical Reports.

5.5.4 Methodology

5.5.4.1 The methodology section describes:

- how the baseline conditions were established
- how effects were assessed
- criteria used to assess significance of effects

Establishment of Baseline Conditions

5.5.4.2 A review of existing, available information was undertaken using various methods, including literature research, desktop review of previous reports and studies, site visits, surveys, site investigations and consultations. The majority of the baseline was established during 2004 to 2006. Sources of information, survey methodologies and survey periods are provided under each of the specialist sections.

Assessment of Effects

5.5.4.3 The overall methodology can be summarised generally (although not for every topic) as a three-stage process:

- the evaluation of the value or importance of a resource and the sensitivity of the receptors
- assessment of the magnitude of the impact of the Scheme on the resource or receptor, be it neutral, adverse or beneficial. Effects on existing resources and receptors may be direct or indirect, secondary, cumulative, short, medium and long-term, permanent or temporary, positive or negative
- determination of the significance of effects

Sensitivity of Receptors

- 5.5.4.4 Receptors are defined as the physical resource or user group that would be subject of an impact. The baseline studies have identified potential environmental receptors.
- 5.5.4.5 Some receptors would be more sensitive to certain environmental impacts than others. The sensitivity of a receptor may depend, for example, upon its:
- rarity or relative abundance
 - quality
 - statutory designation, and importance in a national, regional or local context
 - historic or cultural associations
 - regenerative capacity or fragility
 - absorption capacity of the natural environment
 - replaceability
- 5.5.4.6 The sensitivity of a receptor has been assessed with reference to the criteria set out in IAN81/06 (where relevant). Sensitivity is generally described as very high, high, medium, low or negligible. This is specified in each topic chapter.

Magnitude of Impacts

- 5.5.4.7 An impact may affect a range of environmental topics. Impacts may be neutral, adverse or beneficial. They may be also described as:
- direct: caused by activities which are an integral part of the project
 - indirect: due to activities that are not part of the project
 - secondary: a consequence of a primary impact
 - cumulative: comprising many impacts that singly are not significant, but when assessed together may be significant
 - short, medium or long-term
 - temporary or permanent: for example, dust generated during construction would be temporary; land taken by the Scheme would be permanent
- 5.5.4.8 The magnitude of impacts has been assessed against a defined hierarchy of scale as defined in IAN 81/06 (where relevant). Magnitude of impacts generally would be described as: major, moderate, minor or negligible; and may be either adverse or beneficial.

Significance Criteria

- 5.5.4.9 Significance criteria are used to determine the significance of the effect and have used IAN 81/06 where relevant. They are determined by (*inter alia*):
- the magnitude of the impact
 - the spatial relationship of the impact to the receptor

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- the number of receptors affected/scale of the impact
- whether the impact is permanent or reversible through mitigation
- the complexity of the impact
- the probability of the impact
- the value and importance of the receptor in terms of environmental and planning policy legislation
- the sensitivity and rarity of the receptor

5.5.4.10 A significant effect may arise as a result of a minor impact on a resource of national value, or a major impact on a resource of local value. Assignment of significance to an effect has been undertaken in a consistent and systematic manner through the establishment of a set of significance criteria. Significance has been assessed against criteria defined in each of the specialist sections. The significance criteria are generally considered as a scale, for example:

- Very Large, Large, Moderate or Slight Adverse
- Neutral
- Slight, Moderate or Large Beneficial

5.5.5 Baseline Conditions

5.5.5.1 Each specialist chapter presents a baseline of conditions from which the environmental effects of the Scheme were assessed. The existing conditions were derived using the approach described in the methodology section for each topic.

5.5.6 Design and Mitigation

5.5.6.1 In recognition of the iterative design process required by DMRB and IAN 76/06 and 81/06 the general approach to the design of the Scheme has been to build mitigation into the design in order to avoid, reduce and if possible remedy significant adverse environmental effects through an iterative process. This has been achieved through continual environmental review of the design. The principal design mitigation has been the development of an improved drainage system and proposed planting of indigenous trees and shrubs. Design decisions that have environmental benefits or have avoided or reduced new adverse environmental effects have been recorded in the design and mitigation section of each specialist chapter.

5.5.6.2 Further mitigation not included as part of the design has also been presented for each topic.

5.5.7 Assessment of Effects

5.5.7.1 Assessments of effects have been made against the Scheme that incorporates design and mitigation measures to reduce adverse environmental impacts. Therefore, the environmental assessment of the Scheme has assessed the residual effects with mitigation. Landscape and ecological effects of the mitigated Scheme have been

assessed at the year of opening (year 1) and fifteen years after opening (year 15) when planting would have matured.

- 5.5.7.2 Significant effects were identified using the methodology set out under each of the specialist sections and is based on the significance criteria specified in IAN 81/06, where relevant. As described above, the methods for assessment vary depending on the topic under consideration. Where the methods, as set out in DMRB Volume 11, are very prescriptive, these have been followed. For other topics, where they are not prescribed new methods have been developed for this Scheme. Current best practice has been followed in the absence of any guidance.

5.5.8 Summary

- 5.5.8.1 At the end of each specialist section, a summary is provided of the significant effects.

5.6 Cumulative Effects

- 5.6.1.1 The EIA Regulations⁷ require an Environmental Impact Assessment to identify the potential for, and where present assess the cumulative effects. Chapter 17: Cumulative Effects describes the potential cumulative effects that could arise from the interaction between the construction and operation of the Scheme and other M25 widening schemes detailed in Section 1.2 along with other major land development projects in the area. In doing so consideration was given to the development status of the other developments and the probability of cumulative effects occurring.

- 5.6.1.2 The assessment considered the effects that may arise from the same scheme, or from different schemes in the area as follows:

- Multiple Effects: Determined by combining the same type of impacts arising from this and other schemes, which occur at the same or similar time and impact upon the same resource(s) or receptor(s)
- Different Multiple Effects: Determined by combining multiple different environmental impacts arising from this and other schemes, which occur at the same or similar time and impact upon a particular receptor or community
- Incremental Effects: Relate to the impact of a multitude of schemes (including maintenance operations) that have developed over a longer period of time. These individual impacts may be insignificant, but when considered together could be significant. For example, a widening scheme considered on its own may not have a large adverse impact on the environment. However, if the impacts of the Section 1 widening are considered in addition to the impacts of the other widening schemes and other schemes, the continuing development of the motorway could be considered to have had a large combined (cumulative) impact on the environment

6 Landscape Effects

6.1 Introduction

6.1.1.1 The chapter presents an analysis of the existing landscape character and visual amenity receptors within the identified study area and assesses the potential landscape and visual effects of the Scheme.

6.1.1.2 Further baseline and assessment details have been presented in the Landscape Effects Technical Report¹.

6.2 Regulatory Framework

6.2.1.1 Relevant legislation to the assessment is outlined below:

- Area of Outstanding Natural Beauty (AONB) (National Parks and Access to the Countryside Act)². The primary purpose of an AONB designation is to conserve and enhance the natural beauty of the landscape. The Countryside and Rights of Way Act 2000 (the "CRoW" Act)³ added further regulation and protection, ensuring the future of AONBs as important national resources.
- Planning (Listed Buildings and Conservation Area) Act⁴.
- Planning Policy Statement No. 7 (PPS7) Sustainable Development in Rural Areas⁶ provides advice on the role of the planning system in relation to the countryside including special considerations in designated areas, such as AONBs.

6.3 Methodology

6.3.1 Introduction

6.3.1.1 This assessment has been undertaken in accordance with the Design Manual for Roads and Bridges (DMRB)⁷. In addition, other guidance has been referenced to supplement DMRB and to produce a robust landscape and visual assessment including:

- Interim Advice Note (IAN) 77-82/06⁸
- Guidelines for Landscape and Visual Impact Assessment (GLVIA)⁹
- Landscape Character Assessment - Guidance for England and Scotland¹⁰

6.3.2 Study Area

6.3.2.1 An Indicative Visual Envelope (IVE) has been used to define the study area. The IVE describes the area within which the physical components, or changes caused by the Scheme would be perceived. The IVE includes all land within the Scheme Boundary. The boundary of the IVE has been determined through identification of major screening

elements in the landscape such as topography, settlements and woodland blocks and confirmed through a combination of desk study and site survey.

6.3.3 Establishment of Baseline Conditions

6.3.3.1 The baseline conditions consisted of two separate but related areas. These include:

- landscape character assessment, which is the description of the existing features and characteristics of the landscape, including its quality, value and sensitivity to change
- visual amenity assessment, which is the identification of receptors (people), the description of their views and their sensitivity to change

6.3.3.2 The baseline conditions has been based upon a combination of the following:

- relevant Structure, Local and Unitary Authority plans
- previously published assessments
- ordnance survey mapping ¹¹
- aerial photographs ¹²
- M25 Video Roadshow DVD, Clockwise/Anticlockwise. Junctions 16 – 23 October 2004¹³
- site surveys, October to November 2005, January to February 2006 and June 2006
- M25 ES Phase 1 Habitat Survey¹⁴

6.3.4 Evaluation of Landscape

6.3.4.1 The landscape within the study area has been classified into broad homogenous units of landscape character (landscape character areas), and landscape quality and value, based upon desk study and site survey.

6.3.4.2 A separate assessment of townscape has not been undertaken and any townscape elements, such as urban or suburban character and features, have been incorporated into the landscape assessment.

6.3.4.3 An assessment at the regional and county level has been undertaken using previously published landscape character assessments:

- The Countryside Agency, Countryside Character Volume 7: South East & London¹⁵
- Countryside Commission, Landscape Assessment The Chilterns Landscape¹⁶
- Buckinghamshire County Council, The Landscape Plan, Part 1: Landscape Assessment¹⁷
- Hertfordshire County Council, Landscape Character of Hertfordshire¹⁸
- Countryside Protection for Rural England (CPRE), Mapping Tranquillity¹⁹

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6.3.4.4 Landscape relevant designations and field surveys helped to determine the quality and value of the landscape character areas. Landscape quality was based on judgements about the condition of the landscape which creates a sense of place. Landscape value is the relative importance attached to a landscape, often established through designations or other recognition. Quality and value have been defined using the criteria in Table 6.1.

Table 6.1: Landscape Quality and Value

Category	Criteria
Highest Quality	Beautiful, distinctive, unique or outstanding natural landscape character, including significant degrees of amenity and tranquillity. Strong landscape structure, characteristic patterns and balanced combination of landform and land cover. Appropriate management for land use and land cover. Distinct features worthy of conservation. No detracting features. Sense of Place. Internationally or nationally recognised e.g. all or great majority of World Heritage Site and/or National Park and/or Area of Outstanding Natural Beauty (AONB).
Very Attractive	Very attractive, semi-natural or farmed landscape with distinctive or unusual features, including high degrees of amenity and tranquillity. Strong landscape structure, characteristic patterns and balanced combination of landform and land cover. Appropriate management for land use and land cover, but potentially scope to improve. Distinct features worthy of conservation. Occasional detracting features. Sense of Place. Nationally recognised: eg. localised areas within National Park and/or Area of Outstanding Natural Beauty (AONB).
Good	Attractive landscape with some positive distinctive features and a moderate degree of tranquillity and amenity. Recognisable landscape structure, characteristic patterns and balanced combination of landform and land cover are still evident. Scope to improve management for land use and land cover. Some features worthy of conservation. Occasional detracting features. Sense of Place. Regionally, locally recognised e.g. all or great majority of area of local landscape importance.
Ordinary	Typical, commonplace farmed landscape with limited variety or distinctiveness, with a low degree of tranquillity or amenity. Landscapes that have undergone change to the extent that they no longer have a distinctive local character. Distinguishable landscape structure, characteristic patterns and combinations of landform and land cover often masked by land use. Scope to improve management for land use and cover. Some features worthy of conservation. Prominent detracting features.
Poor	Monotonous, uniform landscape that has lost most of its natural features, lacking in tranquillity and amenity. Weak or degraded landscape structure, characteristic patterns of landform and land cover often masked by land use. Mixed or single land use dominates and/or is evident. Lack of management and intervention has resulted in degradation and disturbed or derelict land may require treatment. Frequent detracting features.

Source: DMRB ⁷ for the category terms; criteria based on examples in Appendix 6 of GLVIA ⁹

6.3.4.5 The landscape character areas have also been assessed according to their sensitivity. Sensitivity to change is the degree to which the landscape can accommodate change of the type and scale proposed without detrimental effects upon its character, quality and value. Landscape sensitivity is defined in Table 6.2.

Table 6.2: Landscape Sensitivity

Sensitivity to Change	Evaluation Criteria
High	Highest or very attractive quality landscape that would be unlikely to tolerate change and effective mitigation would be difficult to achieve.
Medium	Good landscape quality that would be tolerant of a small degree of change and effective mitigation would be possible, but results may take time to be effective.
Low	An ordinary or poor quality landscape that would be tolerant of a large degree of change and effective mitigation would be readily achievable.

Source: IAN 81/06⁸ and GLVIA⁹

6.3.5 Evaluation of Visual Receptors

6.3.5.1 Visual receptors include occupiers of residential properties, office buildings or places of work, users of public open space, public rights of way and other transport routes, such as roads and railways. Visual receptors have been identified within the IVE and their views described and illustrated. Visual receptors have also been assessed according to their sensitivity as defined in Table 6.3.

Table 6.3: Visual Receptor Sensitivity

Sensitivity	Receptors
High	Viewers with proprietary/high interest in their everyday visual environment and/or with prolonged and regular viewing opportunities. Such receptors would include: <ul style="list-style-type: none"> residents users of outdoor recreational facilities whose attention or interest may be focused on the landscape i.e. walkers, riders
Medium	Viewers with moderate interest in their environment and discontinuous and/or irregular viewing periods. Such receptors would include: <ul style="list-style-type: none"> workers (outdoors) users engaged in outdoor sport or recreation other than appreciation of the landscape (i.e., hunting, shooting, golf, water based activities)
Low	Viewers with a passing interest in their surroundings and momentary viewing periods. Such receptors would include: <ul style="list-style-type: none"> drivers/travellers and/or passengers of moving vehicles including rail passengers people at their place of work

Source: IAN81/06⁸ and GLVIA⁹

6.3.6 Assessment of Landscape and Visual Effects

Introduction

6.3.6.1 The assessment of landscape and visual effects combines judgements on sensitivity and the magnitude of impact to determine the overall significance (or severity) of effects.

Potential effects on the baseline landscape character and visual amenity, at both day and night-time have been considered at the following stages:

- during construction of the Scheme
- during operation, on a winter's day when the Scheme would be open to traffic, year 1. This assumed that many landscape mitigation measures, such as planting, have not had time to take effect. It is also assumed that the surrounding vegetation will not be in leaf so will offer little in the way of screening. Some mitigation measures would however have immediate effect, such as the location and design of the Scheme including bridges, lighting, gantries and environmental barriers, retention of existing vegetation and the avoidance of areas of landscape value
- during operation, on a summer's and winter's day, year 15, when it has been assumed that the mitigation measures would have reached maturity
- night-time during operation, during winter when the Scheme would be open to traffic, year 1 and during summer and winter, year 15

Magnitude of Landscape Impacts

6.3.6.2 The magnitude of landscape impact is the degree, nature and duration of change as a result of the construction and operation of the Scheme. Landscape impacts have been determined by the character and quality of the landscape and its sensitivity to accept changes of the type and scale proposed. Definitions of magnitude of landscape impact are outlined in Table 6.4.

Table 6.4: Magnitude of Landscape Impact

Magnitude	Definition
Major	Total loss of or major change to elements, features or characteristics of a landscape of high sensitivity
Moderate	Partial loss of or change to elements, features or characteristics of a landscape of high/medium sensitivity
Minor	Minor loss of or change to elements, features or characteristics of a landscape of medium/low sensitivity
Negligible	Very minor loss or change to elements, features or characteristics of a landscape of low sensitivity
No Change	No loss or alteration of elements, features or characteristics

Source: IAN 81/06⁸ and GLVIA ⁹

Significance of Landscape Effects

6.3.6.3 Significance is a qualitative (subjective) measure of the severity of predicted effects upon the landscape, directly or indirectly arising from the Scheme. Significance has been determined by correlating the magnitude of impact (refer to Table 6.4) and the quality, value and sensitivity of the landscape to that change (refer to Tables 6.1 and 6.2). Their relationship is presented in Table 6.5.

Table 6.5: Significance of Landscape Effect

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

Source: IAN 81/06⁸ and GLVIA⁹

6.3.6.4 Descriptions of the significance of landscape effects are defined in Table 6.6.

Table 6.6: Definitions of Significance of Landscape Effect

Significance	Criteria
Very large/Large beneficial (positive)	Very few if any Schemes are likely to merit this score
Moderate beneficial (positive)	The Scheme would: <ul style="list-style-type: none"> fit very well with the scale, landform and pattern of the landscape have the potential, through mitigation, to enable the restoration of characteristic features, partially lost or diminished as the result of changes resulting from intensive farming or inappropriate development enable a sense of place and scale to be restored through well-designed planting and mitigation measures, that is, characteristic features are enhanced through the use of local materials and species used to fit the Scheme into the landscape enable some sense of quality to be restored or enhanced through beneficial landscaping and sensitive design in a landscape which is not of any formally recognised quality further government objectives to regenerate degraded countryside
Slight beneficial (positive)	The Scheme would: <ul style="list-style-type: none"> fit well with the scale, landform and pattern of the landscape; incorporate measures for mitigation to ensure they will blend in well with surrounding landscape enable some sense of place and scale to be restored through well-designed planting and mitigation measures maintain or enhance existing landscape character in an area which is not a designated landscape, nor vulnerable to change avoid conflict with government policy towards protection of the countryside
Neutral	The Scheme would: <ul style="list-style-type: none"> complement the scale, landform and pattern of the landscape incorporate measures for mitigation to ensure that the Scheme will blend in well with surrounding landscape features and landscape elements avoid being visually intrusive nor have an adverse impact on the current

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Significance	Criteria
	<p>level of tranquillity of the landscape through which the route passes</p> <ul style="list-style-type: none"> • maintain existing landscape character in an area which is not a designated landscape, that is, neither national or local high quality, nor is it vulnerable to change • avoid conflict with government policy towards protection of the countryside
Slight adverse (negative)	<p>The Scheme would:</p> <ul style="list-style-type: none"> • not quite fit the landform and scale of the landscape • impact on certain views into and across the area although not very visually intrusive • not be completely mitigated for because of the nature of the Scheme itself or the character of the landscape through which it passes • affect an area of recognised landscape quality • conflict with local authority policies for protecting the local character of the countryside
Moderate adverse (negative)	<p>The Scheme would:</p> <ul style="list-style-type: none"> • be out of scale with the landscape, or at odds with the local pattern and landform • be visually intrusive and would adversely impact on the landscape • not be possible to fully mitigate for, that is, mitigation would not prevent the Scheme from scarring the landscape in the longer term as some features of interest would be partly destroyed or their setting reduced or removed • have an adverse impact on a landscape of recognised quality or on vulnerable and important characteristic features or elements • be in conflict with local and national policies to protect open land and nationally recognised countryside as set out in PPG7 and PPG2
Large adverse (negative)	<p>The Scheme would:</p> <ul style="list-style-type: none"> • be very damaging to the landscape in that it would be at considerable variance with the landform, scale and pattern of the landscape • be visually intrusive and would disrupt fine and valued views characteristic of the area • be likely to degrade, diminish or even destroy the integrity of a range of characteristic features and elements and their setting • be substantially damaging to a high quality or highly vulnerable landscape, causing it to change and be considerably diminished in quality; • not be adequately mitigated for • be in serious conflict with government policy for the protection of nationally recognised countryside as set out in PPS7
Very large adverse (negative)	<p>The Scheme would:</p> <ul style="list-style-type: none"> • be at complete variance with the landform, scale and pattern of the landscape • be highly visual and extremely intrusive, destroying fine and valued views both into and across the area • irrevocably damage or degrade, badly diminish or even destroy the integrity of characteristic features and elements and their setting • cause a very high quality or highly vulnerable landscape to be irrevocably changed and its quality very considerably diminished

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Significance	Criteria
	<ul style="list-style-type: none">• not be mitigated for, that is, there are no measures that would protect or replace the loss of a nationally important landscape• not be reconciled with government policy for the protection of nationally recognised countryside as set out in PPS7

Source: IAN 81/06⁸.

Determining the Magnitude of Visual Impacts

6.3.6.5 The magnitude of visual impacts is the extent of change upon visual amenity receptors as a result of the construction and operation of the Scheme. Visual impacts have been determined by:

- the scale of change in the view with respect to the loss and/or addition of features
- the degree of contrast, or integration of, any new features with existing features in the view
- the duration of the effect (temporary or permanent, intermittent or continuous)
- the distance of the visual amenity receptor from the source of the impact
- the angle of view and presence of intervening vegetation or features
- the dominance of the impact feature in the view

6.3.6.6 Definitions of magnitude of visual impact are outlined in Table 6.7.

Table 6.7: Assessment of Magnitude of Visual Impact.

Magnitude	Definition
Major	The Scheme would dominate or form a significant and immediately apparent part of the view that effects and changes its overall character.
Moderate	The Scheme would form a visible and recognisable new element of the view within the overall character.
Minor	The Scheme would constitute only a minor component of the wider view.
Negligible	Only a very small part or no part of the Scheme would be visible.
No Change	No observable change in view.

Source: IAN 81/06⁸ and GLVIA⁹

Assessing the Significance of Visual Effects

6.3.6.7 Significance is a qualitative (subjective) measure of the severity of predicted effects on the views from identified visual amenity receptors arising from the Scheme. Significance has been determined by correlating the magnitude of impact (refer to Table 6.7) and the sensitivity of the receptor (refer to Table 6.2). Their relationship is presented in Table 6.8.

Table 6.8: Significance of Visual Effects

		Visual Amenity Receptor Sensitivity		
		High	Medium	Low
Impact Magnitude	Major	Very Large/Large	Large/Moderate	Moderate/Slight
	Moderate	Large/Moderate	Moderate/Slight	Slight
	Minor	Moderate/Slight	Slight	Slight/Neutral
	Negligible	Neutral	Neutral	Neutral
	No Change	Neutral	Neutral	Neutral

Source: IAN 81/06⁸ and GLVIA⁹

6.3.6.8 Descriptions of the significance of visual effects are presented in Table 6.9.

Table 6.9: Definitions of Significance of Visual Effect

Significance	Criteria
Very large adverse	The Scheme would cause a very significant deterioration in the existing view
Large adverse	The Scheme would cause a significant deterioration in the existing view
Moderate adverse	The Scheme would cause a noticeable deterioration in the existing view
Slight adverse	The Scheme would cause a barely perceptible deterioration in the existing view
Neutral	No discernible deterioration or improvement in the existing view
Slight beneficial	The Scheme would cause a barely perceptible improvement in the existing view
Moderate beneficial	The Scheme would cause a noticeable improvement in the existing view
Large beneficial	The Scheme would cause a significant improvement in the existing view
Very large beneficial	The Scheme would cause a very significant improvement in the existing view

Source: IAN 81/06⁸ and DMRB⁷

6.3.6.9 A schedule of visual amenity receptors has been produced describing the magnitude of impacts and significance of effects. To aid in the interpretation of impacts, photomontages have been generated from key locations.

6.3.6.10 Further details on the schedule, photomontage and IVE requirements are found in the Landscape Effects Technical Report.

6.3.7 Assessment of Night-Time Baseline Conditions and Effects

6.3.7.1 The night-time effects have also been assessed on both the landscape character and visual receptors within the identified study area.

Baseline Conditions

6.3.7.2 A desk and field survey has been undertaken to establish the night-time baseline conditions. The night-time assessment involved:

- an evaluation of the night-time landscape character, quality and sensitivity
- an evaluation of the view and sensitivity of visual amenity receptors
- a quantitative survey of existing light spillage at each identified visual receptor which concentrated on those receptors identified within 50 metres of the Scheme as it was determined that these receptors would experience the greatest degree of change

Quality, Value and Sensitivity of Night-time Receptors

6.3.7.3 The quality, value and sensitivity of the night-time landscape character and visual amenity receptors has been determined. Quality and value was based on a determination of the 'perceived darkness' of areas or views. For example, intrinsically dark areas and views within or of dark areas, such as within the AONB, were of the highest quality and value, and towns with high levels of lighting or views of or within were of the lowest quality and value.

6.3.7.4 Night-time sensitivity, which is the extent to which the night-time landscape and visual receptors can incorporate increased lighting levels, was directly correlated to the quality and value of the baseline conditions. Thus the highest quality night-time landscape or visual receptor was assessed as being of the greatest sensitivity to change, whilst a poor night-time landscape or visual receptor was assessed as with the lowest sensitivity to change.

6.3.7.5 Further detail on the methodology can be found in the Landscape Effects Technical Report.

Magnitude of Night-Time Impacts and the Significance of Effects

6.3.7.6 To determine the magnitude of night-time impacts and the significance of effects, the sensitivity of the landscape character and visual amenity receptor was balanced against the degree of impacts caused by the proposed lighting, sign lighting and traffic associated with the Scheme.

6.3.7.7 To determine the impacts of lighting on individual visual amenity receptors, industry standard light modelling software was used to determine the likely luminance levels on receptors within 50 metres of the Scheme.

6.3.8 Mitigation Measures

6.3.8.1 Mitigation measures have been considered during two phases. These include:

- construction phase where objectives and methodologies to reduce and manage adverse impacts of construction work have been developed
- operation phase where the Scheme design has been developed in accordance with current best practice and minimum design standards

6.3.8.2 Landscape mitigation measures:

- form an integral part of the Scheme design, such as the location and design of the Scheme including bridges, lighting, gantries and environmental barriers, retention of existing vegetation and the avoidance of areas of landscape value. These are considered during construction and operation (year 1: winter)
- are additional to the Scheme design, such as planting and would seek to reduce and improve identified impacts. These are considered during operation (year 15: summer and winter)

6.3.8.3 The design process and the mitigation measures employed to reduce and manage the effects of the Scheme have been described within the Design and Mitigation section.

6.4 Baseline Conditions

6.4.1 Landscape Designations

6.4.1.1 An overview of landscape designations within the study area are outlined below. The location of the landscape designations are illustrated on Figure 6.1: Landscape Planning Designations.

The Chilterns Area of Outstanding Natural Beauty (AONB)

6.4.1.2 The Chilterns AONB is located just north of Junction 18, largely to the north and north west enclosing both sides of the motorway.

6.4.1.3 The Chilterns AONB has a strong, attractive and high quality landscape character where a distinctive landform of valleys and plateaux dominates and provides unity in a diverse and varied landscape.

6.4.1.4 The AONB is characterised by smooth, rounded, chalky slopes and valleys with only a few rivers that run north-west to south-east. The area is dominated by the River Chess, a dominant feature surrounded by a wide, flat, pastoral flood plain, occasionally enclosed by alders and other small trees. The valley sides rise steeply and are often clothed with beech, mixed with farmland. This mix of landform and vegetation, and the absence of railways and major roads, produces a tight, enclosed, harmonious and secret landscape. The buildings and settlements complement the harmony of the landscape, with a scattering of isolated old farms and picturesque villages.

Colne Valley Park

6.4.1.5 The Colne Valley Park broadly encloses the motorway on both sides between Junctions 16 and 17. It extends from the expansive wetlands and reservoirs of the Thames floodplain in the south to the chalk hills on the edge of the Chilterns to the north.

6.4.1.6 The Colne Valley Park comprises a chain of green spaces, which includes urban open spaces and unspoilt countryside. The key aims of the park are: to maintain and enhance the landscape, to resist urbanisation within the Colne Valley, to conserve the nature conservation resources of the park and to provide accessible facilities and opportunities for countryside recreation.

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Watling Chase Community Forest

6.4.1.7 The Watling Chase Community Forest is situated between Junctions 21 and 23 and encloses both sides of the motorway. It covers an area of 188 square kilometres in Hertfordshire and north London around the towns of Potters Bar, St Albans, Bushey, Borehamwood and Barnet. It consists of a mixture of farmland, meadows, wildlife areas, hedgerows and woodland as well as public open space and urban fringe. The key aims of the forest are to regenerate and revitalise the green space in and around major towns and cities and to create well-wooded environments for work, wildlife, recreation and education.

Tree Preservation Orders

6.4.1.8 Within the study area a number of trees and woodland areas, are protected by Tree Preservation Orders (TPO). The TPOs mainly occur between Junctions 16 to 17 and 21a to 22. There are no TPOs located within the Scheme Boundary. Some TPOs lie immediately outside the Scheme Boundary, including Gladwin's Wood and Oakend and Denham Marsh Woods.

6.4.1.9 Further detail on the location of TPOs is found in Landscape Effects Technical Report.

Ancient Woodlands

6.4.1.10 A number of woodland areas within the study area have been recognised as ancient woodland as illustrated on Figure 7.1: Designated Ecological Sites.

Local Landscape Relevant Designations

6.4.1.11 There are a number of landscape designations within the study area, defined by the relevant Local Authority in their Local Plan, which provide recognition to the existing landscape. These include:

- The South Hertfordshire Plateau Landscape Region: This is situated away from the M25 to the east of Junction 17, to the west of Watford. It is defined as an area of high ground, fragmented by settlements and urban fringe leisure use.
- The Chilterns Landscape Region: This is situated from north of Junction 16 to north of Junction 17, to the west of the M25 and both sides of the M25 from south of Junction 18 to Junction 20. It is defined as a landscape of high scenic quality, a small portion of which is within the Chilterns AONB.
- The Central River Valleys Landscape Region: This is situated north of Junction 16 up to Junction 17 to the east of the M25, wrapping around the fringes of Watford to the east of the M25. It is defined as a low lying, broad shallow valley dominated by corridors of communication and urbanisation.

6.4.1.12 These landscape regions are not restrictive landscape designations, but provide a comprehensive method of considering landscape as part of the planning process.

Other Relevant Designations

6.4.1.13 A number of other designations occur within the study area that are relevant to the landscape and visual assessment. These include numerous Listed Buildings and Conservation Areas. Further details can be found in Chapter 12: Cultural Heritage.

6.4.2 Topography

6.4.2.1 The topography in the study area comprises three rivers and their valleys, which combine with dry chalk valleys to create a gently undulating landform of low hills and flat plains. The topography of the study area is illustrated in Figure 6.2: Topography.

6.4.3 Landscape Character

General

6.4.3.1 An overview of regional and county landscape character areas within the study area is outlined below. Landscape type descriptions have helped to inform the landscape character areas and these are provided in detail in the Landscape Effects Technical Report.

6.4.3.2 The location of the landscape character areas are illustrated on Figure 6.3: Landscape Character Areas.

Regional Landscape Character

6.4.3.3 The following three regional landscape character areas are present within the study area.

110: Chilterns Regional Landscape Character Area

6.4.3.4 This area is located from just south of Junction 18 to Junction 20, largely to the west of the M25, but cutting back and forth over the motorway corridor. Key characteristics include:

- chalk hills and plateau with a prominent escarpment in many places
- extensive dip slopes with numerous dry valleys
- remnants of chalk down land on the escarpment and valley sides
- extensive areas of down land invaded by scrub
- the most extensive areas of beech woodland in the county on the plateau and 'hanging' woodlands in the valleys
- enclosed and intimate landscapes of the valleys contrasting with the more open plateau top and extensive views from the scarp to the clay vale below
- small fields and dense network of ancient hedges, often on steep ground. The agricultural landscape is often dominated by hedges, trees and small woodlands
- many areas of semi-open common land on the plateau

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- scattered villages and farmsteads, some of medieval origin, displaying consistent use of traditional building materials including flint, brick and clay tiles
- network of ancient green lanes and tracks including the Ridgeway, which links numerous archaeological sites and settlements

111: Northern Thames Basin: Hertfordshire Plateau and River Valleys Regional Landscape Character Area

6.4.3.5 This area is located from just south of Junction 19 to Junction 23, although from south of Junctions 19 to east of Junction 20, the area cuts back and forth over the M25 corridor. Key characteristics include:

- a diverse landscape with a series of broad valleys containing the major rivers Ver, Colne and Lea with extensive areas of broadleaved woodlands being the principal features. The landform is varied with a wide plateau divided by the valleys
- Hertfordshire's large towns, the M25 and M1 motorways, railway line and prominent electricity pylons are a major influence on character
- floodplain land is commonly arable sub-divided by hedgerow-deficient field boundaries and open grazing remains in some areas
- many river valleys have been extensively modified by reservoirs, current and reclaimed gravel pits, landfill sites, artificial wetlands, river realignments and canals
- smaller, intimate tree-lined valleys supporting red brick villages provide a contrast to the more heavily developed major river valley floodplains. Within these river valleys, organic field shapes are common, defined by watercourses and the legacy of woodland clearances rather than formal enclosure patterns
- broader plateau areas are mainly in agricultural use, with field patterns exhibiting the regular shape characteristic of 18th century enclosures

115: Thames Valley Regional Landscape Character Area

6.4.3.6 This area is located from Junction 16 to north of Junction 17, enclosing the motorway corridor. Key characteristics include:

- hydrological floodplain of the river Thames as a landscape feature produces unity to the large areas of fragmented agricultural land
- the western Thames valley is wide and flat with the river barely discernible, occupying only a small part of the geological floodplain
- woodlands characterise the north-western area, the wooded character extending up to the southern ridge of the Chiltern Hills
- to the south, the Thames floodplain dominates with its associated grazing land, becoming characterised by a number of small historic landscapes on higher ground such as Windsor Park
- towards London in the east, the natural character of the area is overtaken by urban influences, a dense network of roads including the M25 corridor, Heathrow

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Airport, railway lines, golf courses, pylon lines, reservoirs, extensive mineral extraction and numerous flooded gravel pits

County Landscape Character Assessment

6.4.3.7 Set within the regional landscape character area framework as outlined above, Buckinghamshire and Hertfordshire Counties have produced landscape character assessments. The Buckinghamshire/Hertfordshire County boundary crosses the M25 between Junctions 16 and 17 at Shire Lane.

6.4.3.8 The County Landscape Character Areas present within the study area are summarised below. Their location is also illustrated in Figure 6.3: Landscape Character Areas.

Z12: Colne Valley Landscape Character Zone

6.4.3.9 This area is located largely to the east and west of the M25, crossing the motorway between Junctions 16 and 17. Key characteristics include:

- shallow poorly defined valley
- landscape dominated by development, major roads and pylon lines
- large areas of disturbed ground associated with landfill and mineral extraction
- landscape and wildlife associated with watercourses
- little woodland, approximately 6% cover
- poorly restored land after mineral extraction
- includes Colne Valley Park

6.4.3.10 The M25 threads up the shallow valley mainly at or near ground level and is accompanied by some major screening earthworks. However, major road embankments at the M4/M25 interchange and the elevated M40/A40 at Denham are visually intrusive. The on and off site planting carried out to help integrate the M25 is slowly reducing the wider indirect effects of the motorway on this area. The general character of much of the area is one of disturbed urban fringe landscape.

6.4.3.11 The quality of the landscape character area is good and the sensitivity of the landscape is medium.

Z13: Wooded Plateau Landscape Character Zone

6.4.3.12 This area encloses Junction 16 and the M25, north of Junction 16. Key characteristics include:

- a gently sloping wooded plateau of a wild unkempt character
- unfenced woodland and common land with public access
- quarries and major roads
- security fencing, imposing gateways, signage and lighting dominate
- includes Colne Valley Park

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6.4.3.13 The area slopes gently towards the Thames forming an upper terrace of the river that is dissected by several small incised streams. Areas of urban development encroach on all sides with the M40, M25, other major roads and sand and gravel workings degrading the landscape character on the fringes of the zone. The M40, M25 and gravel workings are prominent and dominate the landscape character.

6.4.3.14 The quality of the landscape character area is good, and the sensitivity of the landscape is medium.

Z9: River Valleys Landscape Character Zone

6.4.3.15 This area is located to the north of Junction 16 and crosses the M25 between Junctions 16 and 17. Key characteristics include:

- deep steep-sided valleys with gently sloping or flat bottoms
- woodland cover predominantly on upper valley sides
- major road and rail routes and development concentrated in valley bottom
- hedgerows accentuate subtle folds in landform
- remnant historic landscape patterns and orchards
- designed parkland and country houses
- includes Colne Valley Park

6.4.3.16 The quality of the landscape character area is good, and the sensitivity of the landscape is medium.

1: Maple Cross Slopes Landscape Character Area

6.4.3.17 This area is located to the south of Chorleywood and Rickmansworth enclosing the M25 to the south of, and including, Junction 17. Key characteristics include:

- strong east-facing slopes with snaking dry valleys pushing westwards
- large arable fields east of the M25 with minimal hedgerows
- visually prominent urban development on lower slopes and along the A412
- woodland areas concentrated on the slopes of the narrow dry valleys to the west
- M25 major feature on the skyline to the west
- views from the upper slopes to the east across the Colne valley
- includes Colne Valley Park

6.4.3.18 This is a very open area of arable fields to the east with extensive views across, along and from local and major roads. The M25 is both visually and audibly a major feature throughout the area on the upper slopes. To the west the landscape becomes more intimate and enclosed, with blocks of woodland and steeply rising and twisting landform providing containment. West of the M25 there is a largely pastoral wooded farmland pattern although there is some arable farmland present. Significant blocks of woodland occupy some of the steeper slopes, creating pronounced features on the horizon. To the

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north of the area and adjacent to the M25 much of the farmland has been altered to form new enclosures. Field sizes are large and irregular in shape.

6.4.3.19 The quality of the landscape character area is good, and the sensitivity of the landscape is medium.

2: Heronsgate Heights Landscape Character Area

6.4.3.20 This area is located to the west of the Junction 17, crossing and enclosing the M25 to the north of the junction. Key characteristics include:

- woodland areas that flow over the slopes into the narrow dry valleys to the east
- M25 is a major feature on the skyline to the east
- sinuous though level plateau with considerable pasture and equestrian land
- coherent settled pattern
- parkland areas, some in institutional uses
- Heronsgate settlement and Chorleywood Common are present

6.4.3.21 This area is a gently undulating and sinuous plateau, locally divided by narrow chalk valleys. A small to medium-scale landscape, it is wooded and treed, which helps to create a visually contained and coherent appearance. Views of the area are generally restricted by vegetation and the elevated plateau landform. Views within the area are generally filtered by vegetation, housing and contained by hedgerows along narrow roads. It is private and relatively remote, despite the proximity to the M25 and the neighbouring settlements. It has a coherent and unified character with mature trees having a strong influence on the wider landscape character.

6.4.3.22 The quality of the landscape character area is good. The sensitivity of the landscape is medium.

106: Middle Chess Valley Landscape Character Area

6.4.3.23 This area is located within the Chilterns AONB to the north of Rickmansworth crossing the M25 to the north of Junction 18. Key characteristics include:

- high quality chalk river flowing through a narrow valley floor with species rich water meadows
- small parklands on slopes and valley floor at Goldingtons and Latimer
- interlocking mixed woodlands along valley providing visual containment
- some good hedges to slopes, but neglected fences and hedges to valley floor and along Flaunden Bottom
- scattered/dispersed settlement along the Chess valley, remote and empty along Flaunden Bottom
- good range of vernacular building styles and built forms including mill houses
- the Chilterns AONB

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6.4.3.24 The main valley has a strong sense of visual unity and historical continuity. The Chess is a shallow fast flowing river that still retains active watercress beds by the ford at the Chenies Road. The associated meadows and wet woodlands are essentially intact. The valley slopes are steep with interlocking woodlands providing strong visual enclosure. The valley is a peaceful, intimate and largely harmonious landscape.

6.4.3.25 Distinctive features include Sarratt Bottom watercress beds, mill houses, chase and fords, the Chess Valley Walk, relic parkland trees and a modest flint church on the edge of the plateau at Sarratt.

6.4.3.26 The quality of the landscape character area is very attractive. The sensitivity of the landscape is medium.

6: Lower Chess Valley Landscape Character Area

6.4.3.27 This area follows the Chess Valley between the M25 in the north-west between Junctions 17 to 18 and its confluence with the River Gade and Colne. Key characteristics include:

- strongly north-east and south-west facing slopes
- urban development generally well concealed in tree groups or set back on the higher ground
- narrow floodplain with meandering small river
- M25 is a major feature crossing the valley to the north west
- grounds of Rickmansworth Park, now Royal Masonic School, is prominent
- a small area of the Chilterns AONB

6.4.3.28 This area has a mixed though coherent pattern of land cover including riverside meadow and arable land cover. From Loudwater to the M25 the area is settled, with low-density housing set in mature and well-treed ground, both along the valley floor and on the side slopes. Houses are concealed behind groups of mature trees. To the north an aquatic garden centre has a pleasant setting alongside the river, dominated by the traffic on the M25. This is a contained landscape due to the strong valley landform and tree cover on the upper slopes. Views are limited due to woodland groups on the valley floor or the curving nature of the valley. Apart from adjacent to the M25 the area is secluded and quiet.

6.4.3.29 The quality of the landscape character area is very attractive. The sensitivity of the landscape is medium.

7: Sarratt Plateau Landscape Character Area

6.4.3.30 This area is located between the valleys of the River Chess to the west and the River Gade to the east and encloses the M25 to the east and west from north of Junction 18 to north of Junction 19. Key characteristics include:

- extensive level plateau with considerable pastoral and equestrian land use
- narrow twisting steep-sided valleys dissecting the plateau
- mix of woodlands including ancient plantation and parkland shelterbelts

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- coherent settled pattern of farms and historic villages set around greens and commons
- arable planned estate area to the east
- parkland areas, some in educational and institutional uses
- M25 and associated features sever the area
- Chipperfield and Commonwood commons
- few detracting features

6.4.3.31 This is a gently undulating plateau locally divided by steep-sided narrow chalk valleys. The area has a mature settled appearance with a number of traditional farm buildings, parklands and a predominantly pastoral land use. There is minimal impact from intrusive 20th century development. Chipperfield Common and Commonwood Common are important for recreation.

6.4.3.32 Distinctive features include Sarratt Green, beech woods in chalk valleys, Westwood quarry, which is a large area of disturbed and unrestored ground that is highly visible from the M25 and a range of vernacular buildings. The M25 and its associated pylons and radio masts are dominant features.

6.4.3.33 The quality of the landscape character area is good. The sensitivity of the landscape is medium.

11: Lower Gade Valley Landscape Character Area

6.4.3.34 This area follows the Gade Valley and its side slopes from Hunton Bridge into Watford to the east of the M25 between Junctions 19 to 21. Key characteristics include:

- narrow valley floor with wide canal and wetland habitats
- historic parkland landscapes, some in declining condition
- historic houses set on the plateau edge overlooking the valley
- arterial routes and M25 to the north
- gently sloping valley sides with minor secondary valleys
- urban development screened by vegetation or set back from the slopes
- major woodland complex at Whippendell Wood centred on narrow steep dry valley
- individual woods within parklands
- extensive public access to the south
- important mosaic of wildlife habitats adjacent to urban population

6.4.3.35 The primary land cover is parkland and woodland where recreation, golf, playing fields and institutional uses dominate. There are also small areas of pastoral farmland. The landscape is generally well contained from surrounding areas, with limited views from the edge of roads encircling the parks, the adjacent plateau and built-up areas. The

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landscape is compartmentalised, with a sense of containment in the parklands and confinement within Whippendell Woods. The M25 Watford spur severs the area north of The Grove. There is a reasonable level of tranquillity to the south, particularly along the canal from The Grove to Cassiobury, while to the north the M25 and Euston railway line dominate.

6.4.3.36 The quality of the landscape character area is very attractive. The sensitivity of the landscape is medium.

8: The Upper Gade Valley Landscape Character Area

6.4.3.37 This area follows the Gade Valley and associated side slopes and encloses the M25 from west of Junction 20 to the west of Junction 21. Key characteristics include:

- level valley floor
- multiple arterial routes including roads, rail and canal
- steeply sloping valley slopes with secondary valleys running perpendicular to the Gade
- high proportion of 20th-century built development, both in the valley and on the slopes
- linear woodland on steep slopes and edge of adjacent plateau
- pastoral slopes in the west and arable to the east
- meadow pasture on the valley floor
- medium-scale parklands overlooking the valley
- M25 viaduct is a major landmark along the valley

6.4.3.38 This area is a narrow but marked floodplain. Steep slopes rise to either side with occasional dramatic open views across the valley. Major land use on the valley floor and west slopes is pastoral with some recreation. On the eastern slopes there is a mix of arable and pasture. The area is visually and functionally divided by built development, including industrial uses along the valley floor and more noticeably up the valley sides, where residential development follows roads that run steeply perpendicular up the slopes.

6.4.3.39 The M25 viaduct as a major landmark hovering over the flood meadows.

6.4.3.40 The quality of the landscape character area is good. The sensitivity of the landscape is medium.

9: Bedmond Plateau Landscape Character Area

6.4.3.41 This area encloses the M25 to the west of Junction 21. Key characteristics include:

- gently undulating plateau with pastoral and equestrian land dominating
- narrow straight lanes to the west
- winding narrow roads to the east

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- discrete woodlands including both ancient woodland and plantations
- coherent settled pattern of farms
- small parkland areas in educational and institutional use
- M25, partially in cutting, severs the area

6.4.3.42 This is a gently undulating plateau area of small to medium sized fields that are predominantly pasture although arable land occurs to the east. Woodlands are discrete and modest except for Hanging and Piecorner Woods to the east of Bedmond. The landscape is visually contained and coherent with a mature and settled appearance arising from a number of traditional farms. Twentieth century development is chiefly residential ribbon development with long gardens.

6.4.3.43 Distinctive features include the thatched Ovaltine Dairy Farm, pig farms, the wireless station on Hyde Lane and a mature treed cemetery on East Lane.

6.4.3.44 The transport pattern is regular with a series of parallel lanes including Bunker's Lane, Hyde Lane and Harthall Lane. To the east of Bedmond Road, which connects Watford to Hemel Hempstead, the pattern is of narrow winding lanes with hedge banks, such as East Lane and Whitehouse Lane. The M25, although partially in cutting, severs the area.

6.4.3.45 With the exception of selected views to the M25, the area is generally well concealed and enclosed due to the elevated landform. There are more open views to the wooded edge from the arable land to the east. The scale of fields and dense hedges means that the landscape is relatively well contained. The area has a coherent and unified character, although the M25 is a major influence.

6.4.3.46 The quality of the landscape character area is good. The sensitivity of the landscape is medium.

10: St. Stephens Plateau Landscape Character Area

6.4.3.47 This area encloses Junction 21 and is dissected by the M1, M25 and M10 motorways. Key characteristics include:

- undulating plateau to north, gently sloping to south east
- medium/large open arable fields
- visually interlocking mixed woodlands to north
- motorways and interchanges with associated earthworks, lights and traffic dominate
- narrow winding lanes with sparse clipped hedgerows
- built edge of urban settlements to east
- dispersed settlement with scattered farmsteads
- part of Watling Chase Community Forest

6.4.3.48 This is a landscape of predominantly open arable fields, which slope from north-west to south-east. To the north several large mixed woodlands create a local sense of enclosure. Elsewhere hedgerows are sparse with few individual trees. The settlement

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pattern is dispersed, connected by a series of narrow winding lanes. A strong network of motorways and junctions overlies the historic land-use pattern. Wooded horizons are common to the north, west and south, whilst to the east the built edge of St Albans and Chiswell Green is prominent.

6.4.3.49 The M25/M1 interchange is well integrated in the surrounding landscape. Considerable earthworks and new planting reduces the scale of the interchange and its effect on the area.

6.4.3.50 The quality of the landscape character area is good. The sensitivity of the landscape is medium.

17: Ver-Colne River Valley Landscape Character Area

6.4.3.51 This area crosses the M25 between Junctions 21 and 22. Key characteristics include:

- well defined linear river corridor from St Albans to Watford
- flat sinuous floodplain with ecologically important floodplain meadows
- steeper valley sides including arable farmland, golf courses and restored land
- parklands fronting river at Munden Hall and Wall Hall
- area of restored mineral workings in river floodplain
- fragmentation of linear valley form and loss of tranquillity where crossed by the M25, M1 and A414
- sense of rural seclusion between Otterspool and Colne/Ver confluence with attractive riverside views
- visual intrusions from urban fringe development at Watford, Park Street, Colney Street and St Albans
- Watling Chase Community Forest

6.4.3.52 The area is a narrow river valley corridor, which skirts a mosaic of settlements, parkland, farmland and both active and restored mineral workings. The River Ver and Upper Colne occupy a meandering floodplain that is grazed by livestock at a number of locations. Riparian willow plantations line the rivers along part of the course whilst south of Park Street restored wetland mineral workings provide recreational opportunities. A number of distinctive features punctuate the river landscape including parklands, rivers and fords. Side slopes and vegetation visually contain the valley, which generally conceal the presence of adjoining settlements. The Ver-Colne Valley Walk provides good pedestrian access.

6.4.3.53 Distinctive features of the area include a mature beech avenue at Munden, ford crossings of the river, stands of willow, converted mills at Moor Mill and Sopwell, the vernacular Three Valleys pumping stations and the threaded river course south of Munden Hall.

6.4.3.54 The area is, however, crossed by a number of motorways and trunk roads, including the M1, M25 and the A414. These major roads are significant features in the area.

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6.4.3.55 The quality of the landscape character area is very attractive. The sensitivity of the landscape is medium.

18: Bricket Wood Landscape Character Area

6.4.3.56 This area crosses the M25 between Junctions 21 and 22. Key characteristics include:

- a number of woodlands, some of which are ancient including Bricket Wood and How Wood
- unrestored and partly restored mineral workings
- strong severance by the M25 and railway line
- secretive and secluded character of Bricket Wood Common
- tall and poorly managed hedgerows
- scattered industrial and residential properties
- Watling Chase Community Forest

6.4.3.57 This is an area of mixed land use and traditional character, including considerable woodland, unrestored mineral workings, educational, industrial, horticultural and arable land. The area has undergone significant changes in the 20th century and is impinged upon by settlement and Bricket Wood and How Wood, together with a marked severance by the M25. The historic pattern is well preserved in Bricket Wood Common, but eroded in many other locations, showing poor management and some dereliction.

6.4.3.58 Distinctive features of the area include the ornamental grounds of HSBC College and associated sports centre and the wells and ponds of Bricket Wood Common. The M25 is a major built feature in the area and causes severance throughout the region. Consequently, extensive new planting at Black Green Wood has been undertaken to create a new woodland edge.

6.4.3.59 The quality of the landscape character area is good. The sensitivity of the landscape is medium.

19: Vale of St. Albans Landscape Character Area

6.4.3.60 This area is located south of St Albans enclosing the M25 east of Junction 21A and east of Junction 22. Key characteristics include:

- broad shallow basin
- extensive views along the Vale and up to Shenley Ridge
- a predominately arable landscape with few small or medium copses and with some grazing on restored land
- areas of woodland and parkland to north east in association with Tyttenhanger Park
- active and restored mineral extraction sites along the course of the Colne and at Radlett aerodrome. Mix of wetland restoration and landfill sites

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- institutional parkland landscapes associated with redundant Victorian psychiatric hospitals at Napsbury and Harperbury
- M25 corridor, overhead pylons and associated urban fringe development
- new planting associated with the road corridor and adjacent land uses
- Watling Chase Community Forest

6.4.3.61 This area forms a broad and shallow basin of the upper River Colne, with some extensive panoramas over arable fields both along the Vale and up towards Shenley Ridge to the south. Mixed land uses include arable, extensive areas of active and restored mineral extraction and urban fringe development. Areas of wooded farmland estate characterise the area to the north east.

6.4.3.62 Distinctive features of the area include Harper Lane Quarry complex including rail aggregates depot and ready – mix concrete bagging plant, historic houses at North Mymms, Tyttenhanger and Salisbury Hall, recreational features on Bell Lane for UCL and Arsenal FC, Napsbury Hospital water tower and moated Salisbury Hall. In addition, All Saints Pastoral Centre chapel is a visual landmark from the M25.

6.4.3.63 There are a number of busy modern roads cutting through the area including the M25. This is an open and disjointed area with road noise being a prominent feature.

6.4.3.64 The quality of the landscape character area is good. The sensitivity of the landscape is medium.

20: Shenley Ridge Landscape Character Area

6.4.3.65 This area is located between Radlett and Redwell Woods, enclosing the M25 to the east of Junction 22 and to the north of Junction 23. Key characteristics include:

- south-west/north-east elevated ridge with steeper northern slopes
- extensive woodland areas, notably Combe Wood on horizon
- areas of grazing in small/medium fields with hedged enclosure, locally mixed with arable and ‘set-aside’ fields
- prominent ridge-top residential development within grounds of former Shenley Hospital
- historic settlement of Shenley and scattered farms set on narrow plateau
- panoramic views to and from ridgeline, particularly to the north
- M25 and pylon lines are prominent as they rise over ridge
- Watling Chase Community Forest

6.4.3.66 This area is dominated by the strong, locally prominent ridge where steep slopes rise from the Vale of St Albans. Panoramic views to and from the ridge characterise the area. Land cover is a mix of woodland, small pasture fields and built development, which all contribute to the character. Other distinctive features include Shenley Park, Shenley water tower, which is a major landmark, and the grain silo at Redwell Wood Farm. The area has a sense of unity, particularly where the pattern of small to medium fields and

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grazing has been retained. The M25 cuts through the ridge and dominates, particularly as seen from the north.

6.4.3.67 The quality of the landscape character area is good. The sensitivity of the landscape is medium.

21: High Canons Valleys and Ridges Landscape Character Area

6.4.3.68 This area is located to the west of Junction 23. Key characteristics include:

- a series of narrow, settled ridges of sinuous form in a broad plateau landscape
- mainly medium to large arable and pasture fields scattered with woodland blocks and copses
- Watling Chase Community Forest

6.4.3.69 This is a plateau landscape divided by narrow valleys with the M25 skirting the northern and eastern fringes. The landcover is mixed with fields of arable and pasture divided by variable hedgerows. Areas of informal parkland divided by woodland blocks and copses are also present. This mixed use creates a variable enclosed and open landscape where the M25 and Junction 23 are prominent in selected areas.

6.4.3.70 The quality of the landscape character area is ordinary to good. The sensitivity of the landscape is medium.

24: Arkley Plain Landscape Character Area

6.4.3.71 This area includes and surrounds Junction 23. Key characteristics include:

- geometric field pattern
- steeply sloping valley
- straight roads of Roman or earlier origin, with wide verges
- sparsely settled
- discrete woodlands to the north
- limited rights of way
- sweeping views over landforms
- mainline railway in cutting
- Potters Bar and M25 to the west
- Watling Chase Community Forest

6.4.3.72 This area is a gently undulating agricultural plain rising up to the east to Potters Bar. The M25 roughly divides the area with small to medium pasture fields enclosed with well maintained hedgerows to the south of the M25 and more open arable fields with isolated trees to the north. The northern section of the area is dissected by the M25 with Junction 23 and the South Mimms service complex prominent in the landscape.

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6.4.3.73 The land use is predominately agricultural overlooked by the urban area of Potters Bar with the main areas of woodland belts surrounding Dyrham Park and a golf course to the south. The woodland perimeter on the ridgeline forms the horizon.

6.4.3.74 The historic parkland, which is now a golf course, surrounding the house at Dyrham Park is the most distinctive feature in the area.

6.4.3.75 The quality of the landscape character area is ordinary to good. The sensitivity of the landscape is medium.

27: Catharine Bourne Valley Landscape Character Area

6.4.3.76 This area is located to the west of Potters Bar and Junction 23, enclosing the M25 to the north and south. Key characteristics include:

- large-scale arable farmland with low hedgerows
- long-distance views
- major transport corridors
- Catharine Bourne stream
- negligible woodland
- Watling Chase Community Forest

6.4.3.77 This area is divided by the M25 and the A1(M) corridors. The small settlement of South Mimms lies between the two roads as they meet at Junction 23 to the south. Arable farmland is prominent throughout the area. Smaller fields fringe the edges of the settlement, including South Mimms. The M25 and A1(M) and the associated traffic dominate the area.

6.4.3.78 The quality of the landscape character area is ordinary to good. The sensitivity of the landscape is medium.

6.4.4 Visual Context

General

6.4.4.1 An overview of the visibility and views from identified receptors within the study area on a Junction by Junction basis is outlined below.

6.4.4.2 The location of the receptors and the extent of visibility are illustrated on Figure 6.4: Indicative Visual Envelope. Existing and proposed signage and street furniture are illustrated on Figure 6.5. In addition, further detail on each viewpoint, including description of the receptor, sensitivity, distance from the existing M25 and description of the existing view during the summer and winter are described on Figure 6.10: Visual Impact Schedules.

Junctions 16 – 17

6.4.4.3 To the west views are restricted by extensive woodland around Tatling End and the motorway is in cutting. As the motorway emerges from cutting, it drops down towards Higher Denham through a shallow valley, allowing distant views to the motorway from

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receptors in the east and west on the valley side. Three bridge structures crossing the motorway are distinctive features. East towards Junction 17, there are views of extensive undulating agricultural land and blocks of woodland and shrubs. Together, these elements allow glimpsed views to the motorway from receptors in selected locations along footpaths.

- 6.4.4.4 The motorway dissects the local character of open agricultural field patterns, reducing the visual amenity of the local area. Junctions 16 and 17 themselves are dominant features within the landscape.
- 6.4.4.5 Receptors are primarily residential and recreational users of footpaths, bridleways and open space with a medium to high sensitivity. Other receptors include railway passengers and motorists on A roads and B roads. Roads cross above and below or run alongside the M25 and a railway line crosses over the M25 permitting intermittent, transient views of the motorway. These receptors have a passing interest in their surrounding environment with a low sensitivity.

Junctions 17 –18

- 6.4.4.6 Views of the motorway from the landscape surrounding Junction 17 and Rickmansworth are primarily restricted to close receptors, footpath users and motorists on roads immediately adjacent to the M25. Long views from receptors to the east are filtered through woodland blocks and hedgerows. Moving north east (clockwise) from Junctions 17, where the M25 is in deep cutting, the landscape falls away and the road crosses over Chorleywood and a railway line on the elevated Berry Lane Viaduct. At this point, surrounding dense ancient woodland tree canopies filters views to the motorway. Towards Junction 18, there are filtered views of the viaduct, motorway and vehicles from receptors in close proximity including residential, recreational and motorists. At Junction 18, views are restricted to close receptors looking down through tree and shrub planting to the motorway in cutting.
- 6.4.4.7 The motorway dissects the settlements of Heronsgate, Moneyhill, Rickmansworth, Mill End and numerous woodland blocks and agricultural fields. Although the Berry Lane Viaduct visually divides Chorleywood, physical links at ground level retain a continuous community. Junctions 17 and 18 create dominant, congested and visually cluttered features within the landscape.
- 6.4.4.8 The minority of viewers consist of walkers, hikers, riders and recreational road users and train passengers with a high, medium or low sensitivity. Residential receptors, with high sensitivity, also form part of this minority group. The majority of viewers are motorists on roads, who have a passing interest in their surrounding environment and experience intermittent and transient views of the motorway, with a low sensitivity. In addition, railway passengers, of low sensitivity, experience glimpsed views of the M25 as they pass under the motorway.

Junctions 18 – 19

- 6.4.4.9 Views of the motorway are substantially screened by landform and mature ancient woodland. Views are restricted to close receptors, including footpath users and motorists on crossroads, immediately adjacent to the M25. North east of Junction 18 the motorway passes through the steep, narrow Chess valley on a bridge. Extensive tree planting and the presence of environmental barriers form the dominant components of views from

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close receptors. North east (clockwise) towards Chandlers Cross and Junction 19 glimpses from close receptors and footpaths through existing vegetation and undulating landform are possible. A large gravel quarry straddles the M25 and the exit to the A41 forms a distinctive visual element to the south east of Junction 19.

6.4.4.10 The motorway visually cuts through Loudwater. It physically and visually separates the small rural settlements of Sarratt and Chandlers Cross, and the Chilterns AONB. Visual severance of the local character of open agricultural field patterns, woodland blocks and the Chilterns AONB cause a reduction in the quality of the visual amenity of the area. Junctions 18 and 19 create dominant, congested and visually cluttered features within the landscape.

6.4.4.11 The minority of viewers consist of walkers, hikers, riders and recreational road users with a high, medium or low sensitivity. Residential receptors, with high sensitivity, also form part of this minority group. The majority of viewers are motorists of low sensitivity who have a passing interest in their surrounding environment and experience intermittent views of the motorway.

Junctions 19 – 20

6.4.4.12 Views of the motorway are substantially screened by undulating landform, large woodland blocks and by the hedgerows dividing the surrounding agricultural landscape. Most views of the motorway and associated infrastructure are distant at strategic points on public footpaths, residences and roads.

6.4.4.13 The M25 between Junctions 19 and 20 is predominantly in cutting, screening it from the surrounding landscape. However, at Junction 20, the motorway becomes visible to a wide variety of receptors as it crosses the intersection on high embankment and over the Gade Valley on viaduct. The elevated road and bridge structure allows for clear views from Kings Langley, Hunton Bridge and Langleybury.

6.4.4.14 The motorway physically and visually separates the small rural settlements of Commonwood, Chipperfield, Kings Langley, Hunton Bridge and Langleybury. Visual severance of the local character of open agricultural field patterns and woodland blocks cause a reduction in the quality of the visual amenity of the area. Junctions 19 and 20 create dominant, congested and visually cluttered features within the landscape.

6.4.4.15 There are few residences. Receptors primarily have distant views, and/or see Junction 20 and the motorway crossing the Gade Valley on viaduct.

6.4.4.16 The minority of viewers consist of walkers, hikers, riders and recreational road users with a high, medium or low sensitivity. Residential receptors, with high sensitivity, also form part of this minority group. The majority of viewers are motorists of low sensitivity who have a passing interest in their surrounding environment and experience intermittent and transient views of the motorway.

Junctions 20 – 21

6.4.4.17 At Junction 20, the motorway crosses the River Gade and Grand Union Canal on a prominent viaduct. The bridge spans the Gade Valley between Kings Langley and Abbots Langley allowing extensive views to the motorway and associated infrastructure from receptors to the east and west in Kings Langley, Abbots Langley and Bedmond. In a clockwise direction, the motorway passes through agricultural land scattered with

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woodland blocks. Around Junction 21, views from close receptors and footpaths become restricted by woodland blocks and the motorway in cutting.

6.4.4.18 The motorway physically and visually separates the settlements of Kings Langley, Abbots Langley and Bedmond. Visual severance of the local character of open agricultural field patterns, settlements and woodland blocks cause a reduction in the quality of the visual amenity. Junctions 20 and 21 create dominant, congested and visually cluttered features within the landscape.

6.4.4.19 The minority of viewers consist of walkers, hikers, riders, rail passengers and recreational road users with a high, medium or low sensitivity. Residential receptors, with high sensitivity, also form part of this minority group. The majority of viewers are motorists of low sensitivity who have a passing interest in their surrounding environment and experience intermittent and transient views of the motorway. In addition, railway passengers, of low sensitivity, experience glimpsed views of the M25 as they pass under the motorway.

Junctions 21 – 22

6.4.4.20 The majority of the M25 between Junctions 21 to 22 is in cutting. Clockwise from Junction 21 to the River Colne, highway planting and adjacent woodland blocks assist in screening the motorway from the surrounding landscape. The exception is around Colney Street at Moor Mill where the motorway crosses the River Ver valley on a bridge. From the River Colne eastwards to Junction 22 extensive sections of the motorway is at grade or on embankment, allowing open views to the M25.

6.4.4.21 The motorway physically and visually separates the settlements of Bricket Wood, How Wood, Frogmore, Colney Street, London Colney and Shenley. It also severs valuable woodland blocks (Blackwood Green), agricultural field patterns and recreational land (Frogmore Home Park). Visual severance of open agricultural field patterns, settlements and woodland blocks cause a reduction in the quality of the visual amenity of the local area. Junctions 21, 21a and 22 create dominant, congested and visually cluttered features within the landscape.

6.4.4.22 The minority of viewers consist of walkers, hikers, riders, rail passengers and recreational road users with a high, medium or low sensitivity. Residential receptors, with high sensitivity, also form part of this minority group. The majority of viewers are motorists of low sensitivity who have a passing interest in their surrounding environment and experience intermittent and transient views of the motorway. In addition, railway passengers, of low sensitivity, experience glimpsed views of the M25 as they pass over and under the motorway.

Junctions 22 – 23

6.4.4.23 The majority of this section of the M25 is on embankment which forms a dominant and extensive visual feature within the local environment. Low planting within the highway boundary fence does not offer significant screening.

6.4.4.24 At Junction 22, the motorway runs in close proximity to some receptors and is a dominant visual feature. Clockwise from Junction 22, the motorway crosses the slopes of the Colne Valley, with some screening to the south by the local landform and woodland blocks around Ridge Hill, before descending towards South Mimms. From South Mimms, the M25 moves into cutting, and is therefore screened from the

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landscape through to Junction 23. There are views of Junction 23 and the motorway from properties, farms and recreational users in South Mimms and Ridge.

6.4.4.25 The motorway physically and visually separates the small rural settlements of Ridgehill, South Mimms and Ridge. Visual severance of the local character of open agricultural field patterns and small rural settlements cause a reduction in the quality of the visual amenity of the local area. Junctions 22 and 23 create dominant, congested and visually cluttered features within the landscape.

6.4.4.26 The minority of viewers consist of walkers, hikers, riders and recreational road users with a high, medium or low sensitivity. Residential receptors, with high sensitivity, also form part of this minority group. The majority of viewers are motorists of low sensitivity who have a passing interest in their surrounding environment and experience intermittent and transient views of the motorway.

6.4.5 Night-time Context

General

6.4.5.1 An overview of the night-time character, visibility and views from identified receptors within the Study Area on a Junction by Junction basis is outlined below.

Junctions 16 – 17

6.4.5.2 For two kilometres north of Junction 16 the presence of arterial roads intersecting the motorway corridor and associated low-pressure sodium lighting combined with the presence of residential and street lighting from the village of Gerrards Cross bring a distinct glow to the night-time sky. This creates a night-time landscape where dominant elements are transport corridors and residential and commercial development.

6.4.5.3 North beyond Higher Denham, the character of the night-time landscape changes dramatically. The motorway is no longer lit and the presence of man-made development diminishes. A distinct and recognisable woodland structure emerges around isolated residences as an intrinsically dark landscape begins to dominate. Post curfew lighting from residences is infrequent and many of the properties along the motorway corridor are well screened with vegetation.

6.4.5.4 Country lanes intersecting the M25 are narrow and unlit and are generally enclosed by tall hedgerows increasing the sense of darkness up to approximately 30 metres away from the motorway. Occasional views of motorway traffic are glimpsed from the surrounding lanes through this hedgerow planting.

6.4.5.5 Further north to Maple Cross and up to Junction 17, low-pressure sodium street lights are glimpsed more frequently across the night-time landscape indicating a weakened woodland structure and open farmland. The darkness is reduced on the approach to Junction 17.

Junctions 17 - 18

6.4.5.6 The night-time landscape on the eastern side of the motorway is dominated by the lights of the street network of Mill End, a medium density residential area, with leisure and educational facilities in close proximity to the motorway. The housing is separated from

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the motorway by a strip of unlit public open space. This runs parallel with the motorway and is separated by a strip of mature vegetation which narrows from 80 to 40 metres width over its 270 metre length. This area provides a dark zone between the motorway and housing and screens the open land on the opposite side of the motorway from Mill End, increasing the quality of the night-time landscape on the western side. From Queens Lane, the land dips down beneath the level of the motorway into Pheasants Wood and Solomons Wood, which provide relief from the urban sprawl. The heavily wooded Berry Lane is dark in places but the presence of occasional low pressure sodium lights along this lane and low density large residences interrupt any sense of enduring darkness or separation.

- 6.4.5.7 To the west between Chorleywood Bottom and the motorway the area is much less developed and consists of open mostly flat farmland. The high quality of the night-time landscape is diminished by the frequent presence of headlights visible from the motorway. The public open space on the opposite side of the motorway and the mature vegetation helps to screen lighting from Mill End. However lighting from man-made development is still frequently visible due to the lack of a strong vegetation structure between field boundaries.

Junctions 18 – 19

- 6.4.5.8 The Junctions and slip roads are lit and the motorway is lit from the central reservation. In addition, just north of Junction 18, for approximately 1.5 kilometres of climbing lane, there is a vertical concrete barrier in the central reservation onto which 15 metre mounted lighting columns are mounted.
- 6.4.5.9 The motorway lighting forms a distinctive feature in the wider landscape and in views from identified visual amenity receptors, although there is some local screening by existing woodland and development.

Junctions 19 – 20

- 6.4.5.10 The Junctions and slip roads are lit and the motorway is lit from the central reservation.
- 6.4.5.11 The lighting forms a distinctive feature in the wider landscape and in views from identified visual amenity receptors, although there is some local screening by existing woodland and development.

Junctions 20 – 21

- 6.4.5.12 The Junctions and slip roads are lit and the motorway is lit from the central reservation. In addition, just north of Junction 20, 15 metre columns light the Gade Valley Viaduct. South of the Ovaltine Footbridge, the lighting is at different levels, due to the separation of the carriageways.
- 6.4.5.13 The lighting forms a distinctive feature in the wider landscape and in views from identified visual amenity receptors, although there is some local screening by existing woodland and development.

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Junctions 21 – 22

- 6.4.5.14 As the M25 heads west from Junction 21, the night-time landscape switches frequently between the orange glow from street lighting within man-made development and along arterial roads crossing the motorway, between open, dark, unlit, farmland landscape and the white light coming from commercial and office development. Although the motorway dips into a cutting between Smug Park and Frogmere, only the intermittent presence of small woodland pockets prevents the lighting from residential, transport and office buildings from completely dominating the night-time landscape.
- 6.4.5.15 Beyond the line of the A5183, which crosses the M25, the night-time character changes again to a landscape whose general character is one of darkness. This is punctuated by visible strips and clumps of woodland which screen developments and offer only glimpsed views of isolated lighting from man-made developments. Further east, the B556 runs closer to the M25 and small rows of housing occur east and west of the roundabout Junction with the B5378 along Bell Lane and Harper Lane. The housing starts to redefine the night-time character although low pressure sodium street lighting is infrequent and street trees help to filter light from more distant landscapes. The surrounding landscape remains free of light pollution on both sides until approximately 0.5 kilometres before Junction 22 where the heavily lit creamy white lights of Junction 22 roundabouts and a superstore puncture the overall darkness.

Junctions 22 – 23

- 6.4.5.16 From Junction 22, the sense of darkness returns to the landscape. Although the B556 runs parallel with the motorway, it remains unlit and crosses the motorway only once, allowing the general landscape to be free from lit arterial crossing roads. Recognisable natural features of woodland strips and clumps are detectable within the landscape. The northern side of the motorway is dominated by the distinct night-time presence of Redwell Wood which forms a dark presence within the landscape as it stands on a plateau overlooking the open land below.
- 6.4.5.17 On the southern side of the M25, dense strips of vegetation screen the landscape from the vehicle headlights until the B556 runs under the motorway. The landscape either side has no key light sources other than isolated farmsteads and cottages, which are generally screened from the motorway. Where the B556 crosses the motorway however, the quality of the night-time landscape deteriorates as vegetation along the motorway weakens, views of motorway traffic headlights and the glow from the motorway corridor become more frequent from the surrounding unlit farmland. Towards Junction 23, the character of the night-time landscape becomes increasingly dominated by the orange glow of man-made developments and the presence of residential street lighting becomes more evident on the approach to South Mimms.

6.5 Design and Mitigation

6.5.1 Construction

- 6.5.1.1 Management of the construction activities to avoid or mitigate landscape and visual impacts would be set out within the Construction Environmental Management Plan (CEMP). The CEMP would be produced by the Contractor prior to commencement of

works. Landscape and visual mitigation covered by the CEMP would include, but not be limited to:

- protection of sensitive landscape areas/vegetation
- specific methodology for vegetation clearance to minimise the likelihood of impacts to the landscape and visual context
- timing of construction activities to avoid seasonal constraints
- protection of sensitive visual receptors
- recycling of resources including the collection, storage and re-use of topsoil, subsoil, or translocated soil from species-rich areas
- solid hoardings erected around temporary work sites and removed when no longer required
- restrictions on heights of stockpiles
- lighting of compounds and works sites restricted to agreed working hours and which are necessary for security
- location of contractors' compounds away from residential areas wherever possible
- tidy storage of materials and machinery
- timely removal of all spoil and construction materials
- making good all work sites at the end of the construction period
- advance planting in selected sensitive areas to limit impacts where possible

6.5.2 Operation

6.5.2.1 Generally, the landscape mitigation to address potential landscape and visual operational impacts have been an integral part of the design process. The landscape design mitigation includes:

- avoidance and retention of important landscape features (e.g. gantries, signs or environmental barriers have been positioned to avoid loss of high quality existing vegetation)
- measures to reduce the significance of adverse impacts (eg building of retaining walls to reduce land take and preserve essential screening vegetation and minimise encroachment onto adjacent TPOs and Ancient Woodland) or locating Environmental Barriers, where feasible, to allow linear tree and shrub planting along the boundary between the barrier and visual receptors
- specific measures such as planting within the Scheme Boundary, mitigation earthworks, careful consideration of the form and finish of structures, the alignment and appearance of balancing ponds and realigned watercourses
- screening of the visual effects of gantries, lighting columns, bridges, environmental barriers etc. through planting

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- careful consideration of the lighting requirements and any potential increase in light pollution
- appropriate fencing design, the detail of which would be defined by the DBFO Contractor
- appropriate noise mitigation features in different landscape character areas
- minimising the loss of vegetation which makes a significant and positive contribution to landscape quality, has significant value in terms of biodiversity, or maintains a plantation buffer protecting TPO and Ancient Woodland immediately adjacent to the Scheme Boundary
- replacement of comparable vegetation where vegetation loss has been unavoidable
- establishment of basic principles for appropriate fencing design. The detail of which would be agreed and clarified during the detailed design
- liaison with acoustic engineers in establishing the most appropriate form of noise mitigation features in different landscape character areas
- maximising planting opportunities to improve the character of the Scheme corridor, the wider landscape character and screening opportunities from identified sensitive receptors
- the use of planting appropriate to the local character and to enhance biodiversity value - planting would be sourced of local provenance as defined by Forestry Commission Practice Note 6: Using Local Stock for Planting Native Trees and Shrubs²¹
- planting that would enhance and link to existing landscape features, to promote a unified landscape character and 'sense of place'

6.5.3 Specific Landscape Design Mitigation Measures

The specific landscape design mitigation measures are outlined in Table 6.10 on a Junction by Junction basis. The landscape design mitigation measures are also illustrated on Figure 6.7: Landscape Reinstatement Plans.

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Table 6.10: Landscape Mitigation Measures

Direction	Chainage	Landscape Design Mitigation Measures
Junctions 16 to 17		
CW	3,400 to 3,750	South of A413 underpass, woodland planting to provide screening to environmental barrier and provide landscape integration to existing woodland
CW	4,500 to 4,600	Woodland planting to provide screening on approach to bridge
CW	5,850 to 5,900	Woodland planting to provide screening and integration on approach to underpass
CW	6,050 to 6,300	North of Nockhill Wood, new hedge to provide landscape integration between retained woodland blocks
CW	6,850 to 8,500	Hedgerow and linear planting for screening, integration and biodiversity
CW	8,700 to 9,100	West of Maple Cross, hedge and shrub planting to provide landscape integration and visual amenity for properties in Horn Hill
CW	9,150 to 9,200	Woodland planting to provide screening and integration
CW	9,350 to 9,450	East of Bottom Wood, woodland planting to provide landscape integration and biodiversity
CW	9,500 to 10,200	South of Heronsgate, linear hedge and woodland planting to provide visual amenity and screening for receptors in Heronsgate
Anti-CW	3,000 to 3,300	South of Tatling End, woodland planting replaced to reduce visual impact of Environmental Barrier
Anti-CW	3,350 to 3,600	West of Tatling End, woodland planting to provide screening to adjacent residential properties and clearer definition to Scheme Boundary
Anti-CW	3,700 to 3,750	North west of Tatling End, woodland planting incorporated into edge of pond area to provide landscape integration and nature conservation
Anti-CW	6,170 to 6,350	Southeast of Chalfont St Peter, extension of an existing Environmental Barrier to provide landscape amenity screen for West Hyde in an area with limited space to provide planting
Anti-CW	6,750 to 7,750	Southeast of Chalfont St Peter, mixture of woodland, shrub and hedge planting to provide screening, landscape integration and biodiversity between woodland blocks
Anti-CW	7,950 to 8,100	Hedge planting to reduce visual impact of Environmental Barrier for properties along the south western edge of Maple Cross

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Direction	Chainage	Landscape Design Mitigation Measures
Anti-CW	8,200 to 8,500	South west of Maple Cross, hedgerow planting to screen and for biodiversity adjacent to Environmental Barrier
Anti-CW	8,500 to 8,650	West of Maple Cross, hedge planting to reduce impact of Environmental Barrier for surrounding visual amenity receptors and for biodiversity
Anti-CW	8,800 to 9,050	West of Maple Cross, hedge planting for biodiversity and to reduce impact of Environmental Barrier (Chainage 8,800 to 8,900) and visual amenity for properties along Pollards, Bradbery and Long Lees
Anti-CW	9,050 to 9,400	Northwest of Maple Cross, hedgerow planting to provide landscape screening, landscape integration and biodiversity for properties along Pollards and Oakhill Road
Anti-CW	9,400 to 10,050	Northwest of Maple Cross, hedge and linear planting to provide landscape amenity and screening for Wood Oaks Farm and properties along Oakhill Close and A412 Denham Way
Junctions 17 to 18		
CW	10,750 to 11,300	North of Junction 17, woodland planting to provide landscape integration, visual amenity for properties along Nottingham Road, Long Lane and the southern edge of Mill End
CW	11,250 to 11,650	West of Mill End, hedge planting to provide integration and biodiversity for properties in Chorleywood Bottom
Anti-CW	11,300 to 11,700	West of Rickmansworth, hedge to provide integration and biodiversity for properties in Mill End and linking of woodland blocks
Anti-CW	11,300 to 11,430	West of Rickmansworth, extension of an existing Environmental Barrier to provide landscape amenity screen for properties to the south and east of the M25, along Shepherd Lane, which is in an area that is elevated and exposed
CW and Anti-CW	12,300 to 12,500	West of Rickmansworth, woodland planting to link existing woodland plots
Junctions 18 to 19		
CW	14,150 to 16,750	Hedge planting to provide visual screening, amenity and biodiversity for the periphery of Chilterns AONB, properties in Micklefield Green, Great Wood Cottages, along Chandlers Lane and Templepan Lane
CW	17,000 to 17,300	Shrub planting on approach to junction for visual amenity and biodiversity
Anti-CW	14,150 to 14,750	Woodland planting for screening
Anti-CW	14,900 to 15,150	Linear planting for screening and integration

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Direction	Chainage	Landscape Design Mitigation Measures
Anti-CW	15,450 to 15,900	Woodland planting for screening and biodiversity
Anti-CW	15,900 to 16,050	Hedgerow and shrub planting around ponds for screening and biodiversity
Junctions 19 to 20		
CW	17,350 to 17,650	Linear and shrub planting to divide link roads and provide landscape integration
CW	18,000 to 18,250	Linear and shrub planting to link existing vegetation
CW	18,900 to 19,400	Shrub planting to provide visual amenity for properties in Langlebury and for Model Farm
Anti-CW	17,800 to 18,200	Directly north of Junction 19, hedge planting to provide visual amenity for properties in Langlebury
Anti-CW	18,250 to 18,800	Shrub planting to link existing vegetation
Anti-CW	18,900 to 19,200	South of Langlebury, hedge and woodland planting on Scheme Boundary to provide screening for properties along Langlebury Lane
Junctions 20 to 21		
CW	21,450 to 21,950	Woodland and shrub planting to link to existing woodland to provide landscape integration
CW	21,800 to 21,950	Woodland planting to provide landscape integration for ponds
CW	22,000 to 22,500	North of Abbots Langley, woodland and shrub planting to provide integration and screening for properties along Sheppeys Lane and Toms Lane and biodiversity
CW	23,200 to 23,600	North of Abbots Langley, hedge planting to enhance the existing landscape character of agricultural fields and hedges around Tenement's Farm
CW	23,700 to 24,450	Linear and woodland planting to provide screening and biodiversity
CW and Anti-CW	20,000 to 20,200	North of Junction 20, woodland and linear planting to divide link roads and provide visual amenity
Anti-CW	21,050 to 21,450	Intermittent woodland and shrub planting to connect to existing vegetation for screening and integration

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Direction	Chainage	Landscape Design Mitigation Measures
Anti-CW	21,550 to 22,200	North of Abbots Langley, woodland planting for integration and biodiversity
Anti-CW	22,800 to 23,150	Woodland planting for screening
Anti-CW	23,200 to 24,000	North of Abbots Langley, hedge planting to provide visual screening and landscape integration for the land to the north of Chequers Lane
Junctions 21 to 22		
CW	25,700 to 25,950	North of Bricket Wood, shrub planting to provide landscape integration in the area around Allington Court nursing home
CW and Anti-CW	25,600 to 25,700	Woodland planting for screening North of Smug Oak, woodland planting retained with new shrub planting to provide screening and landscape integration around Bricket Wood Sports and Country Club, Smug Oak Business Centre, Horseshoe Business Park and properties on Park Street Lane
CW and Anti-CW	26,400 to 26,850	Shrub planting to connect to adjacent woodland for visual amenity and biodiversity
CW	27,000 to 27,500	Northeast of Smug Oak, hedge planting to provide landscape integration
CW	28,000 to 28,500	North of Colney Street, shrub and woodland planting to provide visual screening to Environmental Barrier for properties in Frogmore and along Moor Mill Lane
CW	30,200 to 30,950	Hedge planting for screening and biodiversity
CW	31,300 to 31,750	South of London Colney, hedge planting for visual screening and landscape integration for properties off Shenley Lane, the southern edge of London Colney and All Saints Pastoral Centre
CW	32,000 to 32,350	Shrub planting to provide landscape integration on slip roads
Anti-CW	25,700 to 26,400	Intermittent shrub planting to link with existing retained woodland vegetation for landscape integration
Anti-CW	27,000 to 27,500	Northeast of Smug Oak, hedge planting to provide visual screening for receptors along Smug Oak Lane, and landscape integration
Anti-CW	28,000 to 28,500	North of Colney Street, shrub and woodland planting to provide visual screening to Environmental Barrier for the Travel Inn, and properties in Colney Street and towards Radlett

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Direction	Chainage	Landscape Design Mitigation Measures
Anti-CW	29,450 to 29,750	Shrub planting for landscape integration and biodiversity adjacent to existing woodland and pond
Anti-CW	30,200 to 30,750	Shrub planting adjacent to existing woodland for landscape integration and biodiversity
Anti-CW	32,000 to 32,550	Shrub planting adjacent to existing retained woodland for landscape integration
Junctions 22 to 23		
CW	32,850 to 33,000	North of Salisbury Hall, woodland and shrub planting to provide visual screening against the proposed Quarry works to the north east of Junction 22
CW	33,350 to 34,400	Adjacent to Redwell Wood, woodland planting to provide screening and landscape integration
CW	34,400 to 34,700	South of Redwell Wood, hedge planting to provide visual screening for the surrounding countryside and landscape integration
CW	34,709 to 35,653	South of Redwell Wood, linear, shrub and hedge planting to provide landscape integration and visual screening for the surrounding countryside including screening to South Mimms Conservation Area
CW	35,300 to 35,670	South of Redwell Wood, Environmental Barrier to provide screening to South Mimms Conservation Area
CW	35,700 to 35,800	East of Redwell Wood, shrub planting to provide screening around the Catharine Bourne, towards South Mimms Conservation Area
CW	36,000 to 36,450	Hedgerow planting for screening and biodiversity
CW	36,650 to 37,250	Woodland planting to provide landscape integration and visual screening for properties in South Mimms
Anti-CW	33,150 to 33,300	Woodland planting to provide visual screening for Salisbury Hall
Anti-CW	33,500 to 33,750	Shrub planting to connect to existing woodland blocks for visual amenity and biodiversity
Anti-CW	33,850 to 34,500	West of Redwell Wood, woodland and shrub planting to provide visual screening for properties in Ridgehill, connect to existing woodland and nature conservation
Anti-CW	35,200 to 35,250	South of Redwell Wood, linear planting to provide landscape integration and visual screening
Anti-CW	35,350 to 36,350	West of South Mimms, hedge planting to provide visual screening for properties along Packhorse Lane and Earls Lane, including Rabley Park and Rabley Park Farm, and landscape integration

6.6 Assessment of Effects

6.6.1 Construction Phase

6.6.1.1 The assessment of the construction phase impacts has been based primarily on Figures 6.6: Zone of Construction Impact. For the purposes of this assessment, compliance with the CEMP has been assumed.

6.6.1.2 In addition, general assumptions have been made in order to assess the impact of the construction works upon landscape character and visual amenity. Essentially, the Scheme would impact upon the same areas as those affected by the operational phase of the Scheme. However, the nature and scale of the impact would be different in the sense that construction activities are likely to result in a greater area of disturbed land, but be temporary.

6.6.1.3 The following potential landscape and visual impacts have been considered during the construction phase:

- site clearance/demolition works including removal of vegetation; demolition of existing structures and road infrastructure and earthworks
- vehicles moving materials to/from site and between construction sites
- off-site construction plants
- temporary diversions to public rights of way
- workers travelling to/from work, and moving between different areas of the site

6.6.1.4 The construction effects as outlined above are based on the worse-case scenario.

Landscape Character Effects

6.6.1.5 In those landscape character areas of greater sensitivity (medium to high), the magnitude of impact would be moderate to major and the significance of effects would be moderate adverse. The areas would include:

- 2: Heronsgate Heights
- 6: Lower Chess Valley, including the Chilterns AONB
- 106: Middle Chess Valley, including the Chilterns AONB
- 20: Shenley Ridge, including Watling Chase Community Forest
- 27: Catharine Bourne Ridge, including Watling Chase Community Forest

6.6.1.6 In all other landscape character areas, the magnitude of impact would be moderate for these areas of medium sensitivity.

6.6.1.7 Overall, the significance of the effects upon the majority of the landscape character areas would be moderate adverse.

Visual Amenity Effects

- 6.6.1.8 Construction vehicles would be seen in the context of a busy road currently frequented by heavy goods vehicles (HGVs) and therefore would not be out of context with existing views. Demolition, clearance, earthworks and installation of the Scheme and associated infrastructure would constitute the largest change in view.
- 6.6.1.9 Generally, high sensitivity property receptors would experience a moderate magnitude of impact upon their visual amenity with prolonged viewing opportunities and a high interest in their visual environment.
- 6.6.1.10 Overall, the significance of effects upon property receptors with clear views of the works during construction would be moderate adverse.
- 6.6.1.11 Generally footpath users would experience a moderate magnitude of impact upon their visual amenity during construction as viewers have a high interest in their visual environment but with discontinuous and irregular viewing periods. Overall, the significance of effects upon PROW receptors would be moderate adverse.
- 6.6.1.12 Users of open space with a medium sensitivity would experience a moderate to minor magnitude of impact upon their visual amenity. Overall, the significance of effects upon visual amenity for open space receptors during construction would be slight adverse.
- 6.6.1.13 All TPOs lie outside the Scheme Boundary, therefore construction works would not encroach upon these designations. Measures would be put in place by the DBFO Contractor to ensure that TPOs located immediately outside the Scheme Boundary (e.g. Gladwins Wood) would not be affected during the construction phase. As such, the significance of effects upon TPOs during construction would be neutral.
- 6.6.1.14 Motorists and rail passengers crossing or running alongside the Scheme would experience views of construction activities. Generally these receptors would experience a minor to negligible magnitude of impact upon their visual amenity during construction as viewers have a passing interest in their visual environment and fleeting and/or intermittent viewing opportunities. Overall, the significance of effects upon visual amenity for road and rail user receptors during construction would vary between slight adverse to neutral.
- 6.6.1.15 Generally, for all visual amenity receptors during the summer, views would be slightly improved. Vegetation in leaf within the Scheme Boundary and in the wider landscape would help to screen, at least partially, many views. However, although the reduction of many views through screening provided by vegetation during the summer would slightly reduce the magnitude of impact, this would not be significant enough to alter the predicted effect on the views.

6.6.2 Operation Phase

- 6.6.2.1 The assessment of the operational phases has been based on the Scheme described in the Landscape Reinstatement Plans (Figures 6.7). The Scheme is programmed to open in 2012.
- 6.6.2.2 The following day-time landscape impacts have been considered on landscape designations and landscape character areas during the operation phase (year 1: winter and year 15: summer and winter):

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- permanent loss of some landscape elements/features
- permanent loss of some vegetation
- increase in road infrastructure such as signage, gantries and lighting columns. This would include the increase in lighting columns in currently unlit areas of the Scheme as well as the movement of lighting columns from central reserve to verges
- increases in traffic volumes
- introduction of attenuation ponds
- creation of new landscape elements and planting

6.6.2.3 The following visual amenity impacts have been considered on receptors and their views during the operational phase (year 1: winter and year 15: summer and winter):

- new and/or altered road infrastructure including: gantries; lighting; crash barriers; Environmental Barriers; retaining walls; signage; maintenance parking bays; potential relocation of statutory facilities; and increase in new road surfacing
- landscape changes impacting on the view as a result of the removal of vegetation, and replacement planting and earthworks
- increased vehicle movement
- proposed lighting, including columns, sign lighting and vehicle head-lights

6.6.2.4 Each receptor, or receptor group, is considered in detail in Figure 6.10: Visual Impact Schedules.

6.6.3 Effects on Landscape Designations

The Chilterns AONB

6.6.3.1 The combination of the screening provided by the undulating topography and woodland areas of Blunt's Wood and Millfield Plantation would contain the wider effects of the Scheme on the AONB. The impacts on the AONB, is described in the landscape character areas of 106: Middle Chess Valley and 6: Lower Chess Valley. The landscape effects on the Chilterns AONB would be contained within these landscape character areas and have been assessed in detail in Section 6.6.4.

Colne Valley Park

6.6.3.2 The Chilterns to the west and the more urban areas to the east and south contain the wider effects of the Scheme on the Colne Valley Park. The impacts on the Colne Valley Park has been described in the landscape character areas Z13: Wooded Plateau, Z12: Colne Valley and 1: Maple Cross Slopes. The landscape effects have been assessed in detail in Section 6.6.4.

Watling Chase Community Forest

- 6.6.3.3 The key aim of the community forest is to revitalise and regenerate the green space and this aim has been considered in developing the design and assessing the effects of the Scheme. The impacts on the Watling Chase Community Forest have been described in more detail in the landscape character areas 18: Bricketwood, 17: Ver-Colne Valley, 19: Vale of St Albans, 20: Shenley Ridge, 27: Catharine Bourne Valley, and 24: Arkley Plain. The landscape effects have been assessed in detail in Section 6.6.4.

Ancient Woodlands and Tree Preservation Orders

- 6.6.3.4 The Scheme design sought to protect and maintain any Ancient Woodlands and Tree Preservation Orders.
- 6.6.3.5 No Ancient Woodlands or Tree Preservation Orders would be affected by the Scheme.

Local Landscape and Other Relevant Designations

- 6.6.3.6 The effects of local landscape and other relevant designations have been considered below in both the landscape character areas (6.6.4) and visual amenity receptor (6.6.5) effects sections.

6.6.4 Effects on Landscape Character Areas

Buckinghamshire County Landscape Character Zone Z13: Wooded Plateau, Z12: Colne Valley and Z9: River Valleys and the Hertfordshire County Landscape Character Area 1: Maple Cross Slopes, including Colne Valley Park

Year 1:

- 6.6.4.1 The Landscape Character Zone Z13: Wooded Plateau, is defined primarily by the woodland planting surrounding Junction 16 before opening up to the east and west over the River Misbourne. The key impacts on the landscape character area focus on the loss of the woodland edge along the western edge of Gladwin's Wood and the general perception of the expansion of the junction infrastructure at the expense of the wooded areas. The proposed retaining wall minimises the loss of the vegetation within the Scheme Boundary and new planting has been proposed to replant the area between the retaining wall and the woodland edge. At year 1, the loss of vegetation would expose a new edge to Gladwin's Wood that may be vulnerable to further loss until the new planting establishes.
- 6.6.4.2 North of Tatling End the Scheme continues through the Landscape Character Zone Z9: River Valleys, over the A413 Amersham Road and between Oakend and Quarters Woods. The key impacts would be the introduction of an attenuation pond within the grassed area adjacent to the A413 Amersham Road, and the introduction of a retaining wall and loss of the hedge boundary planting between River Misbourne and Oakend Wood on both sides of the carriageway. Restrictions on planting parameters prevent the replanting of the boundary hedge. This loss removes the visual containment of the Scheme and the physical connectivity between Oakend Wood and Chalfont Viaduct. The loss of existing planting alongside Oakend Wood has been kept to minimum with the use of retaining walls in the Scheme design.

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- 6.6.4.3 Landscape Character Zone Z12: Colne Valley crosses the M25 in a narrow band between Oakend Wood and Shire Lane. The character of much of this section of the valley is open with the Scheme cutting through the chalk in a short series of scalloped cuttings and embankments. The land cover on these earthworks is predominantly grass and scrub, and the Scheme would introduce new lighting infrastructure to this open character.
- 6.6.4.4 Landscape Character Area 1: Maple Cross Slopes, including Colne Valley Park, is also open, but contained in the wider landscape, particularly to the west, by landform, woodland and development. The Scheme would influence the immediate landscape character, particularly through the addition of built elements and the removal of existing vegetation which would increase the perception of the motorway on this area.
- 6.6.4.5 The sensitivity of the landscape character areas is medium. The magnitude of impact would be moderate. Overall, the significance of effects would be moderate adverse.

Year 15:

- 6.6.4.6 Mitigation measures such as new planting would have matured, however, there would still be an overall local reduction in the quantity of trees and woodland, grassland and shrubs as a result of the Scheme.
- 6.6.4.7 The loss of the planting to the edge of Gladwin's Wood would remain marked although the proposed replacement planting would have matured to recreate a stronger edge.
- 6.6.4.8 The loss of the boundary hedging within Landscape Character Zone Z9: River Valleys and the introduction of the retaining walls between the River Misbourne and Oakend Wood would remain an adverse effect on the landscape character, removing the visual and physical connectivity between the woodland blocks to the east and west of the Scheme. The benefits gained by the new planting would be offset against the permanent loss of planting in those areas where it would not be possible to carryout any replacement planting.
- 6.6.4.9 The proposed hedge planting would have matured to provide a unifying edge to the Scheme Boundary, and a visual foil, screening some vehicle movement and the general infrastructure of the Scheme. However the lighting and gantries would remain a strong visible element. The verge mounted columns in both the currently unlit section and where central lighting is currently used would increase the visibility of the Scheme clearly identifying its route through the predominately open landscape.
- 6.6.4.10 The magnitude of impact would be moderate. Overall, the significance of effects would be moderate adverse.

Hertfordshire County Landscape Character Area 2: Heronsgate Heights

Year 1:

- 6.6.4.11 Within Landscape Character Area 2: Heronsgate Heights, the Scheme passes through the densely wooded areas of Pheasant's Wood and Home Wood. The Scheme would remove significant areas of vegetation along the anti-clockwise length west of Rickmansworth, opening up views over the open landscape from Mill End and Rickmansworth.

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- 6.6.4.12 The Scheme requires the widening of the Berry Lane Viaduct and the removal of an approximate 10 metre strip of mature woodland either side. The proposed widening of the viaduct would include the introduction of centrally mounted lighting and Environmental Barriers. The loss of the woodland and the introduction of the lighting would alter the character in the immediate vicinity of the viaduct. These changes would be contained by the surrounding dense planting and would, with the successful implementation of an appropriate planting scheme, be integrated into the remaining woodland.
- 6.6.4.13 The Scheme cuts through the settlements of Chorleywood and Loudwater and would require the removal of some mature vegetation from the carriageway and the introduction of Environmental Barriers on top of existing retaining walls. This would have an adverse impact and increase the canyon effect of the M25. While vegetation would be retained in selected areas, there is limited opportunity to carry out any replacement planting. Environmental Barriers would remain as the main screening elements, however at between 2.0 and 4.0 metres in height and located on the boundary these elements would be imposing when viewed from the adjacent properties in Wyatts Close, Chess Way and Old Solesbridge Lane.
- 6.6.4.14 The sensitivity of the landscape character area is medium. The magnitude of impact would be moderate. Overall, the significance of effects would be moderate adverse.

Year 15:

- 6.6.4.15 Mitigation measures would have matured to provide further screening and integration, although there would still be an overall local reduction in the quantity of trees and woodland, grassland and shrubs within the Highway Boundary. This would be evident west of Rickmansworth on the approach to the Berry Lane Viaduct where the Scheme would remain prominent on the horizon. At Berry Lane the new planting would not have fully compensated for the loss of the mature woodland planting adjacent to the viaduct.
- 6.6.4.16 This would result in a moderate to minor impact. However, with limited opportunities to introduce reinstatement planting on the Scheme through the settlements of Chorleywood and Loudwater the magnitude of impacts would be moderate in these areas. Overall, the significance of effects would be moderate to slight adverse.

Hertfordshire County Landscape Character Areas 106: Middle Chess Valley and 6: Lower Chess Valley, including Chilterns Area of Outstanding Natural Beauty (AONB)

Year 1:

- 6.6.4.17 The Scheme would widen into the cut face, on the anti-clockwise section, introduce new gantries over both carriageways and be lit with 15 metre columns set in the verge. Proposed mitigation would include new hedge planting along the boundary line to provide visual connectivity with the woodland blocks to the east and west.
- 6.6.4.18 The section of the Scheme within the AONB would remain in cutting. Impacts on the character of the AONB would be restricted to the additional light columns and gantries that would be visible. While the section is currently lit, the proposed double row of columns and gantry would appear more 'urban' within the AONB and would be perceived as an extension of the urbanisation of the landscape around Chorleywood.

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6.6.4.19 Primarily, new planting would be immature and would not screen new road infrastructure elements.

6.6.4.20 The sensitivity of the landscape character areas is medium. The magnitude of impact would be moderate. Overall the significance of effects would be moderate adverse.

Year 15:

6.6.4.21 The proposed hedge would provide visual connectivity along the Highway Boundary and provide added foreground interest to views from the south. It would not provide a full screen, but it would help place the new gantries and lighting columns within the landscape.

6.6.4.22 The magnitude of impact would be minor. Overall, the significance of effects would be moderate to slight adverse.

Hertfordshire County Landscape Character Areas 7: Sarratt Plateau and 11: Lower Gade Valley

Year 1:

6.6.4.23 The character switches between open agricultural land and the dense woodland blocks north of Chandlers Cross and enclosing Junction 19.

6.6.4.24 Where the Scheme passes through the woodland blocks, the aim is to retain as much planting as feasible and to replant where technically possible. Replacement planting of hedges, shrubs, grass and woodland, appropriate to the local context, would aid in compensating for the losses.

6.6.4.25 Proposed hedge planting along the boundaries would provide both visual and physical connectivity with the woodland blocks. Introduction of treatment and/or attenuation ponds at Coltspring School, and Junction 19 would cause an adverse impact on established vegetation and would alter the local character. Appropriate planting would aid integration, however, at year 1 planting would be immature and would not aid integration.

6.6.4.26 The sensitivity of the landscape character areas are medium. The magnitude of impact would be moderate. Overall, the significance of effects would be moderate adverse.

Year 15:

6.6.4.27 Replacement planting appropriate to the local context would have matured and would provide screening and integration into the surrounding landscape.

6.6.4.28 The magnitude of impact upon the landscape would be minor. Overall, the significance of effects would be slight adverse.

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Hertfordshire County Landscape Character Areas 8: Upper Gade Valley, 9: Bedmond Plateau and 10: St Stephens Plateau

Year 1:

- 6.6.4.29 The Scheme would increase the width of carriageway resulting in permanent removal of woodland, shrubs, grass and grass verges from within the Scheme Boundary. Replacement planting of hedges, shrubs, grass and woodland, appropriate to the local context, would aid in compensating for this loss. However, planting would be immature and would not aid integration into the surrounding landscape.
- 6.6.4.30 Introduction of treatment and attenuation ponds on the east side of Junction 20 and west of Bedmond Road would remove established vegetation and alter the local character. The proposed water treatment areas and ponds within Junction 21A would be contained predominantly adjacent to the carriageway and the associated losses of established planting minimised.
- 6.6.4.31 The proposed Environmental Barrier on the Gade Valley Viaduct would appear incongruous within a highly visible context and have an adverse impact on the character of the area.
- 6.6.4.32 The sensitivity of the landscape character areas are medium. The magnitude of impact would be minor. Overall, the significance of effects would be slight adverse.

Year 15:

- 6.6.4.33 Replacement planting appropriate to the local context would have matured and would provide screening and integration into the surrounding landscape. However, there would still be an overall local reduction in the quantity of trees and woodland, grassland and shrubs within the Highway Boundary as a result of the Scheme.
- 6.6.4.34 The proposed Environmental Barrier on the Gade Viaduct would appear incongruous within a highly visible context and would retain its adverse impact on the character of the area.
- 6.6.4.35 The magnitude of impact would be minor. Overall, the effects would be slight adverse.

Hertfordshire County Landscape Character Areas 18: Bricket Wood

Year 1:

- 6.6.4.36 The Scheme would set out to retain the woodland edges to the north and south of the Scheme Boundary that visually links How Wood and Bricket Wood. This would maintain this visual pinch before the Scheme enters the more open agricultural character to the east.
- 6.6.4.37 An Environmental Barrier on the anti-clockwise approach to Junction 21A would be prominent on the horizon with the new gantry and verge lighting infrastructure clearly visible. This additional infrastructure would bridge the visual and physical gap between Junctions 21 and 21A, visually merging the junctions. This is of particular relevance within this section of the motorway, due to the high level of existing road infrastructure around Junctions 21 to 21A.

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6.6.4.38 New planting would be immature and would not screen new road infrastructure elements, which would be at odds with the wider and local landscape character.

6.6.4.39 The sensitivity of the landscape character areas are medium. The magnitude of impact would be minor. Overall, the significance of effects would be slight adverse.

Year 15:

6.6.4.40 Replacement planting appropriate to the local context would have matured and would provide screening and integration into the surrounding landscape. However, there would still be an overall local reduction in the quantity of trees and woodland, grassland and shrubs within the Scheme Boundary as a result of the Scheme.

6.6.4.41 The magnitude of impact would be minor. Overall, the significance of effects would be slight adverse.

Hertfordshire County Landscape Character Areas 17: Ver/Colne River Valley and 19: Vale of St Albans

Year 1:

6.6.4.42 The removal of existing planting and the introduction of lighting columns, gantries and an Environmental Barrier on the anti-clockwise carriageway would have an adverse effect. They would open up the motorway, making it more visible in the landscape and would be at odds with the wider and local character. This would be particularly important at Frogmore where the combination of widening, regrading and environmental barriers would require the removal of existing vegetation. There would also be adverse effects around Harpers Lane and Shenley Lane where the Scheme is currently in cutting. Gantries, signage, some areas of new lighting, additional road surfacing and increased traffic volumes would be introduced into a landscape primarily rural in character.

6.6.4.43 Replacement planting of hedges, shrubs, grass and woodland, appropriate to the local context, would aid in compensating for this loss. However, planting would be immature and would not have reached full mitigation potential for aiding in integration of the Scheme into the surrounding landscape.

6.6.4.44 The sensitivity of the landscape character areas are medium. The magnitude of impact would be moderate. Overall, the significance of effects would be moderate adverse.

Year 15:

6.6.4.45 The Scheme would reinforce the dominance of the M25 within the open and predominantly rural landscape although replacement planting appropriate to the local context would have matured and would provide limited screening and integration into the surrounding landscape.

6.6.4.46 Mature planting would slightly reduce the impact, however, the magnitude of impact would remain as moderate. Overall, the significance of effects would be moderate adverse.

Hertfordshire County Landscape Character Areas 20: Shenley Ridge, 21: High Canons Valleys and Ridges, 27: Catharine Bourne Valley, 24: Arkley Plain

Year 1:

- 6.6.4.47 There would be, as a result of the Scheme permanent removal of woodland, shrubs, grass and grass verges. Removal of the limited, but important (for screening/integration), roadside planting would have a detrimental effect. The 'green' element to the road edge would be replaced with hard road elements and infrastructure intruding into the adjacent landscape and impacting upon the quality and amenity of the wider area. There would be little scope for replacement planting within the Scheme Boundary. Where possible, woodland, hedge, shrub and grass planting would be implemented to aid in compensating for vegetative loss. However, at year 1, planting would be immature and would not aid in the integration of the Scheme into the surrounding landscape.
- 6.6.4.48 An Environmental Barrier has been proposed to provide screening along the section between the B556 and Catharine Bourne. The introduction of two treatment and/or attenuation ponds and a bio-retention facility would further reduce the existing vegetation cover in an area that is generally exposed due to the surrounding topography. In addition, the Scheme on embankment would cause an adverse impact upon the local environment by introducing additional retaining walls and altering the local character.
- 6.6.4.49 The village of South Mimms, to the north of the Scheme, is in a slightly elevated position. The Scheme would be clearly visible dominating the surrounding character. The introduction of a lighting scheme would reinforce the existing alignment adding further to its dominance.
- 6.6.4.50 Gantries, signage, new lighting, additional road surfacing and increased traffic volumes would be introduced into a landscape primarily rural in character and be particularly visible from the adjacent ridges.
- 6.6.4.51 The sensitivity of the landscape character areas are medium. The magnitude of impact would be moderate. Overall, the significance of effects would be moderate adverse.

Year 15:

- 6.6.4.52 Replacement planting appropriate to the local context would have matured and would provide screening and integration into the surrounding landscape. However, there would still be an overall reduction in the landscape character and quality due to the elevation of the Scheme. In addition, the quantity of trees and woodland, grassland and shrubs within the Scheme Boundary would be reduced as a result of the Scheme.
- 6.6.4.53 The magnitude of impact would be moderate. Overall, the significance of effects would be moderate adverse.

6.6.5 Effects on Visual Amenity Receptors

- 6.6.5.1 The location of the visual amenity receptors and the extent of visibility are illustrated on Figures 6.8: Visual Impacts (year 1) and Figures 6.9: Visual Impacts (year 15). In addition, further detail on the impacts on each viewpoint, including descriptions of change in view at year 1 during Winter, year 15 during Summer and Winter as well as the magnitude of impact and the significance of effect at both year 1, Winter and year

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15, Summer and Winter are shown on Figures 6.10: Visual Impact Schedules. Photomontages, at selected viewpoints, also illustrate the predicted changes at year 1 and year 15. These are shown on Figure 6.11: Photomontages.

6.6.5.2 An overview of the day and night-time visibility and views from identified receptors within the Study Area on a junction by junction basis has also been outlined below.

6.6.5.3 In addition, a summary of the visual effects is illustrated in Tables 6.11 to 6.14.

Table 6.11: Number of Properties Affected by the Scheme

	Large Adverse	Moderate Adverse	Slight Adverse	Neutral	Slight Beneficial	Moderate Beneficial	Large Beneficial
Year 1 Winter	0	100	72	12	0	0	0
Year 15 Summer	0	36	111	37	0	0	0
Year 15 Winter	0	36	111	37	0	0	0

Table 6.12: Number of PRoWs Affected by the Scheme

	Large Adverse	Moderate Adverse	Slight Adverse	Neutral	Slight Beneficial	Moderate Beneficial	Large Beneficial
Year 1 Winter	0	5	60	6	0	0	0
Year 15 Summer	0	2	33	36	0	0	0
Year 15 Winter	0	2	33	36	0	0	0

Table 6.13: Number of Open Space Receptors Affected by the Scheme

	Large Adverse	Moderate Adverse	Slight Adverse	Neutral	Slight Beneficial	Moderate Beneficial	Large Beneficial
Year 1 Winter	0	0	8	3	0	0	0
Year 15 Summer	0	0	5	6	0	0	0
Year 15 Winter	0	0	5	6	0	0	0

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Table 6.14: Number of Road and Rail Receptors Affected by the Scheme

	Large Adverse	Moderate Adverse	Slight Adverse	Neutral	Slight Beneficial	Moderate Beneficial	Large Beneficial
Year 1 Winter	0	0	12	20	0	0	0
Year 15 Summer	0	0	12	20	0	0	0
Year 15 Winter	0	0	12	20	0	0	0

6.6.5.4 Generally, all views from visual amenity receptors during the Summer, impacts would be slightly improved due to the screening provided in the wider landscape through the existing woodland, tree and shrub and hedgerow vegetation in leaf and also the vegetation surrounding the Scheme. However, although these improvements would reduce the magnitude of impact slightly, the changes would not be major enough to alter the significance of effects for the majority of visual amenity receptors.

Junctions 16-17

Year 1

Properties:

6.6.5.5 Key impacts would be:

- properties located adjacent to the A413 overbridge at Tatling End would experience close, open views, and long views of increased traffic volumes, lighting columns, gantries, signage, retaining walls and Environmental Barriers
- from the Thames Water Depot and Industrial Site at High Denham an overall reduction in density of planting would open up greater views of the bridge structure. New lighting columns and gantry would be visible as well as the new attenuation pond and associated planting (Chainage 3,650-3,700)
- properties close to the Scheme scattered along its east and west side, at Fulmer Lane, Owls Hoot Cottage, Further Wood Caravan Site, Coldharbour Farm Cottages and Isle of Wight Farm, would experience views of the new Scheme elements often filtered through the existing landform and planting, and/or by the Scheme in cutting;
- properties at Gerrards Cross, Horn Hill and Maple Cross would experience views of high-sided vehicles and tall Scheme elements (e.g. lighting, gantries and signage) filtered by landform and existing vegetation, and/or the Scheme in cutting. There would also be some decrease in screening of the Scheme through the reduction in density of existing trees within the Scheme Boundary.

6.6.5.6 The sensitivity of receptors is high and the magnitude of impacts would be minor to moderate. The significance of effects would be moderate adverse.

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Public Rights of Way:

6.6.5.7 Key impacts would be:

- footpaths cross over, under and run adjacent to the Scheme. Direct views would be obtained from footbridges, which cross the Scheme. Close to the Scheme, views of new elements are generally filtered through existing landform and vegetation. Further from the Scheme, views would often be filtered by existing planting and landform. Where there is loss of vegetation adjacent to the Scheme clearer views would be obtained

6.6.5.8 The sensitivity of receptors is high and the magnitude of impact would be minor. The significance of effects would be slight adverse.

Open Space:

6.6.5.9 The loss of vegetation within the Scheme Boundary would result in more open views from the southern edge of the Gerrards Cross Golf Course, with wider views of vehicle movements, new lighting infrastructure and gantries.

6.6.5.10 The sensitivity of receptors is medium and magnitude of impact would be minor. The significance of effects would be slight adverse.

Roads and Railways:

6.6.5.11 The key roads either cross over or under the Scheme and the railway line crosses over the Scheme. Motorists and rail passengers using these routes would experience channelled and glimpsed views of increased traffic volumes, new lighting columns, gantries, signage, and additional road surfacing with clear views obtained where the motorway is crossed on over bridges (e.g. on Oxford Road).

6.6.5.12 The Scheme would be introduced into an established busy transport corridor and would not appear out of context with the motorist's visual environment. New lighting columns introduced into the section of the Scheme, which is currently unlit, would constitute the greatest change in and intrusion into views.

6.6.5.13 The sensitivity of road receptors is low and the magnitude of impact would be minor. The significance of effects would be slight adverse. The sensitivity of rail passengers is low and the magnitude of impact would be minor. The significance of effects would be neutral.

Year 15

Properties:

6.6.5.14 Woodland planting which would provide screening of the Environmental Barrier structures and integrate the Scheme into the surrounding landscape would be mature and would have reached full mitigation potential.

6.6.5.15 The magnitude of impact would be minor. The significance of effects would be slight adverse.

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Public Rights of Way:

6.6.5.16 Replacement planting would have matured and reached full mitigation potential, integrating and screening the Scheme from selected views, although some views would be possible over the Scheme.

6.6.5.17 The magnitude of impact would be minor. The significance of effects would be slight adverse.

Open Space:

6.6.5.18 Replacement hedge planting within the Scheme Boundary would have matured reinstating a low level foil to the vehicle movements and carriageway infrastructure, although the lighting columns would remain visible. Views would be broadly comparable to existing views.

6.6.5.19 The magnitude of impact would be minor. The significance of effects would be neutral.

Roads and Railways:

6.6.5.20 Motorists and rail passengers crossing the Scheme would experience passing and intermittent views of the Scheme. Due to the fleeting and intermittent nature of views and clear views obtained from over-bridges, any replacement planting would not provide complete screening or integration of the Scheme particularly of the lighting columns.

6.6.5.21 The magnitude of impact would be minor. The significance of effects would be slight adverse for motorists. For rail passengers, the magnitude of impact would be negligible to minor, the significance of effect would be neutral.

Junctions 17-18

Year 1

Properties:

6.6.5.22 Key impacts would be:

- properties on the north eastern edge of Mill End and Rickmansworth would experience clear views of increased traffic flows of high sided vehicles, new light columns, gantry and an Environmental Barrier on the horizon (Photomontage Location 1: Figure 6.11)
- Properties south of Junction 18 and north and south of Berry Lane viaduct would experience views of the Scheme with the loss of mature vegetation and the introduction of an Environmental Barrier and lighting on the viaduct
- Scattered, individual properties to the west would experience greater views of the Scheme due to loss of existing vegetation and introduction of new lighting and gantries

6.6.5.23 The sensitivity of receptors is high and the magnitude of impact would be minor. The significance of effects would be moderate adverse.

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Public Rights of Way:

6.6.5.24 Key impacts would be:

- footpaths cross over, under and run adjacent to the Scheme. Direct views would be obtained from footbridges, which cross the Scheme. Close to the Scheme, views of new road elements would be generally filtered views through existing landform and vegetation. Further from the Scheme views would be distant, filtered by existing planting and landform

6.6.5.25 The sensitivity of receptors is high and at the magnitude of impact would be minor. The significance of effects would be slight adverse.

Open Space:

6.6.5.26 The William Penn Leisure Centre lies south of the Scheme where it would be visible on the horizon crossing over Shepherd's Lane. A public open space (POS), north of Rickmansworth is immediately north of where the Scheme enters a cutting as it approaches Pheasant's Wood. Both of these receptors would experience clear views of the Scheme due to the loss of existing screening vegetation and the introduction of lighting, gantries and an Environmental Barrier.

6.6.5.27 There would be no views of the Scheme from Chorleywood Common due to the topography and the dense planting between the Common and the Scheme.

6.6.5.28 The sensitivity of receptors is medium and the magnitude of impact would be moderate. The significance of effects would be slight adverse.

Roads and Railways:

6.6.5.29 The key roads and railway line either cross over or under the Scheme. Motorists and rail passengers using these roads would experience channelled and glimpsed views of increased traffic, new lighting columns, gantries, signage and additional road surfacing. Wider views would be obtained from Shepherds Lane as motorists descend from higher land. Views from Berry Lane and Rickmansworth Road and Chorleywood Road would be more restricted by woodland and the Scheme in cutting respectively.

6.6.5.30 The Scheme would be introduced into an established busy transport corridor and would not appear out of context with the motorist's visual environment. New lighting columns introduced into the section of the motorway, which is currently unlit, would constitute the greatest change in and intrusion into views.

6.6.5.31 The sensitivity of receptors is low and the magnitude of impact would be minor to negligible. The significance of effects would be slight adverse to neutral.

Year 15

Properties:

6.6.5.32 Replacement planting would have matured and reached full mitigation potential. It would at least partially integrate and/or screen the Scheme into/from the surrounding landscape from many sensitive receptors.

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6.6.5.33 Specifically, the establishment of vegetation would provide some filtering of views from properties on the eastern side of Mill Hill, Rickmansworth and individual properties to the west of the Scheme, although views of the Scheme will still be possible from the fringes of these sensitive receptors.

6.6.5.34 In addition, new planting at Berry Lane viaduct would compensate for the loss due to construction, however lighting would remain prominent on the horizon in many views from the settlement fringes.

6.6.5.35 The magnitude of impacts would be moderate. The significance of effects would be moderate adverse.

Public Rights of Way:

6.6.5.36 Footpath users would experience filtered views through existing landform, retained and new vegetation. Replacement planting, including hedges, would have matured and reached full mitigation providing integration and screening. The footpath from Shepherds Lane through Rickmansworth is an exception with clear views to the Scheme elements due to loss of screening vegetation along the Scheme Boundary.

6.6.5.37 The magnitude of impacts would be minor. The significance of effects would be slight adverse.

Open Space:

6.6.5.38 There would be limited scope to carry out replacement planting for screening and integration purposes. The Environmental Barrier, lighting columns and gantries would remain clearly visible on the horizon

6.6.5.39 The magnitude of impacts would be moderate. The significance of effects would be slight adverse.

Roads and Railways:

6.6.5.40 Motorists on roads and rail passengers crossing the Scheme would still experience passing and intermittent views. Due to the fleeting, intermittent, elevated and channelled nature of views replacement planting would not provide complete screening or integration of the Scheme, particularly the lighting columns.

6.6.5.41 The magnitude of impacts would be negligible. The significance of effects would be slight adverse to neutral.

Junctions 18-19

Year 1

Properties:

6.6.5.42 Key impacts would be:

- properties adjacent to the Scheme at Chorleywood and Loudwater (Wyatts Close, Chess Way, Old Solesbridge Lane and Solesbridge Lane) would experience

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views of the replaced Environmental Barrier, gantries and signage combined with a reduction in density of screening planting alongside the Scheme

- Other properties at Mickleford Green, Sarratt Road and Chandlers Cross would experience views filtered by landform, environmental bunds and existing vegetation, high sided vehicles, tall new road elements including gantries and signs

6.6.5.43 The sensitivity of receptors is high and the magnitude of impacts would be moderate. The significance of effects would be moderate adverse.

Public Rights of Way:

6.6.5.44 Key impacts would be:

- users of footpaths running adjacent to the Scheme would experience filtered views through existing landform and vegetation, new road elements and replaced timber Environmental Barriers
- from footbridges crossing the Scheme views would be elevated and unobstructed
- Footpath No. F28, running north-south across the Chilterns AONB, would have clear views east over curved alignment of the Scheme. The Scheme would be in a cutting but would be defined by the increased number and height of the light columns and the new gantry (Photomontage locations 2 and 3, Figure 6.11)
- Treatment and attenuation ponds with new wetland planting would intrude into views from the footpath east of Chandlers Cross

6.6.5.45 The sensitivity of receptors is high and the magnitude of impacts would be minor. The significance of effects would be slight adverse.

Open Spaces:

6.6.5.46 There are no major public open spaces.

Roads and Railways:

6.6.5.47 The key roads cross over the Scheme. Motorists using these routes would experience channelled and glimpsed views of increased traffic volumes, lighting columns, gantries, signage, and additional road surfacing with clear views obtained where the motorway is crossed on over-bridges (e.g. on Sarratt Road, Solesbridge Lane and Chandlers Lane).

6.6.5.48 The Scheme would be introduced into an established busy transport corridor which is already lit and would not appear out of context with the motorist's visual environment. There are no railway lines.

6.6.5.49 The sensitivity of receptors is low and the magnitude of impact would be negligible. The significance of effects would be neutral.

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Year 15

Properties:

6.6.5.50 New planting would have matured screening views from properties adjacent to the Scheme at Chorleywood and along Solesbridge Lane, Loudwater. Other properties at Mickleford Green, Sarratt Road and Chandlers Cross would experience views filtered by the continued establishment of existing vegetation.

6.6.5.51 The magnitude of impact would be moderate. The significance of effects would be slight adverse.

Public Rights of Way:

6.6.5.52 Users of footpaths would experience views through the matured vegetation of increased traffic volumes, gantries, signage and additional road surfacing. Replacement planting, including hedges, would have matured and reached full mitigation potential, integrating and screening the Scheme into and from the surrounding landscape.

6.6.5.53 The magnitude of impact would be minor. The significance of effects would be neutral.

Roads and Railways:

6.6.5.54 Motorists on roads crossing the Scheme would experience passing and/or intermittent views. Replacement planting would not provide complete screening or integration of the Scheme due to the fleeting and intermittent nature of views, particularly those obtained from over-bridges.

6.6.5.55 The magnitude of impact would be negligible. The significance of effects would be neutral.

Junctions 19-20

Year 1

Properties:

6.6.5.56 The scattered properties to the north east of the Scheme on Old House Lane and Langlebury Lane and to the west of the Scheme at Hunton Bridge would have distant views, filtered by vegetation and landform, of tall road elements (lighting columns and high sided vehicles). Some reduction in density of roadside vegetation would decrease screening of the road.

6.6.5.57 The sensitivity of receptors is high and the magnitude of impacts would be minor to moderate. The significance of effects would be slight to moderate adverse.

Public Rights of Way:

6.6.5.58 Users of footpaths would experience predominantly open views with some filtered views through existing landform and vegetation. Where footpaths cross the Scheme on a footbridge users would have elevated, unobstructed, direct views.

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6.6.5.59 The sensitivity of receptors is high and the magnitude of impact would be minor. The significance of effects would be slight adverse.

Open Space:

6.6.5.60 The view from the Sports Ground at Langleybury would change with the loss of existing screen planting within the Scheme Boundary. It would open up wider views of vehicle movement, gantries and increased lighting columns.

6.6.5.61 The sensitivity of receptors is medium and the magnitude of impact would be minor. The significance of effects would be slight adverse.

Roads and Railways:

6.6.5.62 Motorists along Old House Lane, which crosses the Scheme, would experience views of increased traffic volumes, lighting columns, gantries, signage, and additional road surfacing.

6.6.5.63 The Scheme would be introduced into an established busy transport corridor which is already lit and would not appear out of context with the motorist's visual environment. There are no railway lines.

6.6.5.64 The sensitivity of receptors is low and the magnitude of impact would be negligible. The significance of effects would be neutral.

Year 15

Properties:

6.6.5.65 Views from residential property receptors would remain similar to year 1 with distant filtered views to the Scheme. New hedge planting would offer some screening to properties north east of Junction 19.

6.6.5.66 The magnitude of impact would be minor. The significance of effects would be slight adverse.

Public Rights of Way:

6.6.5.67 Users of PROW would continue to experience clear views of the Scheme with little change from year 1.

6.6.5.68 The magnitude of impact would be minor. The significance of effects would be slight adverse.

Open Space:

6.6.5.69 There would be limited scope to carryout replacement planting for screening for integration purposes. The lighting columns and gantries would remain visible on the horizon.

6.6.5.70 The magnitude of impact would be minor. The significance of effects would be slight adverse.

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Roads and Railways:

6.6.5.71 Motorists on the road crossing the Scheme would experience passing and intermittent views of the Scheme. Due to the nature of views from the over-bridges, any replacement planting would not provide complete screening or integration of the Scheme.

6.6.5.72 The magnitude of impact would be negligible. The significance of effects would be neutral.

Junctions 20-21

Year 1

Properties:

6.6.5.73 Key impacts would be:

- residents of properties at Kings Langley, north of Junction 20 and on the eastern edge of Abbots Langley would experience close, open views of new elements on, and adjacent to the Gade Viaduct including signage and gantries, lighting and upgraded Environmental Barriers
- properties on the edge of Abbots Langley close to the Scheme would have partial screening of new road elements
- Properties at a distance from the Scheme, at Bedmond and Abbots Langley, would experience filtered views through existing planting (woodland blocks and hedgerows with trees), landform and built form
- individual scattered properties south of Bedmond would experience greater views due to loss of vegetation

6.6.5.74 The sensitivity of receptors is high and the magnitude of impact would be moderate. The significance of effects would be moderate adverse.

Public Rights of Way:

6.6.5.75 Key impacts would be:

- from footpaths crossing under the Scheme at the Gade Viaduct, users would experience filtered views through existing landform and vegetation, and clear views to Junction 20 of increased traffic volumes, increased road width, new gantries and signage, grass seeding to cutting works and new immature woodland planting. Distant views to the north east would allow views to embankment works attenuation ponds and an overall reduction in the density of roadside planting
- several footpaths will cross over the Scheme on a footbridge and users would have elevated and unobstructed, direct views
- users of footpaths at a greater distance from the Scheme would experience glimpses through existing planting and landform of traffic movements and new tall road elements. Glimpses through woodland of traffic movements would be

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possible due to an overall reduction in the density of planting. Attenuation ponds would also be visible, with immature pond and surround planting

6.6.5.76 The sensitivity of receptors is high and the magnitude of impact would be minor. The significance of effects would be slight adverse.

Open Space:

6.6.5.77 The existing views of the Gade Valley Viaduct are open and clear due to its elevated position. The view would remain similar with the addition of an Environmental Barrier on the Gade Valley Viaduct.

6.6.5.78 The sensitivity of receptors is medium and the magnitude of impact would be minor. The significance of effects would be slight adverse.

Roads and Railways:

6.6.5.79 The key roads and railway lines either cross over or under the Scheme Motorists and rail passengers using these routes would experience channelled and glimpsed views of increased traffic volumes, lighting columns, gantries, signage, and additional road surfacing with clear views obtained where the Scheme is crossed on over bridges (e.g. Bedmond Road).

6.6.5.80 The Scheme would be introduced into an established busy transport corridor, which is already lit and would not appear out of context with the motorist's visual environment.

6.6.5.81 The sensitivity of receptors is low and the magnitude of impacts would be negligible. The significance of effects would be neutral.

Year 15

Properties:

6.6.5.82 Replacement planting would have matured and reached full mitigation potential, integrating and/or screening the Scheme into and from the surrounding properties.

6.6.5.83 Views from properties to the Gade Viaduct would remain unchanged. For scattered properties east of Bedmond, matured new hedge planting would provide screening. Properties with views towards the attenuation pond at Junction 20 would benefit from maturation of associated planting providing some screening. Otherwise, views from properties would remain unchanged from year 1.

6.6.5.84 The magnitude of impact would be moderate to minor. The significance of effects would be slight adverse.

Public Rights of Way:

6.6.5.85 Replacement planting, including hedges and planting to pond surrounds would have matured and reached full mitigation potential, integrating and/or screening the Scheme into and from the surrounding landscape.

6.6.5.86 The magnitude of impact would be minor to negligible. The significance of effects would be slight adverse to neutral.

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Open Space:

6.6.5.87 There would be limited scope to carry out mitigation planting for screening and integration purposes. The lighting columns and gantries would remain visible on the horizon.

6.6.5.88 The magnitude of impact would be minor. The significance of effects would be slight adverse.

Roads and Railways:

6.6.5.89 Motorists on roads and rail passengers crossing the Scheme would experience passing and intermittent views of the Scheme. Replacement planting would not provide complete screening or integration of the Scheme due to the fleeting and intermittent nature of views, particularly those obtained from over-bridges.

6.6.5.90 The magnitude of impacts would be negligible. The significance of effects would be neutral.

Junctions 21-22

Year 1

Properties:

6.6.5.91 Key impacts would be:

- properties north of Bricketwood (Photomontage Location 4 Figures 6.11) would experience views of Environmental Barrier and gantries, on the anticlockwise approach to Junction 20
- properties at Frogmore would experience greater views due to loss of vegetation, introduction of replacement Environmental Barrier and a new gantry
- properties along Harper Lane, Shenley Lane and All Saints Pastoral Centre (Photomontage Location 5 Figure 6.11) and to the west of London Colney would experience close, open views of new elements, including signage and gantries and upgraded Environmental Barriers
- properties at Shenley are at a distance from the Scheme but would experience open views

6.6.5.92 The sensitivity of receptors is high and the magnitude of impact would be moderate to minor. The significance of effects would be moderate adverse to slight adverse.

Public Rights of Way:

6.6.5.93 Key impacts would be:

- the majority of footpaths cross over the Scheme on a footbridge and users would have elevated, unobstructed, direct views on the approach to the footbridge and from the footbridge itself. Views would consist of attenuation ponds and associated planting, increased traffic volumes, increased width of the road itself,

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gantries and signage and all associated road elements as well as an overall decrease in planting density

- where footpaths cross under the Scheme users would experience views on the approach to the underpass of replaced Environmental Barriers, signs and gantries, new lighting, embankment works, increased traffic volumes, increased road width and decreased density of vegetation
- users of footpaths that follow the Scheme Boundary would experience views that vary along the Scheme, from filtered views through existing planting, open views of the Scheme and glimpses of vehicle movement, signs and gantries, new lighting through retained woodland in winter and decreased density vegetation
- users of footpaths to the north of Shenley would experience distant views of traffic movements and new tall road elements (gantries and signs, new lighting, increased traffic volumes, replaced Environmental Barriers) that would be glimpsed through planting, landform and some retained vegetation

6.6.5.94 The sensitivity of receptors is high and the magnitude of impact would be minor. The significance of effects would be slight adverse.

Open Space:

6.6.5.95 The Scheme is in cutting south of the public open space (POS) east of Frogmore however the loss of existing vegetation within the Scheme Boundary would open up wider views of vehicle movements, gantries and new lighting columns. At the University College of London Sports Ground, the clear views currently experienced would be widened with the loss of existing vegetation, opening greater views of vehicle movement, gantries and new lighting columns.

6.6.5.96 Broad Colney Lakes Nature Reserve would have no direct views of the Scheme due to the topography and the dense planting between the reserve and the Scheme.

6.6.5.97 The sensitivity of receptors is medium and the magnitude of impact would be minor. The significance of effects would be slight adverse.

Roads and Railways:

6.6.5.98 Motorists using the key roads that cross the Scheme (e.g. Lye Lane and Radlett Road) and the railway lines would experience channelled and glimpsed views of increased traffic volumes, lighting columns, gantries, signage, and additional road surfacing. New lighting columns introduced into the section of the motorway, which is currently unlit, would constitute the greatest change in and intrusion into views (e.g. on Harper Lane/Bell Lane).

6.6.5.99 The Scheme would be introduced into an established busy transport corridor which has both lit and unlit sections and would not appear out of context with the motorist's visual environment.

6.6.5.100 The sensitivity of receptors is low and the magnitude of impact would be minor to negligible. The significance of effects would be slight adverse to neutral.

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Year 15

Properties:

- 6.6.5.101 Replacement planting would have matured and reached full mitigation potential, integrating and screening the Scheme into and from the surrounding properties.
- 6.6.5.102 Views from properties to the Gade Viaduct would remain unchanged. For scattered properties east of Bedmond, matured new hedge planting would provide screening. Properties with views towards the attenuation pond at Junction 20 would benefit from maturation of associated planting providing some screening. Otherwise, views from properties remain unchanged from year 1.
- 6.6.5.103 The magnitude of impact would be minor. The significance of effects would be slight adverse.

Public Rights of Way:

- 6.6.5.104 Replacement planting, including hedge and planting to pond surrounds would have matured and reached full mitigation potential, integrating and screening the Scheme into and from the surrounding PROW.
- 6.6.5.105 The magnitude of impact would be minor to negligible. The significance of effects would be slight adverse to neutral.

Open Space:

- 6.6.5.106 There would be limited scope to carry out mitigation planting for screening and integration purposes. The lighting columns and gantries would remain visible.
- 6.6.5.107 The magnitude of impact would be minor. The significance of effects would be slight adverse.

Roads and Railways:

- 6.6.5.108 Motorists on roads and rail passengers crossing the Scheme would experience passing and intermittent views of the Scheme. Due to the fleeting and intermittent nature of views and clear views obtained from over-bridges any replacement planting would not provide complete screening or integration of the Scheme, particularly of the lighting columns.
- 6.6.5.109 The magnitude of impact would be minor to negligible. The significance of effects would be slight adverse to neutral.

Junctions 22-23

Year 1

Properties:

6.6.5.110 Key impacts would be:

- the Listed Building, Salisbury Hall, lies in an open location south of Junction 22. The Scheme removes the vegetation cover along the anti-clockwise section on the western approach to Junction 22 resulting in a further degrading of an already poor setting, dominated by Junction 22, (Photomontage Location 6, Figure 6.11)
- individual properties over a wide area would have open and extensive views of all new road elements. Where the Scheme is on embankment the open nature of the landscape would allow clear views from properties at South Mimms and scattered properties to the south west of the Scheme (Photomontage Location 7, Figure 6.11). To the south of South Mimms, a hedge has been proposed to provide a visual boundary to the Scheme and a screen to the low level infrastructure and vehicle movement. Where hedge planting is not feasible an Environmental Barrier would be introduced
- residences on Blanche Lane situated close to the Scheme would experience views of high sided vehicles and tall road elements including lighting, signage and gantries
- scattered properties north east of Shenley and properties at Ridge would experience filtered views through existing planting (woodland blocks and hedgerows with trees) of the Scheme

6.6.5.111 The sensitivity of receptors is high and the magnitude of impact would be moderate. The significance of effects would be moderate adverse.

Public Rights of Way:

6.6.5.112 Key impacts would be:

- the majority of footpaths run adjacent to, cross under the Scheme and/or connect to local paths. Users would experience filtered views through existing landform and vegetation. From a distance users would experience open views of all elements of the Scheme

6.6.5.113 The sensitivity of receptors is high and the magnitude of impact would be minor. The significance of effects would be slight adverse.

Open Space:

6.6.5.114 There would be filtered views of the Scheme from the open space in South Mimms of the gantries, lighting and increased vehicular movement as a result of the loss of screening vegetation within the Scheme Boundary.

6.6.5.115 There would be limited views of the Scheme from the Ridge Tennis Courts, largely as a result of the increase in the height of the proposed lighting columns.

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6.6.5.116 The sensitivity of receptors is medium and the magnitude of impact would be minor. The significance of effects would be slight adverse.

Roads and Railways:

6.6.5.117 Motorists on key roads would experience channelled and glimpsed views of increased traffic volumes, new lighting columns, gantries, signage and additional road surfacing with clear views obtained where the Scheme is crossed on over bridges. Elevated, prolonged and clear views are obtained from St Albans Road, which descends from South Mimms and runs closely parallel to the Scheme for some distance. There are no railway lines.

6.6.5.118 The sensitivity of the receptors is low and the magnitude of impact would be minor. The significance of effects would be slight adverse.

Year 15

Properties:

6.6.5.119 Replacement planting would have matured and reached full mitigation potential, integrating and screening the Scheme into and from the surrounding properties. Wetland and screen planting would have matured integrating ponds into the surrounding views.

6.6.5.120 The magnitude of impact would be minor. The significance of effects would be slight adverse.

Public Rights of Way:

6.6.5.121 Users of footpaths would experience views through existing landform and matured vegetation of increased traffic volumes, gantries, signage, attenuation ponds and additional road surfacing. Replacement planting, including hedges and planting to pond surrounds would have matured and reached full mitigation potential, partially integrating and screening the Scheme into and from the surrounding views.

6.6.5.122 The magnitude of impact would be minor to negligible. The significance of effects would be slight adverse.

Open Space:

6.6.5.123 There would be limited scope to carry out mitigation planting for screening and integration purposes. The lighting columns and gantries would remain visible.

6.6.5.124 The magnitude of impact would be minor. The significance of effects would be slight adverse to neutral.

Roads and Railways:

6.6.5.125 Motorists on roads crossing or running alongside the Scheme would experience passing and intermittent views of the Scheme. Due to the nature of views which are fleeting and intermittent or prolonged and elevated for motorists travelling along St Albans Road, any replacement planting would not provide complete screening or integration of the Scheme, particularly of the lighting columns.

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6.6.5.126 The magnitude of impact would be minor. The significance of effects would be slight adverse.

6.6.6 Night-time Effects

6.6.6.1 An overview of the night-time effects on landscape character and views from identified receptors within the Study Area on a junction by junction basis has been outlined below.

Junctions 16 – 17

Year 1

6.6.6.2 Clockwise from Junction 16, the existing motorway lighting in combination with the presence of lit arterial roads with residential and commercial development ensures that any additional impact from the Scheme lighting would be greatly diluted.

6.6.6.3 The impact of new lighting, north of Tatling End, where the existing motorway is not lit, would increase as the presence of man-made development diminishes and an existing distinct and recognisable woodland structure emerges along the motorway corridor. However the effect of horizontal light spill from the Scheme would be generally contained, in many locations, by the presence of dense strips and blocks of woodland located in close proximity to the Scheme. However where this screening does not exist the fundamental character of inherent darkness would be altered dramatically by the presence of permanently lit structures within the landscape, which would be visible across the open farmland between blocks of woodland.

6.6.6.4 Further north-east towards Maple Cross and beyond up to Junction 17, the woodland structure around the Scheme begins to weaken and low pressure sodium streetlights and the motorway traffic headlights would be glimpsed more frequently across the night-time farmland landscape.

6.6.6.5 The night-time sensitivity varies between high/medium to medium/low due to variation between lit areas, around and extending from the junctions and motorway, and the unlit sections of motorway. The magnitude of impact would vary between major to moderate. The significance of effects would be moderate adverse to slight adverse.

Year 15

6.6.6.6 The night-time visual effects would be as year 1, with only a minor reduction in light spillage from the establishment and maturing of proposed planting.

6.6.6.7 The magnitude of impacts would be moderate. The significance of effects would be moderate adverse to slight adverse.

Junctions 17 – 18

Year 1

6.6.6.8 The impact from the Scheme lighting would be relieved by the existing night glow and street lighting emanating from the town of Rickmansworth. However, proposed lighting would dramatically increase the amount of light spill onto the residential district and the associated public open space. The night-time character of farmland on the opposite side

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would also be altered by the presence of proposed lighting. As the motorway approaches Junction 18, the extensive mature tree vegetation enclosing the Scheme would significantly assist in filtering light spill from the corridor. The proposed higher lighting columns, particularly on the elevated Berry Lane Viaduct, however, would be visible within the landscape.

- 6.6.6.9 The night-time character sensitivity varies between high/medium to medium/low due to variation in night-time character between lit areas around the junctions and motorway and the unlit sections of motorway. The magnitude of impact would vary between major to moderate. The significance of effects would be moderate adverse to slight adverse.

Year 15

- 6.6.6.10 There would be a minor reduction in light spillage from the establishment and maturing of proposed planting.
- 6.6.6.11 The magnitude of impact would vary between moderate to minor. The significance of effects would be moderate adverse to slight adverse.

Junctions 18 – 19

Year 1

- 6.6.6.12 The motorway is currently lit and lighting proposals would be to upgrade the existing lighting lanterns and columns.
- 6.6.6.13 The sensitivity varies between medium/low to low. The magnitude of impact would be moderate to minor. The significance of effects would be slight adverse to neutral.

Year 15

- 6.6.6.14 There would be a minor reduction in light spillage from the establishment and maturing of proposed planting.
- 6.6.6.15 The magnitude of impact would vary between minor to negligible. The significance of effects would be slight adverse to neutral.

Junctions 19 – 20

Year 1

- 6.6.6.16 The motorway and junctions are currently lit and lighting proposals would be to upgrade the existing lighting lanterns and columns.
- 6.6.6.17 The sensitivity varies between medium/low to low. The magnitude of impact would be moderate to minor. The significance of effects would be slight adverse to neutral.

Year 15

- 6.6.6.18 The night-time effects would be as year 1 with only a minor reduction in light spillage from the establishment and maturing of proposed planting.

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6.6.6.19 The magnitude of impact would be negligible. The significance of effects would be slight adverse to neutral.

Junctions 20 – 21

Year 1

6.6.6.20 The motorway and junctions are currently lit and lighting proposals would be to upgrade the existing lighting lanterns and columns. The proposed lighting on Gade Valley Viaduct will be identical to the existing and therefore there will be no change to its effect. At Junction 21 the existing lighting is low pressure sodium, but this will be replaced by full cut-off high pressure sodium lighting, leading to a reduction of light spill.

6.6.6.21 The sensitivity varies between medium/low to low. The magnitude of impact would be moderate to minor. The significance of effects would be slight adverse to neutral.

Year 15

6.6.6.22 There would be a minor reduction in light spillage from the establishment and maturing of proposed planting.

6.6.6.23 The magnitude of impact would vary between minor. The significance of effects would be slight adverse to neutral.

Junctions 21 – 22

Year 1

6.6.6.24 For the first three kilometres clockwise from Junction 21A and around Junction 22 the impact of the proposed lighting on the surrounding landscape would be minimal due to the existing presence of lighting from street, commercial and office development and arterial roads crossing the motorway, with only occasional dark zones of unlit farmland.

6.6.6.25 Almost immediately after the A5183 crosses the Scheme, however, the night-time character changes to a dark landscape. The impact of the proposed lighting would dramatically alter the nature of the night time character.

6.6.6.26 The night-time character sensitivity varies between high/medium to medium/low due to the variation in night-time character before and after the A5183 crosses the Scheme and also between the lit and unlit sections of motorway. The magnitude of impact would vary between major to moderate. The significance of effects would be moderate adverse.

Year 15

6.6.6.27 The night-time effects would be as year 1 with only a minor reduction in light spillage from the establishment and maturing of proposed planting.

6.6.6.28 The magnitude of impact would vary between moderate. The significance of effects would be moderate adverse.

Junctions 22 – 23

Year 1

6.6.6.29 As the Scheme runs southeast from Junction 22 across the North Thames Basin towards Junction 23, the existing sense of darkness would be removed by the introduction of the lighting. Although vegetation along the southern side of the motorway screens traffic headlights, the size of new columns would appear over this existing vegetation as permanent lit elements within the extensive landscape, altering its fundamental character. Until the B556 runs under the Scheme most receptors are heavily screened and some views of lighting would be filtered by woodland blocks and strips of vegetation. Beyond the point where the B556 crosses under the Scheme the farmland landscape is dark and open and the impact of lighting on the wider landscape would be dramatic producing a glow around the corridor and also horizontal light spill onto the surrounding landscape.

6.6.6.30 The night-time character sensitivity varies between high/medium to medium/low due to the variation in night-time character. The magnitude of impact would vary between major to moderate. The significance of effects of the lighting would be moderate adverse.

Year 15

6.6.6.31 The night-time effects would be as year 1 with only a minor reduction in light spillage from the establishment and maturing of proposed planting.

6.6.6.32 The magnitude of impact would vary between major to moderate. The significance of effects would be moderate adverse.

6.7 Summary

6.7.1 Landscape and Visual Effects

6.7.1.1 The landscape and visual effects that would result from the Scheme have been assessed in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3.7.

6.7.1.2 An Indicative Visual Envelope (IVE), including the Scheme Boundary, was identified that describes the area within which the physical components, or changes caused by the Scheme would be perceived. The IVE defines the extent of the Study Area.

6.7.2 Landscape Effects

6.7.2.1 The description of existing landscape conditions has been based on previously published landscape assessments, reference to landscape relevant designations and site survey. The description of the existing landscape conditions forms the basis against which the magnitude of impacts and the significance of effects are described.

6.7.2.2 Landscape impacts would generally result from the loss of vegetation within the Scheme Boundary, introduction of new elements such as gantries and lighting columns and new lighting in the currently unlit sections.

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6.7.2.3 Broadly, the Scheme would result in effects on the surrounding landscape relevant designations and the Buckinghamshire and Hertfordshire Landscape Character Areas that range from moderate adverse during construction, slight adverse to moderate adverse at year 1, reducing generally to slight adverse with the maturing of the Scheme planting by year 15.

6.7.2.4 However, the Scheme would result in moderate adverse landscape effects in year 15 in three main areas: the landscape character areas between Junctions 16 and 17, the Chilterns Area of Outstanding Natural Beauty, Chorleywood settlement and the landscape character areas between Junctions 21A and 22.

6.7.3 Visual Effects

6.7.3.1 The indicative visual envelope (IVE) identified the areas from which the Scheme would be visible. In broad terms, the Scheme crosses undulating ground in a wide sweeping curve across several shallow river valleys which open up panoramic views from and to the Scheme where it follows higher ground or cuts through ridgelines. The existing motorway is currently a visible element in many views, particularly where it crosses rivers or dry valleys or is on high embankments or viaducts.

6.7.3.2 The key visual effects on receptors resulting from the Scheme would be from the loss of existing vegetation and the introduction of signage, gantries and lighting.

6.7.3.3 Broadly, the Scheme would result in a moderate adverse effect during construction, a moderate to slight adverse effect at year 1 reducing to slight adverse with the maturing of the planting proposals on surrounding visual amenity receptors. During the Summer the impacts would be broadly reduced due to the screening provided by the surrounding woodland, trees, shrubs and hedgerows in leaf. However, this would largely not reduce the significance of effects.

6.7.4 Night-time Effects

6.7.4.1 The key night-time effects resulting from the Scheme would be from the loss of existing vegetation and the introduction of signage, gantries and lighting. This would include lighting in currently un-lit areas and the movement of lighting columns from central reserve lighting to verge lighting.

6.7.4.2 Broadly, the Scheme would result in effects on the surrounding landscape relevant designations, the landscape character areas and visual amenity receptors. Effects would range from moderate adverse during construction, slight adverse to moderate adverse at year 1, reducing generally to slight adverse with the maturing of the Scheme planting by year 15.

6.7.5 Overall Effects

6.7.5.1 The overall effects of the Scheme is determined through balancing the year 15 effects on landscape character (including designations) and visual amenity receptors, during the day and night time.

6.7.5.2 The effects of the Scheme, including continuous lighting, gantries and signage as well as the increase in road surface and the subsequent removal of vegetation within the Scheme boundary will continue to affect the landscape character and visual amenity at year 15.

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- 6.7.5.3 The greatest effects to landscape character will be the increase in built elements and the subsequent increased perception of urbanisation in the largely rural landscape surrounding the Scheme. The Scheme will also affect the recognised high quality landscape of the Chilterns Area of Outstanding Natural Beauty.
- 6.7.5.4 Day-time effects on visual amenity receptors will be from increased views of lighting columns, gantries and signage. Night-time effects will be intrusion from continuously lit areas along the Scheme.
- 6.7.5.5 Overall, the balance of these effects of the Scheme would be moderate adverse.

7 Ecology and Nature Conservation

7.1 Introduction

7.1.1.1 This chapter summarises the significant effects of the Scheme on ecology and nature conservation. Further details are available in the Ecology and Nature Conservation Technical Report¹.

7.2 Regulatory Framework

7.2.1.1 The assessment has been carried out in accordance with the following legislation and best practice guidance:

- Wildlife & Countryside Act 1981 (as amended) (W&CA)²
- Countryside and Rights of Way Act 2000 (CRoW)³
- Protection of Badgers Act 1992⁴
- Conservation (Natural Habitats &c.) Regulations 1994⁵
- Surface Waters (Fishlife) (Classification) Regulations 1997⁶ & Surface Waters (Fishlife) (Classification) (Amendment) Regulations 2003⁷
- Planning Policy Statement (PPS) 9, Biodiversity and Geological Conservation⁸
- UK Biodiversity Group: Tranche 2 Action Plans - Volumes I – VI⁹
- Highways Agency Biodiversity Action Plan¹⁰ (HABAP)
- A 50 Year Vision for the Wildlife and Natural Habitats of Hertfordshire¹¹
- Buckinghamshire and Milton Keynes Biodiversity Action Plan 2000-2010¹²

7.3 Methodology

7.3.1.1 The assessment has been undertaken in accordance with the Design Manual for Roads and Bridges (DMRB) Volumes 10¹³ and 11¹⁴, and Interim Advice Note 81/06¹⁵. The study area for this assessment comprises the existing highway estate and the land within two and a half kilometres either side. Environmental constraints including designated sites, habitats and protected/notable species have been mapped. Detailed surveys have been generally confined to within the Scheme Boundary and land within 150 metres, unless further requirements have been identified.

7.3.2 Establishment of Baseline Conditions

7.3.2.1 Establishment of baseline conditions involved collation of existing published data and collection of original data through specialist site surveys.

7.3.2.2 The scope of surveys was assisted by consultation with staff at Natural England (formerly English Nature, the environmental activities of Rural Development Service and

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the Countryside Agency's Landscape, Access and Recreation division) and the Environment Agency (EA). Species survey methodology has followed best practice guidelines and the methodologies outlined in DMRB Volume 10¹³.

7.3.2.3 Habitat surveys undertaken were:

- an initial Phase 1 Habitat Survey (PIHS)¹⁶ was completed up to 150 metres from the Secretary of State Land during May to August 2004
- National Vegetation Classification (NVC) surveys were carried out to identify the location of important plant communities during August 2004 (followed Rodwell^{17,18})
- River Corridor Surveys in October 2005 and surveys for aquatic macrophytes in October 2005

7.3.2.4 Surveys for specific species/groups undertaken were:

- badgers in January to May 2005 with updates during winter 2005/2006 and a complete resurvey during spring 2007 (followed DMRB and Harris et al., 1989¹⁹ but deviated from DMRB to only 100 metres as the Scheme is restricted to Secretary of State land)
- bats from August to September 2005 (modified from DMRB to develop a more targeted approach)
- dormouse from May to November 2005 (followed DMRB supplemented by Bright, 1996²⁰, Bright and MacPherson, 2002²¹ and Bright and Morris, 1996²²)
- otter from January to November 2005 (followed Chanin, 2003²³)
- water vole from January to November 2005 (followed Strachan, 1998²⁴)
- breeding birds from March to June 2005 (followed Blondel et al., 1981²⁵ and Hill et al., 1990²⁶)
- wintering birds from February to March, 2005 (followed the Winter Farmland Bird Survey methodology created by British Trust for Ornithology (BTO)²⁷)
- great crested newt from April to June 2005 (followed the Great Crested Newt Conservation Handbook²⁸, the Great Crested Newt Mitigation Guidelines²⁹ and the Herpetofauna Worker's Manual³⁰) and repeated from April to June 2007 covering ponds with negative results in 2005 only
- reptiles in September 2004, 2005 and April to June 2006 (modified from DMRB¹³ supplemented by Herpetofauna Worker's Manual and Natural England guidelines³¹)
- fisheries in January 2006 (followed Ward, Holmes and José, 1994³²)
- terrestrial invertebrates in September to October 2004 (followed standardised pitfall trapping, sweep netting and suction sampling methodology with the guidelines of Brooks, 1993³³ used for Odonata survey and hand and litter searches used for molluscs)

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- aquatic macro-invertebrates in October 2005 (followed the Biological Monitoring Working Party (BMWP) system³⁴)
- 7.3.2.5 Surveys were affected but not compromised by a number of issues, principally: the large size of the study area, gaps in the land registry information and difficulties associated with land access.
- 7.3.2.6 Nomenclature for flowering plants followed Stace³⁵ and bryophytes followed that of the British Bryological Society³⁶. Scientific names for protected fauna follow those used in protected species legislation where relevant.

7.3.3 Assessment of Effects

- 7.3.3.1 The assessment of effects has largely followed guidance for a Stage 3 Assessment in the DMRB Volume 11, Section 3, Part 4, and guidance set out by the Institute of Environmental Assessment's Guidelines for Baseline Ecological Assessment³⁷ and the Institute of Ecology and Environmental Management's Guidelines for Ecological Impact Assessment in the UK³⁸. Effects have been scored using IAN 81/06. Habitat and species evaluations have been combined in the scoring system and a focus has been placed on habitats within the Scheme Boundary as this is where the largest impact is anticipated. Sensitivity of features and assessing impacts and significance of effects is shown in Tables 7.1 to 7.4.

Table 7.1: Environmental Value (or Sensitivity) and Typical Descriptors

Value (sensitivity)	Typical descriptors
Very High	High importance and rarity, international scale and limited potential for substitution.
High	High importance and rarity, national scale and limited potential for substitution.
Medium	High or medium importance and rarity, regional scale, limited potential for substitution.
Lower	Low or medium importance and rarity, local scale.
Negligible	Very low importance and rarity, local scale.

Table 7.2: Magnitude of Impact and Typical Descriptors

Magnitude of Impact	Typical Criteria Descriptors
Major	Loss of resource and/or quality and integrity; severe damage to key characteristics, features or elements (Adverse). Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality (Beneficial)
Moderate	Significant impact on the resource, but not adversely affecting the integrity; Partial loss of/damage to key characteristics, features or elements (Adverse). Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality (Beneficial).
Minor	Some measurable change in attributes quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements (Adverse). Minor benefit to, or addition of, one (maybe more) key characteristics, features or elements; some beneficial impact on attribute or a reduced risk of negative impact occurring (Beneficial).
Negligible	Very minor loss or detrimental alteration to one or more characteristics, features or elements (Adverse). Very minor benefit to or positive addition of one or more characteristics, features or elements (Beneficial)
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction

Table 7.3: Descriptors of Significance of Effects

Value (sensitivity)	Typical descriptors
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 serious change in a site or feature of district 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 issues may become a decision-making issue if leading 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 issues. 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 7.4: Arriving at the Significance

Magnitude of Potential Impact	Nature conservation sensitivity of sites damaged or improved				
	Very High	High	Medium	Low	Negligible
Major	Very large	Large or Very large	Moderate or Large	Slight or Moderate	Slight
Moderate	Large or Very large	Moderate or Large	Moderate	Slight	Neutral or Slight
Minor	Moderate or Large	Slight or Moderate	Slight	Neutral or Slight	Neutral or Slight
Negligible	Slight	Slight	Neutral or Slight	Neutral or Slight	Neutral
No Change	Neutral	Neutral	Neutral	Neutral	Neutral

7.4 Baseline Conditions

7.4.1 General

- 7.4.1.1 The Scheme falls within two of the Natural Areas defined by English Nature (Natural England)³⁹. The majority of the Scheme falls under Area No. 66, known as the London Basin. The area around Junction 18 falls under Area No. 65, known as the Chilterns Natural Area.

7.4.2 Statutory Designated Sites

- 7.4.2.1 Statutory designated sites located within two and a half kilometres of the existing motorway are listed below in Table 7.5 and presented in Figure 7.1. None are directly adjacent to the Scheme.

Table 7.5: Statutory Designated Sites within the Study Area

Site Name
Black Park Site of Special Scientific Interest (SSSI) (1.5 kilometres from M25)
Mid Colne Valley SSSI (2 kilometres from M25)
Kingcup Meadows and Oldhouse Wood SSSI (0.2 kilometres from M25)
Old Park Wood SSSI (2.5 kilometres from M25)
Old Rectory Meadows SSSI (1.5 kilometres from M25)
Sarratt Bottom SSSI (2 kilometres from M25)
Frogmore Meadows SSSI (2.5 kilometres from the M25)
Whippendell Wood SSSI (0.8 kilometres from the M25)
Bricket Wood Common SSSI (1 kilometre from the M25)
Redwell Wood SSSI (0.26 kilometres from the M25)
Castle Lime Works Quarry SSSI (1.6 kilometres from the M25)
Water End Swallow Holes SSSI (2.5 kilometres from the M25)

7.4.3 Non-Statutory Designated Sites

- 7.4.3.1 There are 38 non-statutory designated sites located adjacent to the motorway. These are shown and labelled in Figure 7.1.

7.4.4 Habitats within the Scheme Boundary

- 7.4.4.1 A number of different habitats were identified during the Phase 1 Habitat Survey (PIHS), as shown in Figure 7.2. These include:

Broad-leaved Semi-natural Woodland

- 7.4.4.2 Very little of this woodland is present within the Scheme Boundary, although significant areas are found at Junction 16, which are of ancient designation. Other areas of secondary woodland are present. Habitat Action Plans (HAPs) have been prepared for woodland habitats in the HA and regional BAPs.

Mixed Semi-natural Woodland

- 7.4.4.3 Junction 16 contains significant areas of mixed semi-natural woodland much of which can be considered ancient. Mixed semi-natural woodland can also be found between Junctions 20 and 21 at Long Wood, which is also designated as ancient woodland. This is also a HA and local BAP habitat, see above.

Semi-natural Woodland (CWS)

- 7.4.4.4 Woodland beneath the Berry Lane Viaduct (Junctions 17-18) includes part of the Horns Wood CWS. This is largely secondary within the Scheme Boundary although it provides an important buffer zone between the higher quality habitat beyond and the carriageway. This is also a HA and local BAP habitat, see above.

Broad-leaved and Mixed Plantation Woodlands

- 7.4.4.5 Young broad-leaved plantations have been extensively planted along the highway verges, especially in association with adjoining woodland. A similar suite of species appears to have been used throughout, consisting largely of hawthorn (*Crataegus monogyna*), wild cherry (*Prunus avium*), ash (*Fraxinus excelsior*) and field maple (*Acer campestre*). These are typically densely planted and as such, support little ground flora. To a lesser extent plantations are mixed with additional coniferous species such as European larch (*Larix decidua*). This is a HABAP habitat.

Scattered Trees

- 7.4.4.6 Scattered trees are present throughout the Scheme. They are generally young (<25 years old) and comprise of common and widespread species such as ash, grey poplar (*Populus x canescens*) and common lime.

Dense/Continuous Scrub and Scattered Scrub

- 7.4.4.7 The most significant areas of scrub are present on the motorway embankments. They tend to be dominated by a few competitive species, including hawthorn, blackthorn

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(*Prunus spinosa*) and bramble (*Rubus fruticosus*). This habitat is targeted by the HABAP.

Native Species-rich Hedgerow

7.4.4.8 Native species-rich hedgerow is present but is uncommon. Examples include hedgerows at Chainage 5,950, which abuts the motorway, and includes a wide range of species such as pedunculate oak (*Quercus robur*), blackthorn, hazel, field maple and honeysuckle. Habitat Action Plans (HAPs) have been prepared for boundary features in the HABAP and for hedgerows and species-rich hedgerows by the Buckinghamshire BAP and national BAP respectively. Species-rich hedgerows are a Priority Habitat type under the national BAP.

Native Species-poor Hedgerow

7.4.4.9 Species-poor hedgerows are widespread throughout the study area, sometimes defining the Scheme Boundary as at Chainage 4,350 to Chainage 4,950. They generally consist of just a few woody species, most often dominated by hawthorn and blackthorn. This is also a HABAP and BAP habitat type, see above.

Semi-improved Neutral Grasslands

7.4.4.10 No unimproved neutral grassland was found within the Scheme Boundary, however large areas of semi-improved neutral grassland are present. The vast majority of this grassland is species-poor and tends to be dominated by false oat-grass (*Arrhenatherum elatius*) with other common species. In some areas, more diverse communities can be found with additional species such as meadow vetchling (*Lathyrus pratensis*), black knapweed (*Centaurea nigra*), wild carrot (*Daucus carota*), perforate St John's-wort (*Hypericum perforatum*) and occasionally bee orchid (*Ophrys apifera*) and pyramidal orchid (*Anacamptis pyramidalis*). HAPs have been prepared for grassland habitats in the HA and regional BAPs. Species-rich neutral grasslands are targeted by the HABAP.

Semi-improved Calcareous Grasslands

7.4.4.11 Calcareous grassland was found at relatively few locations although a substantial area is present at Junction 21. The herb-rich sward here is dominated by calcicole species such as marjoram (*Origanum vulgare*), kidney vetch (*Anthyllis vulneraria*) and clustered bellflower (*Campanula glomerata*). Evidence suggests that this area is the result of being sown with a wild flower seed mix as varieties are present from continental Europe. The NVC survey at Junction 21 did not define a specific community, although there were affinities with CG3 *Bromus erectus* grassland. This is a HABAP habitat type.

Marshy Grassland

7.4.4.12 Marshy grassland is present within Junction 16 where it has developed within a silted treatment pond. This area supports reed canary-grass (*Phalaris arundinacea*), tufted hair-grass (*Deschampsia cespitosa*), soft rush (*Juncus effusus*), great willowherb (*Epilobium hirsutum*) and water mint (*Mentha aquatica*) with scattered grey willow (*Salix cinerea*). It is unmanaged and somewhat rank with invading ruderal species. HAPs have been prepared for grassland habitats that would include this habitat in the HA and regional BAPs.

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Amenity Grassland

7.4.4.13 Amenity grassland is present at a number of locations, for example at Junctions or on the approach to signage. These areas are often sown with commercial species and are closely mown. They tend to be of negligible or lower value for biodiversity.

Improved Grassland/Arable Land

7.4.4.14 Small areas of improved grassland fall within the Scheme Boundary. These are subject to elevated nutrient levels and as such generally support an impoverished sward of lower value for biodiversity.

7.4.4.15 Significant areas of arable land are present throughout the study area and are incorporated within the Scheme Boundary in some areas. In general these are monocultures of crops, subject to significant inputs of pesticides and fertilisers. As such they are of lower nature conservation importance. HAPs have been prepared for farmland habitats that would include these habitats in the regional BAPs.

Continuous and Scattered Bracken

7.4.4.16 Only one small area of continuous bracken (*Pteridium aquilinum*) was noted within Junction 16. This habitat is considered of lower value for biodiversity.

Tall Ruderal Vegetation

7.4.4.17 Extensive areas of ruderals are present on the motorway embankments and disturbed ground. This includes Junction 16 where dense areas of nettle are present. Two species covered by legislation due to their invasive nature were noted, these being Japanese knotweed and giant hogweed. Their locations are given in the PIHS and in the Technical Report¹. It is an offence under the W&CA 1981 (plus amendments) to plant these species or otherwise cause them to grow in the wild.

7.4.4.18 A band of ruderal species is present along the hard shoulder where disturbance from traffic is high. This is also an area in receipt of a large quantity of salt spray during the winter months. Species that are present reflect this salinity, with Danish scurvygrass (*Cochlearia danica*) and sea couch (*Elytrigia atherica*) occurring frequently. These species are normally associated with coastal habitats.

Ephemeral/Short Perennial

7.4.4.19 This is an uncommon habitat within the Scheme Boundary. It is present at Junction 21 for example, where chalky bare ground is present with species such as perforate St John's-wort and American willowherb (*Epilobium ciliatum*).

Dry Ditches

7.4.4.20 Dry ditches are common features of the embankments and cuttings. They are often surrounded by scrub.

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Bare Ground

7.4.4.21 Bare ground is present in numerous locations and also forms a feature of some of the steeper slopes where vegetation is thinner (e.g. Junction 21).

Neutral Flush

7.4.4.22 A flush within Junction 16 is possibly the result of a breach in the retaining wall of a treatment pond. The saturated ground has become colonised by typical species such as water mint, hard rush (*Juncus inflexus*) and yellow iris (*Iris pseudacorus*). HAPs have been prepared for grassland/wetland habitats that would include this habitat in the HA and regional BAPs.

Swamp

7.4.4.23 The largest area of swamp is present within Junction 16. This area is dominated by sedge species with meadowsweet (*Filipendula ulmaria*), hogweed (*Heracleum sphondylium*) and bramble. In addition, many of the treatment ponds support wetland marginal species. HAPs have been prepared for grassland/wetland habitats that would include this habitat in the HA and regional BAPs.

Standing Water

7.4.4.24 Standing water is present in the form of highway treatment ponds, ditches and oil traps. These tend to be of low quality, although water vole is present around those within Junction 16. These have a band of marginal vegetation including bulrush (at inlet), water mint and yellow iris. There are no obvious submerged aquatic plants although the ponds do support common amphibians. HAPs have been prepared for standing water and wetland habitats in general in the HA and regional BAPs.

Running Water

7.4.4.25 Rivers and streams drain from the Chiltern Hills and the Hertfordshire Plain. The motorway crosses the Alder Bourne, Rivers Misbourne, Chess and Gade (including the Grand Union Canal) which run off the chalk of the Chiltern Hills. Apart from the Grand Union Canal they generally have a swift flow over a gravel or sand base and are classified as high quality chalk streams of significant nature conservation value.

7.4.4.26 The motorway also crosses the Rivers Ver and Colne, the Catharine Bourne, a tributary of the Mimmshall Brook and Hanstead's Ditch, which all drain from the Hertfordshire Plain. Apart from the tributary of the Mimmshall Brook, these rivers tend to be sluggish, with deep water over a silt base. They support bands of marginal vegetation dominated by reed sweet grass with branched bur-reed, reed canary grass and flowering rush and submerged species including water starwort. The River Colne and the Catharine Bourne are noted as winterbournes, with some stretches being seasonally dry. The Catharine Bourne was largely dry at the time of survey in the vicinity of the motorway. HAPs have been prepared for this habitat in the national, HA and regional BAPs, including specific plans for chalk streams¹². Chalk rivers are a priority habitat type under the national BAP.

7.4.5 Evaluation of Habitats within the Scheme Boundary

7.4.5.1 The intrinsic values of habitats within the Scheme Boundary are evaluated in Table 7.6. Where similar habitats achieve the same valuation they are grouped together for simplicity. Table 7.7 describes the relationships between habitats and protected species.

Table 7.6 Evaluations of Habitats within the Scheme Boundary

Feature	Comments	Sensitivity
Semi-natural broadleaved woodland	Localised habitat often of ancient origin. Of ecological value with limited potential for substitution. Secondary woodland is of medium or lower value.	High
		Medium
		Lower
Semi-natural mixed woodland	Localised habitat of ancient origin. Of ecological value with limited potential for substitution	High
Semi-natural woodland (CWS)	Mature woodland, part of a CWS although within the Scheme largely secondary. With some potential for substitution	Medium
Plantation woodland	Secondary habitat of ecological value but with potential for substitution	Lower
Scattered trees	Widespread habitat with potential for substitution	Lower
Dense/continuous scrub	Widespread habitat of ecological value with potential for substitution	Lower
Scattered scrub	Widespread habitat of ecological value with potential for substitution	Lower
Hedgerows (species-rich)	Species-rich hedgerows are likely to be protected by the Hedgerow Regulations 1991 and have limited potential for substitution	High
Hedgerows (species-poor)	Widespread habitat of some ecological value but with potential for substitution	Lower
Semi-improved neutral grasslands	Widespread habitat of ecological value with potential for substitution	Lower
Semi-improved calcareous grassland	Localised relatively species rich habitat but with potential for substitution. Likely to be derived from commercial seed mix	Lower
Marshy grassland	Localised habitat of ecological value with potential for substitution	Lower
Amenity grassland	Managed habitat with potential for substitution	Negligible
Improved grassland / arable land	Widespread habitat of ecological value with potential for substitution	Lower
Continuous bracken/tall ruderal	Widespread habitat of some ecological value and with potential for substitution	Lower
Ephemeral/short perennial	Localised habitat with potential for substitution	Lower
Dry ditch	Widespread with potential for substitution	Negligible

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Feature	Comments	Sensitivity
Bare ground	Localised habitat of limited ecological value with potential for substitution.	Negligible
Neutral flush	Associated with the balancing ponds within Junction 16, of ecological value but with potential for substitution	Lower
Swamp and marginal vegetation	Associated with the treatment ponds, of ecological value but with potential for substitution	Lower
Running water	Numerous rivers crossed by the Scheme. Most of high value with very limited potential for substitution	High
Standing water	Various water bodies, associated with run-off treatment. Subject to pollutants and disturbance. Potential for substitution	Lower

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Table 7.7 Inter-relationships between Notable Species and Habitats

Species and Evaluation	Semi-natural woodland			Semi-natural mixed woodland	Semi-natural woodland (CWS)	Plantation woodland	Scattered trees	Dense/continuous scrub	Scattered scrub
	Lower	Medium	High						
Badger (medium sensitivity)	Medium	High	High	High	High	Medium	Lower	Medium	Medium
Bats (very high sensitivity)	Medium	High	High	High	High	Medium	Medium	Medium	Medium
Otter (very high sensitivity)	Medium	High	High	High	Medium	Lower	Lower	Medium	Medium
Water vole (high sensitivity)	Medium	High	High	High	Medium	Lower	Lower	Medium	Medium
Great crested newt (very high sensitivity)	Medium	High	High	High	High	Medium	Lower	Medium	Medium
Reptiles (medium sensitivity)	Medium	High	High	High	Medium	Medium	Lower	Medium	Medium
Breeding birds (high sensitivity)	Medium	High	High	High	High	Medium	Medium	Medium	Medium

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Table 7.7 Inter-relationships between Notable Species and Habitats (continued)

Species and Evaluation	Hedgerows (species-rich)	Hedgerows (species-poor)	Semi-improved neutral grasslands	Semi-improved calcareous grassland	Marshy grassland	Amenity grassland	Improved grassland / arable land
Badger (medium sensitivity)	High	Medium	Medium	Medium	Medium	Lower	Medium
Bats (very high sensitivity)	High	Medium	Medium	Medium	Medium	Lower	Medium
Otter (very high sensitivity)	High	Lower	Medium	Medium	High	Lower	Medium
Great crested newt (very high sensitivity)	High	Medium	Medium	Medium	High	Lower	Medium
Water vole (high sensitivity)	High	Lower	Medium	Medium	Medium	Lower	Medium
Reptiles (medium sensitivity)	High	Medium	Medium	Medium	Medium	Lower	Medium
Breeding birds (high sensitivity)	High	Medium	Medium	Medium	Medium	Lower	Lower

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Table 7.7 Inter-relationship between Notable Species and Habitats: (continued)

Species and Evaluation	Tall ruderal / continuous bracken	Ephemeral/ short perennial	Dry ditch	Bare ground	Neutral flush/ swamp and marginal vegetation	Running water	Standing water
Badger (medium sensitivity)	Lower	Lower	Lower	Negligible	Lower	High	Lower
Bats (very high sensitivity)	Lower	Lower	Lower	Negligible	Medium	High	Medium
Otter (very high sensitivity)	Lower	Lower	Lower	Negligible	Medium	High	Medium
Water vole (high sensitivity)	Lower	Lower	Lower	Negligible	Medium	High	High
Great crested newt (very high sensitivity)	Medium	Medium	Lower	Negligible	Medium	High	High
Reptiles (medium sensitivity)	Medium	Medium	Lower	Lower	Medium	High	Medium
Breeding birds (high sensitivity)	Lower	Lower	Lower	Negligible	Lower	High	Lower

7.4.6 Habitats Outside of the Scheme Boundary

- 7.4.6.1 All habitats outside of the Scheme Boundary have been mapped, up to 150 metres. Phase I Habitat Survey maps are shown in Figure 7.2.

Semi-natural Woodlands

- 7.4.6.2 Broad-leaved and mixed semi-natural woodlands within the study area are largely distributed through the edge of the Chiltern Hills (Junctions 16 to 20) and to a lesser extent on the sands and gravels of Hertfordshire from Junction 20 to just past Junction 21a. The bulk of this woodland is designated as ancient woodland and could support a number of protected or notable species, for example evidence of badger is widespread. These woodlands are of high sensitivity for biodiversity.

Plantation Woodland

- 7.4.6.3 The majority of plantation woodland outside of the Scheme is predominately mixed although small areas of broadleaved plantation can also be found. These are typically densely planted with impoverished ground floras. Only small areas of coniferous plantation are present within the study area, for example between Junctions 18 and 19. Young plantations have the potential to support breeding birds, badger setts and are likely to be used by foraging badgers. The sensitivity of this habitat is considered as lower or medium where protected species are present.

Scrub

- 7.4.6.4 Dense/continuous and scattered scrub of hawthorn, bramble and other typical scrub forming species, is present at various locations within the study area. The sensitivity of this habitat is considered as lower or medium where protected species are present.

Hedgerows

- 7.4.6.5 Hedgerows of varying quality border grasslands and arable plots. Some of these are native species-rich hedgerows with mature trees, which are of local significance. Those that have good links to ancient woodland and have been established for a significant length of time can support dormouse and invertebrates, such as white letter hairstreak butterfly (*Satyrion w-album*). Other less significant hedgerows include those that are defunct and/or species-poor and are widespread. They are largely post Enclosure Act hedges, planted in the 19th Century so of relatively recent origin. Consequently they are of lower ecological sensitivity than species-rich hedgerows. The sensitivity of this habitat would be considered as high where hedgerows are species-rich and likely to be protected by the Hedgerow Regulations 1991. Species-poor hedgerows are of lower sensitivity.

Semi-improved Grasslands

- 7.4.6.6 The majority are neutral semi-improved grassland, being largely species-poor and dominated by competitive grass species such as false oat-grass (*Arrhenatherum elatius*) and cocksfoot (*Dactylis glomerata*). Small areas of semi-improved calcareous grassland border the Scheme where a variety of herbs can be found. These habitats are considered to be of lower sensitivity or medium where protected species are present.

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7.4.6.7 An NVC survey undertaken of the semi-improved neutral grasslands adjacent to Hanstead's Ditch (Chainage 27,550) revealed communities strongly associated with MG9 *Holcus lanatus-Deschampsia cespitosa* grassland *Poa trivialis* sub-community and is considered of high sensitivity. Other surveys in this area revealed grasslands of community MG9 *Holcus lanatus-Deschampsia cespitosa* grassland *Arrhenatherum elatius* grassland¹¹ which is more degraded and is currently considered to be of lower sensitivity.

Marshy Grassland

7.4.6.8 An extensive area of marshy grassland is adjacent to Junction 16. This area is herb-rich and such habitats are botanically important due to their diversity and characteristic structure and may also support locally or nationally scarce species. An NVC survey suggests that the community present closely correlates with M27 *Filipendula ulmaria-Angelica sylvestris* mire *Urtica dioica-Vicia cracca* sub-community. This is typical of rich, moist, circumneutral soils in situations protected from grazing. The sub-community present indicates slightly drier and more eutrophic conditions and would be vulnerable to further drying. It is of a high importance for biodiversity, being of regional importance and not easily re-created.

Amenity Grassland

7.4.6.9 Amenity grassland is present in isolated areas, particularly associated with buildings and built up areas. These habitats are of negligible sensitivity for biodiversity often being regularly mown and intensively managed.

Improved Grassland

7.4.6.10 Large expanses of agriculturally improved grasslands are present outside the Scheme Boundary, often used as cattle or sheep pasture. These have generally been resown with productive grasses such as perennial rye-grass (*Lolium perenne*) and are subject to high inputs of fertilisers and pesticides. Such intensively managed areas are generally of little nature conservation value, although they may be important foraging areas for badger.

Arable Land

7.4.6.11 Arable land is a common feature bordering the Scheme Boundary. All arable land within the survey area was found to be intensively farmed and of lower sensitivity for biodiversity. There is one notable exception, this being the Cornflower Field Site of Nature Conservation Importance at London Colney. Here the headlands showed a number of notable plants including cornflower (*Centaurea cyanus*) (endangered), spreading hedge-parsley (*Torilis arvensis*) (nationally scarce), and the very localised Venus's looking-glass (*Legousia hybrida*) and prickly headed poppy (*Papaver argemone*). Apart from its botanical interest, notable invertebrates and nesting birds such as quail (*Coturnix japonica*) or grey partridge may be present. Relatively low-intensity cropping such as this may also favour harvest mouse (*Micromys minutus*), a species that is declining in a national context. Some areas were of note for wintering birds and protected or notable species such as grey partridge, barn owl and hobby.

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Scattered Bracken

7.4.6.12 Continuous and scattered bracken is present in isolated areas, usually within semi-natural woodland, such as at Blackgreen Wood and are generally of lower sensitivity for biodiversity.

Tall Ruderal Vegetation

7.4.6.13 Small areas of tall ruderal habitat are present where the ground has been subject to disturbance. Ruderal habitats are generally of lower nature conservation value, but may be used for foraging by badgers, bats and birds such as finches. In addition, areas of open ground could be of importance for species such as little ringed plover (*Charadrius dubius*) and skylark (*Alauda arvensis*). Ruderal habitats are also sometimes of interest for invertebrates associated with bare ground and some of the colonising species typical of such habitats.

Ephemeral/Short Perennial

7.4.6.14 Ephemeral/short perennial habitat was noted outside the Scheme Boundary, where soil conditions were too poor to enable grassland or ruderals to establish. Such habitats can be botanically important and may support reptiles due to their open areas for basking and if based on rubble or stone, warmth and refugia.

Introduced Shrub

7.4.6.15 Introduced shrub is typically associated with gardens, retail parks and other areas of human occupation. Such habitats tend to be planted with ornamental species and as such are likely to support a narrower range of invertebrates and be of lower ecological sensitivity. Areas of dense planting may be of importance for nesting birds.

Caravan Sites

7.4.6.16 Urbanised areas such as caravan sites are present right up to the Scheme Boundary. Areas of housing with gardens may support badger setts, reptiles such as slow-worms, amphibians including great crested newt and even dormouse if adjacent to wooded areas. However, in general the majority of urbanised areas are of lower sensitivity overall.

Quarry

7.4.6.17 Quarry or gravel pits are present at Junction 19. These are active workings consisting of bare ground with a fringe of ruderals. Open water appears to be present in one of these pits, although this is outside the study area. Other gravel workings have been used as landfill and are now capped and categorised under other habitat types. Open gravel pits are of value for a range of specialised species. These include notable invertebrates and nesting birds such as little ringed plover (*Charadrius dubius*). However, overall such disturbed habitats are of lower value for nature conservation.

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Bare Ground

7.4.6.18 Bare ground such as exposed chalk, clay banks or sand can be of importance for invertebrates, especially specialised hymenoptera. Such features are generally only likely within the gravel pits at Junction 19. As a rule such habitats are of lower value for nature conservation.

Neutral Flush

7.4.6.19 Two small neutral flushes were noted at Chainage 27,150 (see Figure 7.2). Inundation vegetation is limited to seasonally flooded depressions in pasture. Such habitats are botanically interesting but in this instance are unlikely to support notable invertebrates due to their apparent recent origin.

Swamp

7.4.6.20 A small area of swamp is present within broadleaved semi-natural woodland north of Junction 16 and also bordering Hanstead's Ditch between Junctions 21 and 22. The limited extent and species poor nature of this habitat makes it of lower value for biodiversity.

Standing Water

7.4.6.21 Most of the standing water inside the study area was found to be neglected. Some such as the pond at Chainage 36,100 are isolated within arable fields and choked with scrub, whilst larger ponds were managed for recreation and stocked with fish. Protected species that may use such features include amphibians (including great crested newt) and reptiles (especially grass snake). Certain ponds may also be of importance for notable invertebrates and larger waterbodies may be locally important for birds, particularly waterfowl and others associated with aquatic habitats such as warblers and kingfisher. Standing water is typically considered to be of lower sensitivity, although the presence of protected species such as great crested newt would significantly raise their sensitivity.

Running Water

7.4.6.22 Rivers and streams draining from the Chiltern Hills cross the west of the Scheme and those draining from the Hertfordshire Plain cross the east half of Scheme and are described earlier under Habitats within the Scheme Boundary.

7.4.7 Protected and Other Important Species

7.4.7.1 Detailed historic records of protected and notable species within two kilometres of the existing motorway are presented in the Ecology and Nature Conservation Technical Report.

Flora

Historic Records

7.4.7.2 One species of plant receiving statutory protection, namely starfruit (*Damasonium alisma*), has been recorded at Black Park SSSI. Additionally, numerous notable plant species (nationally or locally rare) have been recorded here and include common yellow sedge (*Carex viridula oediocarpa*), tower mustard (*Arabis gladra*), sneezewort (*Achillea ptarmica*), small sweet-grass (*Glyceria declinata*), ivy-leaved crowfoot (*Ranunculus hederaceus*), viper's bugloss (*Echium vulgare*), and bell heather (*Erica cinerea*). Notable plant species (nationally or locally rare) have also been recorded in Mount Wood and near the River Chess which includes coralroot (*Cardamine bulbifera*) and red hemp-nettle (*Galeopsis angustifolia*).

Baseline Survey Records

- 7.4.7.3 National Vegetation Classification (NVC) results are detailed under habitat descriptions above, where appropriate.
- 7.4.7.4 Bluebell is a floristic component of the semi-natural woodland located within Junction 16. The species is afforded protection under the Section 13(2) of the W&CA against sale only and is also included within the UKBAP, regional BAPs and HABAP. Ancient woodland indicators such as wood sedge (*Carex sylvatica*), alder buckthorn (*Frangula alnus*) and wild service tree (*Sorbus torminalis*) (Buckinghamshire BAP species) are also present within Junction 16.

Invasive Species

7.4.7.5 All invasive species have been recorded during the Phase I Habitat Survey (see Figure 7.2 and the Technical Report for further details). Japanese knotweed (*Fallopia japonica*), giant hogweed (*Heracleum mantegazzianum*), Himalayan balsam (*Impatiens glandulifera*) and Michaelmas daisy (*Aster novi-belgii*) have all been recorded within the Scheme Boundary.

Badger

Historical Records

7.4.7.6 Numerous records of badger (*Meles meles*) exist between Junctions 16 and 23, both within the Scheme Boundary, and more extensively on adjacent land. Evidence includes setts, latrines and signs of foraging. Records are shown in the confidential appendices to the Ecology and Nature Conservation Technical Report.

Baseline Survey Records

7.4.7.7 Detailed surveys revealed badger to be present throughout the study area (refer to the Confidential Appendix and Figures within the Technical Report for details of sett locations). The majority of setts were inactive although seven were identified as active main setts and a further seven were identified as active subsidiary and/or outlier setts. Various other signs of badger were recorded such as latrines, badger hair and paths.

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The majority of badger activity is present between Junctions 16 and 21 with a number of main setts, some of which are present within the Secretary of State Land.

Bats

Historical Records

7.4.7.8 The majority of bat records are from urban areas around Rickmansworth and Chorleywood. Seven species of bat were noted: brown long-eared (*Plecotus auritus*), noctule (*Nyctalus noctula*), natterer's (*Myotis nattereri*), daubenton's (*Myotis daubentonii*), serotine (*Eptesicus serotinus*), common pipistrelle (*Pipistrellus pipistrellus*) and the soprano pipistrelle (*Pipistrellus pygmaeus*). This includes observations of individuals in flight as well as roosts. These records are presented in the Technical Report.

Baseline Survey Records

7.4.7.9 A total of 7 species of bats were recorded during survey work with a total of 23 foraging areas of Parish/Neighbourhood importance, 9 foraging areas of District/Borough importance, 4 foraging areas of County/Metropolitan importance, 2 active roosts and 5 carriageway-crossing points identified. 6 potential roosts were identified but not confirmed active. These would be surveyed again prior to the start of construction to establish if they are still inactive. Survey results are presented in Figure 7.3. Notable areas of activity were present close to the Rivers Chess, Colne and Ver and elsewhere bordering woodlands. Crossing points were present along the watercourses, especially the Rivers Gade, Colne and Ver and also around the Chalfont Viaduct which also supported a common pipistrelle roost. Species recorded were common pipistrelle, soprano pipistrelle, noctule, serotine, Daubentons, Leisler's and brown-long eared bat.

Deer

Historical Records

7.4.7.10 Muntjac (*Muntiacus reevesi*) and roe (*Capreolus capreolus*) deer have been recorded within the Secretary of State Land in scattered locations as well as further a field between Junctions 17 and 20.

Baseline Survey Records

7.4.7.11 Although there were no specific surveys carried out for deer, incidental observations suggest muntjac deer are concentrated to the north of Junction 16 and on the embankments close to Junctions 21 and 23. In addition, roe deer prints were observed within Junction 16. Incidental observations such as deer hair, droppings and slots are recorded in the PIHS target notes contained within the Technical Report.

Dormouse

Historical Records

7.4.7.12 There are no historical records of dormouse in the study area.

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Baseline Survey Records

7.4.7.13 A total of twenty-eight sites that targeted suitable habitat types were surveyed for dormice (*Muscardinus avellanarius*) although there were no individuals or signs of dormice in any location.

Otter

Historical Records

7.4.7.14 Two records of otter (*Lutra lutra*) exist for the Grand Union Canal to the east of Junction 17 and there are two records for the River Ver along both sides of the M25 carriageway between Junctions 21 and 22.

Baseline Survey Records

7.4.7.15 Evidence of otters were found for the River Colne and River Ver. The species was not found along the Alder Bourne, River Misbourne, River Chess, River Gade, Grand Union Canal and the Catharine Bourne. Locations of rivers and survey points are detailed in the Technical Report.

Water Vole

Historical Records

7.4.7.16 Records of water vole are widespread: within Junction 16 and along the Alder Bourne; the Grand Union Canal (River Gade); Batchworth Lake in the Colne Valley; the River Chess; the River Ver; the River Colne; the Catharine Bourne; and the Mimmshall Brook.

Baseline Survey Records

7.4.7.17 The Alder Bourne, River Misbourne, River Chess, River Gade, Grand Union Canal, River Colne, River Ver and the Catharine Bourne were all surveyed for water vole up to 250 metres from the motorway. Positive results were obtained for the Alder Bourne (including the ditches throughout Junction 16), River Misbourne, River Chess, River Ver and Catharine Bourne. Locations of rivers and survey points are detailed in the Technical Report.

Other Mammals

Historical Records

7.4.7.18 Water shrew (*Neomys fodiens*) has been recorded along watercourses within Junction 16. There are no other notable mammal records within the study area.

Baseline Survey Records

7.4.7.19 Although specified surveys for other mammals were not undertaken, numerous species were identified utilising the habitats within the Scheme. Incidental records of water shrew obtained during other surveys were noted, with one dead juvenile observed at Junction

16. Other mammals observed also include rabbit (widespread), fox and small rodents such as wood mice (observed in dormice boxes), field voles (widespread and commonly seen under reptile refugia) and shrews. In addition, evidence of mink and brown rat was also observed. Other common and widespread species are also likely to be present.

Breeding Birds

Historical Records

7.4.7.20 A number of Schedule 1 (under the W&CA, 1981) species have been recorded including kingfisher (*Alcedo atthis*), firecrest (*Regulus ignicapillus*) and marsh warbler (*Acrocephalus palustris*). Bullfinch (*Pyrrhula pyrrhula*) and song thrush (*Turdus philomelos*) have also been recorded which are both UKBAP species.

Baseline Survey Records

7.4.7.21 The locations of notable breeding birds are presented in Figure 7.3. Numerous breeding birds were identified including Schedule 1 species and Red and Amber List species of Conservation Concern⁴⁰ that are of County Importance. These included barn owl (*Tyto alba*), hobby and kingfisher (Table 7.8). Although no key areas of value for breeding birds were located within the Scheme Boundary a number of important areas are adjacent such as Nockhill Wood.

Table 7.8 Protected and Notable Breeding Bird Species

Species	Description
Little Ringed Plover (Nationally Scarce, Schedule 1)	Little ringed plover (<i>Charadrius dubius</i>) was located on a number of locations. Sightings included pairs and single birds.
Hobby (Schedule 1) (<i>Falco subbuteo</i>)	Observed at locations through the survey corridor, for example close to Junction 16, along the Gade Valley and the Colne and Ver valleys.
Kingfisher (Schedule 1)	Birds were noted along the rivers Misbourne, Colne, Ver and the Mimshall Brook. One old nest was located along the River Chess.
Barn Owl (Schedule 1)	Barn owl (<i>Tyto alba</i>) was observed close to Nockhill Wood and pairs were seen hunting close to the carriageway at Bottom Wood. Barn owls generally hunt close to their nesting sight so this is good indication that the species bred within the study area.
Turtle Dove (Red List species) (<i>Streptopelia turtur</i>)	Although no proof of breeding was found, two birds seen together in appropriate breeding habitat, well into the season, southeast of Junction 16 may have been on territory.
Lesser Redpoll (Amber List species)	A single lesser redpoll (<i>Carduelis cabaret</i>) was noted in display flight over Cartpath Wood.
Grey Partridge (Red List species)	Grey partridge (<i>Perdix perdix</i>) was recorded from eight transects, the majority being associated with arable and grasslands on disused gravel workings, in the Colne Valley area with a further sighting between Junctions 22 and 23. Records were always of single birds or pairs only, but it is likely that breeding took place in all areas where the species was seen.

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Species	Description
Redshank (Amber List species) (<i>Tringa tetanus</i>)	At least one territorial pair, though possibly as many as three, are thought to have attempted breeding at the former Radlett Airfield.
Yellow Wagtail (Amber List species)	Yellow wagtail (<i>Motacilla flava</i>) was recorded as a likely breeder near to Millhouse Farm and the old Radlett Airfield. One record of breeding birds was made, near to Redwell Wood Farm.
Tree Sparrow (Red List species) (<i>Passer montanus</i>)	One site only, provided records of tree sparrow. These came from the area of Redwell Wood Farm where nest boxes have been provided. The observed birds were not proved to be breeding, but on the two occasions when they were recorded, they were active and noisy and breeding is thus likely.
Other Birds of Conservation Concern	Lesser spotted woodpecker (local red list) (<i>Dendrocopus minor</i>) was recorded from Gallows Wood, Spotted flycatcher (local red list) (<i>Muscicapa striata</i>) was recorded from the River Misbourne and the Alder Bourne and marsh tit (local red list) was recorded from Bottom Wood.

Wintering Birds

Historical Records

7.4.7.22 There are no specific historical wintering bird records within the study area.

Baseline Survey Records

7.4.7.23 Of the 64 wintering birds survey sites, 24 are considered to be of importance based on the assemblage of protected or notable species. These are Sites 1, 2, 6, 8, 11, 12, 13, 16, 17, 20, 27, 28, 32, 38, 41, 42, 45, 46, 47, 50, 58, 60, 61 and 65. The locations of the sites surveyed are shown in Figure 7.3. Typical species present included redwing (*Turdus iliacus*), fieldfare (*Turdus pilaris*) and song thrush (*Turdus philomelos*) together with mixed finch flocks with species such as yellowhammer (*Emberiza citrinella*) and goldfinch (*Carduelis carduelis*).

Great Crested Newts

Historical Records

7.4.7.24 Great crested newt (*Triturus cristatus*) has been recorded within ponds close to Junction 16. Two records have been identified in the Chorleywood area to the west of the M25 carriageway between Junctions 17 and 18 with further records between Junctions 21 and 23.

Baseline Survey Records

7.4.7.25 A total of 137 ponds and 2 pond complexes (a collection of closely related waterbodies) within 500 metres of the carriageway were surveyed for great crested newt (results are shown in Figure 7.4). Great crested newt was recorded from four ponds (Ponds 8, 9, 15 and 20) between Junctions 16 to 17, eleven ponds (Ponds 68, 69, 72 to 75, 77, 83b, 85 and 88) between Junctions 21 and 22 and in 11 ponds (Ponds 91, 92, 98, 107, 111, 111a to 111e and 112) located between Junctions 22 and 23 within the study area.

Reptiles

Historical Records

7.4.7.26 Common lizard (*Lacerta [Zootoca] vivipara*) has been recorded within Black Park SSSI. Slow-worm (*Anguis fragilis*) has been recorded in the Gerrards Cross area, close to the River Colne and north of Junction 23 and grass snake (*Natrix natrix*) has been recorded along the River Gade and Colne and in the Bricket Wood area.

Baseline Survey Records

7.4.7.27 Typically reptiles were uncommon although abundant in certain locations and associated with features such as railway lines and ancient woodland. They were recorded between Junctions 16 and 17, Junctions 20 and 21 and Junctions 21 and 22. Survey Results are presented in Table 7.9 and shown in Figure 7.4.

Table 7.9: 2005 Reptile Survey Results

Site	2005		2006	
	Slow-worm	Grass snake	Slow-worm	Grass snake
L	One adult observed on one occasion	One individual observed on one occasion	-	-
U	Juvenile observed on one occasion	-	Adults observed on one occasion (max count = 2 females, 1 male)	-
V	Juveniles observed on two occasions (max count = 1)	-	Juvenile and adult slow-worms observed on six occasions (max count = 3 juveniles, 3 adult males and 1 adult female)	-
O	-	-	-	1 juvenile observed
HB	-	-	-	One sub-adult observed on a single occasion
M	-	-	-	One juvenile observed on a single occasion
MB	-	-	Adults and/or juveniles observed on four occasions (max count = 4 juveniles)	Juveniles observed on two occasions (max count = 2 juveniles)
MC	-	-	Adults and juveniles observed on seven occasions (max count = 3 adult female, 2 adult male and 2 juveniles)	Juveniles observed on four occasions (max count = 2 juveniles)

7.4.7.28 Max count refers to the highest number of reptiles observed in any single survey visit.

Fish

Historical Records

7.4.7.29 Historical records were not available.

Baseline Survey Records

7.4.7.30 Following guidance from the EA, fisheries were investigated for the Millstream (River Gade) using electro-fishing. Only three species were captured, these being pike (*Esox lucius*), common gudgeon (*Gobio gobio*) and chub (*Leuciscus cephalus*). The latter species was the only one found in moderate numbers. It was concluded that the River Gade is of poor quality for fish supporting few top predators such as pike.

Terrestrial Invertebrates

Historical Records

7.4.7.31 Stag beetle (*Lucanus cervus*) has been recorded within Gossams Wood, adjacent to the carriageway, close to Junction 16. The southern wood ant (*Formica rufa*), which is a BAP species, has been recorded at a number of locations including Black Park SSSI and Nockhill Wood BNS.

7.4.7.32 The following nationally or locally rare butterflies have also been recorded within the study area: Brown argus (*Aricia agestis*), white-letter hairstreak (*Satyrrium w-album*), white admiral (*Limenitis camilla*), silver washed fritillary (*Argynnis paphia*), grizzled skipper (*Pyrgus malvae*), together with the purple emperor (*Apatura iris*) and brown hairstreak (*Thecla betulae*) which are also noted as Species of Conservation Concern⁹.

Baseline Survey Records

7.4.7.33 Four locations between Junctions 16 and 17 and one location between Junctions 21 and 22 were surveyed for terrestrial invertebrates. The results of the surveys are presented in Figure 7.5. The Species Rarity Indices (SRI)⁴¹ to determine habitat quality for invertebrates are shown in Table 7.10.

Table 7.10: Terrestrial Invertebrates: Junction 16 to 17 and Junction 21 to 22

Site	Assessment
1A	Average Quality (mean SRI = 1.16)
1B	Average Quality (mean SRI = 1.27)
1C	Average/High Quality (mean SRI = 1.32)
1D	Average Quality (mean SRI = 1.18)
2B	Very High Quality (mean SRI = 1.56)

7.4.7.34 In addition to the survey, low numbers of common glow-worm (*Lampyris noctiluca*) larvae were discovered incidentally, sheltering beneath reptile refugia, on the eastbound side of the motorway directly adjacent to a railway line (Chainage 29,025). Common glow-worm receives no official legal protection but is recognised as a declining species.

Incidental observations also include a number of dragonfly and damselfly (*Odonata*) species around balancing ponds and adjacent to watercourses.

Aquatic Macro-invertebrates

Historical Records

7.4.7.35 The EA provided one record of white-clawed crayfish (*Austropotamobius pallipes*) on the River Misbourne and one for the River Chess.

Baseline Survey Records

7.4.7.36 Six sites were sampled each for the River Misbourne and River Chess. An Average Score per Taxon (ASPT) of between 5.22 and 6.13 was achieved for both rivers. This Biological Monitoring Working Party (BMWP) score can be interpreted as indicating “good” to “very good” water quality³⁴. Species richness (the number of taxa or species) was also high with a range across sample sites of between 9 and 19 different groups identified.

7.4.7.37 Six sites were sampled for the millrace (River Gade) with an ASPT of between 3.75 and 5.83. This BMWP score can be interpreted as indicating “moderate” to “good” water quality. Species richness was moderate with a range across sample sites of between 6 and 12 different groups identified. In addition, incidental observations of the non-native, invasive signal crayfish (*Pacifastacus leniusculus*) were also made during other survey work along the River Colne, River Ver and the River Chess.

7.4.7.38 No notable or protected aquatic macro-invertebrates were recorded for any of the sampled watercourses.

7.5 Design and Mitigation

7.5.1 Design

7.5.1.1 Three strategies were used to mitigate the adverse ecological effects of the design as follows:

- **Avoidance** – of the most ecologically sensitive features or receptors. For example the design has aimed to site the new drainage treatment ponds and water vole mitigation ponds in Junction 16 where they would cause the least impact upon existing nature conservation value. A plantation buffer has been retained to protect woodland outside the Scheme wherever possible, as at Blackgreen Wood between Junctions 21 and 22. Avoidance would also be achieved by stipulating the timing of works in order to miss the most ecologically sensitive periods during the year
- **Mitigation** – Measures to reduce the significance of adverse effects include the use of steep retaining works to reduce the extent of land-take within areas of valuable habitat. Other design mitigation includes reductions in noise from a low noise road surface and Environmental Barriers, improvements to drainage design and measures to combat accidental spillage, fencing to protect badgers

where required, improvements to existing badger tunnels and appropriate planting to act as buffer zones to adjacent habitat and improve connectivity

- **Compensation** – Actions that offset the residual impacts remaining following mitigation would be achieved through the enhancement of existing habitats through modification of management regimes as well as creation of entirely new habitats. The use of nutrient-poor sub-soil to encourage development of species-rich grassland within areas of the Secretary of State Land disturbed by construction activities would be a key compensatory measure. Wherever possible lost habitats would be replaced with the same habitat or similar habitat of a higher value for biodiversity (e.g. species-poor neutral grassland would be replaced by species-rich neutral or calcareous grassland (dependant on underlying geology))

7.5.2 Construction

- 7.5.2.1 General impacts from construction would be addressed through the Construction Environment Management Plan (CEMP) which include timing of construction activities to avoid seasonal constraints, protection of sensitive receptors using barriers, fencing and sedimentation and erosion control systems, dust control and safe storage of hazardous substances.
- 7.5.2.2 Disturbances resulting from the construction of two new outfalls on the Catharine Bourne would be minimised by implementation of the CEMP, with measures to safeguard excess silt loading or damage to the bankside. This would include a minimum working area. Land drainage consent would be required from the EA prior to works within 8 metres of the watercourse. In addition, construction would take place during the summer when the watercourse is more likely to be dry.

7.5.3 Monitoring Strategy

- 7.5.3.1 Monitoring of specific mitigation measures would be undertaken in order to review levels of success and more importantly to enable the implementation of prompt remedial measures where these are required.
- 7.5.3.2 Pre-construction surveys would be required to verify findings of the baseline surveys and capture any baseline changes that would affect the design and construction.
- 7.5.3.3 A post-construction survey would be undertaken on some of the watercourses as part of an agreement with the Environment Agency. This would include macro-invertebrate sampling and a fisheries survey upstream and downstream of the current discharge point on the River Gade and the River Chess. In addition, a post-construction survey would be required for any relocation work (such as for water voles at Junction 16).

7.5.4 Advance Mitigation Works

- 7.5.4.1 Advanced ecological works would be required prior to commencement of the construction phase to safeguard or avoid constraints associated with features of nature conservation interest. Limited vegetation clearance, fencing and relocation or translocation of protected or notable species would be undertaken as part of the advanced works programme. Site preparation of receptor sites would be an additional requirement.

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7.5.4.2 A complete discussion of the advance mitigation works on a Junction-by-Junction basis is provided within the Ecology and Nature Conservation Technical Report¹.

Flora

7.5.4.3 Where notable plant species are to be lost (e.g. bluebells within Junction 16), translocation to new plantations or existing plantations or woodlands would take place. This would contribute towards mitigation for the loss of ancient woodland and construction activities close to this habitat type.

Invasive Species Control

7.5.4.4 At a number of locations Japanese knotweed, giant hogweed and Himalayan balsam would be directly disturbed by the construction works or are immediately adjacent to the works. Advance works would remove all above and below ground parts of Japanese knotweed and giant hogweed to prevent further spreading in disturbed ground. Safe disposal of this material under licence would then be required prior to construction.

Badgers

7.5.4.5 In order to minimise the impacts of loss of setts or foraging habitat, advanced works would be required in accordance with the HABAP targets to 'continue to mitigate impacts on setts and potential mortality on new schemes and improvements'.

7.5.4.6 Prior to the commencement of works, a search would be made for any as yet undiscovered setts, in conjunction with advanced preparations such as vegetation clearance. Presently known setts would also be checked to confirm activity status. Current information shows that three setts would be directly affected by the construction footprint and would need to be closed. The use of pile-driving equipment would in certain circumstances increase the 'impact zone' for badgers. This is generally regarded to be up to 100 metres from construction activity and therefore would bring other setts into consideration, some of which would require disturbance licences. The following approach would be applied to setts:

- **Inactive setts directly affected by the construction footprint.** These setts would first be soft blocked to ensure that they are still inactive prior to works commencing. If they are confirmed as inactive, these setts would be closed. If signs of activity were found then exclusion would be necessary (see below) under licence
- **Active setts directly affected by the construction footprint.** Active outlier and subsidiary setts that require closure would first require an exclusion exercise, through the use badger fencing and exclusion gates. These setts would be closed under licence following a satisfactory period after which an ecological advisor would be certain that there are no badgers present (this would vary from sett to sett). There is one active main sett affected by the construction footprint and one active significant subsidiary sett that would require the same treatment as a main sett. To mitigate the partial loss of the active main sett and significant subsidiary sett, the provision of artificial setts would be required within suitable adjacent habitat. The artificial setts would need to be constructed a minimum of six months prior to the closure of the main and significant subsidiary sett to allow for establishment. The precise nature of

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closure and artificial sett construction would need to be determined by qualified and experienced badger consultants as part of the detailed design of the Scheme. There are various constraints attached to this mitigation procedure, including seasonal constraints associated with badger activity. Further details are given in the confidential Appendix of the Technical Report

- **Active setts not directly affected by the construction footprint.** Active setts within 30 metres of the construction zone would require a Natural England disturbance licence prior to works taking place. These setts would not require closure
- **Inactive setts not directly affected by the construction footprint.** Confirmed inactive setts (i.e. tested by soft blocking) within 30 metres of the construction zone would not require further action other than monitoring to ensure that they do not come into use

Bats

7.5.4.7 Surveys would be necessary of potential roosts to confirm that they are inactive prior to works taking place. A Natural England licence would be required for disturbance to the active roost at the Chalfont Viaduct and any others encountered. This would need to be in place prior to works commencing. A precise methodology for mitigating against disturbance on the active roost during works on the viaduct would need to be prepared by the DBFO Contractor prior to the works commencing. This methodology would be agreed with Natural England.

Water Vole

7.5.4.8 Although present along several watercourses only the water voles within Junction 16 would require direct mitigation. The HABAP states, 'where impacts of new schemes and road improvements on water vole habitat are unavoidable, consider the options for compensatory habitat improvements and pollution control.'

7.5.4.9 To compensate for the loss of water vole habitat, advance mitigation works are proposed within Junction 16. This entails the creation of new ponds and the enhancement of existing habitat. Mitigation and habitat creation would be accordance with the latest edition of the Water Vole Conservation Handbook⁴².

7.5.4.10 Areas of water vole habitat that would be affected by the proposed works would be secured with vole-proof fencing and cleared of animals, which are then moved to the receptor sites (new ponds and enhanced habitat, also fenced with vole-proof fencing). The fencing would remain around the working areas for the entirety of construction to avoid voles recolonising the construction zone. Further specific details can be found in Figure TR2-7 of the Ecology and Nature Conservation Technical Report.

7.5.4.11 Any animals to be translocated into newly created habitat would need to be located in pens as part of a 'soft release' programme. However, this is subject to further study and the discovery of large numbers of individuals within working areas (as populations can fluctuate in size rapidly in short periods of time) would require further consultation with Natural England. It may be more appropriate to donate them to a captive breeding programme for release at other sites.

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7.5.4.12 Current surveys indicate that water vole are not present on the Catharine Bourne immediately adjacent to the motorway where the new outfalls are to be located. Most of this area is culverted and is dry for parts of the year and unsuitable for water vole. However prior to construction a water vole survey would be required to confirm that water voles have not colonised.

7.5.4.13 The HABAP targets habitat creation for water vole stating, 'increase the amount of available water vole habitat by removing barriers to dispersal. Create 20 new vole-friendly drains/water features'. The proposals are in line with the UKBAP action to 'ensure that development schemes do not affect the integrity of water vole populations'.

Breeding Birds

7.5.4.14 In order to reduce impacts upon breeding birds, where clearance of suitable breeding habitat (such as plantation and dense scrub) is necessary this would be undertaken outside of the breeding period (September to January) prior to construction commencing.

Great Crested Newt

7.5.4.15 Great crested newts (GCN) are present in various ponds within 500 metres of the Scheme. Advanced preparation would be necessary to mitigate disturbance and loss of terrestrial habitat.

Ponds 15, 72 to 75, 77, 85, 88, 98, 111, 111a to 111e and 112

7.5.4.16 English Nature (Natural England) Guidelines would be followed. This would involve the installation of newt proof fencing and pitfall traps around the working area where this falls within 500 metres of the ponds. Fencing would ensure that animals are not harmed during construction and it would be necessary that it is maintained throughout construction as any action that results in injury or death would be an infringement of the W&CA. The area within the newt proof fence would then be cleared of newts. They would be placed within an adjoining receptor area that would contain suitable terrestrial cover including artificial hibernacula. This receptor area would be as close to the breeding pond as possible but within the Scheme Boundary. Newts cannot be translocated while hibernating and thus works must take place between March and October. Ponds 16, 17, 18 and 19 were not surveyed due to a lack of access permissions. Surveys of these ponds would be carried out prior to works taking place.

Reptiles

7.5.4.17 Reptiles were identified at relatively few locations. However, suitable habitat is present and they are typically mobile species. In the event that reptiles are unexpectedly encountered, works would halt and an ecologist would be consulted to advise on further actions.

7.5.4.18 In those areas where reptiles were found during the survey a comprehensive survey and capture exercise would first be undertaken with animals translocated or relocated to suitable receptor sites. This would involve fencing the areas affected by construction with reptile-proof fencing for the entirety of construction. Following DMRB guidelines, capture would take place over at least one spring and early summer until encounter rate has remained at or close to zero for a suitable period. Capture would then be followed by a 'destructive search' to ensure no animals remain in the working area. Capture and

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translocation of reptiles cannot take place within the winter months (mid October to late March) when reptiles are hibernating or during mid-late summer (June to August) when it is likely that they would have entered a period of aestivation (a period of inactivity during the hottest months of the year). Liaison with Natural England would be maintained throughout the process.

Terrestrial Invertebrates

- 7.5.4.19 In areas of high invertebrate value (e.g. calcareous grasslands at Junction 21) advanced mitigation would be employed to ensure that impacts are minimised. This would include the use of a suction sampler to transfer key species to adjacent habitat, or used to inoculate new habitat once instated. Further mitigation would involve the maintenance of the grassland as a low sward through regular mowing to help disperse the uncommon species into unaffected contiguous habitat.

7.5.5 Scheme Mitigation, Enhancement and Compensation

- 7.5.5.1 The following outlines general recommendations in relation to mitigation, enhancement and compensation for habitats and species. Detailed plans providing specific locations for prescribed species-specific management and habitat creation, management and enhancement can be found in Figure 7.6. Where operations refer to the construction phase they form part of landscape planting improvements. Where prescriptions refer to the operation of the Scheme these are more long-term management considerations that would help to maintain habitat quality. Management prescriptions would be incorporated into any existing or new habitat management plans.

Habitats

Semi-natural Woodlands

- 7.5.5.2 Mitigation through Scheme design would reduce impacts of disturbance and loss. For example, the use of retaining walls at Gladwin's Wood, Denham Marsh Wood and Pheasants Wood would prevent encroachment into these habitats. Scheme design was modified to minimise impacts to key receptors. This can be seen with treatment ponds at Junction 16 where pond location, size, access routes for construction and working areas were modified to lessen direct loss of ancient woodland habitat. Reinstatement of plantation woodland and hedgerows would be used to mitigate disturbance and loss through creation of buffer habitats and improving links to adjacent habitats.
- 7.5.5.3 The ground flora and coppice stools of the small areas of ancient woodland within the zone of construction (for example at Junction 16 and Long Wood) would be translocated to appropriate positions nearby and continuous with existing ancient woodland blocks. These positions would be in areas either of low current interest or already cleared for the Scheme. Designated ancient woodland at Horns Wood would also be lost since it is badly degraded by the original construction of the motorway it would not be translocated.
- 7.5.5.4 Specific management of ancient semi-natural woodlands (within Junction 16 at Broadspring Wood, Gladwin's Wood, Denham Marsh Wood and Horns Wood) would be initiated during operation year 1 and continued during subsequent years. This would include practices such as selective coppicing to provide a more varied structure to the woodland understorey. Selective thinning where required, removal of conifers and

selective replanting with native species such as ash and pedunculate oak (of local provenance stock). In addition, the control or removal of invasive species such as rhododendron would be required, which if ignored can quickly form dense layers that ultimately shade out the ground flora that help define these woodlands. These activities would help to mitigate against loss of habitat through improving existing resources. This is in line with the HABAP which states “ensure that existing woodlands/areas of plantings are managed appropriately (including the removal of alien species) to maintain and enhance their nature conservation value...” The Hertfordshire BAP has similar targets for woodlands in general.

Plantation Woodland

- 7.5.5.5 Thinning/coppicing of dense plantations and the creation of glades (small clearings typically of grass within woodlands) and rides (open tracks or pathways within woodlands) where suitable accessible areas for management are present would help to improve plantation quality. They would require management during the operation of the Scheme, such as mowing in order to prevent their loss to woodland succession. Where new plantations are created, local provenance stock (i.e. from the south of England) would be used to ensure no species or varieties are used that are not locally indigenous. Reinstatement of plantation habitat with a diverse and species-rich composition would be used to mitigate against loss of this habitat during construction (and the subsequent knock-on effects upon reliant species such as birds and badgers). The HABAP targets this type of habitat creation stating, “identify all areas where new tree and shrub planting could be undertaken to link/increase the size of existing valuable woodlands and/or to enhance their structural diversity.” The Hertfordshire BAP has similar targets for woodlands in general. The Buckinghamshire BAP aims to “encourage the creation and management of new native woodlands, equal to 10% of the current woodland cover in Bucks”.

Scrub

- 7.5.5.6 The HABAP targets this type of habitat creation stating “identify all areas where new tree and shrub planting could be undertaken to link/increase the size of existing valuable woodlands and/or to enhance their structural diversity”. Creation of new scrub to mitigate for losses during construction (and the subsequent knock-on effects upon reliant species such as birds, badgers and reptiles) and management of existing scrub to enhance this habitat type would be undertaken. New scrub would be created using local provenance stock of small shrub species which form dense understorey layers (e.g. hawthorn and bramble). Occasional and selective coppicing during the operation of the Scheme would help to improve the structural diversity.

Mature Scattered Trees

- 7.5.5.7 Where works are proposed adjacent to large mature trees, particularly those of native origin (for example at the site of the runoff treatment zone adjacent to Blackhorse Lane, South Mimms), the Scheme design would avoid loss or long-term damage. Mature trees are important features of the landscape and have the potential to support protected species.

Hedgerows

7.5.5.8 New hedgerows are included in the design to link woodland and plantation blocks and restore bat flight paths in order to directly mitigate habitat loss. Species-rich hedgerows derived from local provenance stock would be located from Chainage 6,800 to 7,550 clockwise and Chainage 23,200 to 24,550 clockwise. These and existing hedgerows within the Scheme Boundary would both require management to maintain or enhance their value for biodiversity. This would include cutting and replanting where necessary and closing gaps of defunct hedgerows. This would promote the HABAP targets to “ensure the favourable management of roadside hedges...” and to “target the creation of 100 kilometres of species-rich hedgerows within new road schemes...linking existing features affected by severance; encouraging commuting or foraging bats away from, rather than onto, the carriageway”. The Buckinghamshire BAP has similar policies for hedgerow replacement.

Semi-improved Grasslands

7.5.5.9 New grasslands would be created within the Scheme Boundary using local provenance material to directly mitigate habitat loss. The inversion of soil profiles for new grassland creation would bring nutrient-poor subsoils to the surface, inhibiting competitive grasses and allowing a more diverse sward to develop in both neutral and calcareous conditions. In many areas the underlying geology permits the establishment of calcareous grassland which has the potential to be species-rich and therefore of greater value for biodiversity than the current resource. Where the engineering design allows, chalk cuttings would be retained to add structural diversity to grassland.

7.5.5.10 Semi-improved neutral grasslands (often species-poor) are abundant throughout the Scheme and would be vastly enhanced by correct management during operation. This is particularly relevant to the wet and neutral grasslands within Junction 16 which have become degraded over recent years. An annual cut and clear operation in selected areas would discourage dominance by grass species and other competitive plants and promote the development of a more diverse sward. In addition, the removal of vegetative biomass each year would help to reduce nutrient levels thus further enhancing the potential for a more varied habitat.

7.5.5.11 These various measures directly mitigate for habitat loss through reinstatement and habitat enhancement and support the HABAP, Hertfordshire BAP and the Buckinghamshire BAP.

Arable Land

7.5.5.12 Ecological Scheme design has influenced landscaping decisions to ensure minimal impact to bordering habitats. This is particularly relevant to Cornflower Field SW of London Colney CWS where screening was reduced to ensure no shading of the field margins, as many of rare and notable plant species are found here.

Aquatic Habitat

7.5.5.13 The Scheme drainage design would maintain water quality and flow rates of discharges to river habitats. Pollution control measures would also be improved (see Chapter 8). New ponds created within Junction 16 as part of water vole mitigation provide an additional wetland resource together with the additional treatment ponds. The UKBAP

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objective to “maintain the characteristic plants and animals of chalk rivers, including their winterbourne stretches” would be maintained. The Hertfordshire BAP has similar targets for watercourses in general and the Buckinghamshire BAP for chalk streams and other watercourses. The Buckinghamshire BAP also aims to maintain the quality of standing water.

Badger

7.5.5.14 Scrub, woodland and species-rich grassland would be created which would benefit badgers through improved foraging habitat and cover. Existing crossing points would be maintained and improved through appropriate fencing. These crossing points include an existing badger tunnel and drainage tunnels that are being used by badgers throughout the Scheme. Dispersal corridors would be enhanced with new hedgerows. This is in line with the HABAP target that states, 'where significant impacts of new schemes and road improvements on badger habitat are unavoidable, consider the options for habitat re-creation, improvement and enhancement, and mitigate fragmentation by designing safe means of crossing the new roads'.

Bats

7.5.5.15 Construction works in the vicinity of known roosts would be carried out under the guidance of a licensed and suitably experienced bat worker. Factors such as floodlighting and vibration would need to be strictly controlled. This would be done in a number of ways including the use of shields to reduce light spill, filtering light where possible and reducing working practices needing lighting during the hours of darkness to lessen the impacts on bats. An alternative roost at Chalfont Viaduct would be provided if there is a risk of the bats abandoning the current roost.

7.5.5.16 To reduce the impact of the lighting design upon bats, key foraging areas such as along watercourses would be protected through the use of shields on the lanterns. Improved grassland or woodland diversity ultimately leads to increased prey abundance and diversity. In addition, habitat reinstatement (after a suitable period during which new landscaping is able to mature) would offset many of the impacts associated with construction phase habitat loss. Treatment ponds would provide additional foraging habitat for bats and new hedgerows would improve the provision of linear features and help restore flight paths (for example at Chainage 5,725 to 5,900 clockwise and Chainage 12,550 to 12,700 clockwise). Bat boxes would also be provided in areas of plantation woodland where natural roosting opportunities are rare as at Chainage 2,499 and 24,600 anti-clockwise. This is in line with the HABAP target that states, 'where impacts of new schemes and road improvements on bats are unavoidable, consider options for roost replacement, enhancement of feeding habitats and mitigation of fragmentation by maintaining 'green links' across the road. Install 200 roosting/hibernation bat boxes.' The UKBAP SAP for pipistrelle states that decline has been caused by a 'reduction in insect prey abundance, due to high intensity farming practice and inappropriate riparian management. Loss of insect-rich feeding habitats and flyways, due to loss of wetlands, hedgerows and other suitable prey habitats'.

Deer

7.5.5.17 Due to the widespread distribution of deer, fencing is not included in the Scheme design to avoid the risk of animals becoming trapped on the motorway side.

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Otter

7.5.5.18 The Scheme does not require direct mitigation for otter as habitats utilised by this species are not directly affected. However, the provision of otter holts are seen as a key enhancement, aimed at encouraging the continued recovery of this species. New treatment ponds would ensure water quality and thus food sources are maintained (a reason for otter decline outlined in UKBAP and Hertfordshire BAP). Artificial holts by watercourses within the Scheme would be in line with HABAP target '...install...20 artificial holts or other measures'.

Water Vole

7.5.5.19 Habitat creation, enhancement and management within Junction 16 would benefit water vole; the creation of three new ponds is detailed in Advanced Mitigation. In addition, enhancement of the Alder Bourne river corridor and associated ditches would increase habitat suitability. Such enhancement would include the clearance of scrub and trees to open up watercourses/ditches in consultation with the Environment Agency. Although present on watercourses elsewhere within the Scheme, no other mitigation is proposed for water vole as impacts are not envisaged in these locations.

Birds

7.5.5.20 Improved grassland or woodland diversity ultimately leads to increased prey abundance and diversity. In addition, compensation in the form of habitat reinstatement (after a suitable period during which new landscaping is able to mature) would offset many of the impacts associated with construction phase. For birds, nesting boxes would be recommended in plantation woodland where natural opportunities are less common as at Chainage 2,400 anti-clockwise and would benefit tree sparrow, a Hertfordshire BAP species. Where the carriageway passes through areas known to support wintering birds the provision of screening and Environmental Barriers would help to ensure that these areas remain favourable. Hedgerows are proposed to provide screening for this purpose (such as at Chainage 5,900 to 6,300 clockwise and Chainage 36,000 to 36,450 clockwise) and also act to improve linkage between habitats. This supports the HABAP for barn owl which states, '...consider the options for habitat recreation and enhancement, and consider mitigation of fragmentation by maintaining 'green links' across roads.'

Great Crested Newt

7.5.5.21 Improved and new scrub, woodland and species-rich grassland would directly benefit this species through improved terrestrial habitat mitigating for initial habitat loss and disturbance. In addition, hibernacula would be created where of potential benefit to GCN populations close to the Scheme, thus further mitigating the loss of potential GCN habitat within the Scheme Boundary as a result of the construction phase. This is in line with HABAP targets that state, 'where impacts of new schemes and road improvements on great crested newts and their habitats are unavoidable, consider the options for protection, translocation, habitat recreation, improvement and enhancement, and consider mitigation of fragmentation by maintaining safe road crossings. Create 150 new ponds or hibernacula.' The proposals would be in line with the UKBAP objective to 'maintain the viability of existing great crested newt populations.' The Hertfordshire BAP has similar objectives for great crested newt.

Reptiles

7.5.5.22 Many of the habitat prescriptions would benefit reptiles. For example, improved grassland diversity and structure or increased foraging habitat through new ponds would mitigate against direct habitat loss and disturbance during construction. In addition, the provision of hibernacula in strategic positions would provide over-wintering habitat further enhancing the Scheme's capacity for this group. This promotes the HABAP targets for reptile habitat improvements.

Aquatic Fauna

7.5.5.23 Negative effects on aquatic fauna are only considered to be minor, and in addition, the increase in the number of ponds would provide additional habitat. The use of verge lighting and the lighting of areas that are currently unlit could have long-term impacts on water resources that are not easily mitigated. The use of lantern shields would be used to help mitigate the impact of increased lighting although it would not be possible to eliminate light spill entirely.

7.6 Assessment of Effects

7.6.1.1 The Scheme would result in the loss of habitats peripheral to the existing carriageway of approximately 686,399 metres² (from a total resource of 1,848,371 metres²) as shown in Figure 7.2.

7.6.1.2 Mitigation, enhancement and compensation (including reinstatement of habitats) have been taken into account when assessing the effects of the Scheme. The presence of a protected species within a habitat can heavily influence its sensitivity and therefore the significance of effect on the habitat. For example, water vole is present within marshy grassland at Junction 16. Although the intrinsic value of the marshy grassland in this location is lower, the presence of water vole elevates its sensitivity to medium, hence affecting the significance of the effect.

7.6.2 Designated Sites

Construction Phase Impacts

7.6.2.1 Construction phase impacts would vary depending upon the location. Work within Junction 16 would impact upon Kingcup Farm Meadows CWS as well as designated ancient woodland. This would include direct loss of woodland habitat as well as wetland habitats associated with the Alder Bourne river. The magnitude of impact is therefore considered to be minor (adverse). Through implementation of good working practices in the CEMP the impact on the adjoining Kingcup Meadows and Oldhouse Wood SSSI would be negligible.

7.6.2.2 Horns Wood CWS is present below the Berry Lane Viaduct. Direct impacts to this site would occur as a result of the construction phase through loss of habitat and disturbance from works. However, the woodland adjacent to the carriageway is low quality and the loss of this only amounts to a minor (adverse) impact.

7.6.2.3 Construction impacts would involve loss of buffer habitat adjacent to Little Lady's Wood CWS and a minor (adverse) impact is expected.

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- 7.6.2.4 Construction phase impacts would result in the partial loss of a thin strip of ancient woodland adjacent to Long Wood CWS. There would also be a loss of buffer habitat to Long Wood. In addition loss of plantation connecting the woodland blocks that make up the CWS would also be removed. The magnitude of impact is considered to be moderate (adverse).
- 7.6.2.5 A proportion of plantation woodland included under the Old Parkbury Fishing Lakes CWS would be lost during construction. A minor (adverse) impact is expected.
- 7.6.2.6 Works adjacent to the site would affect Black Green Wood CWS indirectly, causing increased edge effects resulting from removal of buffer habitat. A minor (adverse) impact is expected.

Operational Phase Impacts

- 7.6.2.7 Measures to safeguard water quality and surface water discharges would ensure that habitats associated with the Alder Bourne are protected. Therefore Kingcup Farm Meadows CWS would be shielded from future pollution events, although loss of ancient woodland at Junction 16 would remain. The magnitude of impact is considered to be minor (adverse).
- 7.6.2.8 Operational phase effects in general would not differ extensively from the current situation. Reinstatement of lost woodland to Horns Wood CWS would consist of native species. The magnitude of impact is considered to be minor (adverse).
- 7.6.2.9 Reinstated landscaping would over time mature, thus resulting in recovery of buffer habitat to Little Lady's Wood CWS (negligible impact).
- 7.6.2.10 At Long Wood CWS between Junctions 20 to 21, reinstatement would include the replacement of some of the connecting plantation but the woodland cover would still be reduced. For this reason the magnitude of impact is considered to be minor (adverse).
- 7.6.2.11 Reinstatement would replace much of the plantation lost at Old Parkbury Fishing Lakes CWS. In addition, habitat management practices highlighted in Section 7.5.5 would improve the quality of the existing resource (negligible impact).
- 7.6.2.12 Operational effects to Black Green Wood CWS are not likely to differ much from the current situation. Reinstatement of plantation would take place, minimising any increased edge effects resulting from the construction phase (negligible impact).

7.6.3 Habitats within the Scheme Boundary

Changes to Habitat Abundance

- 7.6.3.1 The existing habitat resources within the Scheme Boundary together with the construction losses and reinstatement are presented in Table 7.11. In addition, the predicted operation year 15 values are also given, calculated on the basis of recovery of reinstated habitats, together with remaining resources unaffected by the construction footprint.

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Table 7.11: Changes to Habitat Abundance

Habitat Type	Existing Resource	Construction Losses	Reinstated	Predicted >15 Years
Semi-natural broadleaved woodland (m ²)	64,959	4,675	0	60,284
Semi-natural mixed woodland (m ²)	40,588	2,534	0	38,054
Semi-natural woodland (CWS) (m ²)	23,289	5,866	0	17,423
Plantation woodland (m ²)	986,495	359,573	112,273	739,194
Scattered trees	Present throughout, would naturally colonise			
Dense/continuous scrub (m ²)	109,131	41,414	49,313	117,030
Scattered scrub	Present throughout, would naturally colonise			
Hedgerows (species-rich) (m)	1	0.2	18,113	18,114
Hedgerows (species-poor) (m)	2,273	1,425	0	848
Hedgerows (combined) (m)	2,274	1,425	18,113	18,962
Semi-improved neutral grassland (m ²)	625,360	372,562	272,345	525,143
Semi-improved calcareous grassland (m ²)	37,289	21,581	121,794	137,503
Semi-improved grassland (combined) (m ²)	662,650	329,504	394,140	727,286
Marshy grassland (m ²)	1,358	1,358	0	0
Amenity grassland (m ²)	3,853	0.5	53,226	57,078
Improved grassland/arable land (m ²)	15,902	9,303	0	6,599
Tall ruderal/continuous bracken (m ²)	54,415	20,830	0	33,585
Ephemeral/short perennial (m ²)	5,150	286	0	4,865
Dry ditch (m)	20,014	8,562	Reinstated throughout for drainage purposes	
Bare ground (m ²)	7,050	1,404	0	Naturally present throughout
Neutral flush (m ²)	2,345	184		2,162
Swamp (m ²)	4,072	960		3,113
Running water (m)	2,785	0	0	2,785
Standing water (m ²)	5,448	3,317	25,295	27,426

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Effects of Construction on Habitats

- 7.6.3.2 An assessment of construction effects is presented in Table 7.12. Reference should be made to Tables 7.6 and 7.7 for the habitat sensitivities used and the relevant tables within Appendix L of the Ecology and Nature Conservation Technical Report for the specific locations where these apply.

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Table 7.12: Assessment of Construction Phase Effects upon Habitats

Habitat	Sensitivity	Magnitude of Impact	Effect Significance
Semi-natural woodland	Lower	Loss is low (4,675 metres ² of the total resource) on a Scheme wide basis. The majority of the affected woodland is of ancient origin as at Junction 16, although other less valuable woodlands are also affected. Woodland in this area, although fragmented by the existing carriageway would not be integrally degraded. There exists large areas of unaffected habitat and the magnitude of impact is considered to be minor (adverse).	Slight Adverse
	Medium		
	High		
Mixed semi-natural woodland	High	Semi-natural mixed woodland lost at Long Wood (2,534 metres ²) is significant in that it is ancient in origin and cannot be replaced. Moreover, where this occurs at Long Wood, which is already degraded, there would be further fragmentation and thus the loss is considered to be moderate (adverse).	Moderate Adverse
Semi-natural woodland (CWS)	Medium	Loss of woodland at Berry Lane Viaduct is 5,866 metres ² and amounts to 25% of the Scheme resource. The woodland supports protected species however, the loss is a relatively small proportion of the woodland as a whole and the integrity of this receptor would remain intact. The impact magnitude is considered to be minor adverse.	Slight Adverse
	High		
Plantation woodland	Lower	Losses amount to 359,573 metres ² (25% of the Scheme resource) and occur throughout the Scheme. This is significant and in some areas plantation would be entirely removed (e.g. Chainage 2,200 to 2,950, anti-clockwise). Furthermore, many areas are utilised by protected species. The impact magnitude of the construction phase is considered to be major adverse.	Slight Adverse
	Medium	Where protected species are present the impacts to these habitats are less severe and a moderate adverse impact would occur.	Moderate Adverse
Scattered trees	Lower	The number of points marked on the PIHS (Figure 7.2) can be used as an indication of the relative abundance of such features and therefore the percentage loss of points is the most useful indicator. Approximately 55% of scattered trees would be lost throughout the Scheme. This initial loss would lead to a temporary major adverse impact.	Slight Adverse
Dense/continuous scrub	Lower	Dense scrub is a widespread habitat of lower value for biodiversity and is easily replaced. However, the construction phase would result in a large area of loss, 41,414 metres ² (which equates to a 38% reduction) throughout the Scheme and therefore equates to a major adverse magnitude of impact.	Slight Adverse
	Medium	Where protected species are present the areas affected are less and an moderate adverse impact is expected.	Moderate Adverse

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Habitat	Sensitivity	Magnitude of Impact	Effect Significance
Scattered scrub	Lower	As for scattered trees, percentage loss of scattered scrub points was used as an indicator. Throughout the Scheme, approximately 46% of scattered scrub would be lost. The magnitude of impact is considered to be major adverse.	Slight Adverse
Hedgerows (species-rich)	High	This is an uncommon habitat within the Scheme Boundary and largely remains unaffected except where it abuts onto the Scheme as at Chainage 6,250. Loss is minimal and the impact is considered to be negligible.	Slight Adverse
Hedgerows (species-poor)	Lower	This is lost throughout the Scheme as at Chainage 5,200. The overall loss of 63% (1,425 metres) is significant in the short term, although this habitat is easily replaced. The magnitude of impact as a result of the construction phase is major adverse.	Slight Adverse
Semi-improved neutral grasslands	Lower	Most of the semi-improved neutral grasslands are species-poor and of lower value for biodiversity. However, they are significantly affected by the proposals with a large proportion of the resource being lost during the construction phase (372,562 metres ² which equates to 60% of the total resource). In addition, many areas are utilised by protected species. The overall magnitude of impact is considered to be major adverse.	Slight Adverse
	Medium		Moderate Adverse
Semi-improved calcareous grasslands	Lower	Semi-improved calcareous grassland is rare within the Scheme Boundary and whilst only of lower value for biodiversity it does currently present some of the better grassland habitat. The loss (21,581 metres ²) is considered to be significant and equates to 58% of the total resource. Loss is greatest within Junction 21 (Chainage 23,850 to 25,250). The magnitude of impact is therefore considered to be major adverse.	Slight Adverse
Semi-improved grasslands (combined)	Lower	To assess the impact of the Scheme upon grassland habitats as a whole, it is helpful to consider both semi-improved neutral and calcareous habitats. The loss of these habitats combined amounts to 329,504 metres ² which equates to a 50% reduction overall. The magnitude of impact of the construction phase is therefore considered to be major adverse.	Slight Adverse
	Medium		Moderate Adverse
Marshy grassland	Medium	Only a small area of this habitat is present within Junction 16 and would be entirely lost (loss of 1,358 metres ²). Due to the presence of a large, high quality marshy grassland within the immediately adjacent Kingcup Meadows BNS, it is sensible in this case, to assess the effect within the context of the wider landscape. The construction phase would therefore have an moderate adverse impact upon this habitat type.	Slight Adverse
Amenity grassland	Negligible	Construction losses of this habitat would be minimal and this habitat is easily replaced. A negligible impact is predicted.	Neutral

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Habitat	Sensitivity	Magnitude of Impact	Effect Significance
Improved grassland/ arable land	Lower	Loss would be relatively small and is not considered significant (e.g. Chainage 4,950 to 5,700). A minor adverse impact would result.	Slight Adverse
Tall ruderal/ continuous bracken	Lower	Tall ruderal habitat is adversely affected during construction with a 38% reduction. The main loss occurs within Junction 16. Overall however, tall ruderal vegetation would develop naturally on disturbed ground caused by the construction process and therefore the magnitude of impact is considered to be negligible. Continuous bracken is found within Junction 16. The habitat is not affected during construction and therefore the magnitude of impact is considered to be negligible.	Slight Adverse
Ephemeral/ short perennial	Lower	Only minor losses (6%) would occur to this habitat and it is therefore not given special consideration here. It is temporal in nature and would naturally vary during the construction phase. The magnitude of impact is considered to be negligible.	Neutral
Dry ditch	Negligible	A 43% reduction in this habitat would present a temporary major adverse impact.	Neutral
Bare ground	Negligible	This feature would be created during construction. The magnitude of impact is therefore considered to be major positive.	Neutral
Neutral flush	Lower	The neutral flush located within Junction 16 would suffer minor losses (a loss of less than 184 metres ²) during the construction phase. Although the vast majority would be retained (2,345 metres ²) this is a difficult habitat to replace. Therefore the magnitude of impact is considered to be minor adverse.	Slight Adverse
Swamp vegetation	Lower	Swamp would be lost at Junction 16 and between Chainage 35,800 to 36,000 clockwise where it is associated with runoff treatment ponds. This habitat is of lower biodiversity value although it is not easily recreated. The overall magnitude of impact of the construction phase is considered to be minor adverse.	Slight Adverse
Running water	High	There is no loss of this resource. The CEMP includes measures to ensure drainage is appropriately treated and would also work to minimise construction related disturbance. The magnitude of impact would be considered no change provided all preventative measures are in place – failure to do so would significantly raise this impact, potentially to major adverse.	Neutral

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Habitat	Sensitivity	Magnitude of Impact	Effect Significance
Standing water	Lower	Advanced mitigation for water vole would involve the creation of three new ponds within Junction 16 prior to the commencement of the primary works. Thus initially the construction phase would lead to a positive effect upon standing water, especially given the fact that these ponds would be particularly attractive to wildlife. However, the majority of the current standing water resource (61%) would be lost as a result of construction leading to a temporary major adverse impact. The new ponds would be larger and thus standing water resource would increase as a result of the construction phase (total reinstatement of 25,295 metres ²). Although aquatic habitats do colonise quickly, during construction disturbance would remain high for treatment ponds. The overall magnitude of impact for the construction phase is therefore considered to be minor adverse.	Slight Adverse

Operational Effects on Habitats

- 7.6.3.3 Habitats are already subject to impacts associated with the current motorway. Habitats close to the carriageway would comprise communities able to tolerate the disturbance such as regular mowing and road traffic spray contaminated with particulates and during the winter months de-icing salts. Hydrocarbon deposition would increase with greater traffic volumes, although drainage treatment would result in negligible impacts upon water quality. Buffer zones have been maintained where possible but the introduction of new lighting would affect certain habitats. The River Ver and Colne in particular would suffer new light spill reducing to 1 Lux (illuminance) up to 60 to 70 metres from the road verge although associated species are more affected than the habitats themselves. Although improvements to habitats would be undertaken, initially for operation year 1 and during the following years, reinstated habitats would still suffer the impacts of construction until they mature.
- 7.6.3.4 The overall magnitude of year 1 impacts upon habitats is considered to be negligible. This is considered to be a background assessment of the new Scheme upon habitats and applies in subsequent years of operation but does not take into account lasting impacts from construction or subsequent impacts resulting from mitigation.
- 7.6.3.5 An assessment of effects for the operation year 15 assessment is presented in Table 7.13 where the habitat sensitivities used are the intrinsic values. Inter-relationships with species cannot be taken into account as baseline information shows the situation prior to construction. Species are mobile in nature and future distributions cannot be accurately predicted. In addition, reinstated habitats are not the same as those lost during construction and imposing an elevated sensitivity value to these habitats is not appropriate.

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Table 7.13: Assessment of Effects upon Habitats in Operation Year 15

Habitat Type	Sensitivity	Magnitude of Impact	Effect Significance
Semi-natural woodland	High	It is not possible to reinstate semi-natural woodland; however some natural colonisation of areas would occur. Mitigation measures outlined in Section 7.5 would help to improve the remaining habitat structure and diversity. The overall magnitude of impact by operation year 15 is considered to be minor adverse.	Slight Adverse
Semi-natural mixed woodland	High	Reinstatement of plantation habitat would partially restore this woodland although cover would not be entire and loss of ancient woodland associated mature trees cannot be replaced. The impact is considered to be minor adverse.	Slight Adverse
Semi-natural woodland (CWS)	Medium	The quality of woodland lost is low, although it does form part of a wider woodland block within a relatively urbanised area. Nevertheless, reinstatement of plantation would restore woodland cover. The impact would be negligible.	Neutral
Plantation woodland	Lower	Reinstatement of plantation woodland amounts to 112,273 metres ² and therefore by operation year 15 the resource would total 739,194 metres ² . This equates to an effective 25% reduction in comparison to the existing resource. However, mitigation as outlined in Section 7.5 would help to improve the structure and diversity of the remaining resource. The overall magnitude of impact by operation year 15 is considered to be moderate adverse.	Slight Adverse
Scattered trees	Lower	Scattered trees would colonise open habitats naturally in areas not subject to rigorous management. The specific provision of this habitat during reinstatement is not therefore considered necessary. The overall magnitude of impact by operation year 15 is considered to be negligible.	Neutral
Dense/continuous scrub	Lower	Reinstatement of dense/continuous scrub would largely replace that removed during construction (7% loss overall by operation year 15). In addition it is an easily created habitat and would quickly resemble the existing resource. Measures outlined in the Section 7.5 would ensure that the new resource is diverse and that the retained areas are improved through sympathetic management. The overall magnitude of impact is considered to be minor adverse.	Slight Adverse
Scattered scrub	Lower	Scattered scrub often develops naturally in areas not subject to rigorous management. The specific provision of this habitat during reinstatement is not therefore considered necessary. The overall magnitude of impact by operation year 15 is considered to be negligible.	Neutral
Hedgerows (species-rich)	Medium	A significant amount of species-rich hedgerow is proposed as part of reinstatement (18,113 metres). By operation year 15 these would have matured and management would ensure a suitable structure develops. The magnitude of impact by operation year 15 is therefore considered to be moderate positive.	Moderate Beneficial

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Habitat Type	Sensitivity	Magnitude of Impact	Effect Significance
Hedgerows (species-poor)	Lower	Species-poor hedgerow would not be reinstated as new hedgerow habitat would be species-rich. Furthermore, retained hedgerows would be managed to enhance their value for biodiversity. Thus the magnitude of impact to species-poor hedgerow is considered to be negligible.	Neutral
Semi-improved neutral grassland	Lower	Reinstatement of semi-improved neutral grassland would amount to 272,345 metres ² within the Scheme Boundary. The proposals therefore result in an effective reduction of 16% by operation year 15. However, mitigation measures would result in an improved resource. The overall magnitude of impact is therefore considered to be minor adverse.	Slight Adverse
Semi-improved calcareous grassland	Lower	A large proportion of reinstated grassland habitat would be calcareous grassland (121,794 metres ²) which equates to an increase of approximately 269% compared with the existing situation by year 15. Positive impacts resulting from mitigation, as outlined above for neutral grasslands would also apply. The overall magnitude of impact is considered to be major positive.	Slight Beneficial
Semi-improved grasslands (combined)	Lower	Taken together the reinstatement of 394,140 metres ² of grassland habitat would almost equal the construction losses across the Scheme. In addition, the newly created habitat would be of higher value than the existing resource. The balance between neutral and calcareous grassland would also change with calcareous grassland making up 19% of the resource by operation year 15 (compared with 6% presently). In addition, grassland habitat would increase slightly (10%) and together with the improvements to the existing resource and the development of a higher quality substitute, a moderate positive of impact would result.	Slight Beneficial
Improved grassland/ arable land	Lower	There is no provision of improved grassland or arable land and the impact to this habitat is considered to remain at negligible.	Neutral
Amenity grassland	Negligible	Amenity grassland is to be created in many areas, for example surrounding features such as treatment ponds, on the approach to signage and around other functional features. Currently this habitat is probably under recorded due to the small areas involved. Nevertheless, the provision of 53,226 metres ² would probably be an increase on the current resource. The magnitude of impact is considered to be minor positive.	Neutral
Marshy grassland	Lower	Operation year 15 impacts for marshy grassland have to be considered in the wider landscape context due to relative uncommon nature of this habitat and the presence of large alternative substitutes nearby. The overall magnitude of impact is considered to be minor adverse by operation year 15.	Slight Adverse
Neutral flush	Lower	It is likely that the neutral flush within Junction 16 is fed by a number of sources other than the treatment pond and therefore the magnitude of impact is considered negligible.	Neutral

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Habitat Type	Sensitivity	Magnitude of Impact	Effect Significance
Swamp and marginal vegetation	Lower	Although swamp and marginal vegetation is not reinstated specifically, marginal plants would be used in treatment ponds and swamp would develop at the boundaries. The magnitude of impact is therefore considered to be negligible.	Neutral
Ephemeral/ short perennial	Lower	Ephemeral/short perennial is dynamic and would develop naturally on rough ground and unmanaged areas. The impact is considered to be negligible.	Neutral
Tall ruderal/ continuous bracken	Lower	Tall ruderal/continuous bracken would develop naturally overtime and the impact is considered to be negligible.	Neutral
Dry ditch	Negligible	Dry ditch would be reinstated during construction as part of the drainage provisions. This over time would become scrubbed over in places and would largely resemble the current resource. The impact is therefore considered to be negligible.	Neutral
Bare ground	Negligible	Bare ground generated during construction would be planted and landscaped and thus this habitat would reduce. Nevertheless, bare ground would develop naturally and would take a variety of forms, for example on steep slopes or where soils are thinner bare ground and semi-exposed soils would develop. The impact would be minor positive.	Neutral
Running water	High	The drainage design would ensure maintenance of discharge water quality and flow rates to rivers. In addition, capacity to treat and contain pollutant events would be improved (this is a recommendation of the HABAP). Although the drainage design includes two new outfalls to the Catharine Bourne (a watercourse that does not currently receive highways runoff), there are measures in place for treatment prior to entry to the river and pollutant levels would still be within the Environmental Quality Standards set by the Environment Agency. The magnitude of impact by operation year 15 is expected to be negligible.	Slight Adverse
Standing water	Lower	Habitats created as part of water vole mitigation would continue to develop and by operation year 15 would support numerous species. Treatment ponds would also show signs of community development although the species present would be tolerant of periodic disturbance associated with maintenance activities and the input of highway pollutants, some of which would be seasonal (e.g. salt contaminated runoff). The impact upon standing water by operation year 15 is considered to be minor positive.	Slight Beneficial

7.6.4 Habitats Outside of the Scheme Boundary

Construction Phase Impacts

Woodland

- 7.6.4.1 Where plantation woodland acting as a buffer to adjacent woodland is lost (e.g. Chainage 2,200 to 2,950, anti-clockwise) impacts associated with edge effects would occur. For example, increased light reaching the woodland floor would lead to an increase in more competitive species such as nettles and bramble, excluding smaller plants. Black Green Wood County Wildlife Site (CWS) and Long Wood (part CWS) are designated ancient woodlands and would suffer some disturbance as they are adjacent to the Scheme and construction would involve removal of buffer habitat. The semi-natural woodland beneath the Berry Lane viaduct is a CWS. Work to widen the bridge structure would cause an impact through disturbance, noise, increased lighting and loss of a buffer strip between the higher quality woodland and the carriageway. The magnitude of impact is considered to be minor (adverse).

Other Habitats

- 7.6.4.2 Other habitats that border the Scheme, such as hedgerows, dense/continuous scrub and semi-improved grasslands would be affected by construction activities. However, when the CEMP is adhered to these impacts would be minimal. The CEMP would also include measures to ensure drainage is appropriately treated for adjacent aquatic habitats. The magnitude of impact is considered to be negligible.

Operational Phase Impacts

- 7.6.4.3 Operational impacts relating to the post-construction Scheme are not envisaged to be very different from the current situation although the change to the lighting design would result in adjacent habitats being exposed to increased light spill. This would be most pronounced in raised sections where the carriageway is on an embankment (e.g. between Junctions 22 and 23), where sensitive habitats (and therefore species) are very close (e.g. ancient woodlands that border the Scheme) and at the Rivers Ver and Colne.
- 7.6.4.4 Reinstatement of habitats would help to reduce edge effects resulting from construction losses. Air quality would improve overall leading to a reduced impact on vegetation from nitrate deposition in comparison with the existing situation. The magnitude of impact is therefore considered to be negligible.

7.6.5 Species Effects

- 7.6.5.1 Tables 7.14 and 7.15 detail impacts and effects of the Scheme on species during construction, operation year 1 and operation year 15.

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Table 7.14: Assessment of Construction Effects On Species

Species/Group	Sensitivity	Magnitude of Impact	Effect Significance
Notable plants	Medium	Remodelling of the treatment ponds within Junction 16 would result in some loss of ancient woodland resource and possibly some notable plant species such as bluebell although advanced mitigation aims to relocate plants wherever possible. Therefore the magnitude of impact is considered to be minor (adverse).	Slight Adverse
Badger	Medium	Advanced mitigation would require the closure of two badger setts, including one active main sett and a significant subsidiary setts. In addition to the closure of setts, some setts would require Natural England disturbance licences. Some loss of foraging or cover habitat as a result of the construction phase is considered to be likely. Furthermore, badgers would likely suffer disturbance resulting from night time construction with the presence of works staff, machinery, lighting etc. The construction phase impacts to badger would be moderate (adverse).	Moderate Adverse
Bats	Very high	Loss of plantation woodland, hedgerows and grassland habitat would affect foraging areas of Parish/Neighbourhood, District/Borough and County/Metropolitan Importance. An example would be disturbance to a District/Borough area from Chainage 10,050 to 10,500. Construction activities at the Chalfont Viaduct would impact upon the roost by reducing its attractiveness to bats. Any works that cause disturbance to a confirmed roost would require a Natural England licence before proceeding. Floodlighting (and therefore possibly forms of construction related lighting) has been shown to affect bat foraging behaviour and habitation of roosts ⁴² and can present significant problems. If lighting is necessary in the vicinity of the roosts at the Chalfont Viaduct or Ladywalk Wood, direct illumination would be avoided as this would cause disruption to bat emergence times or cause bats to abandon the roosts. The magnitude of impact of the construction phase across the whole Scheme upon bats foraging within or close to the Scheme Boundary is considered to be moderate (adverse). However, if either roost were affected to the extent that works cause injury or death or abandonment of the roosts then the impact would be major (adverse).	Large Adverse
Deer	Lower	Excavations are considered a low risk to most deer although muntjac is more vulnerable than other species. In line with precautions for other mammals (e.g. badgers) excavations would contain a means of escape together with a covering and/or fencing. In addition, disruption of normal commuting routes would present a road safety hazard if animals seek alternative tracks close to the carriageway. The magnitude of impact of the construction phase on deer is considered to be minor (adverse).	Slight Adverse

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Species/Group	Sensitivity	Magnitude of Impact	Effect Significance
Otter	Very high	Disturbance through floodlighting and vibration noise would be restricted to areas adjacent to the Rivers Colne and Ver. The CEMP would ensure drainage is appropriately managed during construction. The impact magnitude is considered to be negligible.	Slight Adverse
Water vole	High	<p>Construction impacts upon water vole would only take place within Junction 16, where mitigation work would involve translocation and housing of individuals in temporary receptors, prior to release. This would incur impacts through direct disturbance and inhibiting normal behaviour. Construction phase impacts would be minimised and suitable habitat for translocation would be mature and ready by the time any reintroductions occur. Water vole habitat would be protected as the CEMP would ensure drainage is appropriately managed. The magnitude of impact of the construction phase on water vole is considered to be moderate (adverse) due to the disruption of the Alder Bourne population. The discovery of large numbers within working areas (population sizes fluctuate from year to year) would result in the magnitude of impact being elevated to major (adverse).</p> <p>Water vole are currently not present on the Catharine Bourne where the new outfalls are proposed because of unsuitable habitat. Therefore, no disturbance of water vole habitat is envisaged during construction in this location.</p>	Large Adverse
Other mammals	Lower	Other mammals such as rodents and rabbits would be most significantly affected by loss of extensive grassland areas, for example at Chainage 30,600 clockwise where there are many rabbit burrows. Larger, more mobile mammals are not likely to be affected to the same extent. The overall magnitude of impact of the construction phase upon other mammals is considered to be moderate (adverse).	Slight Adverse
Breeding birds	Medium	Construction phase impacts upon breeding birds largely stem from habitat removal. However, all potential breeding habitats under the construction footprint would be removed during the winter months, thus minimising direct impact on breeding animals. Nevertheless this would inevitably reduce the number of territories that can be established in the following spring. Removal of woodland and dense/continuous scrub would reduce the amount of habitat suitable for shelter and foraging and would result in an increased risk of mortality. Loss of small mammals from grassland areas would have an impact upon birds of prey such as kestrel (<i>Falco tinniculus</i>) (a HBAP species). A number of key areas have been identified outside of the Scheme Boundary and construction adjacent to these would have the most significant impact on birds (for example adjacent to Nockhill Wood) through noise, light, vibration and the removal of screening. It is unlikely that on the whole, work within the Scheme Boundary would significantly affect the integrity of key areas in the long term. The overall magnitude of impact is considered to be moderate (adverse).	Moderate Adverse

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Species/Group	Sensitivity	Magnitude of Impact	Effect Significance
Wintering birds	Medium	Construction phase impacts upon wintering birds largely stem from removal of plantation that currently shields adjoining land from noise and visual disturbance. This is the case at Chainage 5,900 to 6,300 clockwise and Chainage 36,000 to 36,450 clockwise. These habitats would be replaced in the long term. As relatively few areas are affected in this manner the overall magnitude of impact is considered to be minor (adverse).	Slight Adverse
Great crested newt	Very high	Only terrestrial habitat is affected by the Scheme. The mitigation set out under the advanced works would significantly reduce the likelihood of great crested newts remaining at risk within construction zones close to all ponds. The populations are considered to be either Low (e.g. Horse Paddock pond complex) or Good (e.g. Springfield Farm Fishing Lakes and Colney Private Park Pond). In the event that individuals are encountered within the construction zone, an ecologist would be sought to supervise any further work and translocate individuals to a safe location. The magnitude of impact of the construction phase overall is considered to be minor (adverse).	Slight Adverse
Reptiles	High	Advance works mitigation would significantly reduce the likelihood of encountering reptiles within the zone of construction. Loss of habitat for shelter and foraging would occur with removal of grassland and scrub such as around the balancing ponds in Junction 16. This would result in reptiles being displaced into sub-optimal habitat. However, on the whole reptiles tend to be concentrated in specific locations, usually associated with features such as railway lines or ancient woodland. The overall magnitude of impact is considered to be minor (adverse).	Slight Adverse
Terrestrial invertebrates	Lower	Terrestrial invertebrates are most likely to be affected by construction losses of botanically diverse habitats such as the relatively species-rich calcareous slopes of Junction 21. Although the specific locations surveyed in the Stage 3 invertebrate survey would remain largely unaffected by the works, there is similar habitat within Junction 21 that would be lost. The habitat sampled within Junction 21 is considered to be of 'Very High' quality for invertebrates and loss of similar calcareous grassland habitat is likely to have a significant impact upon invertebrate communities. Mitigation to translocate and to disperse invertebrates from high quality habitat would help to minimise construction impacts. Construction lighting would result in a negative impact upon nocturnal insects that are attracted or disorientated by artificial lights (see also operational impacts). In addition, widespread loss of grassland habitat would impact upon common species. The overall magnitude of impact is considered to be moderate (adverse).	Slight Adverse

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Species/Group	Sensitivity	Magnitude of Impact	Effect Significance
Aquatic macro-invertebrates (running water)	Lower	The adoption of pollution prevention measures and best practice guidelines outlined in the CEMP would prevent (adverse) changes to aquatic habitats and ensure statutory compliance. A negligible impact to running water species is expected.	Neutral
Aquatic macro-invertebrates (standing water)	Lower	Initially there would be an impact to aquatic flora and fauna within existing treatment ponds. Thus, there is likely to be a minor (adverse) impact upon aquatic species associated with standing water.	Slight Adverse
Fish	Medium	There is no expected significant change in the water quality of watercourses as a result of the Scheme. The CEMP would ensure that all reasonable measures are undertaken to prevent (adverse) changes and ensure statutory compliance. Lighting of sensitive areas during construction would be kept to a minimum and the overall impact magnitude would be negligible.	Neutral

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Table 7.15: Assessment of Operational Effects On Species

Species/Group	Sensitivity	Magnitude of Impact	Effect Significance
Notable plants	Medium	<p>Operation year 1 impacts relating to the post-construction Scheme are not envisaged to be very different from the current situation. Overall air quality would improve in comparison to the existing situation leading to less deposition of nitrates on vegetation. The magnitude of impact is therefore considered to be negligible.</p> <p>Air quality would be improved as a result of the Scheme (apart from an increase in CO₂) and operation year 15 impacts would not change significantly from that of operation year 1 (negligible).</p>	Neutral
Badger	Medium	<p>Immediately following construction, badgers would be presented with an enlarged barrier to movement. Mortality of individuals attempting to cross the carriageway would increase, although badgers appear to be using existing tunnels, overbridges and underbridges. Newly established habitats such as grassland and plantation woodland, would at year 1 present little in the way of suitable foraging or cover habitat as these areas would be immature. However, the percentage area affected by the Scheme within each clan territory would be small. Badgers residing in active setts close to the carriageway but which did not warrant closure would experience an increase in disturbance resulting from vibrations and in some locations noise. The overall magnitude of impact of operation year 1 is considered to be minor (adverse).</p> <p>Over time, badgers would become accustomed to vibrations and noise and would adapt their activity and behaviour accordingly. In addition, they would become accustomed to their new setts and improved habitat resulting from mitigation and enhancement would have positive effects. The overall magnitude of impact by operation year 15 is considered to be negligible.</p>	Slight Adverse
Bats	Very high	<p>Bats currently residing at Chalfont Viaduct are already exposed to vibration, noise and air quality impacts from a busy motorway and these would not increase sufficiently to have a long-term (adverse) impact on bats. The most significant impact would be through increased lighting, most noticeably to those species that are light sensitive (e.g. brown long-eared) or occupying roosts⁴³. Increased lighting impacts would occur throughout the Scheme as significant bat interest is present in areas that are currently lit from the</p>	Slight Adverse

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Species/Group	Sensitivity	Magnitude of Impact	Effect Significance
		<p>central reservation or unlit. This would result in additional barriers to dispersal and inhibit future population expansions. Impacts would be most significant adjacent to foraging areas of County/Metropolitan Importance as at Chainage 28,150, of District/Borough Importance as at Chainage 4,950 to 5,200 and on the Rivers Ver and Colne. The use of shields would help to reduce light spill in particularly sensitive areas, although it is not possible to eliminate this impact entirely. New treatment ponds would provide additional foraging habitat although during operation year 1 this would not be fully realised. The overall magnitude of impact of operation year 1 upon bats is considered to be minor (adverse).</p> <p>Many of the habitat and species-specific targeted measures outlined in Section 7.5 would result in improved foraging habitat and roosting opportunities during the operation of the Scheme. In some cases important features would be more abundant (e.g. hedgerows) and thus in the long term, foraging habitat within the Scheme Boundary would improve. Furthermore, treatment ponds would be more numerous than at present and these would provide some foraging habitat, even if they receive relatively high pollution loads. However, increased lighting would continue to have an effect in all areas of significant bat interest along the Scheme. The overall magnitude of impact of the year 15 operation, upon bats is considered to be minor (adverse).</p>	Slight Adverse
Deer	Lower	The addition of two lanes to the carriageway would reduce the likelihood that deer successfully traverse the carriageway although current indications are that they are using underpasses and overbridges. In addition, Environmental Barriers would present physical obstructions to deer movements. Many of the measures outlined in Section 7.5 would benefit deer although the majority of habitats would be immature and provide little in the way of cover or foraging habitat. At year 1 the impact of the operational phase is considered to be minor (adverse). Maturation of planting by year 15 would restore lost cover for deer and a negligible impact would result.	Slight Adverse
			Neutral
Otter	Very high	The provision of two artificial otter holts would provide females with a safe and secure refuge in which to raise young, thus encouraging otter to become resident in the area. The magnitude of impact of the operation year 1 and year 15 is considered to be minor positive.	Large Beneficial
Water vole	High	Water vole would benefit from the provision of new ponds and habitat improvements. Although these ponds need to be established prior to works taking place, they would still be relatively immature and the	Slight Adverse

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Species/Group	Sensitivity	Magnitude of Impact	Effect Significance
		impact at year 1 would be minor (adverse). By year 15 the ponds would have matured significantly, providing abundant high quality habitat and the impact would be moderate positive.	Large Beneficial
Other mammals	Lower	Mortality of other mammals caused by attempts to cross the carriageway would continue. Routine management operations such as vegetation mowing would also result in adverse impacts through disturbance. Reinstated habitats would still be immature and thus largely unattractive to other mammals, although small mammals would likely exploit newly created grasslands rapidly. A minor (adverse) impact is envisaged during operation year 1 of the Scheme. By year 15 improvements to and maturation of habitats would help other mammal populations to recover. A negligible magnitude of impact is envisaged by operation year 15 of the Scheme.	Slight Adverse
			Neutral
Breeding birds	Medium	Breeding birds would suffer in some areas due to localised increases in noise levels ⁴⁴ (i.e. where low noise surfaces are already present: e.g. Junctions 16 to 18, Chainage 2,090 to 15,546). Barn owls are particularly vulnerable to collisions with vehicles ⁴⁵ and increased volumes of traffic could therefore have an adverse impact upon this protected species where it has been recorded between Junctions 16 and 17. However, it is not envisaged that the highways verge would be attractive to foraging barn owl, which would reduce the likelihood of this risk. Reinstated habitats would still be immature and thus loss of breeding, foraging and shelter habitat would still be relevant to most breeding bird species. Impacts relating to increased noise and lighting would continue to be significant. The overall magnitude of impact of the operation year 1 is considered to be moderate (adverse). By year 15, birds would benefit from the relevant group-specific and habitat mitigation prescriptions. These would go some way to offsetting the negative impacts mentioned above through improved habitat quality, connectivity and the provision of features such as nest boxes. Reinstated plantation would have reached a sufficient age by year 15 to provide screening to adjacent key areas such as Nockhill Wood and help reduce noise and lighting further. These features would help to reduce the magnitude of impact to minor (adverse).	Moderate Adverse
			Slight Adverse
Wintering birds	Medium	Replacement of screening would help to mitigate operation impacts. In year 1 it would not be significantly mature to make an effective contribution against noise and visual disturbance and the impact would remain at minor (adverse). By year 15 screening would be significantly mature to make an effective contribution. The overall magnitude of impact would be negligible.	Slight Adverse
			Neutral

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Species/Group	Sensitivity	Magnitude of Impact	Effect Significance
Great crested newt	Very high	New treatment ponds would present potential colonisation opportunities although approaching and during operation year 1 these waterbodies would be too heavily disturbed. Loss of foraging or shelter habitat would still be relevant as the reinstated plantations would still be immature. However, the provision of features such as hibernacula (such as at Chainage 5,350 clockwise) and the abundance of alternative habitat near to most ponds would compensate for this impact. The overall magnitude of impact of operation year 1 is considered to be negligible. By operation year 15, if these ponds are utilised then there would be the risk of periodic disturbance during maintenance operations. Ultimately these ponds would work to maintain the overall surface water quality of the area and this would lead to no further degradation within ponds currently known to support great crested newt (as a result of the Scheme operation). Other habitat improvements including provision of hibernacula would result in a negligible impact magnitude by operation year 15.	Neutral
Reptiles	High	Mitigation such as the provision of hibernacula within Junction 16 would go some way to improving the habitat suitability for reptiles during the operation of the Scheme, although during operation year 1 habitats would still be relatively immature and of lower value to reptiles. The magnitude of impact is considered to be minor (adverse). By operation year 15, mitigation measures such as the provision of hibernacula, would improve the habitat suitability for reptiles during the operation of the Scheme. Reinstatement of key foraging habitats such as negligible and calcareous grasslands would provide a higher quality resource than currently present. New treatment ponds would also provide foraging habitat for grass snake if they support amphibians. The overall magnitude of impact upon reptiles during the operation of the Scheme is considered to be negligible.	Slight Adverse
Terrestrial	Lower	Terrestrial invertebrates such as moths and other night-flying insects are attracted to lights, and it is	Slight Adverse

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Species/Group	Sensitivity	Magnitude of Impact	Effect Significance
invertebrates		believed that artificial lighting adversely affects their populations. Lighting has also been shown to cause ground dwelling invertebrates to move closer to the surface, thus increasing their risk of predation. The lighting design includes the use of verge lighting with brighter, high pressure sodium bulbs which are more attractive to insects. The proposed lighting would therefore result in an adverse impact upon local terrestrial invertebrate populations. Reinstated habitats would be colonised immediately by certain species although while they are still immature they would not support a wide range of species. The magnitude of impact is considered to be minor (adverse) during operation year 1. As habitats mature, an increase in invertebrate numbers would be expected. In addition, the proposed planting of new habitats would mean an increase in habitat with a higher ecological value in some areas. Importantly, the total area of grassland habitat would remain virtually the same. In addition, the provision of calcareous grassland would be increased and this would lead to an improvement in invertebrate diversity. By operation year 15 the overall impact to terrestrial invertebrates would be negligible.	Neutral
Aquatic macro-invertebrates (running water)	Lower	Mitigation as outlined in Chapter 8, would result in a negligible impact to the quality and flow rate of discharges to watercourses. However, aquatic invertebrates would be affected by increased lighting, particularly in areas that are currently unlit (e.g. the River Ver). The use of verge lighting would increase the level of light spill although shields installed around the lights would help to reduce this impact in particularly sensitive areas. Therefore impacts upon running water species during operation year 1 and year 15 are considered to be minor (adverse).	Slight Adverse
Aquatic macro-invertebrates (standing water)	Lower	New nature conservation ponds would improve the provision of standing water and in addition, the reinstatement of treatment ponds far exceeds the current resource, although the water bodies would take some time to settle and mature. Thus the magnitude of impact is considered to be negligible during operation year 1 and moderate <i>positive</i> during operation year 15 for standing water species.	Neutral
			Slight Beneficial
Fish	Medium	There would be no significant change to the river quality and a neutral impact on fish is predicted. However, verge lighting would result in an increase in light spill and therefore the area of river corridor lit at night. Shields would help to reduce light spill in sensitive areas, although it is not possible to remove this impact entirely. Artificial lighting would have effects upon normal fish behaviour, particularly in areas currently unlit, and therefore a minor (adverse) impact is predicted overall during operation year 1 and year 15.	Slight Adverse

7.7 Summary

- 7.7.1.1 The existing motorway already impacts surrounding habitats and species through disturbances such as noise, vibration, air quality, water quality and traffic mortality. The Scheme has been designed to minimise and mitigate effects through the use of low noise surfacing, use of Environmental Barriers and improved drainage design. The Scheme also includes habitat reinstatement, new planting and enhancement of existing habitats in line with the HABAP. Impacts including disturbance through noise and air pollution would persist. However, the carriageway in places forms a corridor, linking otherwise isolated habitats and this connectivity would increase as a result of the Scheme.
- 7.7.1.2 Overall the Scheme would involve a loss of periphery habitat and an increase in road surface area.

7.7.2 Designated Sites

- 7.7.2.1 Designated sites would remain largely unaffected by the Scheme. Construction activities would involve some loss of habitat although this would be minor or is of lower quality habitat. The integrity of such areas would not be adversely affected although where mature or ancient semi-natural woodland is lost replacement would not be possible (for example at Junction 16 and Long Wood CWS). The impact magnitude is considered to be moderate (adverse) resulting in a moderate adverse effect significance.
- 7.7.2.2 Reinstatement and where possible improved connectivity and habitat structure would reduce these impacts during operation of the Scheme. Thus overall the impact of the Scheme on designated sites is considered to be minor (adverse) resulting in a slight adverse effect significance.

7.7.3 Habitats

- 7.7.3.1 Approximately one third of the habitats within the Scheme Boundary would be affected during construction. This includes grasslands, plantation woodland and hedgerows. A small amount of ancient woodland would also be lost at Junction 16 and at Long Wood. Apart from ancient woodland, the majority of these habitats are of lower value for biodiversity being created relatively recently, often comprising limited numbers of species and being structurally poor. The overall impact of construction upon habitats is considered to be major (adverse) which equates to a moderate adverse effect significance.
- 7.7.3.2 The Scheme reinstatement would replace lost habitats leading to an overall reduction in terrestrial habitat of approximately 14%. However, these habitats would comprise more diverse communities than are currently present. Although plantation woodland would be reduced, the Scheme would involve virtually no loss of grassland habitat (following reinstatement) and in addition the balance between neutral and calcareous substrates would be addressed. Retained areas would be enhanced through coppicing and thinning in plantation, plug planting and cutting regimes in grasslands and gapping or layering hedgerows. The understorey and field layer of ancient woodland areas that are lost would be translocated to appropriate sites. Drainage design would ensure motorway drainage quality and flow rates into chalk rivers is maintained. Much of the mitigation relates directly to national, HABAP and regional BAP targets. The overall impact of the

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Scheme upon habitats is considered to be minor adverse which equates to a slight adverse effect significance.

7.7.4 Species

- 7.7.4.1 Impacts on species from construction include the loss of habitats together with disturbances such as noise and lighting, which would all result in displacement and/or disruption to normal activities. The overall impact of the construction phase upon species is considered to be major (adverse) due to disturbance of water vole and bats. This equates to a large adverse effect significance.
- 7.7.4.2 Operational effects would vary between species although many of the effects from the current situation would remain. The Scheme would include lighting, which would have more long-term effects, especially for species such as bats, birds, fish and invertebrates (this is of particular note in areas that are currently unlit). Reinstatement of habitats together with mitigation, enhancement and compensation prescriptions would offset adverse effects on most species. For example, improved plantation structure and more diverse grasslands would present improved foraging/shelter habitats for many species including bats where connectivity of woodland habitats would be improved (a HABAP target). In addition, species-specific measures such as hibernacula, bird boxes and water vole ponds would further improve many areas. Targets of the HABAP such as the installation of bat boxes where appropriate and the creation of new ponds for water voles would be included in the Scheme. On the whole, the impact of the Scheme upon species is considered to be minor (adverse) as features such as lighting would have long term implications. This equates to an overall slight adverse effect significance.

7.7.5 Overall Impact

- 7.7.5.1 Impacts on designated sites, habitats and species all have an overall slight adverse effect significance. These are the three measurable factors which have been used to define ecological value in relation to the Scheme. It may be concluded from this therefore that the overall effect significance of the Scheme on ecology will be slight adverse.

8 Road Drainage and the Water Environment

8.1 Introduction

8.1.1.1 This chapter identifies and, where possible, quantifies the likely effects on the quality and integrity of the potential surface and groundwater drainage receptors from the Scheme. The chapter also identifies measures in the design which mitigate or reduce the significance of these effects. A detailed assessment of the Scheme on the water environment on a Junction by Junction basis is available in the Road Drainage and the Water Environment Technical Report¹. The implications of any changes in the water environment on aquatic ecology are covered in Chapter 7.

8.2 Regulatory Framework

8.2.1.1 The assessment considered the following legislation:

- The Highways Act 1980, (as amended)²
- Water Resources Act 1991, (as amended)³
- Land Drainage Act 1991, (as amended)⁴
- Environment Act 1995, (as amended)⁵
- The Surface Waters (Fishlife) (Classification) Regulations 1997 (amended 2003)⁶ which transposes the EC Freshwater Fish Directive 78/659/EEC
- The Surface Waters (River Ecosystem) (Classification) Regulations 1994⁷
- The Groundwater Regulations 1998⁸ as amended which transposes the EC Groundwater Directive 80/68/EC
- The Surface Waters (Dangerous Substances) (Classification) Regulations 1998⁹ which transposes the EC Dangerous Substances Directive 76/464/EEC (and daughter directives)
- The Pollution Prevention and Control Act (1999)¹⁰
- The Pollution Prevention and Control Regulations (2000)¹¹
- The Water Environment (Water Framework Directive) (England and Wales) Regulations 2003¹² which transposes the Water Framework Directive 2000/60/EC
- Drinking Water Directive (98/83/EEC)¹³

8.2.1.2 The main guidance documents consulted were:

- A Better Quality of Life – A Strategy for Sustainable Development for the United Kingdom¹⁴
- Planning Policy Statement (PPS) 23 – Planning and Pollution Control¹⁵

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- Planning Policy Statement (PPS) 25 – Development and Flood Risk¹⁶
 - Policy and Practice for the Protection of Groundwater¹⁷
- 8.2.1.3 Pollution Prevention Guidance Notes (PPGN) produced by the Environment Agency (EA) with particular relevance to the Scheme include:
- PPGN01 General guide to the prevention of water pollution¹⁸
 - PPGN02 Above ground oil storage tanks¹⁹
 - PPGN03 The use and design of oil separators²⁰
 - PPGN05 Works in, near or liable to affect watercourses²¹
 - PPGN06 Working at construction and demolition sites²²
 - PPGN08 Storage and disposal of used oils²³
 - PPGN10 Highway depots²⁴
 - PPGN13 High pressure water and steam cleaners²⁵
 - PPGN18 Control of spillages and fire fighting runoff²⁶
 - PPGN22 Dealing with spillages on highways²⁷
 - PPGN23 Maintenance of structures over water²⁸

8.3 Methodology

8.3.1 Study Area

- 8.3.1.1 In terms of the impact on surface water quality from the Scheme, the Design Manual for Roads and Bridges (DMRB)²⁹ Stage 3 Assessment would normally consider the potential impacts on those water bodies downstream of the motorway, i.e. those water bodies that receive road drainage, or might be affected during the construction process. Whilst the consideration of minor water bodies was restricted to an area within 500 metres of the Scheme for the water quality assessment, the study area for water bodies of national or international , high economic or recreational importance was wider.
- 8.3.1.2 The study area used to assess the potential impact on hydrogeological features was extended beyond the normal 500 metres either side of the Scheme because of the special hydrogeological characteristics of the Chalk aquifer in this area (see Section 8.4.6). An extended study area allowed the numerous important features (major groundwater abstractions, major groundwater fed rivers and streams and the major aquifer) that may potentially be affected by the Scheme to be assessed. In addition hydrogeological monitoring data is comparatively sparse in the vicinity of the Scheme and so a considerably larger study area was required.

8.3.2 Establishment of Baseline Conditions

8.3.2.1 Data was obtained from the following sources:

- Highways Agency Area 5 Maintaining Agents
- Environment Agency records – routine information and specific reports^{30, 31}
- Local authorities
- Veolia Water Company
- Published material and scientific literature^{32,33,34,35,36}
- Groundwater monitoring: boreholes at soakaways at Maple Cross (NGR TQ 024,930), Junction 21 (NGR TL 117,028), Catharine Bourne (NGR TL 216,014) and of outfalls during 2005 to 2006

8.3.3 Assessment of Effects

8.3.3.1 An assessment was made of the residual impacts that the Scheme would have on the receiving environment, i.e. on the surface water bodies and on the groundwater, in the vicinity of the Scheme following surveys and consultation with the EA. Impact prediction took into account amelioration measures which have already been incorporated into the design, such as drainage design measures, and construction mitigation.

8.3.3.2 The methodology used for this assessment followed DMRB Volume 11, Section 3, Part 10 (HA216/06). For surface waters this included an assessment of the risk of pollution from accidental spillage, the impact to the water bodies that receive highway drainage runoff and flooding impacts. For groundwater, the quality of the highway runoff entering the soakaway systems was assessed as well as the impact on groundwater recharge.

8.3.3.3 The calculation for accidental spillage risk took into account the area drained, the volume of traffic and percentage of Heavy Goods Vehicles, and the speed of response of emergency services. This compared the Do Minimum with the Do Something in 2012 and 2027. This produced an estimated return period of accidental spills which might gain access to watercourses through the drainage system. If the risk is deemed to be unacceptable then containment for spilled liquids would be installed. The level of acceptability is usually taken to be less than 1% in any year for sensitive watercourses.

8.3.4 Significance Criteria

8.3.4.1 The importance of the feature and magnitude of the impact were used to determine the significance of the effect as defined in Tables 8.1 to 8.3 taken from DMRB guidance HA216/06.

Table 8.1: Importance of Water Attributes

Importance	Criteria	Examples
Very High	Attribute has a high quality and rarity on regional or national scale	<ul style="list-style-type: none"> • Major aquifer providing regionally important resource or supporting site protected under wildlife legislation SPZ1 • EC Designated Salmonid fishery* • RQO river ecosystem class RE1 • Flood plain or defence protecting more than 100 residential properties
High	Attribute has a high quality and rarity on local scale	<ul style="list-style-type: none"> • Major aquifer providing locally important resource or supporting river ecosystem SPZ II • RQO river ecosystem class RE2 • EC Designated Cyprinid fishery • Flood plain or defence protecting 1 to 100 residential or industrial properties
Medium	Attribute has a medium quality and rarity on local scale	<ul style="list-style-type: none"> • RQO river ecosystem class RE3 or RE4 • Aquifer providing abstraction water for agricultural or industrial use with limited connection to surface water SPZIII • Flood plain or defence protecting 10 or fewer industrial properties
Low	Attribute has a low quality and rarity on local scale	<ul style="list-style-type: none"> • RQO river ecosystem class RE5 • Non-aquifer • Floodplain with limited existing development

* fishery designated under the Surface Waters (Fishlife) (Classification) Regulations 1997 (amended 2003) which transposes the EC Freshwater Fish Directive 78/659/EEC

Table 8.2: Magnitude of Impact on the Water Environment

Magnitude	Criteria	Example
Major Adverse	Results in loss of attribute	<ul style="list-style-type: none"> Loss of EC designated Salmonid fishery Potential exceedance of total zinc and dissolved copper EQS Calculated risk of pollution from accidental spillage >2% annually. Increase in 1% flood peak level >100mm Pollution of potable water supply
Moderate Adverse	Results in impact on integrity of attribute or loss of part of attribute	<ul style="list-style-type: none"> Potential exceedance of total zinc or dissolved copper EQS. Calculated risk of pollution from accidental spillage between 1% and 2% annually Partial loss of fishery Increase in 1% flood peak >50mm
Minor Adverse	Results in some measurable change in attributes quality or vulnerability	<ul style="list-style-type: none"> No change in exceedance of dissolved copper or total zinc EQS Calculated risk of pollution from accidental spillage between 0.5% and 1%. Increase in 1% flood peak level >10mm
Negligible	Results in an impact on attribute but of insignificant magnitude to affect the use or integrity	<ul style="list-style-type: none"> Risk of pollution from accidental spillages <0.5% Negligible change in 1% flood peak level
Minor Beneficial	Results in some beneficial effect on attribute or a reduced risk of negative effect occurring	<ul style="list-style-type: none"> Calculated reduction in existing spillage risk by 50% or more when existing risk is <1% annually Reduction in 1% flood peak level >10mm
Moderate beneficial	Results in moderate improvement of attribute quality	<ul style="list-style-type: none"> Calculated reduction in existing spillage risk by 50% or more when existing risk is >1% annually Reduction in 1% flood peak level >50mm
Major Beneficial	Results in major improvement of attribute quality	<ul style="list-style-type: none"> Removal of existing pollution discharge or removal of likelihood of polluting discharges to watercourse or aquifer Reduction in 1% flood peak level >100mm

Table 8.3: Significance of Effects on the Water Environment

Magnitude of Impact	Importance of Attribute			
	Very High	High	Medium	Low
Major	Very Large	Large/ Very Large	Large	Slight/ Moderate
Moderate	Large/ Very Large	Moderate/ Large	Moderate	Slight
Minor	Moderate/ Large	Slight/ Moderate	Slight	Neutral
Negligible	Neutral	Neutral	Neutral	Neutral

8.4 Baseline Conditions

8.4.1 Surface Water

Catchments

- 8.4.1.1 The Scheme lies largely within the River Colne catchment as shown in Figure 8.1. The Colne is predominantly a Chalk catchment with clays in the valleys supplemented by extensive gravel tracts. Although the river catchment has rural headwaters there is considerable suburban development in the middle to lower reaches that impact on water quality. There is also a large number of sewage treatment works and other discharges entering the river.
- 8.4.1.2 The valley of the River Colne forms a major, low lying feature to the south and south-east of the study area with an elevation of generally between +30 metres AOD to +65 metres AOD. The tributaries of the Colne generally flow to south south east-south east across the study area towards the Colne.
- 8.4.1.3 The eastern end of the Scheme is in the Mimmshall Brook Catchment. This watercourse flows northwards before draining into groundwater. The normal groundwater flow is into the upper Colne catchment but in some circumstances it is also believed to feed the River Lea.
- 8.4.1.4 The flow in the Colne and many of its tributaries has been affected by increased groundwater abstraction and this has led to very low flows in some reaches in recent drought years. These episodes will have had an impact on habitat and aquatic life in the catchment, and there is some concern (as expressed by the EA) that this may have a long term effect on the character of the river.
- 8.4.1.5 There are 3 abstraction licenses to surface water in the study area. These are all for agricultural uses.

Rivers Crossed by the Scheme

- 8.4.1.6 The rivers which are crossed by the Scheme are all tributaries of the River Colne. The rivers and streams present in this section tend to flow southwards. Hanstead's Ditch flows into the River Ver. The Rivers Misbourne, Chess, Gade and Ver all flow into the River Colne. In the extreme east of the study area the Mimmshall Brook flows northwards but then disappears to groundwater to the north of the study area. Historic tracer tests have revealed that this groundwater can travel rapidly towards the River Lea situated at considerable distance to the north west but normally flows to the headwaters of the River Colne situated only a short distance to the west.
- 8.4.1.7 The Alder Bourne is a small tributary of the River Colne, which it joins to the west of Uxbridge. The catchment upstream of the M25 crossing is mixed agriculture and woodland, with some urban development. Immediately downstream of the M25 the watercourse is shallow and fairly fast flowing with a meandering section. On site visits the water was clear but there was a considerable amount of sediment on the bottom. A few hundred metres downstream of the outfalls is the Kingcup Meadows and Oldhouse Wood Site of Special Scientific Interest (SSSI). This SSSI is cited for its woodland, unimproved pastures and semi and unimproved meadowland, rather than aquatic

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species. Maintenance of the hydrological regime is therefore of importance but there are no special water quality requirements arising from the SSSI.

- 8.4.1.8 The Misbourne is an elongated dip-slope catchment in the Chilterns. There is urban growth in the valley but the catchment is mostly Green Belt and the main land use is agriculture with scattered tracts of woodland. The catchment upstream of the M25 crossing is approximately 90 km². Downstream of the M25 is a gently meandering section of river with slow to moderately fast flow. This is culverted beneath the M25. The river is approximately 4-8 metres wide and 0.1 - 0.3 metres deep, with a substrate consisting of silt, gravels and pebbles. Channel vegetation consists of emergent and submerged aquatic macrophytes and the river appears to be a good example of Chalk watercourse.
- 8.4.1.9 The River Chess is crossed 3 kilometres upstream of its confluence with the River Colne. The catchment area at the crossing point is approximately 103 km². This reach has been modified to a straight cut-through channel. It is a narrow channel shaded upstream, with a series of steps downstream. Downstream this channel merges with the Solesbridge Lane Loop and finally ends at a weir. The main buildings for a plant and fish aqua centre are at this confluence. The channel is 5 metres wide (upstream), 2.5 metres (downstream), with a depth of 0.2 – 0.5 metres. The substrate is gravel, with soft earth banks increasing in height from downstream. Channel vegetation consists of emergent and submerged aquatic macrophytes.
- 8.4.1.10 The River Gade at the Scheme crossing has been canalised to form part of the Grand Union Canal. It is a straight concrete sided channel, a slow flowing river lacking in aquatic macrophytes. The channel is approximately 4-5 metres wide and approximately 1.5 metres deep, the water is generally turbid and the substrate not usually visible. The Old Mill Stream takes some of the flow from the Gade which it re-enters downstream of the M25 crossing. The Old Mill Stream is also a slow flowing stretch lacking macrophytes within the water channel. It is approximately 4-5 metre wide at the M25 crossing, but width varies along its length. The substrate consists of mud and silt and the water is turbid.
- 8.4.1.11 Hanstead's Ditch, a tributary of the River Ver, consists of a drainage ditch with a slow flow and a small catchment upstream of the M25 crossing. Immediately downstream of the outfall the channel is tree lined and very overgrown and shaded. The Channel is approximately 1 metre wide and 150 millimetres deep with substrate consisting of silt and pebbles. The ditch flows into the River Ver approximately 1 kilometre downstream of the Scheme crossing point.
- 8.4.1.12 The River Ver has a catchment area of approximately 131 kilometres² at the M25 crossing point. The Ver is a Chalk stream with clear water and a substrate of silt and pebbles. The channel at the motorway bridge has been widened and considerable deposition of sediment has occurred in this section as a result.
- 8.4.1.13 The M25 crosses the Colne at the upper end of its catchment, where the catchment area is quite small (the actual catchment depends on groundwater movement from the Mimms Hall Brook catchment). The mean flow is therefore quite small and because of the low topography this is a slow flowing and meandering section of river. The water is generally turbid, with a substrate consisting of silt and gravels.
- 8.4.1.14 The Mimms Hall Brook is culverted under the M25 and in normal conditions is thought to be the headwaters of the River Colne. From the source south of the M25 the brook flows

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through a predominately rural catchment dominated by agriculture with scattered woodland. To the north the land use is again mainly agricultural with some dwellings. Approximately 4 kilometres downstream of the M25 the Mimmshall Brook sinks through various swallow holes into the groundwater at Waters End. It probably rises again 2 kilometres west at the River Colne. At the M25 crossing the meandering Mimmshall Brook is culverted in a concreted lined channel approx 4-5 metres wide under the motorway. Downstream of the M25 the moderate flowing meander narrows to approximately 1.5 metres with varying depths and sections of the riverbed exposed. The water appears slightly turbid due to the silt and pebbles substrate and moderately flowing water.

8.4.1.15 The Catharine Bourne is a tributary of the Mimmshall Brook, which it joins between the motorway crossing and its disappearance underground. A further small tributary of the Mimmshall Brook also receives drainage from the motorway.

Surface Water Quality

8.4.1.16 The water quality in the rivers discussed above is summarised in the Table 8.4.

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Table 8.4: Summary of Surface Water Quality

River Name	EA Classification	Fisheries Designation	Chemical Water Quality	Biological Water Quality
Alder Bourne	RE3	No Designation	The chemical quality for this stretch of the River Alder Bourne has improved between "Fairly Good" in the period 1988 to 1993 to the present "Good" in 1996-2003. The nutrient quality of the River Alder Bourne is also "Good" with nitrate levels moderately low (less than 20mgNO ₃ /l) and phosphate at low levels (less than 0.06mgP/l).	The results for this stretch of river are good and suggest the biology is a little short of an unpolluted river. There thus seems to be little or no discernable impact from the M25 outfalls on the Alder Bourne.
Misbourne	RE2	Salmonid	This stretch is classified as RE2; "Good", with Very Good chemical and biological results. The river stretch at the M25 crossing is achieving its target of Grade 2 quality, but the quality deteriorates in its final stretch downstream of the Gerrards Cross sewage treatment works. Nutrient concentrations are low upstream of the sewage works discharge.	The biology results for the River Misbourne, for both the upstream and the downstream stretches are similar to that expected for an unpolluted river.
Chess	RE3	Salmonid	The EA has not established a River Ecosystem class for the stretch of where the Scheme crosses the River Chess, but the chemical quality indicates the river is in "Good" condition apart from the high nutrient results. The chemical grade for this stretch of the River Chess is "Very Good" and has varied between "Good" in 1988 – 1995 improving to "Very Good" in 1996-2003.	The biological quality for this stretch of river, for both the upstream and the downstream stretches, is similar to that expected for an unpolluted river, as indicated by the ASPT results being higher than predicted by RIVPACS. The records show that these stretches have been classified as "Very Good" since 1990, with all observed results higher than predicted.
River Gade	RE2	Cyprinid	The reach of the River Gade where the Scheme crosses (Bulbourne – Watford to Gade Ave SWO) achieves the River Quality Objective target of RE2. The chemical grade for this stretch of the River Gade/Grand Union Canal has improved from "Fair" in 1993 and 1997, to "Fairly Good" in 1990, 1994 – 1996, 1998, 1999 and reached "Good" in 2000 -	The biology results upstream and downstream of the Scheme outfalls are "Good". Whilst the biology is a little short of predicted; the observed result for NTAXA for the upstream section is higher than predicted. The biological results have been between "Fairly Good" and "Good" since

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River Name	EA Classification	Fisheries Designation	Chemical Water Quality	Biological Water Quality
			2003.	1990 with a higher than expected result for NTAXA in 2000.
Hanstead's Ditch	Unclassified	No Designation	As Hanstead's Ditch is very small there are no chemical data available.	As Hanstead's Ditch is very small there are no biological data available.
River Ver	RE2	Cyprinid	The River Ver achieves its RE2 target classification and the quality recorded by routine sampling appears to be "Good".	The biology in the upstream reach of the River Ver (Red-Sopwell) is Poor, with a range of pollutant tolerant species present. Biological results improve downstream however and in the reach where the M25 crosses (Sopwell-Colne), the biological results are "Good".
River Colne	RE3	Cyprinid	The reach of the River Colne at the Scheme crossing achieved the River Quality Objective Target of RE3. The chemical grade for this stretch of the River Colne is "Good" and has improved from "Fairly Good" recorded in 1994 – 1996. During a ten-year period from 1993 to 2003 the River Colne has achieved RE3 objective	The biology for the upper stretch of the Upper Colne at the M25 crossing is "Good" and shows only minimal impact from polluting discharges. However, the biological results have fluctuated since 1990 between "Fair" and "Good", so there are some intermittent impacts.
Catharine Bourne	RE5	No Designation	The Catharine Bourne is a tributary of the Mimmshall Brook. See below.	The Catharine Bourne is a tributary of the Mimmshall Brook. See below.
Mimmshall Brook	RE3	No Designation	The chemical quality for this stretch of the Mimmshall Brook appears to be "Fairly Good" and has achieved the target of RE3. The chemical grade for this stretch has varied from "Fairly Good" during 1993 – 1997, "Good" in 1998 – 2001 and "Fairly Good" from 2002 to present. Overall, during the ten-year period from 1993 to 2003, the Mimmshall Brook has achieved RE3 classification each year. It achieved the classification marginally in 1993 with high alkaline pH.	The biology of the Mimmshall Brook is also monitored for one stretch, Elstree – Colne. The biology of the Elstree to Colne stretch is a little short of expected; indicating that there are some polluting or toxic impacts on the watercourse. The river quality has been steadily improving since 1990 when the result was recorded as "Fair".

8.4.2 Hydrogeology

- 8.4.2.1 The hydrogeology of the study area is dominated by the Cretaceous Chalk. The Chalk is classified a 'Major Aquifer' under the Policy for Protection of Groundwater and supports numerous significant abstractions for public water supply, agricultural uses, commercial use and private domestic supply (see Figures 8.1 and 8.2).
- 8.4.2.2 Minor aquifers occur where the sand and gravel deposit that overlie the Chalk form perched aquifers on the low permeability London Clay Formation deposits and/or Reading Formation. This is most obvious in the area immediately east of Mimms Brook around Junction 23 and in the area around Junction 16. Here spring discharges are identified on the Ordnance Survey Explorer maps and appear to issue at the boundary between the sand and gravel and the underlying clay (see Figure 8.1).
- 8.4.2.3 Boulder Clay (Till) is generally considered a non-aquifer although coarse horizons can sometimes support small domestic abstractions. London Clay Formation and Reading Formation constitute important non-aquifer units that act as a confining layer to the underlying Chalk Aquifer in the London basin situated to the southeast of the River Colne.

8.4.3 Hydrogeology and Groundwater Abstractions

- 8.4.3.1 The Scheme passes over a number of river valleys and aquifers. Most of the Scheme is situated on the Chalk aquifer with patches of glacial sand and brickearth on top. The area surrounding Junction 16 has fluvial gravels above the Chalk. Regional groundwater flow is to the southeast and has levels ranging from 30 to 70 metres AOD. The 1:25,000 OS map shows two springs to exist to the northwest of Junction 16. These occur where the outcrop of the Reading Formation dips beneath the London Clay Formation.
- 8.4.3.2 Most of the Scheme is underlain by chalk, which is a Major Aquifer. The aquifer comprises highly permeable strata known to have significant fracturing. The aquifer is highly productive and able to support large water abstractions for public and other purposes. At each end of the Scheme the road runs across Reading Formation and London Clay Formation, which are classified as Minor and Non Aquifers, respectively.
- 8.4.3.3 The Scheme moves through Inner, Outer and Total Catchment Source Protection Zones (SPZ). Two Inner SPZs are located upstream of the Misbourne and Chess. Two Inner SPZs are associated with the River Gade upstream and downstream of M25. Inner SPZs are also located where the Rivers Ver, Colne and Catharine Bourne cross the motorway.
- 8.4.3.4 There are numerous public water supply boreholes situated in the Colne valley. A number of motorway discharge points are located within or very close to an Inner SPZ (between Junctions 16 and 18 and between Junctions 20 to 23). This has particular significance for the North Mimms Pumping Station (TL 232 037) near to Junction 23 where the public water supply is considered to be at serious risk of contamination due to the karstic nature of chalk in this area and the sinking of the Mimms Brook. The Bricket Wood Pumping Station (TL 1417 0151) would also be vulnerable to contamination by accidental spillage, though dilution is sufficient to reduce this risk. A number of further outfalls are also located in Outer SPZs.

8.4.4 Discharge Consents and Landfill Sites

- 8.4.4.1 There are approximately 65 active licensed discharges in the vicinity of the Scheme to surface water and to groundwater.
- 8.4.4.2 Consented discharges along the Scheme include effluent from domestic properties, arable farms, sewage disposal works, motorway service areas and recreational areas. The impact of the M25 highway drainage runoff could perhaps be masked by the sewage treatment works discharges in the study area.
- 8.4.4.3 Landfills 1.2.B, 1.3A, 1.5, 1.8, 1.10, 1.12 and 1.13 lie within Secretary of State land. Details on these landfills are presented in Chapter 11 Geology and Soils, and their locations are illustrated on Figure 11.2.

8.4.5 Groundwater Quality

- 8.4.5.1 Existing groundwater quality has been assessed using selected data from the EA study 'Groundwater quality in the Chilterns'³⁰ and supported by supplementary data obtained from Veolia Water UK for their pumping stations within the study area. Groundwater hydrochemical data from the EA network used in this assessment is summarised in Table 8.5.

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Table 8.5: Summary of Hydrochemical Data

Sample Ref.	Field Parameter										
	pH	Cond	Alk	Ca	Na	Mg	K	Cl	SO ₄	PO ₄	No. Anal.
	Concentration (mg l ⁻¹)										
632	7.0	774	299	143	30.7	5.7	3.9	53	66	0.08	6
638	7.1	813	270	134	37.5	6.5	5.0	63	76	0.18	10
639	7.3	780	254	120	52.1	5.3	9.0	66	77	0.07	5
644	7.2	668	263	122	21.7	4.7	2.9	42	45	<0.06	8
645	7.2	704	263	123	31.0	4.6	3.8	48	50	0.13	10
646	7.1	849	298	147	45.0	6.7	4.7	63	74	<0.06	4
674	7.2	743	270	127	29.0	5.8	3.5	59	51	<0.06	7
675	7.2	736	282	129	28.0	5.3	3.2	56	48	0.07	3
703	6.9	747	290	141	24.0	6.1	2.2	50	67	<0.06	9
706	7.0	709	237	220	23.7	8.2	4.5	48	84	0.11	12
450	7.1	596	286	117	10.0	2.6	1.4	18	14	0.06	4
633	7.1	604	283	125	10.4	2.3	1.3	19	20	<0.06	12
643	7.1	597	282	124	10.0	2.1	2.0	20	18	<0.06	9
676	7.2	559	260	115	10.0	1.8	1.6	20	14	0.05	5
677	7.2	516	237	106	14.0	2.5	1.4	27	14	0.04	5
678	7.1	585	275	123	11.0	2.6	1.2	22	18	<0.06	3
681	7.2	553	274	113	12.0	2.6	1.5	21	13	<0.06	3
682	7.2	537	252	110	12.0	1.9	1.4	18	10	0.18	3
686	7.1	595	282	127	10.0	2.1	1.2	22	33	0.85	1
700	7.1	569	271	116	9.2	2.3	1.4	19	14	0.05	3
769	7.1	599	262	123	12.0	4.0	1.7	25	38	0.03	11

8.4.5.2 The location of each borehole is shown in Figure 8.2. The majority of monitoring boreholes is situated in close proximity to the River Colne or its tributaries, all of which constitute receptors for groundwater from the Chalk aquifer. It is noticeable that few monitoring boreholes are situated in up-gradient interfluvial recharge areas.

8.4.5.3 Groundwater in the Chalk aquifer is exclusively calcium-bicarbonate in nature with a neutral pH, low ionic strength and low conductivity. This chemistry is typical of young, unevolved water within a carbonate aquifer system and suggests rapid recharge to an unconfined aquifer, with limited residence time in the aquifer.

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- 8.4.5.4 There is no indication of particularly severe nitrate contamination of the groundwater, which is commonly a problem in unconfined agricultural Chalk catchments elsewhere in the UK.
- 8.4.5.5 Groundwater samples from monitoring boreholes situated in close proximity to the River Colne appear to have slightly elevated ionic concentrations for almost all determinands measured (both major and minor ions). The EA attributes elevated ionic concentrations to increased residence times in the confined aquifer to the east of the Colne and recharge through the overlying Quaternary deposits. However, as these samples are obtained from unconfined Chalk near large public water supply abstractions; this chemistry may relate to mixing with surface water from the Colne and adjacent lakes. There is no suggestion that elevated major and minor concentrations result from any other anthropogenic activities.
- 8.4.5.6 Groundwater quality data provided by Veolia Water UK for the public water supply boreholes situated in the Colne valley is consistent with this interpretation. Water quality is high throughout the area and meets all drinking water standards according to Veolia Water³⁷, despite approximately 20 years of highway runoff being discharged to the Chalk with little or no pre-treatment. The groundwater quality data provided by Veolia Water indicates that groundwater abstracted from the Chalk for public water supply contains little dissolved metals or Polycyclic Aromatic Hydrocarbons (PAHs) at the limit of detection. Veolia Water have however identified high conductivity at certain times in groundwater from their North Mimms source. Veolia believe that this may be related to the South Mimms Service Station, situated adjacent to the Mimms Brook, which is the main salting and gritting depot for the M25 and South Hertfordshire³⁷. No analysis for Total Petroleum Hydrocarbon (TPH) has been undertaken by Veolia Water.
- 8.4.5.7 Results from the additional groundwater monitoring undertaken at the three sites along the M25 monitored for this assessment demonstrated that highway runoff was characterised by elevated salts (i.e. sodium and chloride) and elevated metals (including copper and zinc) although concentrations remain within European Drinking Water Standards. Elevated TPHs were also identified in all soakaways. PAHs, which are products of combustion or associated with engine oil, were not identified in soakaways, although the analyses limit of detection for these is considerably greater than maximum acceptable European Drinking Water Standards levels.
- 8.4.5.8 Shallow groundwater in the vicinity of the soakaways showed water quality similar to the public water supply boreholes. The elevated concentration of metals observed in samples of highway runoff were largely absent from the shallow groundwater but residual TPH was found. It seems probable that attenuation in the unsaturated zone and dilution during down-gradient transport is sufficient to dilute background concentration of contaminants in highway runoff to acceptable levels once in the saturated Chalk aquifer.
- 8.4.5.9 The Chalk in the Colne valley and surrounding tributaries constitutes an important regional and national groundwater resource and is designated a 'Major Aquifer'. Twenty pumping stations are located near this part of the M25 which abstract groundwater from the Chalk for public water supply. These sources are shown in Figure 8.2.
- 8.4.5.10 In addition to public water supply, numerous licensed and licence-exempt boreholes abstract groundwater from the Chalk aquifer for agricultural, commercial and domestic purposes. These boreholes are identified in Figure 8.1.

8.4.6 Existing Highway Drainage System

- 8.4.6.1 The M25 was constructed between 1973 and 1986. The majority of the drainage currently serving the motorway is believed to be that which was originally constructed. The principle exceptions are where major alterations have been made to incorporate climbing lanes between Junctions 16 and 17 and Junctions 18 and 19 or additional lanes through various Junctions.
- 8.4.6.2 The existing highway drainage system is generally a conventional system using combined surface water and groundwater filter drains (French), except where the motorway is constructed on embankment, where generally kerbs and gullies draining to a sealed carrier pipe are used. In some instances, where the combined carrier/filter drain required large pipes for capacity, separate filter and carrier pipes were provided in tandem with the chambers common to both pipes. Where required, intercepting cut-off ditches are located at the top of cuttings and the toe of embankments.
- 8.4.6.3 A particular characteristic of this part of the motorway is that many highway drainage outfalls are into soakaways to the Upper Chalk Formation because of the absence of surface watercourses. In some cases the existing soakaways are within SPZ associated with water abstraction points. 52% of the total carriageway length between Junctions 16 and 23 drains to groundwater through soakaway systems. Otherwise, existing highway drainage discharges directly into surface watercourses. Balancing ponds to restrict the rate of discharge to watercourses are located at Junction 16 and Junction 20. All other outfalls have no means of attenuating flows. The design of soakaways varies significantly along this section.
- 8.4.6.4 With the limited permeability of Chalk, soakaways require temporary storage volume to balance the difference between inflow from highway runoff and outflow via infiltration. Generally storage is provided in a chamber on each soakaway.

Existing Outfalls & Treatment

- 8.4.6.5 Outfall points on the existing motorway drainage system and carriageway catchments that drain to them are shown on Figure 8.3. Details of the locations of outfalls to both ground and surface water and the lengths of carriageway draining to them, are provided in the Road Drainage and the Water Environment Technical Report.
- 8.4.6.6 The M25 is an existing motorway with a high traffic flow. It was designed and built when the impact of highway drainage on the aquatic environment was of less concern than it is today. Consequently, there is very little treatment of runoff at the existing outfalls. Details of existing treatment facilities are given in the Technical Report on a Junction by Junction basis, but for the Scheme as a whole the types and extent of treatment provided are summarised in Table 8.6. The maintenance and condition of these treatment facilities, and therefore their treatment performance, is not documented.

Table 8.6: Existing Treatment of Highway Runoff

Type of Treatment	Carriageway Length (m)	Proportion of total length (%)
Pond/infiltration basin	14040	20%
Filter Drains	46855	66%
Kerb and Gully only	9745	14%

8.5 Design and Mitigation

Determining the Need for Mitigation

- 8.5.1.1 The potential risk to the water quality of surface and groundwater receiving runoff from the Scheme was assessed using DMRB methodology published in HA216/06. A detailed discussion of the risk assessment and how mitigation measures were incorporated into the Scheme design is provided in the Road Drainage and the Water Environment Technical Report.
- 8.5.1.2 The Scheme would require changes to the drainage system but is limited by land available within the Secretary of State ownership. The treatment of runoff was not designed from scratch using current guidance but in some places was included to provide an environmental benefit over the current situation. The risk assessment established where treatment was most required from an environmental perspective.

8.5.2 Construction Mitigation

Water Quality Impacts

- 8.5.2.1 Two new outfalls are proposed either side of the Catharine Bourne. There would be no building or raising of ground levels within 5 metres of the top of bank of any ordinary watercourse. Works near watercourses would comply with the requirements of the Land Drainage Act 1991 and the Water Resources Act 1991.
- 8.5.2.2 During construction, the contractor would adhere to the best practice advice as given in the PPGNs (Section 8.2).
- 8.5.2.3 The Construction Environmental Management Plan (CEMP) would limit any adverse impacts to surface waters and groundwater during the construction phase. The CIRIA Reports 'Control of water pollution from construction sites'³⁸ and 'Control of water pollution from construction sites - Guide to good practice'³⁹ provide advice on how to avoid and minimise the risks of pollution to water on construction sites and also provide useful advice on consent matters, liaising with regulatory agencies and developing and implementing on-site pollution management. The CIRIA documents would be used by the contractor in developing the CEMP.
- 8.5.2.4 Control procedures would be developed within the CEMP for activities such as:
- working over or near water
 - storage use and disposal of hazardous materials
 - operation of fuel bowsers

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- disposal of site water and dewatering
- demolition works adjacent to or in water
- concreting near watercourses
- waterproofing concrete and sealing formwork
- washing down of formwork and concreting equipment
- construction of temporary site roads near or over watercourses
- movement and maintenance of plant and equipment
- painting
- drainage excavation and pipe laying
- temporary works for groundwater exclusion

8.5.2.5 Specific mitigation to be included in the CEMP would include:

- on-site environment management and training in relation to the water environment
- water quality monitoring upstream and downstream of construction works in all watercourses to monitor the effects of the construction works
- timing of construction works near to or within watercourses (temporary road crossings, culvert works and outfall works to avoid fish spawning season October-January)
- development and implementation of a surface water management plan within the CEMP to ensure settlement and attenuation of construction site runoff prior to discharge to watercourses or groundwater
- environmental incident planning
- control of concrete and wheel washing runoff
- designated chemical / fuel storage areas to be used to prevent leakage or spills

Flooding Impacts

8.5.2.6 Where possible all equipment, materials and spoil would be located outside of the indicative floodplain to mitigate the potential impacts of the Scheme's construction on flood risk. Good housekeeping techniques would be adopted on site to prevent drainage and watercourse channels from becoming blocked with debris.

8.5.2.7 The EA would be able to advise whether the site is eligible for the advanced flood warning service. A site contingency plan would be drawn up, which would include arrangements for the temporary movement of plant in anticipation of a flood event.

8.5.2.8 The CEMP would consider CIRIA guidance RP708⁴⁰ regarding flood mitigation during construction in the floodplain.

8.5.3 Design Mitigation

Drainage Design

- 8.5.3.1 The Scheme drainage is shown in Figure 8.4. Full details are provided in Section 3.5.9 of this ES. Details of the estimated performance of the drainage solutions are presented in detail in the Road Drainage and Water Environment Technical Report. The drainage system has been designed to meet current Highways Agency treatment and attenuation standards within the constraints of land availability and the sensitivity of the receiving waters. The drainage has been designed to ensure that the widened motorway results in no overall detriment to the wider water environment, and where possible, within the constraints of the Scheme, improvement would be achieved by the treatment of road runoff discharging from the motorway. The drainage design has been developed in full consultation with the Environment Agency (Appendix B).
- 8.5.3.2 The design pays particular attention to discharges to the River Ver via Hansteads Ditch and upper Colne areas where DMRB methodology, using baseline data, indicated that concentrations of Copper and Zinc could be elevated above EQS levels.
- 8.5.3.3 Concern was also expressed by the EA regarding some of the proposed soakaway discharges. These were addressed by making substantial changes to the soakaway drainage design, including:
- removal of existing soakaway discharge points that are located in SPZ1. At one area, in Junction 21 this included a new pumping system to ensure discharge was located well away from a sensitive SPZ1 area. However, balancing ponds have the risk of drying out under drought conditions
 - relocation of soakaways that may be underlain by less than 5 metres of unsaturated zone above the water table
 - incorporation of full retention petrol interceptors where soakaways are in identified SPZs
- 8.5.3.4 These changes would protect groundwater sources and improved the provision of accidental spillage mitigation
- 8.5.3.5 In addition to the soakaway discharges, the following systems would mitigate against deterioration of the water environment:
- balancing ponds to provide a good removal of most pollutants, including total suspended solids, dissolved copper, total zinc and oil
 - grass-lined channels to provide moderate to good removal of pollutants provided low flow rates can be maintained. These would be located directly adjacent to the carriageway where runoff would enter linearly along the channel rather than from point discharges
 - bio-retention ditches in locations where a wide area was available either in a cutting or at the base of an embankment with a length to width ratio much greater than 4:1. These generally provide a good removal of pollutants and an extra level of treatment alongside grass-lined swales for removing nutrients and dissolved pollutants

- filter drains would be located in the verges where possible to provide a moderate to good removal of total suspended solids and moderate removal of other pollutants
- kerbs and gullies are proposed where super-elevation means a drainage system is necessary in the central reservation and no other system is possible (i.e. there is not enough space within the central reservation for grass-lined swales, bio-retention or filter drains). They require very regular maintenance to achieve benefits and have therefore been assumed to provide no overall benefits in removing pollutants for the Scheme

8.5.3.6 The location of these mitigation measures are shown on Figure 8.4 and full details are given within the Road Drainage and Water Environment Technical Report.

8.6 Assessment of Effects

8.6.1 Construction

- 8.6.1.1 Construction phasing and methodologies would be developed by the DBFO Contractor. However during construction, the most significant potential impact would be the risk of contaminants getting into the groundwater or adjacent waterbodies. This could be a direct result of contamination from site runoff or indirect from the existing highway drainage arrangements. Early incorporation of the proposed drainage treatment and attenuation would reduce risks and help to minimise possible impacts.
- 8.6.1.2 Appropriate control measures identified in the CEMP would minimise and contain any adverse contamination to the groundwater and surface waters during the construction phase (Section 8.5).
- 8.6.1.3 The CEMP would minimise effects during construction. Any such effects would be short-term only. As the risk of accidents or other unforeseen circumstances cannot be completely eliminated from the construction process, there remains a residual (though unquantifiable) risk, hence the overall effect would be neutral to slight adverse.

8.6.2 Operation

Surface Water Impacts

- 8.6.2.1 The drainage design includes many elements to reduce the quantity of contaminants reaching receiving watercourses. Estimates for the reduction likely to result from each type of drainage system are presented in the Road Drainage and the Water Environment Technical Report. Combining these data with information on the proportion of each type of system in each drainage run provided an estimate of the total capacity of the drainage system to reduce contamination at each outfall.
- 8.6.2.2 These estimates have been used to assess the impacts on water quality likely to arise from the Scheme. In each case, the impacts from outfalls discharging into a watercourse have been combined to assess the total impact of all outfalls to each receiving watercourse. This provided the most conservative estimate of impact and complied with the guidance in DMRB.

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8.6.2.3 Zinc and copper were taken as proxies for other pollutants and hence the impact of the Scheme upon a watercourse. A summary of the impacts are provided in Table 8.7. A full description of the surface water impacts on a Junction by Junction basis is provided in the Road Drainage and the Water Environment Technical Report.

Table 8.7: Summary of General Water Quality Effects on Watercourses in the Scheme

Watercourse	Meets Dissolved Copper Environmental Quality Standards?	Meets Total Zinc Environmental Quality Standards?	Notes	Estimated Effect
Alder Bourne	Yes	Yes	Both copper and zinc are well within EQS	Neutral
River Misbourne	Yes	Yes	Both copper and zinc are well within EQS	Neutral
River Colne (at Denham)	Yes	Yes		Neutral
River Chess	Yes	Yes		Neutral
River Gade	Yes	Yes		Neutral
Old Mill Stream	Yes	Yes	The combined impact on River Gade and Old Mill Stream is an improvement	Neutral
River Ver	Yes	Yes	Both copper and zinc are well within EQS.	Neutral
River Ver Downstream of Hanstead's Ditch	Yes	Yes	Includes combined effects of discharges to Hanstead's Ditch and the River Ver	Neutral
River Colne (at London Colney)	No	Yes	Dissolved copper decreased from 143 ug/l to 141 ug/l.	Neutral
Mimmshall Brook	Yes	Yes		Neutral
Catharine Bourne	Yes	Yes	RE5 classification so no EQS set for this watercourse. Meets requirements for RE3	Neutral

8.6.2.4 Zinc concentrations are expected to rise as a result of the Scheme on the Alder Bourne, River Misbourne, Mill Stream and the River Ver. Dissolved copper is expected to rise on the River Alder Bourne, River Misbourne, Mill Stream, River Ver and the Mimmshall Brook. These concentrations do not exceed EQS levels and no further mitigation would be required.

8.6.2.5 The River Colne has high levels of both dissolved copper and zinc but the Scheme treatment systems would reduce these concentrations to below those that currently occur downstream of the M25. The Scheme would continue to discharge at three locations along this stretch of the Colne and individually they are not predicted to cause an exceedance of EQS.

8.6.2.6 However, the DMRB methodology predicts the concentration of dissolved copper from the Scheme to exceed the EQS in the River Colne when these outfalls are combined. This situation is considered to be primarily an artefact of the assessment methodology, where the contamination from upstream outfalls is accumulated but not the diluting flow.

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In addition, the methodology is a very conservative assessment. The combination of these outfalls into the upper stretch of the River Colne is not therefore considered to present a risk to the quality of the watercourse.

- 8.6.2.7 The Scheme would replace the existing soakaway infiltration system adjacent to the Catharine Bourne with a discharge, after provision of treatment, directly into the watercourse. The Catharine Bourne is a small watercourse with a very low flow in dry weather. As it is classified as RE5 it does not have assigned EQS levels. However the amount of treatment provided in the Scheme would be sufficient to ensure that zinc and copper levels do not exceed RE3 EQS levels should the watercourse be re-classified in the future.

Groundwater Impacts

- 8.6.2.8 A detailed discussion on the effects on groundwater from routine runoff and accidental spillages as a result of the Scheme is provided in the Road Drainage and the Water Environment Technical Report.
- 8.6.2.9 In summary where in-line treatment is proposed the risk of impact to groundwater from routine runoff would be reduced compared to the existing conditions. The in-line treatment has the largest effect from Junctions 18 to 19 (anti-clockwise) and Junctions 19 to 20 (clockwise). In these areas, the risk of impact is reduced from high in the current situation or Do Minimum scenario to medium when the proposed changes are considered. This resulted in a moderate to large improvement. With the importance of groundwater between Junctions 18 to 20 designated as Very High, the effect would be moderate to large beneficial. In areas where in-line treatment is not proposed, the risk to groundwater from routine runoff remains equal to the existing situation.
- 8.6.2.10 Replacing current soakaways which are within Inner SPZs with new soakaway locations in less sensitive areas would reduce potential impacts on groundwater. This has been achieved wherever possible in the Scheme but is particularly significant at Junction 21 where existing soakaways are close to public water supply abstractions and the Scheme includes replacements away from the abstraction points. In addition, full retention oil interceptors would be provided for soakaways serving drainage where in-line treatment facilities cannot be installed. The Scheme would be unlikely to impact on groundwater quality as the Chalk groundwater levels are many metres below the surface. Prior to construction any nearby groundwater sources would be surveyed to ensure that there would be no interference to supply and quality during construction.
- 8.6.2.11 Groundwater quality could be affected by the mobilisation of existing sources of contaminated groundwater, for example perched groundwater contained in active or disused landfills situated along the Scheme. The widening of the motorway in regions of cutting may potentially intercept perched groundwater in landfills resulting in the need for handling and disposal of contaminated groundwater and/or provide new pathways for contaminated groundwater to access the underlying aquifer by breaching impermeable materials that line landfills. Assessment of the risks posed by old landfills has shown that none will be intercepted by the Scheme.
- 8.6.2.12 A summary of the effects to groundwater is provided in Table 8.8.

Table 8.8: Significance of Effect of the Scheme to Groundwater Resources

Between Junctions	Importance (based on Water Supply and Vulnerability)	Magnitude	Significance
16-17	Very High	Negligible	Neutral
17-18	Very High	Negligible	Neutral
18-19	Very High	Negligible (clockwise) Minor Beneficial (anti-clockwise)	Neutral (clockwise) Moderate to Large Beneficial (anti-clockwise)
19-20	Very High	Minor Beneficial (clockwise) Negligible (anti-clockwise)	Moderate to Large Beneficial (clockwise) Neutral (anti-clockwise)
20-21	Very High	Negligible	Neutral
21-21a	Very High	Negligible	Neutral
22-23	Very High	Negligible	Neutral

Accidental Spillage

8.6.2.13 Containment for accidental spillage would be provided as part of the Scheme. However, the calculation of accidental spillage risk is presented for surface waters for illustrative purposes in Table 8.9. These show that the risk of accidental spillage would be acceptable in all of the watercourses even before spillage containment. However, containment would be provided in the Scheme for all these watercourses so the risk from accidental spillage would be further reduced.

Table 8.9: Impact of Accidental Spillage Risk in Surface Waters due to the Scheme

Watercourse	Probability of Accidental Spillage	Acceptable without containment?	Significance of potential effects
River Alder Bourne	0.24%	Yes	Neutral
Misbourne River	0.52%	Yes	Neutral
River Colne (Lower)	0.17%	Yes	Neutral
River Chess	0.05%	Yes	Neutral
River Gade	0.07%	Yes	Neutral
Mill Stream	0.42%	Yes	Neutral
Hansteads Ditch	0.43%	Yes	Neutral
River Ver	0.33%	Yes	Neutral
River Colne (Upper)	0.58%	Yes	Neutral
Mimmshall Brook	0.15%	Yes	Neutral
Catherine Bourne	0.19%	Yes	Neutral

8.6.2.14 For groundwater, the pollution impact from accidental spillages would be largely unaffected by the Scheme. The probability of serious pollution incidents from accidental spillage is low (less than 1%) both for the current situation and the Scheme.

Flooding

- 8.6.2.15 The Scheme drainage has incorporated extra storage and attenuation which would limit peak discharge rates to no more than those from the existing drainage system, and where possible peak rates would be reduced.
- 8.6.2.16 Widening would be within the existing footprint of embankments and no impact on flood plain storage or restriction of flood routes would occur.
- 8.6.2.17 Storage for runoff at soakaways has been included in the Scheme but it is recognised that in extreme storms some overflow may occur. An assessment of the likely overflow volume for 100 year return period storms was made and the likely route that this overflow would take has been identified. In the few cases where nearby properties could be at risk, extra storage would be proposed to prevent flooding from this excess runoff.
- 8.6.2.18 A summary of the effects to floodwater conveyance is provided in Table 8.10.

Table 8.10: Summary of General Water Quality Effects in the Scheme to Floodplain Conveyance

Attribute	Quality	Importance	Magnitude (after Mitigation)	Significance
River Alderbourne	Medium	Medium	Negligible	Neutral
River Misbourne	Medium	Medium	Negligible	Neutral
Lower Colne	Medium	Medium	Negligible	Neutral
River Chess	Medium	Medium	Negligible	Neutral
Gade	Medium	Medium	Negligible	Neutral
River Ver	Medium	Medium	Negligible	Neutral
Upper Colne	Medium	Medium	Negligible	Neutral
Mimmshall	Medium	Medium	Negligible	Neutral

8.7 Summary

- 8.7.1.1 The existing motorway generates both flood runoff and contamination which are discharged to surface waters via outfalls and to groundwater via soakaways. Little or no treatment is provided in the existing motorway, and there is little provision for the containment of accidental spillage.
- 8.7.1.2 The Scheme drainage would take runoff from the whole motorway and would incorporate treatment, containment and attenuation through the use of a number of drainage features such as filter drains, swales, bio-retention systems and ponds. These features would counteract the adverse impacts to be expected from the increase in motorway area and has been designed to prevent a deterioration compared to the current situation, and where possible provide an improvement.

8.7.2 General Surface Water Quality Effects

- 8.7.2.1 There is a mixture of general water quality effects over the whole Scheme and at half of the receiving watercourses an improvement would result. Most of these changes would be relatively minor and only one of the receiving watercourses would exceed the EQS levels in either dissolved copper or zinc.
- 8.7.2.2 In the River Colne (at London Colney) the DMRB methodology predicts that dissolved copper concentration would exceed the EQS currently and would continue to do so with the Scheme.
- 8.7.2.3 A new discharge is proposed to the Catharine Bourne to replace an existing soakaway system. This is not predicted to cause a significant water quality impact.
- 8.7.2.4 The Scheme would not have an impact on flood risk in receiving watercourses.
- 8.7.2.5 Overall the Scheme is expected to have a neutral effect on routine surface water runoff.

8.7.3 Accidental Spillage – Surface Water

- 8.7.3.1 The risk of accidental spillage reaching receiving watercourses is expected to be acceptable (i.e. is less than 1%) without mitigation.
- 8.7.3.2 The Scheme would incorporate spillage containment throughout and is therefore fully compliant with guidance. As there is little provision for spillage containment in the current motorway the Scheme would have a slight beneficial effect on accidental runoff.

8.7.4 Flooding Effects

- 8.7.4.1 The widening of the carriageway would be achieved without encroaching further onto floodplains so there would be no effect on floodplain storage. The overall impact of the Scheme on floodplain conveyance is considered to be neutral.
- 8.7.4.2 The drainage design allows for a 1 in 100 year flood event attenuation, plus 20% for increase in rainfall intensity as a result of climate change projections. This design thus provides a benefit over the existing drainage system, which does not accommodate any climate change increase. Storage has been provided through a combination of ponds, oversized ditches and storage pipes, to ensure that discharges to the existing outfalls would be limited to the existing discharge rates, with a reduction where possible.

8.7.5 Groundwater Effects

- 8.7.5.1 The significance of potential effect of routine runoff of the Scheme on groundwater is neutral compared to the existing conditions for each stretch of road. The exception to this is between Junctions 18 to 19 and Junctions 19 to 20, where the Scheme would produce a moderate to large beneficial effect, on the anti-clockwise and clockwise carriageways respectively, compared to the existing conditions. In other words, the Scheme would have no additional impact on the quality of road runoff discharging to ground, compared to the existing (baseline) conditions. The risk assessment demonstrates that the Scheme would have a neutral effect on groundwater.

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- 8.7.5.2 Relocation of existing soakaways that are within Inner SPZs, or are in locations close to the groundwater table, to sites that are less sensitive would provide further benefits to groundwater.
- 8.7.5.3 The spillage assessments demonstrated that the return period for the proposed conditions (and existing conditions) would be acceptable for every drainage length that has a discharge to groundwater.
- 8.7.5.4 The inclusion of accidental spillage containment throughout the Scheme is an improvement on the existing drainage system and represents a significant reduction in an important risk factor for groundwater discharges.

8.7.6 Overall Assessment

- 8.7.6.1 Overall, combining the surface and groundwater effects and taking into account the improved treatment and containment provided for soakaway discharges, and the removal of major discharges from SPZs, it is considered that the Scheme would have a slight beneficial effect on the water environment.

9 Traffic Noise and Vibration

9.1 Introduction

- 9.1.1.1 This chapter assesses the road traffic noise and vibration effects associated with the Scheme. The assessment considers the potential noise impact of the Scheme for the opening year 2012 and the worst-case year, which is usually the design year 15 years after opening, i.e. 2027. The assessment also considers the effect of all other sections of the M25 Widening being open (cumulative effect) in the design year (2027). In addition, an indicative assessment has been made of the effect on the local community of constructing the Scheme.
- 9.1.1.2 The assessment considers the potential numbers of properties within 300 metres of the motorway that may be currently at or above the threshold criteria for eligibility of noise insulation in accordance with the Noise Insulation Regulations 1975 (as amended 1988) (NIR)¹. The assessment also considers changes in the noise levels of +/- 1 dB on the wider road network resulting from changes in traffic flows of greater than +25% and - 20%.
- 9.1.1.3 A detailed assessment of Traffic Noise and Vibration on a Junction by Junction basis is presented in the Traffic Noise and Vibration Technical Report ².

9.2 Regulatory Framework

- 9.2.1.1 The assessment has been carried out in accordance with the following legislation and best practice guidance:
- The Control of Pollution Act 1974 (Section 6) ³
 - The Environmental Protection Act 1990 ⁴
 - The Land Compensation Act 1973 ⁵
 - Noise and Statutory Nuisance Act 1993 ⁶
 - The Noise Insulation Regulations 1975 (as Amended 1988) ¹
 - Design Manual for Roads and Bridges Volume 11, Section 3, Part 7 ⁷
 - Calculation of Road Traffic Noise (CRTN) ⁸
 - BS 7580: Specification for the verification of sound level meters⁹
 - BS 5228: A code of practice for Noise and vibration control on construction and open sites ¹⁰

9.3 Methodology

9.3.1 Study Area

9.3.1.1 The study area has included sensitive receivers within a 300 metres envelope in accordance with the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7. Roads that result in change in traffic flows greater than an increase of 25% and a reduction of 20% and lie outside of the 300 metres range were also included in the study area. The study area for the Section 1 Only Scenario (the overall worst case scenario) is illustrated on Figure 9.1 Noise Assessment Study Area.

9.3.2 Establishment of Baseline Conditions

9.3.2.1 Existing Environmental Barriers were identified using aerial photography and their exact location, length, height, construction and condition were qualified by site inspections, carried out in November 2005.

9.3.2.2 The extent of low noise surfacing (LNS) on the existing carriageway was available from the Highways Agency HAPMS database held by Area 5 Maintaining Agent in 2005. The extent of these areas has been included in the base year assessment. It has also been assumed that this extent of LNS would remain until 2012 should the Scheme not proceed. A noise reduction contribution of 3.5 dB has been applied relative to existing hot rolled asphalt (HRA) surfaces, where each carriageway would be covered with LNS following advice from the Highways Agency. A correction of -3.5 dB for LNS represents the worst-case scenario, i.e. a conservative value towards the end of the life of a low noise surface. The noise model includes noise contribution from separate carriageways of the M25.

9.3.2.3 The road surface type and extend was modelled as indicated in the following table:

Table 9.1: Road Surface Type and Extent

Clockwise Carriageway (CW)			Anti-Clockwise Carriageway (ACW)		
Chainage	Chainage	Surface type	Chainage	Chainage	Surface type
<1,820	2,090	HRA	<1,820	2,090	HRA
2,090	15,546	LNS	2,090	13,880	LNS
15,546	16,890	HRA	13,880	24,174	HRA
16,890	17,646	LNS	24,174	32,544	LNS
17,646	19,938	HRA	32,544	37,360	HRA
19,938	21,324	LNS			
21,324	22,245	HRA			
22,245	23,388	LNS			
23,388	24,396	HRA			
24,396	32,544	LNS			
32,544	37,360	HRA			

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9.3.2.4 It has also been assumed that if the Scheme does not go ahead, as a result of road maintenance the existing entire carriageway would be resurfaced with LNS by 2027, in the Do Minimum case.

9.3.2.5 A sample of representative receptors was identified through professional judgement. These were isolated residential properties or a selection in a group thought as being most exposed to road noise. Some neighbouring properties are adjoined to the sample selected for calculation so that all residential properties within 300 metres of the Scheme are accounted for.

9.3.3 Noise Survey

9.3.3.1 Ambient noise level was measured at 21 locations as shown on Figure 9.2 using the guidelines for measurement of noise from road traffic contained in Department of Transport's Calculation of Road Traffic Noise 1988 (CRTN).

9.3.3.2 It was deemed appropriate to undertake sample noise surveys adjacent to the Scheme for the following reasons:

- measurements are necessary to ensure consistency and give confidence to the calculated noise levels through confidence in the computer model
- visit to a site can disclose other local conditions (e.g. queuing, start/stop, acceleration, etc), which may affect correlation between the calculated and measured noise levels

9.3.4 Assessment of Effects

9.3.4.1 The assessment of noise and vibration has been carried out in accordance with the guidance in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7. It covers three aspects of noise and vibration:

- road traffic noise
- vibration caused by road traffic
- construction noise and vibration

9.3.4.2 Other guidance and standards have been used as appropriate.

Road Traffic

9.3.4.3 Traffic noise calculations have been undertaken in accordance with the method prescribed in the Noise Insulation Regulations, namely CRTN as specified in DMRB. Calculations for receptors within the study area have been undertaken using two approaches. For within the 300 metres either side of Section 1 (i.e. a 600 metre corridor), a detailed 3D computer model has been built. For the rest of the study area on the surrounding road network, a simplified approach has been undertaken following the CRTN methodology with the use of spreadsheets.

9.3.4.4 The detailed calculations have been undertaken by generating a 3-D computer model using IMMI Version 5.3.1. This is based on digitised inputs such as road segments, barriers and the receptors for which the noise level is to be calculated. The base data used in the calculations included the following:

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- traffic composition: 18-hour Annual Average Weekday Traffic (AAWT) traffic flow, percentage of heavy goods vehicles and average traffic speed
- road configuration: gradient, surface texture, vertical and horizontal alignment and depth/height of cuttings or embankments
- receiver location: distance from road, angle of view, ground absorption and shielding from natural or purpose built barriers

9.3.4.5 The simplified calculations for the wider study area have been undertaken using the CRTN calculation procedures with excel spreadsheets. This provides an overview of the impacts of road traffic noise on receptors more than 300 metres from the Scheme. In order to assess the number of dwellings affected by changes in noise levels with the introduction of the Scheme, road links within the validated area of the traffic model that are predicted to undergo an increase in traffic flows of 25% or greater, or a decrease of 20% or greater between the Do-Minimum situation in 2012 and the Do-Something situation in 2027, have been identified. Following discussions with the Highways Agency, property counts have been undertaken for dwellings within 50 metres each side of the road for each of these links. Do-Minimum and Do-Something noise levels for both the opening year (2012) and design year (2027) for each section have been calculated following the prediction methodology provided by CRTN. Using the calculated noise levels, it is possible to determine the approximate numbers of dwellings likely to experience a change in noise levels due to the Scheme.

9.3.4.6 Details of the traffic forecasts used in the noise calculations are given in the Technical Report. The calculations have been used to prepare a list of detailed noise levels for a sample of representative receptors as required for Noise Insulation Regulations (NIR).

The Noise Insulation Regulations

9.3.4.7 Under the terms of the Noise Insulation (Amendment 1988) Regulations 1975¹ there is a duty (Regulation 3) on the highway authority to offer sound insulation against traffic noise when the noise level 1 metre from a particular dwelling meets **all** of the following criteria:

- by Design Year, the noise from the new highway reaches or exceeds 68 dB L_{A10} 18-hour (see Appendix B in the Noise and Vibration Technical Report for a brief description of noise units)
- by Design Year the noise level is at least 1.0 dB(A) greater than the pre-Scheme level
- the noise from the sections of new highway contribute at least 1.0 dB(A) to the overall noise level
- the dwelling must be within 300 metres of the new highway

9.3.4.8 The Scheme involves the addition of a new lane, which would affect the position and speed of traffic. The Scheme would, therefore, involve the alteration of an existing highway for which Regulation 4 of the NIR will apply.

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- 9.3.4.9 Regulation 4 provides a discretionary power for the HA to offer insulation for those properties that may be adversely affected by the Scheme proposals. The HA has decided to apply Regulation 4 for this Scheme on the basis of meeting the 68 dB $L_{A10, 18 \text{ hour}}$ threshold as well as a 1 dB(A) contribution resulting from the Scheme. It is often practical to reduce the numbers of properties eligible for insulation by providing other forms of mitigation such as Environmental Barriers or quieter road surfaces within a scheme.
- 9.3.4.10 Any mitigation provided under Regulation 4 would be taken into account in assessing claims for compensation under Part 1 of the LCA 1973. This report, however, does not consider the implications of Part 1 claims.
- 9.3.4.11 For noise created as a result of construction of a highway scheme, Regulation 5 of the Noise Insulation (Amendment 1988) Regulations 1975¹ provides the HA with discretionary powers to offer noise insulation where *'works for the construction of a highway or additional carriageway or the alteration of a highway cause or are expected to cause noise at a level which, in the opinion of the appropriate highway authority, seriously affects or will seriously affect for a substantial period of time the enjoyment of an eligible building adjacent to the site on which the works are being carried out'* (but where the building does not qualify for an offer of noise insulation on grounds of high traffic noise).
- 9.3.4.12 The Noise Insulation Regulations do not explicitly define the noise level to be used in identifying properties that would be 'seriously affected' by construction noise. Almost certainly, the criteria should reflect the construction noise level to which the property will be exposed, but also the duration of the exposure as well as the level of ambient noise, which would otherwise prevail in the absence of the works.

Design Manual for Roads and Bridges (DMRB)

Changes in Noise Nuisance

- 9.3.4.13 The Scheme was assessed for its impact on noise nuisance levels. The procedure for estimating the percentage of people 'bothered' by noise is given in DMRB, Volume 11, Section 3, Part 7 on Traffic Noise and Vibration.
- 9.3.4.14 The procedure suggests that the impact of a new scheme in terms of the noise nuisance due to noise increases is greatest in the opening year, i.e. by comparing the Do Something with the Do Minimum in the opening year, i.e. 2012. Where there is a reduction in the noise levels as a result of the Scheme, the impact in terms of the noise nuisance due to noise decreases is greatest in the design year, i.e. by comparing the Do Something in the design year, 2027, with the Do Minimum in the opening year, 2012.

Vibration Effects

- 9.3.4.15 The effect of vibration due to road traffic has been assessed in accordance with guidance in DMRB. There are two effects of traffic vibration, namely effects on buildings and disturbance to occupiers. Limited research has concluded that vibration nuisance is restricted to properties within approximately 40 metres of the carriageway, where there are no barriers to traffic noise.

Assessment Years

9.3.4.16 DMRB Volume 11 Section 3 Part 7 requires an assessment of the following scenarios:

- opening year - Do Minimum and Do Something
- design year or the worst case situation within 15 years of opening - Do Minimum and Do Something

9.3.4.17 The opening year for this Scheme is 2012 and therefore the design year is 2027.

9.3.4.18 In accordance with NIR, the worst-case scenario assessment is normally for the design year or within 15 years after opening. A sensitivity test was undertaken for 2021 and 2027, and 2027 was shown to be the worst-case in terms of noise impacts, although the difference in terms of the noise level was not significant.

9.3.4.19 The NIR requires an assessment of Do Something in the design year against Do Minimum in the opening year. Details of the calculated noise levels for these two scenarios are given in the Technical Report. The increase in noise levels is compared against the criteria given in the methodology in the Technical Report for each receptor. The noise increase that is compared is the higher of Do Something with Section 1 only or Cumulative, i.e. with all other Sections of the M25 open.

9.3.4.20 The DMRB requires assessments of Do Something against Do Minimum in the opening year (2012) and Do Something in the design year against Do Minimum in the opening year. The assessment of the overall changes in noise nuisance, as a result of the Scheme, is given in Table 9.5.

9.3.4.21 The computer model was also used to prepare noise contour plans showing indicative noise levels predicted in the Do Minimum and Do Something in 2012 and 2027 (Figure 9.3 and 9.4 respectively). The levels are free-field and calculated at grid of 20 metres by 20 metres at a height of 4.5 metres above local ground to equate to noise at the first floor windows. These are free-field values and therefore do not take account of façade reflections from individual properties and therefore these contours are indicative only.

9.3.5 Construction Noise and Vibration

9.3.5.1 Details of construction activities and methodologies would be the responsibility of the DBFO contractor and are not known at this stage. Therefore only a broad assessment of construction noise was made using guidance in BS5228:1997.

9.3.5.2 Assessment of construction ground borne vibration effects would be assessed when the type and number of construction plant are known and considered where these may be significant for sensitive receptors. A qualitative assessment has been made here.

9.3.6 Road Traffic During Construction Period

9.3.6.1 During the construction phase traffic management measures would be put in place along the mainline. This is likely to result in the re-distribution of some traffic onto the surrounding road network. Traffic flows during the construction phase have been predicted using the M25 North of the Thames model. For the purpose of this assessment, noise levels as a result of the maximum predicted traffic flows (Maximum) during the construction period have been compared against those before construction has started (Before).

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- 9.3.6.2 An assessment of the potential noise impacts of the redistribution of traffic due to construction has been completed following the guidance provided in DMRB.
- 9.3.6.3 The changes in traffic flows on the road network in a comparison of the before construction and maximum flow during construction has been considered. Noise levels have been calculated for a kerbside (3.5 metres from centreline of road) location in both the before and maximum flow during construction scenarios for those roads identified. All calculations have been undertaken following the procedures outlined in CRTN.
- 9.3.6.4 The predicted noise levels of the before construction and the maximum flow during construction scenarios have been compared. The significance criteria, as provided in Table 9.2, have been used to describe the magnitude of any noise change due to construction.

9.3.7 Magnitude of Impacts

- 9.3.7.1 The following significance criteria have been used for traffic noise impact. However, these only provide an indication of the magnitude of the impact and not the importance.

Table 9.2: Magnitude of Road Traffic Noise Impacts

Change in noise level (dB)	Descriptor
1 to < 3 - Increase or Decrease	Minimal
3 to < 5 - Increase or Decrease	Slight
5 to < 10 - Increase or Decrease	Moderate
10 to < 15 - Increase or Decrease	Substantial
15 or over - Increase or Decrease	Major

9.4 Baseline Conditions

9.4.1 Existing Low Noise Surfacing

- 9.4.1.1 Low Noise Surfacing (LNS) currently exists on 62% of the Scheme, elsewhere Hot Rolled Asphalt (HRA) still remains. The location of the LNS is shown on Figure 9.2. This has been assumed to be the forecast baseline for 2012 should the Scheme not occur. As stated in Section 9.3.2, noise reduction contribution of 3.5 dB has been applied for LNS relative to HRA.

9.4.2 Existing Environmental Barriers

- 9.4.2.1 The existing Environmental Barriers along the motorway comprise of various materials and are in various states of repair. Details on the location, length, height, construction and condition of each barrier are provided in Table 9.3. The location of each Environmental Barrier is shown on Figure 9.2. The forecast baseline or Do Minimum in 2012 has assumed these Environmental Barriers would remain in place and that structural integrity would be preserved by the maintaining agent.

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Table 9.3: Descriptions of Existing Environmental Barriers

Barrier Number	Direction	Start	Finish	Length	Height	Embankment / Cut	Distance from Motorway	Condition and Materials
1	AC	3,000	3,325	325	2	Up on cut	2	Good - Wooden slats and metal posts
2	C	3,880	4,220	340	2	Embankment - Wall at motorway level	1.5	Good - Wooden slats, concrete posts, wood plate on top concrete base
3	C	5,395	5,675	280	2	Slightly higher than motorway	Between 3 and 5 metres	Good - All wood; posts, slats and beams running along the top
4	AC	5,150	6,170	1020	2	Embankment - Wall at motorway level	Between 1 and 5 metres	Good - Wooden slats, metal girder
5	AC	11,430	11,970	540	2	Embankment - Wall at motorway level	Between 1 and 10 metres, follows J17 off ramp.	Reasonable - Concrete slats with wooden facia
6	C	12,230	13,000	770	2	Level on Berry Lane Viaduct then up on Cut	0 metres at BLV then follows J18 off ramp	Good - Concrete slats with wooden facia, followed by corrugated sheets and metal form work over BLV. Wooden slats and posts along J18 off ramp
7	AC	12,150	12,975	825	2.5	Level on BLV then up on Cut	0 metres at BLV then follows J18 on-ramp	Good - Wooden slats and wooden posts for outer wall, concrete slats and wooden facia for inner wall
8	AC	13,185	13,850	665	2	At motorway level, then follows slip road up. Embankment-Wall at motorway/slip level	0 metres at both slip and Motorway	Poor in places - Concrete slats with wooden facia

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Barrier Number	Direction	Start	Finish	Length	Height	Embankment / Cut	Distance from Motorway	Condition and Materials
9	C	13,170	13,850	825	4 above road level	On top of 7m high retaining wall at J18, descends to motorway level at ch 13310	5 metres in from hard shoulder, 8 metres up on retaining wall	Good, some minor repairs have been carried out - Concrete slats with wooden fascia
10	C	16,840	17,070	230	2	Up on cut	6 metres from verge	Poor in places, leaning at beginning (ch 16840) - Wooden slats and wooden posts
11	AC	16,770	17,055	285	2.5	At motorway level	6 metres from verge	Good - Wooden slats and metal posts
12	C	20,240	20,725	485	2	At motorway level	0 metres	Good, bridge parapet made of solid concrete
13	AC	20,175	20,875	700	2-3 metres	At motorway level	0 metres	Good, bridge parapet made of solid concrete
14	AC	27,900	28,400	500	2	At motorway level	0 metres	Poor, damaged and leaning over. Soil erosion around base of posts - Wooden slats and metal posts. Bridge parapet over river Ver is solid concrete with metal plate above
15	C	27,900	28,470	570	2	At motorway level 27900 - 28275 then top of cut to bridge	0 metres	Good, however access gates within barrier at damaged - Wooden slats and metal posts. Bridge parapet over river Ver is solid concrete with metal plate above
16	AC	31,930	32,200	270	2	At motorway level on slip merge to motorway	3 metres from verge then follow slip (3 metres from slip)	Good - Wooden slats and metal posts

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Barrier Number	Direction	Start	Finish	Length	Height	Embankment / Cut	Distance from Motorway	Condition and Materials
17	AC	36,650	36,750	100	2	Up on retaining wall	Between 1 metres and 8 metres from Motorway, 10 metres up on retaining wall	Good - Wooden slats and metal posts, wooden top.
18	C	36,600	36,640	40	2	Up on retaining wall	Between 1 metres and 8 metres from Motorway, 10 metres up on retaining wall	Good - Wooden slats and metal posts, wooden top.

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9.4.3 Noise levels

9.4.3.1 The results of the ambient noise measurements are presented in Appendix C in the Traffic Noise and Vibration Technical Report, and are summarised in Table 9.4. Locations of the ambient noise monitoring stations (ANMS) are shown on Figure 9.2.

Table 9.4: Ambient Noise Measurements

Ambient Noise Measurement Station	Location (approximate distance in metres from centreline of M25)	Mean $L_{A10,18-hr}$
1	Pinstone Way, off Oxford Road – 95 metres	65.4
2	Over The Misbourne, off Amersham Road – 135 metres	61.4
3	Access to Landfill site/caravan park, off Shire Lane / Chalfont Lane – 40 metres	73.3
4	Footpath, off Shire Lane/Hornhill Road – 340 metres	53.3
5	15 metres into the field, Chalfont Road – 325 metres	56.4
6	130 metres along access to Catlips Farm, Shepherds Lane – 420 metres	54.4
7	135 metres along access to Great Wood Cottages, off Sarratt Road – 135 metres	61.0
8	In front of 2 Great Wood Cottage – 50 metres	65.0
9	Coltspring Riding School car park, Sarratt Road – 165 metres	57.5
10	On top of the M25 embankment on access road leading to Sheepcote Spring off Langleybury Lane	80.3*
10B	In front of Westwood Equestrian car park in Old House Lane – 120 metres	66.4
11	Sheppeys Lane off Bedmond Road – 250 metres from M25 and 120 metres from Bedmond Road	56.3
12	In Dairy Way off Bedmond Road – 275 metres	57.4
13	East Lane – 115 metres	68.8
14	Grounds of a Riding School, Smug Oak Lane – 240 metres	56.1
15	In a field north of M25 close to subway at Chainage 29760 – 75 metres	66.6
16	In a field north of M25 close to subway at Chainage 29760 – 125 metres	62.6
17	In a field north of M25 close to subway at Chainage 29760 – 225 metres	57.5
18	In a field north of M25 close to subway at Chainage 29760 – 325 metres	57.6
19	In a field north of M25 close to subway at Chainage 29760 – 400 metres	53.8
20	All Saints Pastoral Centre – 100 metres	64.1
20A	Close to Farm Cottage, north of All Saints Pastoral Centre	56.7*
21	Earls Lane – 300 metres	62.8
22	Frowyke Crescent off Blanche Lane – 300 metres	58.1

* only one measurement was possible

9.4.4 Calculated Noise Levels

- 9.4.4.1 Calculated noise levels for 2012 Do Minimum are discussed in detail in the Noise and Vibration Technical Report. Receptor locations are illustrated on Figures 9.3 to 9.4 that illustrate the noise contour mapping for 2012 Do Minimum and 2027 Do Something scenarios.
- 9.4.4.2 The presence of existing LNS, HRA, Environmental Barriers and concrete central reserve barriers affects the calculated noise levels for individual receptors. As a result, the noise levels vary throughout the study area, ranging from 52.9 dB to 81.5 dB. A small selection of calculated examples below illustrate the range of noise levels experienced by receptors across the Scheme.
- 9.4.4.3 At Alderbourne Cottage (receptor R14), which is a Listed Building, the noise level is approximately 74 dB $L_{A10, 18-hr}$. In contrast, properties in Queens Drive are protected by an existing Environmental Barrier and noise levels are low 60s dB, e.g. receptor R73, and upper 50s dB, e.g. receptors R74 and R80. Some properties located close to the M25 between Junctions 18 to 19 currently experience noise levels well above 70 dB, including Great Wood Cottages (receptor R192), Glenview (receptor R201) and another house (receptor R197). Similarly, between Junctions 22 to 23 the present HRA road surface results in properties experiencing noise levels well above 70 dB, including those located in Earls Lane (receptor R359).
- 9.4.4.4 The highest calculated noise levels for 2012 Do Minimum are above 80 dB. These are experienced at The Lodge (receptor R333) located on Bell Lane and 39 Blanche Lane (receptor R358).

9.5 Design and Mitigation

9.5.1 Construction

- 9.5.1.1 At present, the contractor's method statement, which would include details of the timing, the type and, number of construction plant is not known. Consequently, it is not possible to assess the noise impact due to construction activity and operations. However, if there is extensive night-time or weekend working, then there is a likelihood of disturbance to local residents. If this were the case, then a noise assessment needs to be undertaken and appropriate noise mitigation measures such as Best Practicable Means (BPM) and others given in BS 5228:Part 1:1997¹⁰, would be assessed and implemented in the Construction Environmental Management Plan (CEMP).
- 9.5.1.2 There are no legislative criteria for limiting noise levels from construction sites. However, a criterion that has been widely applied in large civil engineering projects, such as road construction, uses 75 dB(A), measured as an equivalent level $L_{Aeq,T}$ measured over an 1-hour period, at the nearest noise sensitive location as a limit for daytime construction activities. The threshold is often reduced to approximately 65 dB $L_{Aeq,T}$ in the evening (1800 to 2300 hours) and as low as 50dB $L_{Aeq,T}$ for the night-time period (2300 to 0600 hours).
- 9.5.1.3 The contractor for the Scheme would need to liaise and agree with the Local Authorities' Environmental Officer for controlling noise from construction activities under Section 61 of the Control of Pollution Act 1974. Normally, representative Noise Control Stations are selected along the scheme and these are agreed with the Local Authority together with

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the noise level limits within specified working hours. The Local Authorities would also expect the contractor and their agents to adopt the noise control procedures outlined in BS 5225 and these would be contained in the CEMP.

9.5.1.4 Typical noise control measures that would be included in the CEMP are:

- substitution – where reasonably practicable noisy plant or processes should be replaced by less noisy alternatives
- modification – noise can often be reduced by application of improved sound reduction methods that may be available from the manufacturer
- enclosures – sources of significant noise should be enclosed where practical with suitable materials
- use and siting of noisy equipment – these should be sited away from noise-sensitive areas, and switched off when not in use
- maintenance – proper and regular maintenance by trained personnel will do much to reduce noise from machinery. Loose rattling items can be avoided and frictional noise can be reduced by regular maintenance and proper lubrication

9.5.1.5 Many of the attributes listed in the previous section also apply to reduction and control of vibration from machinery.

9.5.2 Design

9.5.2.1 Following the calculations of noise levels, areas requiring Environmental Barriers were identified for the Scheme. The design aim was to provide appropriate noise mitigation to limit any noise increase, where possible, to 1 dB at any property facing the M25 and where the major source of noise was the M25. Where the main source of noise is a side road, no mitigation measures were considered.

9.5.2.2 Also taken into consideration was the economic concern that noise barriers should not be considered for isolated properties but rather for a group of properties.

9.5.2.3 The Scheme design includes installation of new LNS for the new carriageway and resurfacing of the existing carriageway with LNS at the opening year. Areas that are currently HRA surfacing would benefit from the installation of LNS, with an estimated 3.5 dB reduction in noise levels attributed to LNS.

9.5.2.4 Where the IMMI model has estimated an increase in noise levels above 1 dB and these areas are adjacent to existing carriageways covered with LNS, e.g. areas such as Maple Cross (receptors R53 – R58), Environmental Barriers have been proposed as mitigation.

9.5.2.5 The Scheme incorporates a concrete barrier positioned at the central reservation. Its height has been taken as 0.9 metres above the pavement surface. At present, there is a concrete barrier at the central reservation for a short stretch between Chainage 3,500 and Chainage 10,280. The Scheme would extend the central concrete barrier along the entire length from Junctions 16 to 23. Despite its relatively low height it would provide some benefit in interrupting the path of noise. However, the reflection effect of such a barrier, if it is less than 1.5 metres tall, is not considered to be discernible based on current evidence and advice given in CRTN.

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9.5.2.6 Existing Environmental Barriers and earth bunds would be retained, except for an earth bund at Chainage 25,900 to 26,300 anti-clockwise carriageway, which would be reduced in height due to the engineering requirements of the widening. In this location a new Environmental Barrier is required to ensure surrounding properties in Bricket Wood do not experience an increase in noise levels above 1 dB.

9.5.2.7 All existing Environmental Barriers would be removed during the construction period and replaced with new Environmental Barriers. Details on the location of existing Barriers are provided in Section 3.2.7, Table 9.3 and are illustrated on Figure 3.2 and Figure 9.2. Wherever necessary, these existing (replaced with new materials) Barriers would be raised or extended as required to achieve the design aims of the Scheme to ensure no receptor experiences increases in noise levels above 1 dB.

9.5.2.8 A number of new Environmental Barriers are proposed to mitigate adverse noise impacts, particularly in areas adjacent to existing LNS on both carriageways.

9.5.2.9 Existing Environmental Barriers would be altered in the following areas:

- existing 2 metre high Barrier from Chainage 5,395 to 5,675 on the clockwise carriageway, raised to 2.5 metres high to protect Coldharbour Farm and Coldharbour Farm Cottages (receptors R45, R46 and R47)
- existing 2 metres high Barrier from Chainage 11,430 to 11,970 on the anti-clockwise carriageway raised to 3 metres high to protect properties along The Queens on the western edge of Rickmansworth (receptors R73 – R88)
- 2 metres high from Chainage 27,900 to 28,470 on clockwise carriageway. Proposed increase in height to 2.5 metres between Chainage 28,200 to 28,470 to protect receptors off Moor Mill Lane (receptors R294 to R302)
- 2 metres high from Chainage 27,900 to 28,400 on anti-clockwise carriageway. Proposed increase in height to 2.5 metres between Chainage 28,100 to 28,200 to protect the Moor Mill Public House (receptor R293)

9.5.2.10 New Environmental Barriers are proposed in the following locations:

- 2 metres high from Chainage 3,250 to 3,500 on the clockwise carriageway with opening for A40 Oxford Road to protect properties on the southwestern edge of Tatling End (receptors R27 – R29)
- 2.5 metres high from Chainage 5,300 to 5,395 on the clockwise carriageway to adjoin the altered Environmental Barrier close to Coldharbour Farm Cottages (receptors R46 and R47)
- 2.5 metres high from Chainage 8,200 to 8,900 on the anti-clockwise carriageway to provide noise protection for properties in Maple Cross (receptors R53 – R58)
- 3 metres high barrier from Chainage 11,970 to 12,050 on the anti-clockwise carriageway to adjoin the altered existing Environmental Barrier and reduce noise levels for properties along Berry Lane and The Queens in Rickmansworth (receptors R88 – R91)
- 1 metre high at Chainage 13,120 on the clockwise carriageway to protect receptors on Wyatts Close (receptors R155 – R159), increasing to 3 metres in

height at Chainage 13,150 to 13,170, to phase in with the existing Environmental Barrier (Chainage 13,170 to 13,850)

- 3 metres high from Chainage 25,750 to 26,400 on the anti-clockwise carriageway to reduce noise levels for properties in the north of Bricket Wood area (receptors R260 – R272)

9.6 Assessment of Effects

9.6.1 Construction

- 9.6.1.1 In the absence of details of construction plant, only typical noisy activities and their effects are presented here. Construction activity would involve various operations undertaken by different types of plant, at different locations and at different times. Consequently, construction noise levels would vary with time at different properties as construction noise sources move progressively closer to or further away from a property, and as the activities change.
- 9.6.1.2 Typical construction works and their average noise level of the activity together with the noise impact at various distances from the edge of the motorway is summarised in Table 9.5.

Table 9.5 Typical Construction Works and Effect at Various Distances

Construction activity	Average noise level at 10 metres distance dB LAeq	Noise impact at 20 metres*	Noise impact at 50 metres*	Noise impact at 100 metres*
Breaking road surface	88	82	74	68
Removing debris	87	81	73	67
Road Planing	83	77	69	63
Excavating trench	74	68	60	54
Road surfacing	78	72	64	58
Road sweeping	73	67	59	53

Notes. Information is taken from BS 5228: Part1: 1997.

Some noise levels include pass-by maximum sound pressure levels and therefore the assessment considers the worst-case.

Assumes no screening.

- 9.6.1.3 During the construction works the motorway would still be in operation albeit with traffic at lower average speeds. When comparing the measured background noise levels as indicated in Table 9.4 with the typical noise impact at 100 metres in Table 9.5, it is seen that the overall noise levels are of a similar magnitude. Due to the short-term nature and character of construction noise, there would be a slight adverse impact.
- 9.6.1.4 Due to the distance of the nearest receptor (approximately 30 metres), vibration levels from general construction and civil engineering activities are unlikely to be perceptible at individual residential properties along the Scheme. Therefore, at this stage no measures are proposed to mitigate potential construction vibration impacts of the Scheme. However when exact construction details are available from the DBFO contractor an assessment of vibration would be required.

9.6.2 Disruption due to Construction Traffic

9.6.2.1 The potential noise impacts as a result of changes in traffic flows during the construction phase have been assessed following the guidance provided in DMRB. Noise levels have been calculated for a kerbside location for all links which would experience a change in noise levels of greater than +25% and of greater than -20%. The predicted noise levels and associated magnitude of change are summarised in Table 9.5. Figure 9.6 has been produced outlining the level of change on each road link affected, colour coded to correspond with the level of change as identified in Table 9.2.

Table 9.6 Changes in traffic noise levels as a result of disruption due to construction traffic

Construction Link ID (See Figure 9.5)	Noise Level dB L			
	Before	Maximum	Change	Significance
C1	79.2	82.1	+3.0	Slight
C2	77.6	82.5	+4.9	Slight
C3	77.8	78.9	+1.1	Minimal
C4	70.5	72.2	+1.8	Minimal
C5	79.4	80.7	+1.3	Minimal
C6	74.3	75.5	+1.1	Minimal
C7	77.6	78.9	+1.3	Minimal
C8	80.9	82.1	+1.2	Minimal
C9	81.0	82.0	+1.0	Minimal
C10	71.0	72.7	+1.7	Minimal
C11	71.6	72.6	+1.0	Minimal
C12	73.3	74.4	+1.0	Minimal
C13	73.5	74.9	+1.4	Minimal
C14	70.0	72.0	+2.0	Minimal
C15	72.7	74.1	+1.4	Minimal
C16	72.7	74.1	+1.4	Minimal
C17	69.8	72.5	+2.7	Minimal
C18	82.9	83.5	+0.6	Minimal
C19	83.4	84.5	+1.1	Minimal
C20	90.2	87.3	-2.9	Minimal
C21	90.4	86.6	-3.8	Slight

9.6.2.2 Noise levels are predicted to decrease along the majority of the mainline of the M25 as a result of traffic being re-distributed onto the surrounding road network. Traffic diverting off the M25 onto the surrounding road network would result in increases of road traffic levels on links in the surrounding road network.

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- 9.6.2.3 Increases of traffic flows on the surrounding road networks would result in increases in traffic noise at kerbside locations for a number of links. Increases in noise levels are predicted to range between 0.5 and 5.0 dB. Referring to the significance criteria as provided in Table 9.2 changes in noise levels due to construction traffic would be minimal to slight. The largest changes would be +3.0 and +4.9 dB adjacent to construction links C1 and C2, which are located in the area of Junction 17 of the existing M25.
- 9.6.2.4 Decreases in traffic noise would occur adjacent to construction links C20 and C21 these are sections of the existing M25 which pass under Junction 17. Traffic flows are predicted to decrease by 20 and 30% respectively on these links. Changes in traffic flow of this magnitude would result traffic noise levels being reduced by 2.9 dB adjacent to link C20 and 3.8 dB adjacent to link C21. Referring to the significance criteria as provided in Table 9.2 changes in noise levels as a result of a decrease in traffic flows using the M25 due to construction would be minimal to slight.

9.6.3 Operational effects of the Scheme

- 9.6.3.1 This report assesses the effects of the M25 Section 1. However, the situation is complicated by the simultaneous construction works on other Sections of the M25, i.e. Sections 2 and 3 which are due to open by 2012, and Sections 4 and 5 which would open by 2027. Traffic flows have been forecast for Section 1 alone and Cumulative, i.e. for Section 1 with the other sections open.
- 9.6.3.2 The effects on noise levels due to the Section 1 only and cumulative traffic flows are presented in sections 6.3 and 6.4 of the Traffic Noise and Vibration Report. The noise effects due to Section 1 only traffic flows were marginally worse and these are presented below.
- 9.6.3.3 As required in DMRB, roads outside the 300 metre study area where traffic changes are greater than +25% and -20% between 2012DM and 2027DS have been identified and these are illustrated in Figure 9.1. In agreement with the Highways Agency, properties within 50 metres of these roads have been counted and an assessment based on these is summarised in Table 9.7.
- 9.6.3.4 A further comparison was made between 2012DM vs 2027DS and 2012DM vs 2027DM to determine what proportion of this change in traffic is due to natural growth in traffic over the 15 years and what may be due to the Scheme. This indicates that much of the growth on the surrounding road network is due to expected natural growth in traffic over the 15 year design period. As a result, the effects on traffic growth on the wider road network from the Scheme are likely to be over estimated.
- 9.6.3.5 Calculations show that where at present there is HRA surface on the M25 on both carriageways, the Scheme would result in a significant reduction in the traffic noise level. Where there is HRA surface on either carriageway and LNS on the other, a slight reduction in noise is expected. This applies from the opening year (2012). Where there is LNS on both carriageways at present, the calculations predict a slight reduction in noise primarily resulting from the new central reserve concrete barrier. Where there is LNS and a central reserve concrete barrier present in the Do Minimum, i.e. from Chainage 3,500 to Chainage 10,280, there would be a slight increase in noise level, but this would be reduced to no more than about 1dB by the proposed new Environmental Barriers. There is one area in particular where an existing earth bund would be removed by the widening of the motorway, where as a result there is a significant increase in

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noise level. To mitigate this impact, an Environmental Barrier has been proposed and this together with the proposed new concrete barrier on the central reserve would largely reduce the noise impact to no more than about 1dB.

Junctions 16 to 17

- 9.6.3.6 This section of the M25 already has low noise surface, (LNS), therefore there is no benefit claimed for this with the widening. However, the existing central reserve concrete barrier commenced at Chainage 3,500 to 10,280, means that from the start of Junction 16 and up to Chainage 3,500 the proposed new central reserve concrete barrier would deliver a benefit in terms of a noise reduction.
- 9.6.3.7 The noise increase in the residential area alongside the A40 Oxford Road is restricted to no more than 1 dB $L_{A10, 18\text{-hr}}$ by the new central reserve concrete barrier. A new Environmental Barrier would lie at Chainage 3,250 to 3,500 on the clockwise carriageway, with a proposed height of 2.0 metres with a gap for A40 Oxford Road. Properties in Woodhill Avenue, (receptors R31 – R37), which is off the A413 Amersham Road, would experience an increase in noise primarily from growth in traffic on Amersham Road. The noise increase at these properties would be below 1 dB which would be imperceptible and considered to be a less than minimal impact.
- 9.6.3.8 The existing Environmental Barrier in the vicinity of Coldharbour Farm (receptor R45) and Coldharbour Farm Cottages (receptors R46 and R47), from Chainage 5,395 to 5,675 on the clockwise carriageway, would be extended and raised to meet the design aim of the Scheme. The proposed Environmental Barrier extension would be from Chainage 5,300 to 5,395, and would connect to the existing Environmental Barrier. In addition, this new Environmental Barrier would be 2.5 metres in height, and the existing Environmental Barrier would be raised to 3.0 metres in height compared with its existing height of 2.0 metres. These mitigation measures would limit the noise increase to about 1 dB at these receptors.
- 9.6.3.9 The residential area of Beechen Wood, and in particular those located in Longlees (receptor R57), Buttlehide (receptor R56) and The Hawthorne (receptor R54), would experience an increase in noise of up to 2 dB without an Environmental Barrier. To mitigate this, a new 2.5 metre high Environmental Barrier is proposed from Chainage 8,200 to 8,900 to limit the noise increase to less than 1 dB.
- 9.6.3.10 The noise increase for properties in Nottingham Road would be below 1 dB and therefore would meet the design aim. The proposed new central reserve concrete barrier would provide the necessary mitigation to minimise noise level increases within the 1 dB threshold.
- 9.6.3.11 The increases in noise levels are slight with the Scheme, whereas the decreases are significant. As a result therefore, there would be a decrease in properties that are bothered by noise.

Junctions 17 to 18

- 9.6.3.12 The Scheme would increase the noise levels for properties in Queens Drive (receptor R73) and adjacent roads (receptors R75 and R76). As a result, the existing Environmental Barrier on the anti-clockwise carriageway (Chainage 11,430 to 11,970, 2.0 metres high) would be raised to 3 metres high. This increase in height has been proposed to minimise any impact upon the surrounding properties. In addition, this

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Environmental Barrier would be adjoined by a new 3.0 metres high Environmental Barrier from Chainage 11,970 to 12,050. This would meet the Scheme design aim whereby no property would experience an increase in noise levels above 1dB.

9.6.3.13 The section of the M25 up to Berry Lane already has LNS and therefore there is no credit claimed for this from the Scheme. Any increase in noise is limited to approximately 1 dB as a result of the new central reserve concrete barrier.

9.6.3.14 As a result of the slight increases in noise levels, it is seen that there is some increase in the number of people that are bothered with noise between Junctions 17 and 18.

Junctions 18 to 19

9.6.3.15 Junction 18 of the M25 is surrounded by built up residential areas. Consequently, there are existing Environmental Barriers on both sides of the motorway up to Solesbridge Lane bridge (Chainage 13,850). A new Environmental Barrier is proposed from Chainage 13,120 on the clockwise carriageway, that would adjoin the existing barrier at Chainage 13,170, to screen properties in Wyatts Close (receptors R155 – R159).

9.6.3.16 Between Chainage 13,900 and Chainage 14,750 the Scheme passes through the Chilterns Area of Outstanding Natural Beauty (AONB). LNS would be installed on the anti-clockwise carriageway resulting in a reduction in noise levels for receptors within this designated area, e.g. Lodge (receptor R191) and Great Wood Cottages (receptor R192).

9.6.3.17 As a result of the slight increases and significant decreases in noise levels, it is seen that there would be some overall decrease in people that are bothered by noise with the Scheme.

Junctions 19 to 20

9.6.3.18 This section of the M25 is currently surfaced with HRA, and therefore the proposal of LNS by the Scheme opening year would bring about a slight to moderate reduction in noise and no Environmental Barriers are necessary.

9.6.3.19 This section of the motorway passes through a rural area with very few residential properties. As a result of the decrease in noise, it is seen that there would be some decrease in the number of people that are bothered by noise. These include receptors R206, R209 and R210.

Junctions 20 to 21

9.6.3.20 This section of the M25 currently has HRA, and as a result of the proposed LNS by the Scheme opening year, together with the central reserve concrete barrier, there would be a noticeable reduction in noise. Properties located in The Retreat (receptor R220-R224) and Tenements Farm (receptor R246), where existing noise levels are approximately mid-60's dB, would have reductions of up to 2 dB, which is a significant reduction. As a result, no further Environmental Barriers would be required.

9.6.3.21 As a result of the noise decreases, there would be a reduction in the number of people that are bothered by noise.

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Junctions 21 to 22

9.6.3.22 This section of the M25 already has LNS, and therefore there is no benefit claimed for this from the Scheme. However, the central reserve concrete barrier acts as a new Environmental Barrier and this would be effective in reducing the noise in many areas. Where there is a predicted increase in Do Something 2027 noise levels, this increase is limited to below 1dB. Properties in Lye Lane (receptor R274) and Park Street Lane (receptors R281-283) would experience a change of less than 1 dB and therefore meet the design aim of the Scheme. No additional mitigation would be required. This would also apply to properties in the vicinity of River Ver, Harper Lane and Bell Lane. The Environmental Barriers between Chainage 27,900 – 28,470 on the clockwise carriageway, and between Chainage 27,900 – 28,400 on the anti-clockwise carriageway would be partially raised to 2.5 metres to protect properties along Moor Mill Lane (receptors R294 – R300) and the Moor Mill Public House (receptor R293).

9.6.3.23 As a result of the slight increases in noise levels, there would be a slight increase in the number of people that are bothered by noise.

Junctions 22 to 23

9.6.3.24 This section of the M25 currently has HRA road surface, and therefore the proposed use of LNS by the Scheme opening year, together with the central reserve concrete barrier, would create a noticeable decrease in noise. Subsequently, no additional Environmental Barriers would be necessary. There are a number of properties where existing noise levels are well above 70 dB, e.g. those located in Earls Lane (receptor R359) and Blanche Lane (receptor R356), and almost 80 dB at The Lodge (receptor R333) located on Bell Lane and 39 Blanche Lane (receptor R358). All these properties, and all areas in their vicinity, would experience reductions in noise levels, some up to 6 dB as a result of the Scheme. This would be a moderate reduction in noise levels.

9.6.3.25 As a result of the decreases, there would be a reduction in the number of people that are bothered by noise.

Properties qualifying for Noise Insulation

9.6.3.26 The noise calculations also indicate that there are four properties that would qualify for discretionary offers of noise insulation under Regulation 3 of the Noise Insulation Regulations 1975 (as amended 1988).

These four properties include the following:

- R14 – Alderbourne Cottage (Listed Building). Chainage 2,870 on the clockwise carriageway
- R40/R41 – Isle of Wight Farm. Chainage 4,650 on the anti-clockwise carriageway
- R64 – Bircham Cottage (Listed Building). Chainage 10,300 on the clockwise carriageway
- Four Acres (adjacent to receptor R64) at Chainage 10,275 on the clockwise carriageway

Noise Nuisance

9.6.3.27 The assessment of the overall changes in noise and noise nuisance as a result of the Scheme is summarised in Tables 9.7 and 9.9. The findings confirm that, in accordance with the assessment in DMRB, in the opening year there is a significant reduction in the number of people that might be 'bothered' by noise as a result of the Scheme. Moreover, in 2027 there would be a slight decrease in the number of people bothered for the Do Something compared with the Do Minimum 2027 case.

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Table 9.7 Changes in Noise Nuisance

Ambient Noise Band below 50 L _{A10 18h} dB	Residential		Commercial		Industrial		Community Facilities		Comments
	Do Something	Do Minimum	Do Something	Do Minimum	Do Something	Do Minimum	Do Something	Do Minimum	
Increase in Noise Level L _{A10 18h} dB	0 < 1	0	0						
	1 < 3	0	0						
	3 < 5	0	0						
	5 < 10	0	0						
	10 < 15	0	0						
Increase in Nuisance Level	< 10%	0	0						
	10 < 20%	0	0						
	20 < 30%	0	0	N/A	N/A	N/A	N/A		
	30 < 40%	0	0						
	> 40%	0	0						
Decrease in Noise Level L _{A10 18h} dB	0 < 1	0	0						
	1 < 3	0	0						
	3 < 5	0	0						
	5 < 10	0	0						
	10 < 15	0	0						
Decrease in Nuisance Level	< 10%	0	0						
	10 < 20%	0	0						
	20 < 30%	0	0	N/A	N/A	N/A	N/A		
	30 < 40%	0	0						
	> 40%	0	0						

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Ambient Noise Band 50-60 L _{A10 18h} dB	Residential		Commercial		Industrial		Community Facilities		Comments
	Do Something	Do Minimum	Do Something	Do Minimum	Do Something	Do Minimum	Do Something	Do Minimum	
Increase in Noise Level L _{A10 18h} dB	0 < 1	351	256	1 farm			1 Pastoral		
	1 < 3	0	0						
	3 < 5	0	0						
	5 < 10	0	0						
Increase in Nuisance Level	< 10%	38	256						
	10 < 20%	272	0						
	20 < 30%	41	0	N/A	N/A	N/A	N/A		
	30 < 40%	0	0						
	> 40%	0	0						
Decrease in Noise Level L _{A10 18h} dB	0 < 1	10	10				1 home for the elderly		
	1 < 3	0	0						
	3 < 5	0	0						
	5 < 10	0	0						
Decrease in Nuisance Level	< 10%	308	16						
	10 < 20%	0	0						
	20 < 30%	0	0	N/A	N/A	N/A	N/A		
	30 < 40%	0	0						
	> 40%	0	0						

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Ambient Noise Band 60-70 L _{A10 18h} dB	Residential		Commercial		Industrial		Community Facilities		Comments
	Do Something	Do Minimum	Do Something	Do Minimum	Do Something	Do Minimum	Do Something	Do Minimum	
Increase in Noise Level L _{A10 18h} dB	0 < 1	8958	8481	4				1 Pastoral	
	1 < 3	380	338						
	3 < 5	0	0						
	5 < 10	0	0						
Increase in Nuisance Level	< 10%	7615	8819					1 Pastoral	
	10 < 20%	1384	0						
	20 < 30%	281	0	N/A	N/A	N/A	N/A		
	30 < 40%	58	0						
	> 40%	0	0						
Decrease in Noise Level L _{A10 18h} dB	0 < 1	98	114	8	7		1	Langleybury school	
	1 < 3	11	27	1	3	1		Langleybury school	
	3 < 5	0	0						
	5 < 10	0	0						
Decrease in Nuisance Level	< 10%	109	0					Langleybury school	
	10 < 20%	0	0						
	20 < 30%	0	0	N/A	N/A	N/A	N/A		
	30 < 40%	0	0						
	> 40%	0	0						

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Ambient Noise Band >70 L _{A10} 18h dB	Residential		Commercial		Industrial		Community Facilities		Comments
	Do Something	Do Minimum	Do Something	Do Minimum	Do Something	Do Minimum	Do Something	Do Minimum	
Increase in Noise Level L _{A10} 18h dB	0 < 1	1645	1247						
	1 < 3	0	0						
	3 < 5	0	0						
	5 < 10	0	0						
Increase in Nuisance Level	< 10%	0	0						
	10 < 20%	1525	1247						
	20 < 30%	117	0	N/A	N/A	N/A	N/A		
	30 < 40%	3	0						
	> 40%	0	0						
Decrease in Noise Level L _{A10} 18h dB	0 < 1	0	0	1					
	1 < 3	76	14	1	1				
	3 < 5	8	18						
	5 < 10	5	0						
Decrease in Nuisance Level	< 10%	0	0						
	10 < 20%	0	0						
	20 < 30%	78	0	N/A	N/A	N/A	N/A		
	30 < 40%	11	0						
	> 40%	0	0						

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Noise Exposure Summary

9.6.3.28 The total numbers of dwelling facades calculated to experience noise increases and decreases within the noise change bands are summarised in Table 9.8 below.

Table 9.8: Numbers of Dwellings affected by Noise Change

L _{A10,18-hour} dB	Increase					Decrease				
	Noise change	1-2.9	3-4.9	5-9.9	10- 14.9	≥15	1-2.9	3-4.9	5-9.9	10- 14.9
Number dwellings Do-Min	9,984	338	0	0	0	138	45	0	0	0
Total Do-Min	10,322					183				
Number dwellings Do-Some	10,954	380	0	0	0	184	19	5	0	0
Total Do-Some	11,334					208				
The assessment of noise changes compares the Do-Minimum 2012 against the Do-Minimum 2027 and the Do-Something 2027.										

9.6.3.29 In the Do-Minimum 2027 situation, the results of the assessment indicate that 10,322 dwellings would experience an increase in noise level and 183 dwellings would experience a decrease when compared with the year 2012. The predicted increases in noise levels with the Do-Minimum situation are due to the usual growth in traffic on most roads expected over the years. The decreases are due to the assumption that the existing sections of the road with HRA surface would be replaced with LNS by 2027 in the Do Minimum scenario.

9.6.3.30 Of the 10,332 dwellings predicted to experience an increase, the majority (9,984) are within the lowest 1-2.9 dB band where the change would be considered to be minimal, the remaining 338 are within the 3-4.9 dB band where changes are considered slight. It should be noted that the changes would occur gradually over the 15-year period.

9.6.3.31 In the Do-Something situation, 11,334 dwellings are predicted to experience a noise increase, although the majority of these (10,954) fall within the minimal noise change band of 1-2.9 dB(A), with the remainder in the slight noise change band of 3-4.9 dB(A). In contrast, approximately 208 dwellings are predicted to experience a noise decrease, of which 184 fall within the minimal noise change band of 1-2.9 dB, 19 fall within the slight noise change band of 3-4.9 dB(A) and the remaining 5 within the moderate noise decrease band of 5-9.9 dB(A).

Noise Nuisance Summary

9.6.3.32 The noise levels and noise changes have been used to establish the percentage of people bothered very much or quite a lot by traffic noise using the DMRB procedures. The noise nuisance level for a steady state situation just prior to the Scheme opening has been compared, firstly, to the resultant level of noise nuisance just after the Scheme opening, and secondly, to the steady state position at the end of the 15 year design period. The maximum level of noise nuisance in the Do-Something, i.e. either after the Scheme opening or after 15 years, has then been used to determine the change to the percentage numbers of people affected.

9.6.3.33 The effect of the Scheme upon noise nuisance is summarised in Table 9.9.

Table 9.9: Numbers of Dwellings affected by Noise Nuisance

Noise Nuisance Change	Increase					Decrease				
	< 10%	10-20%	20-30%	30-40%	≥40%	< 10%	10-20%	20-30%	30-40%	≥40%
Number dwellings Do-Min	10,322	0	0	0	0	0	0	0	0	0
Total Do-Min	10,322					0				
Number dwellings Do-Some	9,178	1773	325	58	0	197	11	0	0	0
Total Do-Some	11,334					208				

9.6.3.34 The results of the Do-Minimum assessment indicate that 10,322 dwellings would experience an increase in noise nuisance levels and no dwellings would experience a decrease.

9.6.3.35 The predicted increases in noise nuisance levels in the Do-Minimum assessment are due to the natural growth in traffic on most roads expected over the years. All 10,322 dwellings predicted to experience an increase are within the lowest <10% change band.

9.6.3.36 In the Do-Something assessment, the results show a larger number of dwellings experiencing an increase in noise nuisance (11,334) than a decrease in noise nuisance (208). However, more dwellings would experience a decrease in the Do-Something compared with the Do-Minimum scenario.

9.6.4 Operational Vibration Effects

9.6.4.1 In accordance with guidance in DMRB, the amount of people bothered by traffic induced vibration is 10% lower than the corresponding figure noise nuisance. Consequently, a lower number of people would be bothered by vibration as a result of the Scheme. The assessment of traffic induced

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vibration is limited to people in properties that are within 40 metres of the Scheme and not screened behind an Environmental Barrier. There is only one such property that lies within 40 metres of the Scheme, namely The Lodge at Chainage 33,100 (receptor R332).

- 9.6.4.2 In the opening year (2012), there would be a predicted reduction in traffic noise level of 4.2 dB $L_{A10,18\text{-hour}}$ at this receptor (R332). This is equivalent to a 13% reduction in the number of people bothered by vibration at this receptor.

9.7 Summary

- 9.7.1.1 The design aim of the Scheme is to provide a benefit by way of a reduction in noise and where this is not practicable the aim is to limit any increase in noise, wherever possible, to 1 dB $L_{A10\ 18hr}$.
- 9.7.1.2 A comprehensive 3-D computer model was created to represent the existing situation in order to facilitate calculation of noise levels at selected representative residential properties. Information included in the model for the existing situation comprised of the existing topography, carriageway surface and the existing Environmental Barriers. Another model was created to represent the Scheme.
- 9.7.1.3 In terms of noise mitigation measures, the Scheme would include low noise surface on both carriageways and a concrete barrier at the central reservation. In addition, new Environmental Barriers have been proposed, where necessary, to further reduce the noise effects.
- 9.7.1.4 The noise calculations show that there are four properties that would qualify for a discretionary offer of noise insulation under Regulation 3 Noise Insulation Regulations 1975 (as amended 1988).
- 9.7.1.5 The noise calculations for the assessment of Section 1 and the cumulative assessment indicate very similar results. The noise calculations show that there are reductions in noise of up to 6 dB in the Opening Year at some properties. This reduction is a moderate decrease, and the majority of residential properties within 300 metres of the Scheme benefit from a reduction in the noise levels as a result of the Scheme. Likewise, there is a general reduction in the number of people bothered by noise.
- 9.7.1.6 When considering the overall impacts of the Scheme on the wider area the assessment of Section 1 indicates that there would be more dwellings with increases in noise and noise nuisance with the Scheme than without it, but there would also be an increase in the number of dwellings with a decrease in noise and noise nuisance with the Scheme than without it. The cumulative assessment indicates that with all sections open there would be fewer dwellings with an increase in noise and noise nuisance with the Scheme than without it.
- 9.7.1.7 Details of construction methods including the setting of compounds and use of particular plant are not known at this stage, and therefore only a broad assessment of the construction noise impact can be made. This shows that whilst there may be an adverse effect, this would be masked to some extent

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by noise of traffic on the motorway and the result is likely to be a slight adverse effect.

- 9.7.1.8 The potential noise impacts as a result of changes in traffic flows during the construction phase have been assessed following the guidance provided in DMRB. As a result of disruption due to construction noise levels are predicted to decrease along the majority of the mainline of the M25 as a result of traffic being re-distributed onto the surrounding road network. Traffic diverting off the M25 onto the surrounding road network would, however, result in increases of road traffic levels on links in the surrounding road network.

10 Air Quality

10.1 Introduction

- 10.1.1.1 This report summaries the air quality effects associated with the widening of the M25 between Junctions 16 and 23 inclusive (Section 1), hereafter referred to as the Scheme. In addition, considerations of the indicative air quality effects that are likely to occur during the construction of the Scheme have also been considered. Whilst the Scheme is being promoted to relieve current traffic flows, changes in traffic flows and speeds have an impact on air quality through increasing or reducing emissions and hence altering ambient air quality concentrations. Additional widening schemes, and the possible effects they may have in combination with Section 1, have also been considered.
- 10.1.1.2 The air quality assessment has been carried out in accordance with DMRB Volume 11, Section 3, Part 1, HA207/071. In addition, this assessment considered the current Local Air Quality Management (LAQM) Technical Guidance Notes (LAQM.TG(03))² as well as the latest local authority air quality review and assessment reports.
- 10.1.1.3 A detailed assessment of air quality is available in the M25 Widening Junctions 16 to 23 Air Quality Technical Report³.

10.2 Regulatory Framework

- 10.2.1.1 The assessment has been carried out in accordance with the following best practice guidance:
- Design Manual for Roads and Bridges, Volume 11, Part 3, Section 1 Air Quality(HA207/07)¹
 - LAQM TG(03): Technical Guidance²
 - Draft London Best Practice Guide: The control of dust and emissions from construction and demolition⁴
- 10.2.1.2 The Air Quality Objectives and EU Limit Values that have been used to assess both monitored and modelled air quality are presented in Tables 10.1 and 10.2, along with dates on when they have to be achieved. Whilst sulphur dioxide and lead are listed in Tables 10.1 and 10.2, these pollutants have not been included in the air quality assessment as road traffic is not considered to be a significant source of lead or sulphur dioxide.

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Table 10.1: Air Quality Strategy Objectives

Pollutant	Air Quality Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	16.25 μgm^{-3}	Running annual mean	31/12/2003
	5 μgm^{-3}	Annual mean	31/12/2010
1,3-Butadiene	2.25 μgm^{-3}	Running annual mean	31/12/2003
Carbon monoxide (CO)	10 mgm^{-3}	Running 8-hour mean	31/12/2003
Lead (Pb)	0.5 μgm^{-3}	Annual mean	31/12/2004
	0.25 μgm^{-3}	Annual mean	31/12/2008
Nitrogen dioxide (NO ₂)	200 μgm^{-3}	1-hour mean; not to be exceeded more than 18 times a year	31/12/2005
	40 μgm^{-3}	Annual mean	31/12/2005
Particles (PM ₁₀)	50 μgm^{-3}	24-hour mean; not to be exceeded more than 35 times a year	31/12/2004
	40 μgm^{-3}	Annual mean	31/12/2004
Sulphur dioxide (SO ₂)	350 μgm^{-3}	1-hour mean; not to be exceeded more than 24 times a year	31/12/2004
	125 μgm^{-3}	24-hour mean; not to be exceeded more than 3 times a year	31/12/2004
	266 μgm^{-3}	15-minute mean; not to be exceeded more than 35 times a year	31/12/2005

Table 10.2: European Union (EU) Air Quality Limit Values

Pollutant	EU Objective		Date to be achieved by
	Concentration	Measured as	
Benzene	5 μgm^{-3}	Annual mean	01/01/2010
Carbon monoxide (CO)	10 mgm^{-3}	Running 8-hour mean	01/01/2005
Lead (Pb)	0.5 μgm^{-3}	Annual mean	01/01/2005
Nitrogen dioxide (NO ₂)	200 μgm^{-3}	1-hour mean; not to be exceeded more than 18 times a year	01/01/2010
	40 μgm^{-3}	Annual mean	01/01/2010
Particles (PM ₁₀)	50 μgm^{-3}	24-hour mean; not to be exceeded more than 35 times a year	01/01/2005
	40 μgm^{-3}	Annual mean	01/01/2005
Sulphur dioxide (SO ₂)	350 μgm^{-3}	1-hour mean; not to be exceeded more than 24 times a year	01/01/2005
	125 μgm^{-3}	24-hour mean; not to be exceeded more than 3 times a year	01/01/2005

10.3 Methodology

10.3.1 Study Areas

10.3.1.1 Three main types of air quality assessment have been undertaken for the Scheme. These are a localised air quality assessment: construction and operational phases, generalised assessment and regional assessment. Each of the above assessment types has a specific study area as each study area has been derived using different criteria. The different assessment type study areas are discussed in Sections 10.2.1, 10.2.2 and 10.2.3.

Localised

Operational Assessment

10.3.1.2 The extent of the study area for the localised air quality assessment without additional widening Schemes (Section 1 only) is illustrated in Figure 10.1. The extent of the study area for the localised assessment with additional widening Schemes (cumulative) is illustrated in Figure 10.2. As shown in these figures, air quality effects are anticipated in areas which extend beyond the Scheme route, with and without additional widening Schemes. The main difference between the two localised assessment study areas is that in the scenarios with additional widening, Section 4 is included (Junctions 27 to 30).

10.3.1.3 The localised assessment study area will therefore be reported in four different sub-sections, as follows:

- sensitive receptors within the **Scheme** (between Junctions 16 and 23), including sensitive receptors on routes leading into/away from the Scheme
- sensitive receptors **South of the Scheme** (South of Junction 16)
- sensitive receptors **West of the Scheme** (West of Junction 16, M40 and Beaconsfield)
- sensitive receptors **East of the Scheme** (East of Junction 27). This includes a section of the M25 which is also anticipated to be widened in 2015 between Junctions 23 and 27 known as Section 5 and another section of the M25 also anticipated to be widened between Junctions 27 and 30 known as Section 4. Section 4 is anticipated to be widened and operational in 2012, which is the same opening year as the Section 1 Scheme. This extra widening scheme therefore increases the study area for the 'with additional widening schemes' in the opening year and 2015
- sensitive receptors affected by changes in traffic flows along Section 4 or routes adjoining Section 4 of the M25, due to the widening of both Sections 1 and 4 of the M25, will be considered in the forthcoming Section 4 Environmental Statement and Air Quality Technical Report

10.3.1.4 The localised study areas have been derived from the criteria matrix, shown in Diagram 1.1. The criteria matrix is based on traffic filters developed by

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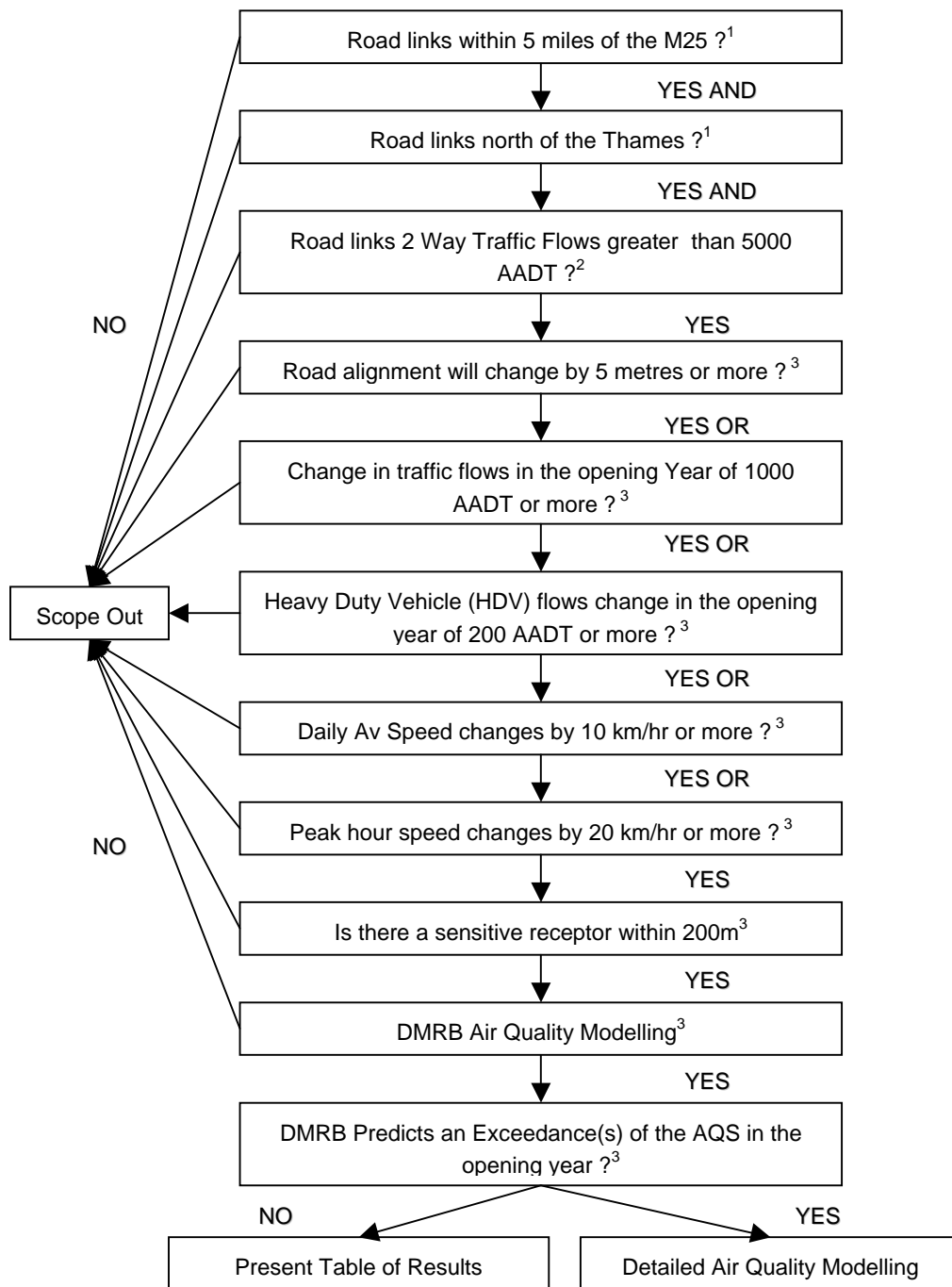
Hyder's traffic engineers and air quality criteria filters taken from DMRB Volume 11, Section 3, Part 1, HA207/07¹.

- 10.3.1.5 Where a particular road has been considered, the extent of the impact with respect to that road is considered to be limited to within 200 metres from the road centreline, in accordance with DMRB Volume 11, Section 3, Part 1, HA207/07¹. Further details of the localised operational assessment methodology are presented in Section 10.3.
- 10.3.1.6 Exceptions to the criteria matrix include detailed modelling of at least one worst case receptor for each Air Quality Management Area (AQMA) for NO₂ along the Scheme route (2004 and 2012 scenarios) and the detailed modelling of receptors at Holmesdale Tunnel and Bell Common Tunnel (2004, 2012 and 2015 scenarios). At the tunnel portals detailed modelling has been undertaken for NO₂ and PM₁₀.

Construction Assessment

- 10.3.1.7 During consultation on the draft Environmental Statement (ES), a number of questions were raised about the effects of traffic on surrounding roads during the construction of the widening between Junctions 16 to 23. The consultees included Statutory Environmental Bodies, Local Authorities, a couple of non-statutory bodies and the Parish Councils. An assessment of localised air quality has therefore been incorporated into the ES. The study area for the construction localised air quality assessment has been derived using the same traffic and air quality filters as those utilised to derive the localised construction air quality assessment study areas. The localised assessment study area for the construction phase is shown in Figure 10.3.
- 10.3.1.8 Further details of the localised construction assessment methodology are presented in Section 10.3.
- 10.3.1.9 An assessment of construction dust has also been undertaken for the Scheme on a junction-by-junction basis. Further details of the construction dust assessment methodology are presented in Section 10.3.

Diagram 10.1: Localised Air Quality Study Area scoping Criteria Matrix.



Footnotes:

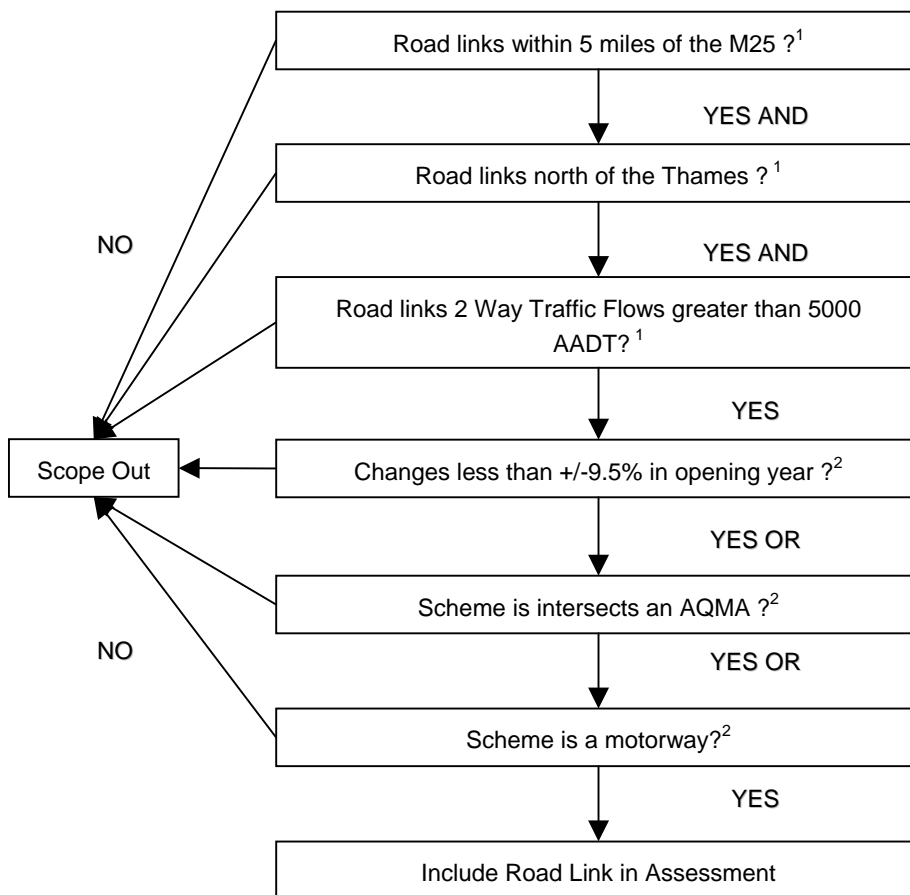
1. Criteria based on advice provided by Hyder's Transportation Engineers
2. Determined by the M25 HA Air Quality Group (Highways Agency, Hyder Consulting, Temple Group and Parsons Brinckerhoff)
3. Criteria based on guidance presented in DMRB Volume 11, Section 3, Part 1, HA207/07¹

Generalised Assessment

10.3.1.10 The extent of the study area for the generalised air quality assessment without additional widening Schemes is illustrated in Figure 10.4. The extent of the study area for the generalised assessment with additional widening Schemes is illustrated in Figure 10.5.

10.3.1.11 The generalised assessment study area is based on traffic filters provided by Hyder’s traffic engineers and the guidance presented in DMRB Vol 11 Section 3 Part 1 has been updated by HA 207/07¹. Further details of the generalised air quality assessment methodology are presented in Section 10.3.

Diagram 10.2: Generalised Air Quality Study Area scoping Criteria Matrix.



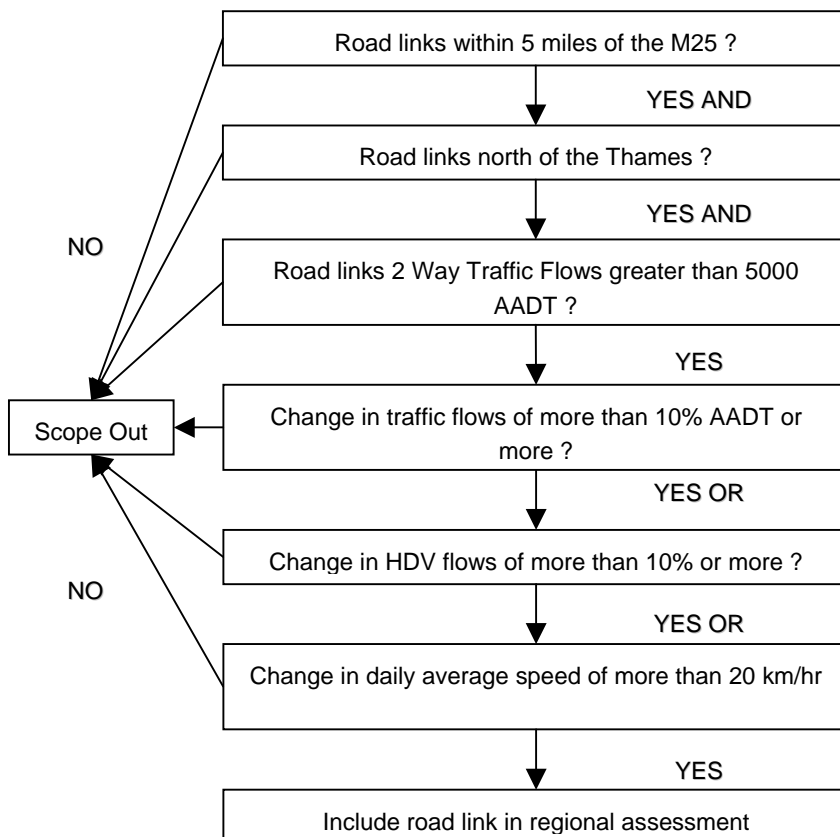
Footnotes:

1. Criteria based on advice provided by Hyder’s Transportation Engineers
2. Guidance presented DMRB Vol 11 Section 3 Part 1 has been updated by HA 207/07¹⁴

Regional Assessment

- 10.3.1.12 The extent of the study area for the regional air quality assessment (total emissions of CO, oxides of nitrogen, PM₁₀ and total hydrocarbons) without additional widening Schemes is illustrated in Figure 10.6. The extent of the study area for the regional assessment with additional widening Schemes is illustrated in Figure 10.7. The regional assessment study areas have been derived using traffic filters provided by Hyder’s traffic engineers and the guidance presented in DMRB Volume 11, Section 3, Part 1, HA207/07¹ (See Diagram 10.3).
- 10.3.1.13 The scoping criteria matrices have been applied to the Do-Minimum versus Do-Something scenarios in the opening year (2012), and also for 2021. All the regional assessment links identified in either year (2012 or 2021) have been assessed for both years. This was to ensure that a consistent study area between years was established and that no link with a change in one year, but not another, was captured. The same process was undertaken for the Do-Minimum versus Do-Something scenario with additional widening.
- 10.3.1.14 The regional assessment calculations have been undertaken using the DMRB regional spreadsheet. Changes in carbon emissions have been provided from the Transport User Benefit Appraisal (TUBA) software. Further details of the regional air quality assessment methodology are presented in Section 10.3.

Diagram 10.3: Regional Air Quality Study Area scoping Criteria Matrix.



10.3.2 Traffic Data

- 10.3.2.1 The air quality assessment was based on traffic data provided by Hyder Consulting's Transportation Team. The basis for the M25 Local Area Transport Model (LATM) was NAOMI, which was the current Highways Agency's road traffic assignment model. The NAOMI model has subsequently been developed into a model specifically for the M25. The M25 LATM used the SATURN suite of programmes to derive the traffic data. NAOMI has a network represented by a simulation area, buffer area and a skeletal network that covers the whole of Great Britain. The area covered by the SATURN simulation network includes the entire area within the M25 and an area roughly bounded by Luton, Reading, Guildford, Crawley, Maidstone, Chelmsford and Stansted. Inside the simulation area, all motorways, A and B roads, as well as important unclassified roads, have been included in the modelled network.
- 10.3.2.2 Traffic data was available for 2004, 2012, 2015 and 2021. Emission factors are only available for up to 2025 and so no air quality assessment was undertaken for 2030. No air quality localised assessment was undertaken on the 2021 traffic due to the improvements in DMRB pollutants emission rates which offset traffic growth over this period. The 2021 dataset was used for total or regional calculations.

10.3.3 Establishment of Baseline Conditions

10.3.3.1 The following was used to determine the existing conditions:

- Local Authority monitoring sites (Figure 10.8)
- Highways Agency routine monitoring sites (Figure 10.8)
- Highways Agency long term additional monitoring sites (Figure 10.8)
- Highways Agency M25 widening monitoring and transect sites (Figure 10.8)
- sensitive receptors, such as residential properties, hospitals, schools as defined in LAQM.TG(03)², were identified within 200 metres of the centre-line of the motorway (Figure 10.8)

10.3.4 Stages of the Assessment

10.3.4.1 The assessment of air quality included the following stages:

- the **Localised Assessment** estimated the pollutant concentrations at sensitive receptors most likely to be affected by the proposals, for the baseline year (2004) and opening year (2012). In the opening year, three scenarios were assessed: one without the Scheme (Do-Minimum Scenario), one with the Scheme (Do-Something Scenario) and lastly a scenario with Section 4 widened (Junctions 27 – 30) in addition to Section 1
- a localised assessment has also been undertaken for an additional assessment year (2015). Three 2015 scenarios were assessed including one without the Scheme (Do-Minimum Scenario), one with the Scheme (Do-Something Scenario) and lastly a scenario with Section 2 (Junctions 5 – 7), Section 3 (Junctions 1b – 3), Section 4 (Junctions 27 – 30) and Section 5 (Junctions 23 – 27) widened in addition to Section 1. These assessments were undertaken to

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confirm that the opening year was the worst case for air quality and to provide an assessment of cumulative effects with all Sections of the M25 widened

- the localised assessments for the baseline year and opening years have been undertaken using either the DMRB spreadsheet and detailed modelling at some receptors using Atmospheric Dispersion Modelling System (ADMS) Roads. Sensitive receptors that have been modelled for NO₂ using ADMS-Roads are identified in results tables by bold text
- a localised assessment has also been undertaken for the construction phase using the DMRB air quality spreadsheet model for 2010
- the **Generalised Assessment** estimated the overall change in exposure at properties up to 200 metres from the road centreline to concentrations of the key traffic related pollutants nitrogen dioxide (NO₂) and particles (PM₁₀) in the Scheme opening year (2012) Do-Minimum vs. Do-Something. A second generalised assessed has also been undertaken for the Do-Minimum versus the scenario with Sections 1 and 4 widened
- the **Regional Assessment and Climate Change** (2004, 2012 and 2021) considered the overall effects in terms of the change in total emissions resulting from the Scheme (Do-Something Scenario), as compared with the Do-Minimum alternative i.e. the net increase or decrease in pollution levels. Regional assessment calculations have also been undertaken for Scenarios in 2012 with Section 1 and 4 widened and in 2021 with Sections 2 (Junctions 5 - 7), 3 (Junctions 1b – 3), 4 (Junctions 27 – 30) and 5 (Junctions 23 – 27) to calculate cumulative regional emissions. Changes in carbon have been calculated from the Transport User Benefit Appraisal (TUBA) software.

10.3.4.2 The pollutants assessed at each stage of the assessment are presented in Table 10.3.

Table 10.3 Summary of Pollutants Modelled for Each Scenario

	Localised assessment	Generalised assessment	Regional assessment
Benzene ⁽¹⁾	✓	Not Required	Not Required
1,3-Butadiene ⁽¹⁾	✓	Not Required	Not Required
CO ⁽¹⁾	✓	Not Required	✓
PM ₁₀	✓	✓	✓
NO ₂ ⁽²⁾	✓	✓	Not Required
NO _x	Not Required	Not Required	✓
Total Hydrocarbons	Not Required	Not Required	✓
Carbon	Not Required	Not Required	TUBA Model
Results compared with AQS	✓	Not Required	Not Required

N

Note 1: The DMRB Pollutants with the exceptions of NO₂ and PM₁₀ were modelled using the DMRB air quality model.

Note 2: Detailed modelling was undertaken for worst case receptors in the AQMAs for the baseline scenario and opening year scenarios along scheme route for NO₂ and for NO₂ and PM₁₀ for Holmesdale and Bell Common Tunnels for NO₂ and PM₁₀.

10.3.5 Background Concentrations

- 10.3.5.1 Localised air quality modelling (DMRB Air Quality Spreadsheet and ADMS-Roads) was undertaken to predict total pollutant concentrations at sensitive receptors. Total pollutant concentrations are the road source pollutant contribution combined with a background pollutant concentration. A background site has therefore been selected that has not been influenced by the road source under consideration, to avoid any double counting of pollutant concentrations.
- 10.3.5.2 The background site selected for the air quality assessment is a diffusion tube located in Watford Borough Councils area at Grid Reference 511000, 200700. The diffusion tube data has been bias adjusted using the University of the West of England (UWE) bias adjustment factors⁵. Background maps for the two squares around the site described above have been averaged to provide the concentrations of the additional DMRB pollutants (Grid References: 511500, 200500 and 510500, 200500).
- 10.3.5.3 Scaling factors defined in LAQM.TG(03)² were used to scale the data from 2004 to 2021 to provide a complete set of background data for use in this assessment (Table 10.4).

Table 10.4 Background Pollutant Concentrations used in DMRB and ADMS-Roads Modelling

Pollutant	Year			
	2004	2010	2012	2015
Benzene $\mu\text{g}/\text{m}^3$	0.5	0.3	0.4	0.3
1,3-Butadiene $\mu\text{g}/\text{m}^3$	0.2	0.2	0.1	0.1
Carbon monoxide mg/m^3	0.3	0.1	0.1	0.1
Oxides of nitrogen $\mu\text{g}/\text{m}^3$	39.1	30.6	28.8	27.3
Nitrogen dioxide $\mu\text{g}/\text{m}^3$	24.1	20.7	20.0	19.4
Particles (PM_{10}) $\mu\text{g}/\text{m}^3$	24.1	22.3	21.9	21.4
2° PM_{10} $\mu\text{g}/\text{m}^3$	11.1	9.5	9.2	8.7

10.3.6 Localised Assessment

- 10.3.6.1 Where necessary (as defined by the scoping criteria matrix Diagram 10.1) the localised assessment has been undertaken at two levels for the different scenarios outlined in Section 10.1.1:

DMRB Air Quality Modelling

- 10.3.6.2 DMRB air quality modelling is a screening assessment of roadside air quality concentrations (up to 200 metres from the highway centreline) used to identify potential areas of pollutant exceedances. The distances of each sensitive receptor from the centre of each road under consideration were measured for each scenario. The concentrations of benzene, 1,3-butadiene, carbon monoxide (CO) and particulates (PM_{10}) were calculated at identified local sensitive receptors (See Figure 10.8). The

background concentrations were entered into the DMRB model and the results were calculated and compared with the AQS objectives or EU Limit Values as appropriate. DMRB Spreadsheet inputs are presented in Appendix D of the Technical Report³. The same methodology has been adopted for both construction and operational phases.

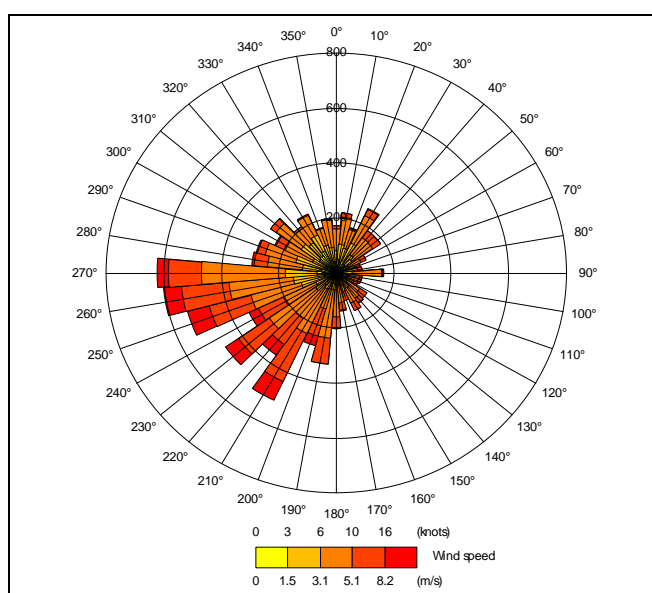
Detailed Air Quality Modelling

10.3.6.3 Detailed modelling was undertaken with the advanced dispersion model ADMS-Roads modelling package, as required by the scoping criteria matrix. Pollutant concentrations were calculated at worst case sensitive receptors. Predictions for NO₂ undertaken using ADMS-Roads are identified in results tables by bold text. A description of some of the main elements of the detailed modelling is provided below:

- the latest emission and vehicle profiles presented on the National Atmospheric Emissions Inventory (NAEI) website⁶ were used to generate a series of standard emission factor profiles
- a sensitive receptor height of 1.5 metres was used to best represent the average respirable height
- the morning (AM), inter peak (IP), evening (PM) and off peak (OP) traffic flows are represented in the ADMS Roads air quality model through the use of the 'Time Varying Emission Profile' (TVEP). Each of the digitised roads is quadrupled to represent the AM, IP, PM and OP traffic profile. The emission profiles for the various time frames are then applied. The TVEP is then created to switch on the AM, IP, PM and OP to corresponding time frames and to utilise emission associated with each period of the day. The same profile used for a weekday is applied to the weekend
- queues have been incorporated in the detailed assessment as queuing traffic is anticipated to have higher emissions than free flowing traffic, thus the inclusion of queuing traffic should allow a more realistic emissions profile to be described and create a more accurate model of ambient air pollutant concentrations. Queues have been digitised into the model where traffic data indicates that a queue of greater than or equal to 10 metres is predicted along a road. Queues of less than 10 metres were omitted from the model as this is the grid resolution of the detailed model. Queues have been included in the model in the morning, inter-peak and evening periods. No queue data was provided for the off peak as traffic is assumed to be free flowing. Where a queue has been digitised a minimum speed of 5 km/h has been assigned to the flow speed
- meteorological data from Heathrow Airport⁷, which is the nearest suitable data source for 2004, was used in the assessment. The wind rose for Heathrow is presented in Diagram 10.4. The predominant wind direction is from the south to westerly quadrant and is associated with the highest wind speeds. There is a low occurrence of wind from any other direction. Where wind does occur, it is associated with low wind speeds
- the modelled NO_x concentrations were converted to NO₂ using the methodology defined in LAQM.TG(03)²
- the model annual average NO₂ concentrations for the baseline year 2004, were compared against monitoring data along the M25 as discussed in Section 4 to verify the model output. This verification allows model predictions to be corrected against monitoring data. This is sometimes necessary if the DMRB

model or ADMS-Roads model over or under predicts pollutant concentrations. For example, in the DMRB air quality model it is assumed that sensitive receptors and road sources are at the same height. Clearly this situation does not always exist, especially in the vicinity of motorways, which are often in cuttings or are elevated. In situations where sensitive receptors are in the vicinity of elevated sections of motorway the model may over predict pollutant concentrations and hence predicted concentrations should be reduced. As only NO₂ monitoring data is widely available in the study area, it is assumed that all other pollutants require the same adjustment to correct the DMRB predictions. Details of the verification procedure are presented in the Technical Report

Diagram 10.4: Heathrow Airport Wind Rose (2004)⁷



10.3.7 Generalised Air Quality Assessment

- 10.3.7.1 For the generalised assessment of air quality, the overall change in people's exposure to concentrations of NO₂ and PM₁₀ has been estimated. These pollutants are considered to be of particular concern with respect to compliance with the Air Quality Strategy objectives.
- 10.3.7.2 The relative exposure of sensitive receptors to the predicted change in air quality arising from the Scheme was assessed using the methodology defined in DMRB Vol 11 Section 3 Part 1 has been updated by HA 207/07¹.
- 10.3.7.3 Properties were counted in 50 metre bands from the road centre for both the Do-Minimum and Do-Something scenarios. Pollutant concentrations were calculated using the DMRB screening method at 20 metres, 70 metres, 115 metres and 175 metres from the road centre for the Do-Minimum and Do-Something scenarios (these are default distances). The total exposure to each pollutant was calculated for the Do-Minimum and Do-Something by multiplying the concentration within each band by the number of properties within the corresponding band. The assessment values for each band were

then aggregated to produce an overall assessment score for the Do-Minimum and the Do-Something, respectively.

10.3.7.4 The overall Do-Minimum score was then subtracted from the Do-Something score to give the change in exposure due to the Scheme. A positive number denotes an increase in concentrations due to the Scheme, i.e. deterioration in air quality, and a negative number a decrease in concentrations due to the Scheme, i.e. an improvement in air quality. Air quality change identified in the generalised assessment was due to differences in road traffic characteristics between the opening year Do-Minimum and Do-Something scenarios, rather than any changes in emission factors, as the assessment compares scenarios in a single year.

10.3.8 Regional Air Quality Assessment and Climate Change

10.3.8.1 The DMRB assessment of the contribution of the Scheme to regional air quality was based on the total annual emission of pollutants over the road network. The methodology for the regional assessment considered the following pollutants:

- CO
- NO_x
- total hydrocarbons
- PM₁₀

10.3.8.2 The regional assessment calculations have been undertaken using the DMRB regional spreadsheet. The DMRB regional assessment calculation used the traffic characteristics and road length for each road in the study area, that has been defined using the criteria matrix (Diagram 10.3).

10.3.8.3 Changes in carbon emissions have been provided from the Transport User Benefit Appraisal (TUBA) software.

10.3.9 Construction Dust

10.3.9.1 The assessment of the effect of construction activities on air quality has been based on an amendment to the requirements of DMRB Volume 11, Section 3, Part 3¹.

10.3.9.2 An assessment of construction dust has been undertaken for the Scheme in accordance with Draft London Best Practice Guide⁴ and DMRB Volume 11, Section 3, Part 1, HA207/07¹. In the Draft London Best Practice Guide this assessment is known as an Air Pollution Risk Assessment (APRA). The risk assessment applies to all proposed construction activities, including site clearing, demolition and construction phases. The draft guidance has been finalised but without the scoring mechanism used to assess the scheme. The scoring mechanism provides a mechanism for establishing risk levels associated with sites and therefore the scoring mechanism from draft guidance has been retained.

10.3.9.3 The APRA focuses on the area surrounding a construction site and the proposed site activities, which are likely to impact local air quality and management of the construction site. In the APRA sensitive receptors adjacent to the site and potential air polluting activities on the site are identified and allocated a score.

10.3.9.4 The APRA has 3 sections: Surrounding Environment, Development of the Site and Construction Activities. In each section a series of questions are posed and scores credited. The final scores of each section are then collated to evaluate the overall risk for that particular site (i.e. High Risk, Medium Risk and Low Risk). The score sheet is based on DEFRA's risk assessment for polluting industries.

10.4 Baseline Conditions

10.4.1 Introduction

10.4.1.1 The existing air quality conditions throughout the Scheme are discussed on a junction-by-junction basis. Whilst existing air quality conditions outside of the Scheme are discussed as follows:

- **South of the Scheme** (South of Junction 16)
- **West of the Scheme** (East of Junction 16, M40 and Beaconsfield)
- Sensitive Receptors **East of the Scheme** (East of Junction 27). This includes two sections of the M25 which are also anticipated to be widened. Baseline conditions for Section 4 (Junctions 27 to 30) will be presented in the forthcoming Section 4 Environmental Statement and Air Quality Technical Report

10.4.1.2 This review includes the identification of AQMAs and air quality monitoring data. The location of AQMAs and continuous and passive NO₂ diffusion tubes and are shown on Figure 10.8.

10.4.1.3 A complete discussion of air quality baseline conditions can be found within the Technical Report.

10.4.2 Air Quality Management Areas (AQMAs)

10.4.2.1 Part IV of the Environment Act 1995⁸ sets out the principles of local air quality management and includes provision for a national Air Quality Strategy (AQS). It is a requirement of the Act that local authorities review current and future air quality within the authority's area, and assess whether air quality standards and objectives are being achieved or are likely to be achieved. Where it is anticipated that an air quality objective will not be met, it is a requirement of the Act that an Air Quality Management Area (AQMA) be declared. Where an AQMA is declared, the local authority is obliged to produce an Action Plan in pursuit of the achievement of the air quality objectives.

10.4.2.2 The location of the AQMAs within the study area are shown on Figure 10.8. There are a total of eight AQMAs listed within the study area for the Scheme. These are:

- one AQMA for NO₂ between Junctions 16 and 17 extends approximately 45 metres either side of the motorway (South Buckinghamshire AQMA)
- one AQMA for NO₂ and PM₁₀ between Junctions 17 and 18, which is primarily situated at Junction 18 (Three Rivers DC, Chorleywood AQMA) extends approximately 74 metres either side of the motorway

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- two AQMAs between Junctions 18 and 19 declared for NO₂ and PM₁₀: one is the extension of the Three Rivers DC, Chorleywood AQMA and the second is at Chandlers Cross (Three Rivers DC)
- one AQMA for NO₂ has been identified between Junctions 20 to 21 known as The Retreat (Three Rivers DC)
- two AQMAs for NO₂ between Junctions 21a and 22 (St Albans AQMA No. 2 and No. 7)
- one AQMA for NO₂ between Junctions 22 to 23 located at Blanche Lane (Hertsmere BC AQMA No. 3)

10.4.2.3 There are a total of four AQMAs listed within the study area for the study area **South of the Scheme**:

- South Buckinghamshire District Council have declared an AQMA for NO₂ between Junctions 16 and 15. The AQMA extends approximately 50 metres from the M40
- London Borough of Hillingdon have declared an AQMA for NO₂ for the entire borough. This encompasses the M25 between Junctions 15 and 14.
- Spelthorne Borough Council have declared an AQMA for NO₂ for the entire borough, which extends from Junction 14 to approximately 250 metres south of Junction 13
- Runnymede Borough Council have declared an AQMA for NO₂ and PM₁₀ that extends approximately 30 metres from the M25 for the entire length of the M25 within their borough (starting at the edge of Runnymede and new Runnymede bridges)

10.4.2.4 There is one AQMA listed within the study area for the study area **West of the scheme** declared by South Buckinghamshire for NO₂.

10.4.2.5 There are a total of five AQMAs listed within the study area for the study area **East of the scheme**. These are:

- there are two AQMAs for NO₂ within close proximity to the M25 between Junctions 23 and 24 (Hertsmere AQMA No. 1 and No. 2)
- the whole of the Enfield area was declared as an AQMA on 27 February 2001 for both NO₂ and PM₁₀. Consequently there is an extensive AQMA located between Junctions 24 and 25 to the south of the M25
- Borough of Broxbourne has declared three AQMAs within its Borough and two of these AQMAs are located between Junctions 25 to 26 (Broxbourne AQMA No. 1 and No. 2)

10.4.2.6 AQMA designations for Section 4 (Junctions 27 to 30) will be discussed within the forthcoming Section 4 Air Quality Technical Report.

10.4.3 Local Air Quality

- 10.4.3.1 The Highways Agency and local authorities carry out continuous air monitoring throughout the study area using passive NO₂ diffusion tubes. There is also a continuous monitoring station located in Tatling End, monitoring for NO_x, NO₂ and PM₁₀. The locations of these monitoring sites are shown on Figure 10.8.
- 10.4.3.2 The concentrations of NO₂ presented from diffusion tubes are reported as unadjusted concentrations and also as bias adjusted concentrations. The bias adjustment factors used are those presented on the UWE LAQM web-page⁵. The UWE bias adjustment factors are derived from a wide range of co-location studies and as such are considered to be a robust bias adjustment.
- 10.4.3.3 The monitoring results for NO_x, NO₂ and PM₁₀ at the continuous monitoring location are shown in Table 10.5, 10.6 and 10.7 and indicate that the annual average NO₂ Air Quality Objective (40 µg/m³) was exceeded with respect to NO₂ in 2004.
- 10.4.3.4 The monitoring results for NO₂ at the diffusion tube locations are shown in Table 10.8 and indicate that the annual average NO₂ Air Quality Objective (40 µg/m³) was exceeded with respect to NO₂ in 2004 at ten locations. Where the concentration is accompanied by a figure in brackets this indicates the number of months of data available.
- 10.4.3.5 The information presented below represents data available from Highways Agency and local authority monitoring in 2004. Additional diffusion tubes have been deployed on behalf of the HA since 2004, and monitoring results are presented in the Air Quality Technical Report³.

Table 10.5: Continuous Monitoring Results Tatling End

Year	Annual Average NO _x (µg/m ³)	Annual Average NO ₂ (µg/m ³)	Annual Average PM ₁₀ (µg/m ³)
2004	85.9	40.5	23.2

Table 10.6: Continuous Monitoring Results Three Rivers DC Background site between Junctions 18 to 19

Year	Annual Average NO ₂ (µg/m ³)	Annual Average PM ₁₀ (µg/m ³)
2004	37	19

Table 10.7: Continuous Monitoring Results Watford Roadside site between Junctions 18 to 19

Year	Annual Average NO ₂ (µg/m ³)	Annual Average PM ₁₀ (µg/m ³)
2004	38	25

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Table 10.8: Local Authority and Routine HA Diffusion Tube Results

Authority Area	Location Code	Location Description	Within 500 metres of M25	2004 Annual Average Bias Corrected NO ₂ (µg/m ³)	2004 Annual Average Raw NO ₂ (µg/m ³)
South Bucks	N/A	Gerrards Cross, Tatling End	Yes	41.3	48.6
South Bucks	N/A	Air Quality Monitoring Station, Gerrards Cross (Diffusion Tube)	Yes	44.5	52.4
Three Rivers	TR05	Hornhill Road, Maple Cross, Rickmansworth	No	30.8 (9)	34.6 (9)
South Bucks	South Bucks 4	Alderbourne Cottage (Next to Junction 16 M25)	Yes	33.7	37.9
South Bucks	South Bucks 5	Highfield, Oxford Road	Yes	35.5	39.9
South Bucks	South Bucks 6	Isle of Wight Farm	Yes	42.2	47.4
Three Rivers	T1	Bircham Cottage	Yes	34.5	34.5
Three Rivers	TR11	The Queens Drive, Mill End	Yes	41.4 (7)	42.9 (7)
Three Rivers	TR12	Rectory Road	No	32.4	36.4 (10)
Three Rivers	TR13	Junction 18, M25	Yes	52.7	59.2
Three Rivers	TR15	Chandlers Cross	Yes	30.1 (11)	33.9 (11)
Three Rivers	Three Rivers 1	6 High View	Yes	35.1	39.4
Watford	WF02	Grove Pumping Station, Hempstead Road	No	18.0	20.2
Dacorum	DC38	Plough Roundabout	No	58.8	71.2
Dacorum	DC39	Bennetts End Roundabout	No	56.0	67.8
Dacorum	DC54	Watford Road, Kings Langley	Yes	44.4 (7)	43.0 (7)
Three Rivers	TR16	The Retreat, Abbots Langley	Yes	32.5 (10)	36.5 (10)

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Authority Area	Location Code	Location Description	Within 500 metres of M25	2004 Annual Average Bias Corrected NO ₂ (µg/m ³)	2004 Annual Average Raw NO ₂ (µg/m ³)
Dacorum	DC55	High Street, Kings Langley	No	32.8 (7)	31.8 (7)
Three Rivers	TR08	High Street, Abbots Langley	No	31.4	35.3
St Albans	SA22	Lybury Lane	Yes	37.9 (10)	40.3 (10)
St Albans	SA25	Searches Farm	No	31.3	33.7
Three Rivers	T2	Station Road	Yes	31.7	31.7
St Albans	SA06	Ridgeview Hostel, Barnet Road, London Colney	Yes	31.3	33.7
St Albans	SA07	Waterdale, Bricket Wood	No	39.3	42.3
St Albans	SA12	Ashridge Drive, Bricket Wood	No	26.2	28.2
St Albans	SA21	Lye Lane, Bricket Wood	Yes	33.5	36.0
St Albans	SA26	Oakwood Road	Yes	33.0 (9)	35.1 (9)
St Albans	SA27	Five Acres Avenue, Bricket Wood	Yes	28.1	30.2
St Albans	SA29	Meadow Close, Bricket Wood	Yes	30.8	33.1
St Albans	SA30	Smug Oak Lane	Yes	40.8	43.9
St Albans	SA31	Radlett Road	Yes	40.0	43.0
Hertsmere	HM22 (Formerly HM32)	Bell Lane, London Colney	Yes	44.0	48.4
St Albans	St Albans 1	Moor Mill Lane	Yes	39.4 (11)	48.3 (11)
St Albans	St Albans 2	Smug Oak Lane	Yes	45.1	50.7
Hertsmere	HM18	Blanche Lane, South Mimms	Yes	49.1 (11)	54.0 (11)
Hertsmere	T3	Salisbury Cottage	Yes	35.8	35.8
Hertsmere	T4	Dell Grove (Background)	No	18.7	18.7
Notes:					
() indicates the number of month of data available					

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10.4.4 South of the Scheme

10.4.4.1 Nine NO₂ diffusion tube locations were identified south of the Scheme within 500 metres of the M25 (Table 10.9). One of the diffusion tube locations exceeds the annual average AQS of 40 µg/m³ (RY6).

Table 10.9: Diffusion tube monitoring sites south of the Scheme

Local Authority	Location Code	Junctions	Within 500m of M25	2004 Annual Average Bias Corrected NO ₂ (µg/m ³)	2004 Annual Average Raw NO ₂ (µg/m ³)
Runnymede BC	RY6	12 to 13	Yes	40.7	33.6
Spelthorne BC	SP24	13 to 14	Yes	28.5	23.6
Spelthorne BC	SP30	13 to 14	Yes	26.4	21.8
Slough BC	24 Slough	14 to 15	Yes	37.0	33.0
South Bucks	1	15 to 16	Yes	30.1	35.4 (11)
South Bucks	2	15 to 16	Yes	35.9	42.2
South Bucks	4	15 to 16	Yes	34.1	40.2
South Bucks*	South Bucks 1	15 to 16	Yes	36.0	40.4
South Bucks*	South Bucks 2	15 to 16	Yes	30.0	33.7

*Highways Agency Routine Monitoring Location (30 March 2004 to 30 March 2005)

10.4.4.2 A continuous monitoring station is also located at Junction 13/14 of the M25. This station monitors for PM₁₀, PM_{2.5}, NO₂, CO, SO₂ and O₃. The pollutants emitted by vehicles monitored in 2004 are listed in Table 4.27. This is a kerbside monitoring location and EU Limit Values and Objectives do not apply in these locations as there is not relevant exposure. The data is presented to indicate kerbside conditions in this part of the M25. The number of times 200 µg/m³ or more NO₂ was monitored in 2004 was exceptional with no occurrences in either 2003 or 2005.

Table 10.10: Continuous Monitoring Results Junction 13/14

Year	Max daily running 8 hour mean CO (ppm)	Annual Average NO ₂ (µg/m ³)	1 hour 200 µg/m ³ exceedances	Annual Average PM ₁₀ (µg/m ³)	Number of 24 hour exceedances
2004	1.51	55.9	21	28.0	19

10.4.5 West of the Scheme

10.4.5.1 No monitoring data was identified between the M25 Junction 16 (M40 Junction 1a) and Junction 2 of the M40.

10.4.6 East of Scheme (Junctions 23 to 27)

10.4.6.1 The monitoring results for NO_x, NO₂ and PM₁₀ at the continuous monitoring location are shown in Table 10.11 and indicate that the annual average NO₂ Air Quality Objective (40 µg/m³) was exceeded with respect to NO₂ in 2004.

10.4.6.2 The monitoring results for NO₂ at the diffusion tube locations are shown in Table 10.12 and indicate that the annual average NO₂ Air Quality Objective (40 µg/m³) was exceeded with respect to NO₂ in 2004 at thirty locations. Additional diffusion tubes have also been deployed along the Scheme route on behalf of the HA. The results of these tubes are discussed in the Air Quality Technical Report.

Table 10.11: Continuous Monitoring Results Arlington Crescent

Year	Annual Average NO ₂ (µg/m ³)	Annual Average PM ₁₀ (µg/m ³)
2004	46	26

Table 10.12: Local Authority and Routine HA Diffusion Tube Results

Authority Area	Location Code	Location Description	Within 500 metres of M25	Baseline Year Annual Average Bias Corrected NO ₂ (µg/m ³)	Baseline Year Annual Average Raw NO ₂ (µg/m ³)
Hertsmere	HM22	South Mimms Services M25	Yes	35.7	39.2
Hertsmere	HM21	Dove Lane, Potters Bar	Yes	40.0 (11)	43.9 (11)
Hertsmere	HM26	Park Ave, Potters Bar	Yes	37.9	41.7
Enfield	8	Bullsmoor Lane	Yes	44.0	49.4
Broxbourne	BB05	22 Arlington Crescent, Waltham Cross	Yes	76.3	69.4
Broxbourne	BB10	Theresa Gardens, Waltham Cross	Yes	42.8	38.9
Broxbourne	BB11	High St, Waltham Cross	Yes	47.8	43.5
Broxbourne	BB13* (38)	Arlington Crescent (Co-located with Continuous Monitor)	Yes	46.7	51.4
Broxbourne	BB14* (39)	Arlington Crescent (Co-located with Continuous Monitor)	Yes	43.3	47.6

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Authority Area	Location Code	Location Description	Within 500 metres of M25	Baseline Year Annual Average Bias Corrected NO ₂ (µg/m ³)	Baseline Year Annual Average Raw NO ₂ (µg/m ³)
Broxbourne	BB15* (40)	Arlington Crescent (Co-located with Continuous Monitor)	Yes	45.0	49.5
Broxbourne	BB17	Parkside, Waltham Cross	Yes	46.9 (9)	42.7(9)
Broxbourne	BB21	36 Eleanor Cross Rd, Waltham Cross	Yes	59.7(7)	54.3(7)
Broxbourne	BB24	Winston Churchill, Junction of High St and Cheshunt Rd, Waltham Cross	No	46.8(11)	42.5(11)
Epping Forest	6	75 Roundhills, Waltham Abbey	Yes	38.5	35.0
Epping Forest	7	M25, Waltham Abbey	Yes	42.3	38.5
Epping Forest	29	A121 Waltham Abbey	Yes	47.4	43.1
Epping Forest	30	A121 Waltham Abbey	Yes	56.3	51.2
Epping Forest	45	Waltham Abbey Link Rd, Burrows Chase	Yes	31.5	28.6
Epping Forest	46	Waltham Abbey Link Rd, Burrows Chase	Yes	32.2	29.3
Enfield	Enfield 1	153 Holmesdale	Yes	40.5	45.5
Enfield	Enfield 2	Westgate Court	Yes	62.2	69.9
Broxbourne	Broxbourne 1	33 to 36 Teresa Gardens	Yes	42.6	47.9
Broxbourne	Broxbourne 2	PNG Motors, High Street, Waltham Cross	Yes	52.9	59.4
Broxbourne	Broxbourne 3	PNG Motors, High Street, Waltham Cross	Yes	51.4	57.8
Broxbourne	Broxbourne 4	PNG Motors, High Street, Waltham Cross	Yes	52.4	58.9

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Authority Area	Location Code	Location Description	Within 500 metres of M25	Baseline Year Annual Average Bias Corrected NO ₂ (µg/m ³)	Baseline Year Annual Average Raw NO ₂ (µg/m ³)
Broxbourne	Broxbourne 5	Arlington Crescent	Yes	82.3	92.5
Epping Forest	Epping 2	Skillet Hill Farm Cottages	Yes	51.5	57.9
Epping Forest	Epping 3	9 Gilsand	Yes	37.6	42.2
Epping Forest	Epping 4	2 Lodge Lane	Yes	46.0	51.7
Epping Forest	5	Woodbine Close Park (Co-located tube with 24)	Yes	40.5	36.8
Epping Forest	21	Ivy Chimneys Road, Near to M25 (Co-located tube with 23)	Yes	44.9	40.9
Epping Forest	23	Ivy Chimneys Road, Near to M25	Yes	43.7	39.7
Epping Forest	24	Woodbine Close Park, closest receptor to M25.	Yes	41.8	38.0
Epping Forest	31	Woodbine Close Park (near to M25)	Yes	40.8	37.1
Epping Forest	32	Woodbine Close Park (near to M25)	Yes	33.9	30.8
Epping Forest	33	Woodbine Close Park (near A121)	Yes	33.8	30.8
Epping Forest	Epping 1	Woodbine Close	Yes	45.7	51.4
Epping Forest	Epping 5	Ivy Chimneys Rd, Epping	Yes	42.9	48.2
Epping Forest	Epping 6	Garnsih Hall M11/M25	Yes	36.8	41.3
Notes: () indicates the number of month of data available					

10.4.7 Section 4 Junctions 27 to 30

10.4.7.1 Baseline Conditions for Section 4 (Junctions 27 – 30) of the M25 will be presented in the forthcoming Section 4 Air Quality Technical Report.

10.5 Design and Mitigation

10.5.1 Construction

10.5.1.1 During construction, dust may be generated both during stripping and excavation, once the bare soil is exposed. Potential dust related impacts include hazards to health, damage to property or nuisance to dwellings or other sensitive receptors, such as flora and fauna.

10.5.1.2 A range of mitigation measures would be included in the Construction Environmental Management Plan to minimise the impacts of airborne dust. The best practice measures identified in the draft London guidance on the control of dust would be applied for low, medium and high risk sites. The assessment of construction/demolition activities in the above guidance, known as an Air Pollution Risk Assessment (APRA) has been undertaken on a junction-by-junction basis in the Technical Report. This assessment of the potential for construction dust impacts on sensitive receptors showed that the following mitigation measures for medium risk construction sites would be required:

- carry out main dust causing activity in spring / autumn
- plan site layout–locate dust activity away from sensitive receptors
- erect solid barriers to site boundary
- no bonfires
- all site personnel to be fully trained
- identify responsible person in charge
- hard landscape site haul routes
- construction Traffic
- all vehicles to switch off engines – no idling vehicles
- wheel washing on leaving site
- all loads leaving site to be covered
- no site runoff of water / mud
- all off-road vehicles to use ULSD where available
- on-road vehicles to comply with LEZ requirements as a minimum
- use enclosed chutes and covered skips
- wrap building to be demolished

- cutting equipment to use water as suppressant or suitable LEV
- minimise dust-generating activities on dry or windy days
- use water as dust suppressant where applicable
- cover dusty stockpiles

10.5.2 Operation

10.5.2.1 Since the Scheme is within Secretary of State land, it is not possible to move the road away from a sensitive receptor as a means of mitigation. Other measures, which may mitigate air quality, include dense vegetation and/or Environmental Barriers (e.g. WS Atkins 2001⁹) which have been implemented along some sections of the Scheme where the design permits.

10.6 Assessment of Effects

10.6.1.1 A complete assessment of effects is presented in the Technical Report.

10.6.2 Construction

10.6.2.1 Potential construction impacts would arise from:

- traffic diversions and rat running
- slow moving traffic over the construction period (40 mph speed limit)
- additional HGV movements
- dust from construction activities

10.6.3 Construction Traffic

10.6.3.1 Traffic management would be the responsibility of the DBFO Contractor, therefore only general assumptions can be made in this report. However, it is assumed that during peak times, with speed restrictions, three lanes would be operational at 40 mph. As such, the possibility for traffic re-routing around the construction as been assessed using the DMRB air quality spreadsheet model.

10.6.3.2 The sensitive receptors predicted to have a worsening in air quality as a result of traffic re-routing have been verified against monitoring data where available. The same verification factors as utilised in the operational assessment have been utilised in the verification for the operational assessment. The results predict that there would not be exceedances of either AQS or EU Limit Values at the majority of sensitive receptors. At sensitive receptor R323 in Hemel Hempstead the annual average EU Limit Value for NO₂ is predicted to be exceeded and a worsening of 0.4 µg/m³ is predicted during construction. Also in Hemel Hempstead sensitive receptor R322 is predicted to exceed both the NO₂ annual average EU Limit Value and also the 24 hour mean PM₁₀ EU Limit Value. However, during the construction period an improvement in air quality is predicted at R322 (e.g. 0.4 µg/m³ reduction of NO₂ concentrations). The above predictions are based on conservative verification factors of 3.7 and 3.3 for R323 and

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322. The factors used are high because the monitoring available in the vicinity of the receptors is located new to roundabouts where there is likely to be slowing and accelerating and possibly congestion which will not be in the air quality DMRB model.

10.6.3.3 Traffic Management would be the responsibility of the DBFO Contractor and only general assumptions can be made here. Three lanes would be operational during peak times with speed restrictions. It has been estimated that as a worst case up to an additional 150 HGV movements per day would be required during the construction period. The routes of these HGVs is not known and would depend on the phasing of the works. However, the M25 is anticipated to be the primary route for the additional HGVs and in the relation to typical daily HGV flows on the M25 of approximately 15,000 HGVs, this additional flow is considered unlikely to be discernable with respect to its impact on air quality. Furthermore, screening calculations utilising the DMRB air quality model suggests that an additional 150 HGVs would not cause an exceedance of the NO₂ annual average EU Limit Value at the DMRB sensitive receptors (shown in Figure 10.3). Additionally, where practicable HGV routes would be selected to avoid air quality management areas.

10.6.3.4 An assessment of the potential for construction dust impacts on sensitive receptors in accordance with Draft London Best Practice Guide⁴ indicated that the Scheme had a medium risk score. With the implementation of mitigation measures for medium risk construction sites detailed above the effect of the Scheme during construction would be neutral.

10.6.4 Operation

Localised Assessment Summary

10.6.4.1 Concentrations of carbon monoxide, benzene, 1,3-butadiene, NO₂ and PM₁₀ were modelled at one hundred and twenty eight sensitive receptors for the scenarios. These receptors are shown on Figure 10.8. A localised assessment of Section 4 (Junctions 27 – 30) with and without additional widening will be presented in the forthcoming Section 4 Environmental Statement and Technical report for Air Quality.

10.6.4.2 NO₂ concentrations were modelled using either DMRB air quality spreadsheet model or ADMS-Roads, an advanced air quality dispersion model, for the baseline year (2004) and the opening year (2012). Three opening year scenarios were assessed a Do-Minimum (No Widening), a Do-Something (Widening of Section 1 only) and a Do-Something with additional widening (Sections 1 and 4 Widened).

10.6.4.3 An additional assessment year of 2015 was also modelled using either the DMRB air quality spreadsheet model or ADMS-Roads. Three scenarios were modelled Do-Minimum (No Widening), a Do-Something (Widening of Section 1 only) and a Do-Something with additional widening (Sections 1, 2, 3, 4 and 5 Widened). Air quality predictions were undertaken for 2015 to ensure that air quality predicted pollutant concentrations were lower than the opening year, thus confirming the opening year to be the worst case air quality year.

10.6.4.4 The DMRB and ADMS-Roads modelling predictions have been verified against NO₂ monitoring data. This verification allows model predictions to be corrected against monitoring data. This is sometimes necessary if the DMRB model over- or under-predicts pollutant concentrations. A conservative approach has been adopted utilising

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the highest verification factors available at sensitive receptors. This approach may, at some locations, over-estimate pollutant concentrations, particularly when monitoring has been used from locations which are likely to have accelerating or decelerating.

- 10.6.4.5 In all scenarios modelled (2004, 2012 and 2015), no exceedances were predicted for benzene, 1,3-butadiene or CO at any sensitive receptor location.
- 10.6.4.6 In the baseline year (2004), exceedances of either the AQS for annual average NO₂ or the EU Limit Values for PM₁₀ were predicted at fifty three of the one hundred and twenty eight sensitive receptors modelled. Thirty of the locations with a predicted exceedance would be as a result of emissions from the M25 and the road network at M25 Junctions. Twenty three of the locations with a predicted exceedances are in the wider study area. The above properties have been selected to represent sensitive receptors which are likely to have the greatest exposure to road traffic pollutants within the study area. Whilst additional sensitive receptors in the base year may exceed standards the greatest exceedances should have been identified. In the baseline year, fifty one NO₂ annual average AQS exceedances have been predicted, together with forty PM₁₀ 24 hour mean EU Limit Value exceedances and one annual average PM₁₀ EU Limit Value exceedances.
- 10.6.4.7 In the opening year scenarios, no exceedances for any of the pollutants emitted by vehicles have been predicted, except for at R54 (NO₂ annual average) in the Do-Minimum scenario. No exceedance is predicted at R54 in either of the Do-Something scenarios. The pattern of reduced predicted concentrations at sensitive receptors is due to improvements in vehicle technology which offset growth in traffic volumes and also predicted improved background pollutant concentrations. Additionally at sensitive receptor R54 the reduced predicted concentrations with the Scheme are due to reduced congestion at Junction 20. As described above the sensitive receptors modelled are anticipated to have the greatest exposure to road traffic pollutants in the study area and as no exceedances are predicted with the scheme there should no exceedances with the scheme at any other sensitive receptors. In general, the pattern between the Do-Minimum and Do-Something scenarios (2012) is a small deterioration in air quality along mainline locations of the Scheme, with a small improvement in air quality in the wider study area (e.g. Beaconsfield, Hemel Hempstead, Rickmansworth). In the opening year of the Scheme small changes in concentration are predicted within the study area, between the Do-Something scenario and the Do-Something with additional widening. This is because traffic growth, in addition to that for Section 1 widening, is small within the study area (e.g. some M25 locations would experience approximately an additional 1,000 AADT).
- 10.6.4.8 In 2015, the pattern described for 2012 is typically repeated with small deteriorations in air quality between the Do-Minimum and Do-Something in M25 locations and small improvements in the wider network. Small changes between the Do-Something scenario and the Do-Something with additional widening schemes are due to small changes in flow anticipated in the majority of the study area due to additional widening Schemes. This is not the situation for parts of Section 5 (Junctions 23 – 27), which is due to be widened in 2015. Traffic flows are predicted to increase with the widening of Section 5 and this increase in flows is reflected by increased predicted pollutant concentrations in the Do-Something with additional widening, primarily between Junctions 25 and 27.

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10.6.4.9 The air quality assessments for 2015 confirmed that 2012 is the worst-case air quality year, with higher predicted concentrations for 2012 compared to 2015. This is due to improvements in background concentrations and vehicle technologies, which are anticipated to reduce pollutant emissions. These improvements offset increases in traffic growth and hence the opening year is the worst case air quality year.

Table 10.13: Baseline Localised Assessment Sensitive Receptors Predicted to Exceed the NO₂ Annual Average AQS and PM₁₀ EU Limit Values

Sensitive Receptor	M25 or wider network	Junctions	Annual Average NO ₂	24 hour mean exceedance	Annual Average PM ₁₀
R1	M25	16 to 17	Yes		
R5	M25	16 to 17	Yes	Yes	
R27	Wider	16 to 17	Yes	Yes	
R38	Wider	16 to 17	Yes	Yes	
R39	Wider	16 to 17	Yes	Yes	
R40	Wider	16 to 17	Yes	Yes	
R9	M25	17 to 18	Yes	Yes	
R43	Both	17 to 18	Yes	Yes	
R36	M25	18 to 19	Yes		
R42	Both	18 to 19	Yes	Yes	Yes
R44	Both	18 to 19		Yes	
R316	Wider	18 to 19	Yes	Yes	
R318	Wider	18 to 19	Yes	Yes	
R51	Wider	19 to 20	Yes	Yes	
R321	Wider	19 to 20	Yes	Yes	
R322	Wider	19 to 20	Yes	Yes	
R323	Wider	19 to 20	Yes	Yes	
R325	Wider	19 to 20	Yes	Yes	
R17	M25	20 to 21	Yes		
R33	Wider	20 to 21	Yes	Yes	
R54	Both	20 to 21	Yes		
R20	M25	21 to 22	Yes		
R22	Both	21 to 22	Yes	Yes	
R35	Wider	21 to 22	Yes	Yes	
R56	Wider	21 to 22	Yes	Yes	
R60	Both	21 to 22	Yes	Yes	

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Sensitive Receptor	M25 or wider network	Junctions	Annual Average NO ₂	24 hour mean exceedance	Annual Average PM ₁₀
R61	Both	21 to 22	Yes	Yes	
R326	Wider	21 to 22	Yes	Yes	
R24	M25	22 to 23	Yes	Yes	
R64	M25	22 to 23	Yes	Yes	
R328	Wider	22 to 23	Yes	Yes	
R330	Wider	22 to 23	Yes	Yes	
R332	Wider	22 to 23	Yes	Yes	
R302	M25	South	Yes	Yes	
R303	Both	South	Yes	Yes	
R304	M25	South	Yes	Yes	
R307	M25	South	Yes	Yes	
R312	Wider	West	Yes	Yes	
R314	Wider	West	Yes	Yes	
R203	M25	East	Yes	Yes	
R207	M25	East	Yes	Yes	
R206	Wider	East	Yes	Yes	
R212	Wider	East	Yes		
R213	Wider	East	Yes		
R216	M25	East	Yes		
R217	M25	East	Yes		
R218	Both	East	Yes		
R220	M25	East	Yes		
R224	M25	East	Yes	Yes	
R227	Both	East	Yes	Yes	
R234	M25	East	Yes		
R236	M25	East		Yes	
R238	Both	East	Yes		

Generalised Assessment

Do-Minimum versus Do-Something Scenarios

10.6.4.10 Results from the generalised assessment calculations for the study area in the opening year (2012) Do-Minimum versus the Do-Something scenario are presented

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below in Table 10.14. The generalised assessment worksheets for the Do-Minimum versus Do-Something scenario are presented in Appendix F of the Technical Report.

Table 10.14: Generalised Assessment Results without Additional Widening Schemes

	Net total Assessment for PM ₁₀	Net total Assessment for NO ₂	No. of Properties with an improvement		No. of properties with no change		No. of properties with a deterioration	
			PM ₁₀	NO ₂	PM ₁₀	NO ₂	PM ₁₀	NO ₂
Do-Something Option	5.64	-21.33	976	1129	0	0	559	406

- 10.6.4.11 The overall generalised assessment scores are 5.6 and –21.3 for PM₁₀ and NO₂ respectively. The negative score for NO₂ indicates an overall improvement in air quality due to the operation of the Scheme, whilst the positive score for PM₁₀ indicates a deterioration in air quality. However, in comparison to the assessment scores for NO₂ and PM₁₀, the net assessment scores are small (e.g. for NO₂ the percentage change from the Do-Minimum is 0.07%). The number of properties with an improvement in NO₂ and PM₁₀ air quality is greater than the number of properties with a deterioration.
- 10.6.4.12 The small change in NO₂ and PM₁₀ predicted for the Scheme is initially counter intuitive, as generally along the widened M25 predicted traffic flows would increase with the operation of the Scheme. However, a review of the worksheets for individual links in the study area identified that, whilst there are increases in traffic flows on the mainline of the M25, this does not always translate into positive assessment scores. This is because generally there are low numbers of properties in the vicinity of the M25. Moreover, increases in AADTs (e.g. 10,000) on roads with already high AADTs (e.g. >100,000) do not typically result in deteriorations in predicted air quality of greater than 1.0 µg/m³. Likewise, any improvements in air quality in the vicinity of the M25 (i.e. due to reduced congestion) are also predicted by the DMRB spreadsheet to be small.
- 10.6.4.13 Conversely, any improvement or deterioration in air quality in the vicinity of A-roads due to the Scheme is likely to result in large individual scores. For example, all links with a negative NO₂ score, which indicate an improvement in air quality, are A- or B-roads with high property counts within 200 metres. It is likely that this combination of high property counts in the vicinity of A-roads combined with changes in predicted air quality, would result in higher individual scores.
- 10.6.4.14 The combination of the two features of the generalised assessment, as described above, explain the small difference between the Do-Minimum and Do-Something scenario.
- 10.6.4.15 The variation in property numbers between the NO₂ and PM₁₀ represents varying contributions from road traffic to ambient air quality concentrations. In the case of PM₁₀, the background concentrations add a notable component, whereas NO₂ is more influenced by road contributions.

Generalised Assessment

Do-Minimum versus Do-Something (with additional widening) Scenarios

10.6.4.16 Results from the generalised assessment calculations for the study area in the opening year (2012) Do-Minimum versus the Do-Something scenario with additional widening are presented below in Table 10.15. The generalised assessment worksheets for the Do-Minimum versus Do-Something scenario are presented in Appendix F of the Technical Report.

Table 10.15: Generalised Assessment Results with Additional Widening Schemes

	Net total Assessment for PM ₁₀	Net total Assessment for NO ₂	No. of Properties with an improvement		No. of properties with no change		No. of properties with a deterioration	
			PM ₁₀	NO ₂	PM ₁₀	NO ₂	PM ₁₀	NO ₂
Do-Something Option	969.53	2486.12	134	299	0	0	1401	1236

10.6.4.17 The overall generalised assessment scores are 969.5 and 2486.1 for PM₁₀ and NO₂ respectively. The positive scores for NO₂ and PM₁₀ indicates an overall deterioration in air quality due to the operation of the Scheme. The number of properties with a deterioration in NO₂ and PM₁₀ air quality is greater than the number of properties with an improvement.

10.6.4.18 The generalised assessment scores with additional widening are higher and show deterioration for the Do-Minimum versus Do-Something with additional widening in contrast to the Do-Minimum versus Do-Something without additional widening scenario generalised assessment. This is because wider effects in the transport network around Section 4 (Junctions 27 – 30) have not been included in the generalised assessment study area. In the Do-Minimum versus Do-Something scenario, some of the positive scores on the mainline of the M25 are offset. This is because the change in AADT flows in the area surrounding Section 4 are less than 10%.

10.6.4.19 The variation in property numbers between the NO₂ and PM₁₀ represents varying contribution from road traffic to ambient air quality concentrations. In the case of PM₁₀, the background concentrations add a notable component, whereas NO₂ is more influenced by road contributions.

Regional Assessment

Do-Minimum versus Do-Something Scenarios

10.6.4.20 Results from the regional assessment calculations for the baseline year and the opening year Do-Minimum and Do-Something scenarios are presented in Table 10.16.

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Table 10.6: DMRB Regional Assessment Results without Additional Widening

	Total Emissions			
	CO	HC	NO _x	PM ₁₀
	kg/year	kg/year	kg/year	kg/year
Baseline Year (2004)	2,531,842	406,037	3,522,959	102,654
Do-Minimum (2012)	1,566,494	270,468	1,976,436	47,826
Do-Something (2012)	1,739,761	294,307	2,241,067	56,444
Change from Do-Minimum (2012)	173,267 (111%)	23,839 (109%)	264,631 (113%)	8,618 (118%)
Do-Minimum (2021)	1,578,328	274,810	1,542,373	36,475
Do-Something (2021)	1,770,066	302,115	1,774,890	43,983
Change from Do-Minimum (2021)	191,737 (112%)	27,305 (110%)	232,517 (115%)	7,508 (121%)

- 10.6.4.21 A reduction in emissions of all pollutants is predicted between the baseline year and the Do-Minimum opening year scenario. This reduction is due to improvements in vehicle technologies over time, which are predicted to result in a reduction in emissions. A reduction between the baseline year and the Do-Something scenario in the opening year is also predicted for all pollutants. Further improvements in vehicle emissions (e.g. Euro V standards) are not considered in the current DMRB emission factors and therefore future emissions will be lower than those predicted.
- 10.6.4.22 The emissions of CO and HC are higher in the 2021 Do-Minimum scenario than the 2012 Do-Minimum scenario. In contrast, the emissions of NO_x and PM₁₀ are lower in the 2021 Do-Minimum scenario than the 2012 scenario. The same pattern of increased emissions of CO and HC compared to reduced emissions of NO_x and PM₁₀ is also predicted in the Do-Something scenarios between 2012 and 2021. This reflects the different rates of anticipated technological improvements in reducing emissions for the different pollutants relative to increased emissions due to traffic growth.
- 10.6.4.23 Emissions of all pollutants are predicted to increase between the Do-Minimum and Do-Something scenarios in both 2012 and 2021. This is due to increased traffic flows along the Scheme.
- 10.6.4.24 The change in pollutant emissions between the Do-Minimum and Do-Something scenarios is consistent for both the 2012 and 2021 assessment years (maximum difference +3% for PM₁₀). This suggests that similar changes in traffic emissions are anticipated in both assessment years with the Scheme.

Regional Assessment

Do-Minimum versus Do-Something (with additional widening) Scenarios

10.6.4.25 Results from the regional assessment calculations for the baseline year and the opening year Do-Minimum and Do-Something with additional widening scenarios are presented in Table 10.17.

Table 10.7: DMRB Regional Assessment Results with Additional Widening

	Total Emissions			
	CO	HC	NO _x	PM ₁₀
	kg/year	kg/year	kg/year	kg/year
Baseline Year (2004)	5,106,858	856,645	8,034,178	230,182
Do-Minimum (2012)	3,078,879	568,147	4,457,933	104,812
Do-Something (with additional widening) (2012)	3,324,188	603,887	4,843,269	117,522
Change from Do-Minimum	245,309 (108%)	35,740 (106%)	385,336 (109%)	12,710 (112%)
Do-Minimum (2021)	3,113,794	581,011	3,466,275	78,320
Do-Something (with additional widening) (2021)	3,563,717	646,434	4,008,667	96,249
Change from Do-Minimum (2021)	449,923 (114%)	65,422 (111%)	542,392 (116%)	17,928 (123%)

10.6.4.26 A reduction in emissions of all pollutants is predicted between the baseline year and the Do-Minimum opening year scenario. This reduction is due to improvements in vehicle technologies over time, which are predicted to result in a reduction in emissions. A reduction between the baseline year and the Do-Something scenario in the opening year is also predicted for all pollutants. Further improvements in vehicle emissions (e.g. Euro V standards) are not considered in the current DMRB emission factors and therefore future emissions will be lower than those predicted.

10.6.4.27 The emissions of CO and HC are higher in the 2021 Do-Minimum scenario than the 2012 Do-Minimum scenario, whilst the emissions of NO_x and PM₁₀ are lower in the 2021 Do-Minimum scenario than the 2012 scenario. The same pattern of increased emissions of CO and HC compared to reduced emissions of NO_x and PM₁₀ is also predicted in the Do-Something scenarios between 2012 and 2021.

10.6.4.28 Emissions of all pollutants are predicted to increase between the Do-Minimum and Do-Something scenarios in both 2012 and 2021. This is due to increased traffic flows along the Scheme and the additional widened sections of the M25.

10.6.4.29 The change in pollutant emissions between the Do-Minimum and Do-Something scenarios between the 2012 and 2021 assessment years is predicted to be a

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maximum of +11% (PM₁₀). The maximum predicted change between the 2012 and 2021 scenario emissions is due to the additional widening Schemes that are anticipated to occur between 2012 (Sections 1 and 4) and 2021 (Sections 1, 2, 3, 4 and 5).

- 10.6.4.30 Regional emissions are greater in the Do-Something with additional widening compared with the Do Something without additional widening. This is due to the extra emissions from the additional widening Schemes, as discussed above.
- 10.6.4.31 The change in Carbon emissions from the TUBA model with the widening of Section 1 in the opening year is an increase of 18,576 tonnes. The increase in carbon emissions over the 60 year appraisal period assessed in the TUBA model is 869,560 tonnes.
- 10.6.4.32 There are no standards to assess the CO₂ emissions predicted as a result of the Scheme. However, the Scheme can be assessed in the context of the UK's commitments to the Kyoto protocol commitments. The Government is on-track to meet its Kyoto commitment to reduce greenhouse gas emissions by 12.5% below 1990 levels by 2008-12. A further national goal has been set to reduce emissions by 60 per cent by 2050.
- 10.6.4.33 Although emissions from the transport sector were 27 percent of the total UK carbon dioxide emissions in 2004, the Government is committed to reducing the impact of travel on the environment and is promoting policies to reduce the fossil carbon content of transport fuels, increase the fuel efficiency of vehicles and move towards more environmentally friendly forms of transport.
- 10.6.4.34 Measures included as part of the 2000 Climate Change Programme¹⁰ are projected to save around 5 MtC by 2010. The voluntary agreement package (including reform of company car taxation and graduated vehicle excise duty (2.3 MtC), wider transport policies (0.8 MtC), sustainable distribution (0.1 MtC) and the fuel duty escalator (1.9 MtC) are the main contributors.
- 10.6.4.35 New measures contained in the Climate Change Programme 2006¹¹ to deliver savings to 2010 include The Renewable Transport Fuel Obligation¹² which will require 5% of all UK fuel sales to come from renewable sources by 2010-11 and further improving the fuel efficiency of new vehicles, for example through the use of fiscal incentives and by working to develop options on how to move forward beyond the first phase of the EU voluntary agreements with automotive manufacturers after 2008. Together it is estimated that these new measures would contribute an additional 1.7 MtC savings to 2010, bringing total savings to 6.8 MtC. Further unquantified carbon savings would be delivered through measures to help people make smarter travel choices, including more fuel efficient vehicles.

10.7 Summary

10.7.1.1 In the baseline year, fifty one NO₂ annual average AQS exceedances have been predicted, together with forty PM₁₀ 24 hour mean EU Limit Value exceedances and one annual average PM₁₀ EU Limit Value exceedances.

10.7.1.2 No exceedances of the EU Limit Values are predicted in any of the opening year (2012) scenarios with respect to any of the pollutants modelled, except for R54 with respect to

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annual average NO₂ in the Do-Minimum scenario. The opening year is predicted to be the worst-case air quality year of the two forecast years assessed (2012 and 2015). A localised assessment of traffic re-routing did not predict any exceedances of the EU Limit Values, except for at two locations R322 and R323. During construction air quality improved at R322 and deteriorated at R323 by the same margin for annual average NO₂ (0.4 µg/m³).

- 10.7.1.3 Therefore, the Scheme can be promoted in accordance with the 2005/2006 Highways Agency commitments for air quality.
- 10.7.1.4 In the generalised assessment only small changes in air quality were predicted, although a greater number of properties were predicted to have an overall improvement in air quality with respect to NO₂ and PM₁₀ as a result of the Scheme. This is due to predicted improvements in traffic flow characteristics on A-roads within the study area for the Do-Something without additional widening. However, in the generalised assessment with the additional widening an overall deterioration in air quality was predicted, with a greater number of properties predicted with a deterioration rather than an improvement.
- 10.7.1.5 The regional assessment of the opening year predicted that there would be an overall increase in all emissions with the Scheme alone and cumulatively with additional widening Schemes. There are no standards against which to evaluate the results of the regional assessment.
- 10.7.1.6 An assessment of the potential for construction dust impacts on sensitive receptors has been undertaken in accordance with Draft London Best Practice Guide – The Control of dust emissions from construction and demolition⁴. A medium risk score has been assigned for the Scheme, which could be addressed by appropriate mitigation measures for medium risk construction sites as detailed in the guidance.

11 Geology and Soils

11.1 Introduction

11.1.1.1 The chapter describes the existing geology and soil conditions, particularly the potential areas of contamination within the Scheme Boundary. The impact of the Scheme on the geology and soils of the area is presented. Conversely, existing soil conditions, structural features, geological important sites and potentially contaminated soils can impose constraints on the Scheme design and impact on other receptors. These aspects are also assessed. A detailed assessment of the Scheme on geology and soils is available in the Geology and Soils Technical Report¹. Hydrogeology is dealt with separately in Chapter 8.

11.2 Regulatory Framework

11.2.1.1 The assessment has been carried out in accordance with the following legislation and best practice guidance:

- Environmental Protection Act, 1990 Part IIA²
- Contaminated Land Report (CLR) Guidance³
- Waste Management Licensing Regulations, 1994 as amended 2005^{4,5,6}
- Hazardous Waste Directive (Council Directive 91/689/EC)⁷
- Wildlife and Countryside Act, 1981 as amended⁸
- Planning Policy Statement PPS23, Planning and Pollution Control 2004⁹

11.2.1.2 Reference is made to Section 8.2 of Chapter 8: Road Drainage and the Water Environment.

11.3 Methodology

11.3.1 Study Area

11.3.1.1 The study area for the assessment generally comprises the existing Secretary of state land and an area 500 metres either side of the centreline (1 kilometre wide study corridor) of the motorway. Variations to this study area are described in the relevant baseline methodology sections.

11.3.2 Establishment of Baseline Conditions

11.3.2.1 The following sources were used to establish the baseline.

- British Geological Survey 1:50,000 scale maps^{10,11,12}
- Provisional Agricultural Land Classification Maps at 1:125,000^{13,14}

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- areas of potentially contaminated land and active and historical landfill sites have been obtained from the Environment Agency Website ¹⁵ and the relevant Local Authorities
- information on quarries and mines within the study area has been obtained from Buckinghamshire and Hertfordshire County Councils and the British Geological Survey website ¹⁶
- historical maps and an Envirocheck report ^{17, 18}
- historical site investigations ^{19, 20, 21}
- site-specific data with regards to contaminated soil has been obtained from geo-environmental investigation conducted by Soil Mechanics in August to September 2005 ²²
- designated sites information from Natural England²³ and relevant Local Authorities

11.3.2.2 Soil sampling and analyses was compared against Soil Guideline Values (SGVs) derived from:

- existing SGVs based on the Contaminated Land Exposure and Assessment (CLEA) model ^{24, 25}
- where SGVs were not available for potential contaminants of concern (speciated poly aromatic hydrocarbons and petroleum hydrocarbons), generic assessment criteria have been derived by Hyder Consulting using the CLEA UK²⁶ methodology
- a Dutch Intervention Value²⁷ has been used for comparison purposes only for total poly cyclic aromatic hydrocarbons

11.3.2.3 Details of the SGVs used are presented in the Geology and Soils Technical Report.

11.3.2.4 For landfill gases guideline values of 1 % v/v methane and 1.5 % v/v carbon dioxide were used ^{28, 29, 30}.

11.3.3 Assessment of Effects

11.3.3.1 The assessment methodology followed guidance for a Stage 3 Assessment in the Volume 11, Section 3, Part 11 of DMRB³¹. This included an assessment of the risk posed from active and historical landfill sites including exposure of landfill material, other identified areas of contaminated land, landfill gas and landfill leachate. Risk was identified for geology and soils attributes (RIGS and SSSIs) and site workers. The risk categories used are fully described in the Geology and Soils Technical Report. These have qualitatively been used to assess the criteria in the determination of magnitude of impacts.

11.3.3.2 The significance criteria used in this assessment have been developed from those specified in DMRB Interim Advice Note 81/06³². In particular, significance criteria have been adapted to consider contaminated land since landfill is present along this part of the motorway. The sensitivity of attributes are defined in Table 11.1. The magnitude of impacts are defined in Table 11.2.

Table 11.1: Value of Geological and Soils Attributes

Value (sensitivity)	Typical descriptors
Very High	High importance and rarity, international scale and limited potential for substitution
High	High importance and rarity, national scale and limited potential for substitution
Medium	High or medium importance and rarity, regional scale, limited potential for substitution
Low (or Lower)	Low or medium importance and rarity, local scale
Negligible	Very low importance and rarity, local scale

Table 11.2: Definition of Magnitude of Impact on Geology and Soils Attribute or Feature

Magnitude of potential impact	Criteria	Example
Major	Results in loss of attribute or, high or very high risk of irreversible pollution to controlled water, or results in high or very high risk to human health.	Contaminated land is causing or is likely to be causing entry of poisonous, noxious or polluting matter into controlled waters and/or presents a risk to human health. Pollution pathway exists or is likely to exist to receptor(s). High concentrations and flow rate of landfill gas migrating to receptor. Destruction or Degradation of Site of Special Scientific Interest (SSSI) or Regionally Important Geological Site (RIGS).
Moderate	Results in impact on integrity of attribute or loss of part of attribute, or results in moderate pollution or moderate risk to controlled water or human health.	Disruption of active quarries and mining activities.
Minor	Results in minor impact on attribute, results in short term deterioration in quality of, or minor risk to, controlled waters.	Degradation of a small area of geological outcrop.

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Magnitude of potential impact	Criteria	Example
Negligible	Results in negligible pollution of, and negligible risk to, controlled water. Results in negligible risk to human health. Results in an impact on attribute but insufficient magnitude to affect the use/integrity.	Pollutant already exists in controlled waters or entry into controlled waters of that substance from the contaminated land has ceased or it is not likely that further entry would take place. No pollution pathway from contaminated land to human receptors. No degradation of geological outcrop.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction	No change to the attribute or feature

Notes: Contaminated land examples have been adapted from Environmental Protection Act 1990: Part IIA and EA R&D publication CLR 8³³.

11.3.3.3 The significance of effects were assigned after design and construction mitigation and considered the sensitivity of the attribute and magnitude of the impact (Table 11.3). The significance criteria are defined in Table 11.4.

Table 11.3: Determination of Significance of Geology and Soils Effects

Environmental value (sensitivity)	Very High	Neutral	Slight	Moderate or Large	Large or very large	Very large
	High	Neutral	Slight	Slight or Moderate	Moderate or Large	Large or Very Large
	Medium	Neutral	Neutral or slight	Slight	Moderate	Moderate or Large
	Low	Neutral	Neutral or slight	Neutral or Slight	Slight	Slight or Moderate
	Negligible	Neutral	Neutral	Neutral or slight	Neutral or slight	Slight
	No change	Negligible	Minor	Moderate	Major	
Magnitude of impact (degree of change)						

Table 11.4: Definition of Geology and Soils Effects

Score	Comment
Large Beneficial	The Scheme would have a large positive impact if it is predicted that it would result in a 'highly' significant improvement to a geological and soil attribute(s) or 'highly' significant improvement of existing likelihood of pollution of controlled waters from contaminated land, with insignificant adverse impacts on other geological and soil attributes.
Moderate Beneficial	Where the Scheme would provide an opportunity to enhance the geology and soil environment, because it results in predicted: <ul style="list-style-type: none"> • significant improvements of existing likelihood of pollution of controlled waters or risk to human health from contaminated land • significant improvements for at least one soil or geology attribute, with insignificant adverse impacts on other attributes • very or highly significant improvements, but with some adverse impacts of a much lower significance • the predicted improvements achieved by the proposal would greatly outweigh any potential negative impacts
Slight Beneficial	Where the Scheme would provide an opportunity to enhance the geology and soil environment, because it provides improvements in geology and soil attributes which are of greater significance than the adverse effects.
Neutral	Where the net effect of the Scheme would be neutral, because: <ul style="list-style-type: none"> • there is no appreciable impacts, either positive or negative, on the identified attributes • there is no appreciable impact, either positive or negative, on controlled waters or human health from contaminated land <p>the Scheme would result in a combination of effects, some positive and some negative, which balance to give an overall neutral effect. In most cases these would be slight or moderate positive and negative impacts. It may be possible to balance impacts of greater significance, however, in these cases great care would be required to ensure that the impacts are comparable in terms of their potential environmental impacts and the perception of these effects.</p>
Slight Adverse	Where the Scheme would result in a degradation of the geology and soil environment, because the predicted adverse impacts are of greater significance than the predicted improvements.
Moderate Adverse	Where the proposal may result in a degradation of the geology and soil environment, because it results in predicted: <ul style="list-style-type: none"> • significant impact on controlled waters or human health from contaminated land • significant adverse impacts on at least one attribute, with insignificant

Score	Comment
	<p>predicted improvements to other attributes</p> <ul style="list-style-type: none"> • very or highly significant adverse impacts, but with some improvements which are of a much lower significance and are insufficient positive impacts to offset the negative impacts of the proposal
Large Adverse	<p>Where the Scheme would result in a degradation of the geology and soil environment, because it results in predicted:</p> <ul style="list-style-type: none"> • highly significant impact on controlled waters or human health from contaminated land • highly significant adverse impacts on a geology and soil attribute • significant adverse impacts on several geology and soil attributes
Very Large Adverse	<p>Where the Scheme would result in a degradation of the geology and soil environment because it results in predicted:</p> <ul style="list-style-type: none"> • potential high risk of pollution of an aquifer providing a locally important resource • very significant impact on human health from contaminated land • very significant adverse impacts on at least one geology and soil attribute • highly significant adverse impacts on several geology and soil attributes

11.4 Baseline Conditions

11.4.1 Geology and Soils

11.4.1.1 The baseline condition described below is the existing condition. For geology and soils the baseline condition immediately before opening of the Scheme would be very similar to the existing condition because most of the attributes and features are unlikely to change in the short and medium term. Where monitoring data of landfill gas shows a trend then a comment has been made to discuss forecast change to the baseline condition.

11.4.1.2 A summary of the geology along the Scheme is presented in Table 11.5 and is presented in Figure 11.1. It should be noted that the origin of “Glacial Gravels” as depicted in geological sheets 238 and 239 has been reinterpreted by the British Geological Survey as being River Terrace Deposits derived from the pre-diversionary ancestral River Thames³⁴. Consequently, newer geological sheets, such as sheet 255, have renamed and subdivided Glacial Gravel into “River Terrace Deposits of the pre-diversionary, ancestral River Thames,” as follows: Winter Hill Gravel, Gerrards Cross Gravel, Beaconsfield Gravel, Chorelywood Gravel and Westland Green Gravel. However, the interpretation of lithology and engineering is unaffected by the new interpretation of the origin of this material. Therefore, for the purposes of this report, the River Terrace Deposits are collectively termed Sands and Gravels between Junctions 16 to 23. As more up-to-date maps covering Junctions 19 to 23 are unavailable, these deposits are still referred to as Glacial Gravel within this report.

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11.4.1.3 Furthermore, the Upper Chalk Formation is now divided into Seaford Formation, Newhaven Formation and Lewes Nodular Chalk Formation. As the mapping of these formations has not fully extended into geological sheets 238 and 239 (covering the area between Junctions 19 to 23), the extent of these formation is unknown. As such, for consistency, this report refers to the chalk formations as the Upper Chalk Formation.

Table 11.5: Summary of the Geology Beneath the Scheme

Strata	Junctions 16-17	Junctions 17-18	Junctions 18-19	Junctions 19-20	Junctions 20-21	Junctions 21-22	Junctions 22-23
Drift Deposits	Alluvium localised	Taplow Gravel localised	Alluvium localised	Valley gravel localised	Alluvium localised	Alluvium localised	Valley gravel localised
	Taplow Gravel localised	Sands and gravels	Glacial sands and gravels	Sands and gravels	Valley gravel localised	Valley gravel localised	Pebble gravel
	Head localised	-	-	-	Glacial sands and gravels	Boulder Clay (Till)	Glacial sands and gravels
	Sands and gravels	-	-	-	-	Glacial sands and gravels	-
Solid Deposits	London Clay Formation	Upper Chalk Formation	Upper Chalk Formation	Upper Chalk Formation	Reading Formation	Upper Chalk Formation	London Clay Formation
	Reading Formation	-	-	-	Upper Chalk Formation	-	Reading Formation
	Upper Chalk Formation	-	-	-	-	-	Upper Chalk Formation

11.4.1.4 The Upper Chalk Formation and the underlying Middle Chalk Formation contain karstic features such as swallow holes, sinkholes and pipes caused by the infiltration of water within discontinuities in the chalk, (see Section 8.4.3). These are located primarily from the Chalfont Viaduct to Junction 17. Where these features are present at or near the chalk surface they are usually infilled with drift deposits and marked by circular depressions. The drift deposits generally consist of alluvium (to the north and south of Junction 16 and in the vicinity of Junction 17), occasionally underlain by valley gravel. Head deposits also underlie much of Junction 16.

11.4.1.5 The Reading Formation overlies chalk in several locations such as by Junction 16. The upper portion of this horizon is typically composed of silty, slightly calcareous fissured clays underlain by dense to very dense silty fine sands. The Reading Formation clays were also subject to glacial induced shearing where present below drift deposits.

11.4.1.6 The Reading Formation is overlain by Eocene London Clay Formation, which in turn is overlain by pebble gravel (in some locations such as east of Junction 22). London Clay Formation is only encountered near the surface at the western and eastern ends of the motorway, in the vicinity of Junction 16 just beyond Chalfont Viaduct and between

Junctions 22 and 23. The London Clay Formation is generally a fissured silty clay of which the upper surface has been subject to weathering. Deep shear surfaces are present within the London Clay Formation produced by glacial processes and are marked by a reduction in strength.

11.4.1.7 The 1992 investigation indicated that made ground was encountered over this whole section of motorway in a small number of exploratory holes with a thickness in excess of one metre recorded. Most of the made ground encountered is considered to represent embankment backfill around structures. The existence of made ground is emphasised by the 2005 investigation where the majority of exploratory holes encountered made ground. Furthermore, landfills have been identified in a number of locations, particularly between Junctions 21 to 22.

11.4.2 Topography and Geomorphology

11.4.2.1 In general, the land varies from approximately 40 metres AOD at Junction 16, to a peak of 128 metres AOD 500 metres south of Chainage 23,050 between Junctions 20 and 21. Thereafter, the land decreases to approximately 60 metres AOD as the motorway passes over the River Ver at Chainage 28,150 and the River Colne at Chainage 29,750 in an area of alluvium deposits. The motorway undulates up to a peak of approximately 120 metres AOD approximately 2.5 kilometres northwest of Junction 23 and then declines to approximately 50 metres AOD at Junction 23.

11.4.3 Agricultural Land Quality

11.4.3.1 The agricultural land within the study area is predominantly classified as Grade 3 on Provisional Agricultural Land Classification (ALC) maps provided by DEFRA. The 'Likelihood of Best and Most Versatile Agricultural Land' map also provided by DEFRA only considers Grades 1 to 3a as being 'Best and Most Versatile'. Consequently, the study area can be considered as Moderate with 'Areas where 20 % to 60 % of the land is likely to be Best and Most Versatile'. In addition the M25 passes through a small area of Grade 4 land adjacent to Gerrards Cross and an area of Grade 2 on the southern side of Junction 17 and also northeast to southwest through Junction 22. The land surrounding Junction 18 is classified as Urban Land Use, at Junction 19 and a small area, between Bricket Wood and Colney Street, is classified as Non Agricultural. The Scheme comprises construction wholly within the Secretary of State and therefore no agricultural land will be removed.

11.4.4 Designated Sites

11.4.4.1 Two geological sites of Special Scientific Interest (SSSIs) lie within 500 metres of the Scheme (Figure 3.2). Westwood Quarry SSSI represents the best available exposure of the 'Lower Gravel Train'²⁹. The exposure provides information about the early history of the River Thames in an area where its existence has only comparatively recently been recognised, and as such is of considerable importance. The site is located between the A41 and the M25. Moor Mill Quarry (West) SSSI²⁹, near Junction 21a, is a site of gravels, silts and chalky till which helps trace the diversion of the proto-Thames. Its unique geological sequence is of fundamental importance in tracing the diversion of the River Thames from its pre-Anglian course.

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11.4.4.2 Shenley Chalk Mine is located 550 metres south of the M25, just outside the study corridor and is situated approximately three kilometres east of Junction 22. It is designated as a Regionally Important Geological Site (RIG) (Figure 11.2).

11.4.5 Areas of Potentially Contaminated Land and Landfill Sites

11.4.5.1 Eighteen operating and former landfills have been identified along this part of the motorway (based on information provided by local authority and county council consultees and Envirocheck), many of which are located immediately adjacent to the motorway and are shown in Figure 11.2. Landfill 1.13 lies directly beneath the existing M25. The majority of the landfills are filled with domestic waste, although at least one area, Landfill 1.3A, anecdotal evidence suggests that there is asbestos present. Landfill sites may be a source of historic contamination and have the potential to produce landfill gases such as methane, carbon dioxide and hydrogen sulphide. Also, it is possible that landfill leachate is being produced, which may contain, but is not limited to, heavy metals, ammoniacal nitrogen, biological oxygen demand, chemical oxygen demand and total organic carbon.

11.4.5.2 Methane has predominantly been identified to be in excess of 1 % volume/volume (v/v) in landfill locations between Junctions 21 and 22. Methane concentrations have been recorded to a maximum of 87.7 % v/v, recorded in Landfill 1.8. Flow rates in some locations for example, borehole BH17 in Figure 11.2, have been recorded at 25 litres per hour suggesting that methane has the potential to migrate. However, many areas have been identified as having low flow rates, indicating that migration of landfill gas is variable.

11.4.5.3 Landfill 1.7 is a bund of tipped material over and above that which was permitted in the planning application. The material was supposed to be of inert material, however, Hertfordshire County Council can no longer confirm whether this is the case and the bund may contain non-inert material. No further information was available at time of writing. Although the bund does not encroach on to the Secretary of State land some material may have slipped onto Secretary of State land. This bund is not of engineering specifications and thus its slope stability may be in question and it is believed to lie on top of natural ground. The location of Landfill 1.7 is illustrated on Sheet 4 of Figure 11.2.

11.4.5.4 Where landfills predate the construction of the motorway, such as Landfill 1.8, Landfill 1.10 and 1.12 (Figure 11.2), material was removed and banded outside of Secretary of State land on top of the existing waste. The motorway was built on top of an embankment and clay fill material was imported to the sides of the motorway. At Landfill 1.13, which also predates the motorway construction, the waste fill material, underlying the motorway carriageway, was dynamically compacted. An embankment, of not more than two metres thickness was then placed on top of the compacted material at Landfill 1.13 and the motorway was then constructed on top of the embankment.

11.4.5.5 In addition to the landfill sites, a number of potentially contaminated sites have been identified. The majority of these sites relate to previous quarrying activities and borrow pits of unknown dimensions that have been subsequently backfilled with unknown materials.

11.4.6 Quarries and Mines

- 11.4.6.1 There are two active quarries within the study area between Junctions 16 and 23. Warren Farm Pit, licensed for sand and gravel extraction, is located between Junctions 16 and 17 and the Great Westwood Quarry, excavated for sand and gravel deposits, is located between Junctions 19 and 20.
- 11.4.6.2 There is one inactive quarry to the south west of Junction 20, which is now a landfill site, two between Junctions 20 and 21, and another between Junctions 22 and Junction 23.
- 11.4.6.3 Furthermore, a number of inactive quarries present between Junctions 21 and 22 have been utilised as landfill sites.
- 11.4.6.4 Shenley Chalk Mine, discussed above in Section 11.4.4, is located 550 metres south of the M25.
- 11.4.6.5 There is one proposed quarry located between Junctions 22 and 23. This is indicated by Hertfordshire County Council to be an expansion of the Tyttenhanger Quarry. However, this is located outside of the Scheme boundary and as such, will not affect the geology and contaminated soils of the existing baseline, (refer to Figure 3.1).

11.4.7 Motorway Cutting and Embankments

- 11.4.7.1 The locations of cuttings are of importance where the Scheme passes through an aquifer or areas of contaminated land. This is particularly important between Junctions 21 and 22 where a large number of landfills exist adjacent to and in at least one location cross the motorway. Motorway cuttings and embankments are shown in Figure 3.2.

11.5 Design and Mitigation

11.5.1 Construction

- 11.5.1.1 During construction, the contractor would adhere to the best practice advice as given in PPS 23, Annex 2 Development on Land Affected by Contamination⁹. The DBFO Contractor would be responsible for arranging land drainage and discharge consents which would be required for works close to or within watercourses and for discharges to controlled waters. Furthermore, all works would be carried out in accordance with legislation listed in Section 11.2.
- 11.5.1.2 In general, in areas where the motorway crosses through areas of landfill, there could be a need to dispose of contaminated arisings which would be disposed of in the appropriate manner. WAC testing has been conducted in selected areas along the Scheme, which indicates materials that may, or may not be, suitable for disposal in inert waste landfills. In order to prevent pollution watercourses, contaminated arisings would not be stockpiled in inert areas.

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11.5.1.3 Best practice procedures would be employed by the DBFO Contractor to minimise the risk of harmful effects of any contaminated land encountered. These would include:

- risk assessments for particular contaminated land sites
- appropriate site procedures and personal protective equipment (PPE) employed to minimise handling of contaminated material as well as minimise harm to human health and minimise pollution of controlled waters
- pollution of the ground and controlled waters from fuel spillages during construction would be avoided and minimised by appropriate bunded hard standing fuelling areas (see Chapter 8)
- explosion risk in areas of landfill gas migration would be assessed and damping down procedures to avoid sparking would be employed as appropriate
- venting of drainage and other confined spaces would be implemented where necessary
- where the exact location and extent of landfill is unknown, additional health and safety procedures would be implemented

11.5.1.4 The following specific mitigation measures have been devised to minimise adverse impacts:

- there is potential for contamination of the Chalk aquifer during the construction period, where the Upper Chalk Formation is at or near the ground surface. This would be mitigated by refuelling and cleaning of equipment away from areas where the Upper Chalk Formation is very close to the ground surface, or is vulnerable to pollution from spillages at the ground surface
- potential degradation of the Westwood Quarry SSSI would be minimised by keeping construction activities within the Scheme Boundary in the vicinity of this area and limiting the construction to the proposed small-scale works comprising the proposed retaining wall and minor works
- potential contamination from excavation of a balancing pond between the carriageways of the A41 link road would be mitigated by the removal of soil and the construction of a low permeability liner at the base of the balancing pond
- in areas of elevated landfill leachate, disturbance of waste fill would be minimised by constructing within existing clay fill where possible
- igniting of potentially explosive landfill gas concentrations at landfills, including Landfills 1.8, 1.10, 1.11, 1.12 and 1.13 would be prevented by damping down measures to prevent sparking from any metal to metal contact during construction.
- elevated carbon dioxide within Landfill 1.5 and adjacent to Landfill 1.6 would be monitored throughout the construction period to ensure that the landfill gas regime does not change, leading to increased concentrations

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- Landfills 1.7 to 1.14 inclusively: potential excavation of large volumes of waste material would be minimised by the construction of embedded retaining walls. The potential pollution by leachate seepage into highway drainage and controlled waters would be mitigated by appropriate sealing of drains and/or treatment of contaminated water
- should asbestos be encountered at Landfill 1.3A then specialists would be employed to contain or remove the contamination whilst minimising release of air borne asbestos

11.5.1.5 Volumes of imported and exported spoil material for earthworks has been estimated in Chapter 16. The DBFO Contractor would determine how much of this material would be re-used, where it would be stored, where it would be disposed to and where imported material would be sourced from. Therefore these effects cannot be assessed at this time and detailed mitigation cannot be developed. However the earthworks strategy would be to:

- maximise re-use of material
- minimise import and export of material
- minimise disposal of waste in landfill

11.5.2 Design

11.5.2.1 The design, with respect to geology and soils, has primarily been concerned with the existence of landfills and chalk strata that are adjacent to, and underlie the M25 carriageway. The design considered solutions to minimise adverse effects on these features. The design has not considered landfills that postdate motorway construction as these are not within Secretary of State land.

11.5.2.2 Seepage of leachate from landfills would be prevented by the appropriate use of embedded retaining walls. Construction at landfills would be within existing clay fill placed on the landfill waste during the original M25 construction. Wherever possible, excavation in waste would be avoided. Where this is necessary best practice measures would be used to prevent cross-contamination. Waste would be sealed to prevent leachate, if present, from escaping. Further investigation would be made, as necessary, to design appropriate sealing of some landfills to prevent new contamination pathways being formed within the existing clay fill where possible.

11.5.2.3 The embedded retaining walls would act as a barrier to prevent exposure of waste to human contact. The formation of vertical pollution pathways would be minimised by using piling techniques with the least potential for forming pathways into underlying aquifers. Embedded retaining walls built within or close to waste fill would be built to resist aggressive ground conditions, where such conditions exist.

11.5.2.4 Between Junctions 21 and 22, where the motorway crosses many landfills, the use of embedded retaining walls, as described above, would be required. This would reduce the amount of material excavated compared with a more traditional cantilever wall. Part of Landfill 1.13 would be sealed where regraded, as appropriate.

11.5.2.5 The Scheme design includes regrading of the chalk in some cuttings where there is potential for the degradation of Upper Chalk Formation outcrops. The mitigation design

would provide steeper slopes (up to 45°) within the Scheme Boundary. In addition soil nailing towards the top of the regrade may be required in some of the cuttings. Existing chalk exposures have naturally grassed over. New exposures would be recolonised in a similar way, or seeded with an appropriate seed mix for ecological mitigation, as described in Chapter 7. This would bind the chalk together thus reducing the risk of chalk rubble falling onto the carriageway.

11.6 Assessment of Effects

11.6.1 Construction

11.6.1.1 Slight adverse to large adverse potential impacts, associated with the construction include:

- waste produced whereby there are a variety of environmental and human health impacts associated with waste handling, transportation and disposal (the former is discussed in Chapters 9, 10 and 16 of the ES, whilst disposal would be the responsibility of the DBFO Contractor and subject to planning and environmental legislation and guidance)
- risk to health of site workers from handling waste and exposure of contaminated materials when working at landfills and areas of potentially contaminated land where the exact extent is unknown and where they are within the Scheme Boundary
- regrade works in area of Landfill 1.12 and 1.13 where the extent of the landfill material is unknown and therefore there is a risk to health of site workers from exposure of contaminated materials
- risk of contamination of controlled waters, via seepage through soils and rock, from spillages from site works discussed in Chapter 8. Generally there would be an insignificant impact after design mitigation has been implemented although particular care would be required where chalk strata is close to the ground surface
- explosion (sparking) during sheet pile works in areas of landfill with high landfill gas emissions
- increased works traffic – impact of increased dust and atmospheric pollution is discussed in the Chapter 10: Air Quality of this ES

11.6.1.2 The predicted magnitude of impacts and significance of effects during the construction phase are presented in Table 11.6.

Table 11.6: Geology and Soils Effects during Construction

Attribute/ Feature	Predicted Impacts and effects	Magnitude of Impacts (after Design and mitigation)	Significance of effects (after Design and mitigation)
Un- designated geological sites / Local soil resource	Increased works traffic and equipment for example diggers and excavators. The main concern relates to refuelling and possible oil spillages within the whole construction area and site compounds. There is a potential significant effect where the Upper Chalk Formation is near ground surface.	Negligible	Slight Adverse
	Regrade of cuttings in the Upper Chalk Formation would involve equipment and machinery coming into direct contact with the stratum and a direct pathway for contaminants to enter the aquifer.	Moderate adverse	Slight Adverse
	Local soil resource. All construction would be within the existing Scheme Boundary so no removal of agricultural land will occur.	Negligible	Slight Adverse
Designated Sites	Westwood Quarry and SSSI are situated beside Junction 19. The motorway expansion would not affect the quarry with respect to geology and soils as the expansion would only be within the existing Scheme Boundary and comprise minor works. Moor Mill Quarry SSSI (Junctions 21 to 22)- is outside of the Scheme Boundary and therefore construction would have a negligible effect. Shenley Chalk Mine (RIG) is outside of the Scheme Boundary at a distance of approximately 550metres. Therefore construction would have a negligible effect	Negligible	Slight Adverse
Quarries and Mines	There are quarries (Warren Farm Pit, between Junction 16 to 17 Great Westwood Quarry, between Junction 19 to 20) within the study area; are outside of the Scheme Boundary and therefore construction would have a negligible effect. Significance depends on extent.	Negligible	Slight Adverse

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Attribute/ Feature	Predicted Impacts and effects	Magnitude of Impacts (after Design and mitigation)	Significance of effects (after Design and mitigation)
Areas of potentially contaminated land and landfill sites	There are two areas of potential contamination at Chainage 10,830 and 12,600. (Junction 17 to 18). There is uncertainty of their extent but some PAH contamination is confirmed. Effects include health and safety of site workers and migration to underlying aquifer.	Moderate to Minor Adverse	Moderate to Slight Adverse
	Landfill 1.3A (Junction 19 to 20). There is uncertainty of location and extent but anecdotal evidence suggests asbestos may be present. The Design includes a regrade of a cutting and therefore there is a potential effect on health and safety of site workers if asbestos is encountered but not controlled immediately.	Major Adverse	Large Adverse
	Landfill 1.7 is a bund composed of predominantly inert material, which may or may not contain non-inert material. Although this is located outside the Secretary of State land, there is potential for the bund to become unstable during works as it is not an engineered bund.	Moderate Adverse	Moderate Adverse
	Landfill 1.13, excavation of waste. The Scheme Design includes a possible 300 metre length regrade in domestic landfill waste deposits along the anti-clockwise carriageway. There is a potential health and safety effect on the site workers, despite use of PPE, if the extent and character of the waste is not assessed fully.	Moderate Adverse	Moderate Adverse
	Landfill 1.13 has one monitoring borehole in which methane has been recorded. At high concentrations 60 plus % v/v methane. Construction risks include possible "sparking" from metal rubbing against metal, such as during sheet piling, even after damping down site procedures.	Moderate Adverse	Moderate Adverse
	Landfill 1.13 contains waste fill material and leachate within the Scheme Boundary, which has the potential to migrate into underlying strata including the Chalk aquifer if disturbed during construction.	Moderate Adverse	Moderate Adverse

Attribute/ Feature	Predicted Impacts and effects	Magnitude of Impacts (after Design and mitigation)	Significance of effects (after Design and mitigation)
Landfill gas	<p>Many locations at or close to landfills, primarily between Junction 21 to 22, have elevated concentrations of methane and carbon dioxide or have the potential to generate gas due to the presence of waste fill. Some areas have recorded high flow rates indicating that gas has the potential to migrate. Landfills 1.8. and 1.10 have recorded high landfill gas flow rates as well as high methane concentrations. Landfill 1.13 has recorded lower flow rates but has recorded high methane concentrations and putrescible waste lies beneath the motorway. The gas flow regimes in these areas are unknown. Construction risks include possible “sparking” from metal rubbing against metal, such as during sheet piling, even after damping down site procedures.</p>	Moderate Adverse	Moderate Adverse

11.6.2 Operation

11.6.2.1 The most significant potential effects during the operational phase would be:

- traffic accident spillages and accident risk to soils and controlled waters
- explosive atmosphere and low oxygen environments from highway drainage and confined spaces within the Scheme and near to landfills would require venting
- contribution of greenhouse gases into the atmosphere from freely venting landfill gas. This would be where the current situation is altered perhaps by the removal of covering layers

11.6.2.2 Other less significant effects include:

- deposition of particulate atmospheric pollution onto agricultural land from increased traffic
- contamination of adjacent soils from runoff from road surface winter gritting
- effect on soils due to works traffic during road and gantry maintenance

11.6.2.3 Further details of the impacts to controlled water (groundwater and surface water) from spillages and accidents and road maintenance is presented in Chapter 8 of this ES.

11.6.2.4 The effects on geology and soils during the operational phase are presented in Table 11.7.

Table 11.7: Geology and Soils Effects during Operation

Attribute/ Feature	Predicted Impacts and Effects	Magnitude of Impacts	Significance of Impacts
Geology and Soils	Settling of atmospheric pollution from traffic (see the Air Quality chapter of the ES) onto surrounding agricultural land.	Minor Adverse	Slight Adverse
	Road surface gritting (winter). Potential runoff onto adjacent soils causing possible contamination of soils.	Minor Adverse	Slight Adverse
	Spillages and accidents (localised) have potential to leach into the underlying strata. Upper Chalk Formation outcrops in some areas, or is very close to the surface making the potential migration of contaminants easier into the underlying Chalk aquifer. (See the Water and Drainage chapter of the ES for further details on impacts on controlled waters).	Minor Adverse	Slight Adverse
	Road and gantry maintenance - works traffic.	Negligible	Slight Adverse
Areas of potentially contaminated land and landfill sites	Landfills 1.8, 1.10, 1.13 (Junction 21 to Junction 22). There is potential for landfill leachate to migrate into underlying strata (dilute and disperse construction) if the landfills are unlined. However it should be noted that these historic landfills should be assumed to have been producing (or have the potential to have produced) leachate since before the M25 was originally constructed and the effect from the Scheme is unlikely to increase leachate migration into underlying strata.	Negligible	Slight Adverse
	Landfill 1.7 is a bund composed of predominantly inert material, which may or may not contain non-inert material. Although this is located outside the Secretary of State land, there is potential for the bund to become unstable during works as it is not an engineered bund.	Moderate Adverse	Slight Adverse
Risk to controlled waters	Spillages and accidents (localised) have the potential to leach into underlying strata including permeable glacial gravels overlying chalk. Motorway drainage would appropriately intercept spillages (Chapter 8).	Negligible	Neutral

11.7 Summary

- 11.7.1.1 An assessment of the geology and soils has been carried out in accordance with of DRMB Volume 11, Section 3 Part 11. This has involved the assessment of the effects of the Scheme on designated geological sites, local soil resource, quarries and mines, landfill sites and contaminated soils. Site-specific data with regards to contaminated soil has been obtained from geo-environmental investigation conducted by Soil Mechanics in August to September 2005. Assessment of contamination has considered the new contaminated land risk based guidance on human health. Treatment of contaminated land and offsite disposal would be the responsibility of the DBFO Contractor and would be subject to the appropriate environmental legislation and guidance and discussions with the local planning authorities.
- 11.7.1.2 The geology underlying the Scheme comprises predominantly sands and gravels of either fluvial or glacial origin overlying Upper Chalk Formation with local variation of drift and bedrock. Agricultural soils within the study corridor are predominantly classified as Grade 3 (Moderate quality). However the Scheme design is confined to Secretary of State land and therefore no agricultural land would be removed as part of the Scheme.
- 11.7.1.3 No geological or geomorphological SSSIs, RIGS or active quarries would be affected by the Scheme.
- 11.7.1.4 The Scheme design considers, but is not restricted to, the use of retaining walls, soil nailing, granular toe replacement, reinforced soil, granular fill extension, and regrade of cuttings. The design proposes the use of retaining walls to minimise the volume of waste arising in areas where landfill is present within the Scheme Boundary.
- 11.7.1.5 Eighteen operating and former landfills have been identified within the study area between Junctions 16 and 23, many of which are located immediately adjacent, or within the Scheme Boundary. There are a number of potentially contaminated land areas that lie within the study corridor. They relate to a variety of possible causes such as location of past spillages or anecdotal information regarding tipping.
- 11.7.1.6 Chemical test results have indicated the existence of a number of contaminants of differing concentrations such as PAH, TPH and heavy metals in the soil at some locations, often confirming contamination at known landfills. Landfill gas has been identified in a number of exploratory holes and primarily includes methane and carbon dioxide and is generally associated with the presence of landfill waste.
- 11.7.1.7 The extent and location of Landfill 1.3A is uncertain but anecdotal evidence suggests asbestos may be present and therefore a large adverse effect on health and safety of site workers in the construction phase is possible if any asbestos encountered is not dealt with appropriately and immediately during construction.
- 11.7.1.8 Landfill 1.8 and 1.10 have been identified to represent areas of elevated methane concentrations and relatively high flow rates indicating potential for gas migration. The gas flow regime in these areas are unknown.
- 11.7.1.9 Landfill 1.13 is known to underlie the existing M25 carriageway and lies both within and outside of the Scheme Boundary. Landfill waste is present beneath the M25 and part of Landfill 1.13 has been identified as being in an area of regrade. There is a potential moderate effect for health and safety of site workers if landfill waste is exposed. Other

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landfills, such as Landfill 1.8 and 1.10, may also be present within the Scheme Boundary.

11.7.1.10 Landfills 1.8, 1.10, 1.12 and 1.13, and nearby other landfills, present a potential risk of flammable landfill gas, which could create an explosive environment in areas of limited ventilation during construction. Damping down during construction would reduce the risk of sparking during sheet piling for example, but construction in the vicinity of landfills would be treated with caution.

11.7.1.11 During the operational phase, the significant effects in vicinity of landfills and particularly at Landfills 1.8, 1.10, 1.12 and 1.13, are considered to be landfill gas migration to M25 drainage, which would be mitigated by appropriate ventilation of the drainage.

11.7.1.12 The overall effect of the Scheme in terms of geology and soils is neutral.

12 Cultural Heritage

12.1 Introduction

- 12.1.1.1 This chapter provides a detailed cultural heritage assessment of the Scheme. It presents details of the baseline conditions in respect of cultural heritage resources (archaeology, built heritage and historic landscape) and provides an evaluation of their importance.
- 12.1.1.2 An assessment of any previous impacts which may have affected archaeological survival, or existing impacts which may affect historic setting along with the likely scale and significance of effects arising from the construction and operation of the Scheme have been undertaken. The assessment includes mitigation measures included in the design and required during construction or operation of the Scheme in order to mitigate any adverse effects.
- 12.1.1.3 Further details on the Cultural Heritage baseline and assessment can be found in the Cultural Heritage Technical Report¹.

12.2 Regulatory Framework

- 12.2.1.1 The assessment has been carried out in accordance with the following legislation and best practice guidance:
- The Highways Act 1980²
 - Planning (Listed Buildings and Conservation Areas) Act 1990³
 - Ancient Monuments and Archaeological Areas Act 1979⁴
 - Planning Policy Guidance Note 15 (PPG 15): Planning and the Historic Environment⁵
 - Planning Policy Guidance Note 16 (PPG 16): Archaeology and Planning⁶
 - By-laws, standards and policy statements of the Institute of Field Archaeologists⁷
 - Association of County Archaeological Officers' Model briefs and specifications for archaeological assessments and field evaluations⁸
 - Cultural Heritage Committee of the Council of Europe's Code of Good Practice on Archaeological Heritage in Urban Development Policies⁹

12.3 Methodology

12.3.1 Study Area

- 12.3.1.1 The study area for this assessment comprised the Scheme Boundary, the existing Secretary of State land and the land within 500 metres on either side of the centre line of the motorway, as shown in Figure 12.1. Where relevant, resources outside the study

area, in the general vicinity of the motorway, have also been considered, to set the Scheme within its archaeological and historical context. For example visual effects on built heritage extended as far as they were visible as detailed in Chapter 6 Landscape Effects.

12.3.2 Establishment of Baseline Conditions

12.3.2.1 The baseline conditions were defined from the following sources:

- desk study based on information collected between 2004 and 2006 from English Heritage National Monuments Record (NMR), Buckinghamshire County Council, Hertfordshire County Council, St Albans City and District Council, the St Albans Verulamium Museum records, National Air Photographic Library at the National Monuments Record (NMR) in Swindon, British Library, Ordnance Survey 1st edition 6" maps, British Geological Survey solid and drift geology maps and Hyder Consulting LiDAR survey 2004
- walkover survey in December 2004
- Misbourne (Chalfont) Viaduct study¹⁰
- geotechnical investigations (Chapter 11 of this ES)

12.3.2.2 The cultural heritage resource was considered within two categories:

- archaeological remains (archaeological sites, finds and palaeoenvironmental deposits)
- built heritage (extant remains including statutorily and locally Listed Buildings; unListed buildings of historic interest, Conservation Areas, Registered Parks and Gardens and the relict historic landscape)

12.3.2.3 Known archaeological sites and finds and Listed Buildings have been assigned a unique reference number for the purposes of this assessment, used in the report and marked on the cultural heritage features mapping, Figure 12.1. For clarity, known sites and finds have an 'S' (Site) prefix; Listed Buildings have an 'LB' (Listed Building) prefix. Buildings of historical interest, identified by this assessment but which are not statutorily Listed, have a 'BH' (Built Heritage) prefix. For clarity, fields within the study area as shown on the features mapping (Figure 12.1) have been assigned a field number by the Museum of London Archaeology Service (MoLAS). These have been referred to in the text as a field number.

12.3.3 Assessment of Effects

12.3.3.1 The impact assessment methodology adheres to guidance provided by Stage 3 Assessment in the DMRB Volume 11, Section 3 Part 2¹¹ and the Highways Agency Interim Advice Note 92/07 Environmental Topics DMRB 11.3.2 Cultural Heritage¹². The significance of environmental effect was determined by resource significance (hereafter termed 'importance'), and the magnitude of change ('impact') upon the resource.

12.3.3.2 Importance of resource is based on existing formal national or local designations but allows for professional judgement where, as is often the case, resources have no designation. Where a resource has been badly damaged or compromised, its

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importance may be downgraded. Conversely, resources which are associated in some way may be given a higher collective rating based on their group value.

12.3.3.3 Table 12.1 provides a list of the criteria based on guidance provided by Interim Advice Note 92/07.

Table 12.1: Criteria used to Describe Resource Importance

Resource importance	Equivalent to
Very high	<ul style="list-style-type: none"> Standing structures inscribed as of universal importance as World Heritage sites World heritage sites inscribed for their historic landscape qualities Other buildings of recognised international importance Assets of acknowledged international importance Assets that can contribute significantly to acknowledged international research objectives Historic landscapes of international sensitivity, whether designated or not Extremely well preserved historic landscapes with exceptional coherence, time-depth, or other critical factors(s)
High	<ul style="list-style-type: none"> Scheduled Monuments Undesignated assets of schedulable quality and importance Assets that can contribute significantly to acknowledged national research objectives Grade I and II* Listed Buildings Other listed buildings that can be shown to have exceptional qualities in their fabric or historical association not adequately reflected in the listed grade Conservation Areas containing very important buildings Undesignated structures of clear national importance Designated historic landscapes of outstanding interest Undesignated landscapes of outstanding interest Undesignated landscapes of high quality and importance, and of demonstrable national sensitivity Well preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factor(s)
Medium	<ul style="list-style-type: none"> Designated or undesignated assets that contribute to regional research objectives Grade II Listed Buildings Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical association Conservation Areas containing important buildings Historic townscape or built-up areas with historic integrity in their buildings, or built settings (e.g. including street furniture and other structures) Designated special historic landscapes Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional sensitivity Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other factor(s)
Low	<ul style="list-style-type: none"> Undesignated assets of local importance Assets compromised by poor preservation and/or poor survival of contextual associations Assets of limited value, but with potential to contribute to local research objectives 'Locally Listed' buildings Historic (unlisted) buildings of modest quality in their fabric or historical association Historic townscape or built-up areas of limited historic integrity in their buildings, or built settings (e.g. including street furniture and other structures) Robust undesignated historic landscapes Historic landscapes with specific and substantial importance to local interest groups, but with limited sensitivity Historic landscapes whose sensitivity is limited by poor preservation and/or poor survival of

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Resource importance	Equivalent to
	contextual associations Robust historic landscapes
Negligible	Assets of very little or no surviving archaeological interest Buildings of no architectural or historical note; buildings of an intrusive character Landscapes with little or no significant historical interest
Unknown	The importance of the resource cannot be ascertained Buildings with some hidden (i.e. inaccessible) potential for historic significance

12.3.3.4 The magnitude of change took into account the severity of impact of the Scheme, the current state of survival/condition of the resource (based on past impacts), and the sensitivity or vulnerability of a site to impact (e.g. presence of 'protective' overburden such as made ground or alluvium). The survival of archaeological deposits within an area is often uncertain, as is their exact extent. The magnitude of change can therefore be difficult to predict with any certainty. Table 12.2 provides a list of the criteria used in determining magnitude of change.

Table 12.2: Criteria used to Determine Magnitude of Change (adapted from IAN 92/07)

Magnitude of change	Description
Major	Change to most or all key archaeological elements, such that the resource is totally altered Change to key historic building elements, such that the resource is totally altered Comprehensive changes to setting of archaeological asset Total change to the setting (in the case of a historic building) Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change to use or access; resulting in total change to historic landscape character unit
Moderate	Changes to many key archaeological elements, such that the resource is clearly modified Considerable changes to setting Change to many key historic building elements, such that the resource is significantly modified Changes to the setting of an historic building, such that it is significantly modified Changes to many key historic landscape elements, parcels or components, visual change to many key aspects of the historic landscape, noticeable differences in noise or sound quality, considerable changes to use or access; resulting in moderate changes to historic landscape character
Minor	Changes to key archaeological elements, such that the asset is slightly altered Slight changes to setting (archaeology) Change to the key historic building elements, such that the asset is slightly different Changes to the setting of an historic building, such that it is noticeably changed Changes to a few key historic landscape character elements, parcels or components, slight visual changes to few key aspects of historic landscape, limited changes to noise levels or sound quality; slight changes to use or access resulting in limited changes to historic landscape character
Negligible	Very minor changes to setting (archaeology) Slight changes to the historic building elements or setting that hardly affect it Very minor changes to key historic landscape elements, parcels or components, virtually unchanged visual effects, very slight changes in noise levels or sound quality; very slight changes to use of access; resulting in a very small changes to historic landscape character
No Change	No change
Uncertain	Level of survival/condition of resource in specific locations is not known: Magnitude of Change is therefore not known

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12.3.3.5 The following types of impact have been considered:

- Direct impacts – physical impacts
- Indirect impacts – those arising from the Scheme via a complex route, where the connection between the Scheme and the impact is complicated
- Cumulative impacts - accumulation of a number of impacts through effects of a different nature at a particular location, at different locations but affecting the same resource, of the same nature at different locations or through recurrence over a period of time, e.g. vibration impacts from increased traffic on historic buildings and structures, emissions damage to historic buildings and structures
- Construction impacts – impacts during construction period, including associated works such as construction compounds, access roads etc
- Operational impacts – impacts caused during the operational lifetime of the Scheme. This mainly relates to permanent indirect impacts upon the setting of historic buildings i.e. through changes in traffic noise and visibility

12.3.3.6 The significance of environmental effect without mitigation was derived using the significance of effects matrix Table 12.3. An appropriate programme of mitigation would aim to reduce the severity of a negative (adverse) effect or remove it completely. Effects were defined as:

- Permanent - effects that result from an irreversible change to the baseline environment or which persist for the foreseeable future
- Temporary - effects that persist for a limited period only
- Beneficial - effects that have a positive influence on receptors and resources
- Adverse - effects that have a negative influence on receptors and resources
- Residual – effects that remain after mitigation

12.3.3.7 Where the survival of the below ground archaeological resource is uncertain more detailed preliminary investigation in the field would normally be required in order to enable a more informed judgement of the effect. Field investigation would clarify not only the importance of any resources but also the level of survival of the archaeological resource within the impact zone. Where the desk-based did not supply enough information to quantify sufficiently either the resource importance or magnitude of change the significance of effect was given as uncertain.

Table 12.3: Significance of Effects. (IAN 92/07)

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

12.4 Baseline Conditions

Known heritage features are shown in Figure 12.1 and historic mapping is provided in Figure 12.2. Detailed baseline details and gazetteers are provided in the Cultural Heritage Technical Report.

12.4.1 Topography and Geology

- 12.4.1.1 The predominant superficial deposit, beneath the Scheme, comprises sands and gravels of Pre-diversionary ancestral River Thames River Terrace Deposits and possible glacial origin. Alluvium is found locally at the location of existing rivers. Elsewhere Valley gravel, Pebble gravel and Boulder Clay is found locally.
- 12.4.1.2 The predominant bedrock beneath the superficial deposits along the Scheme, comprises the Upper Chalk Formation. At the Eastern and Western ends of the Scheme, London Clay Formation is instead present and is located between Junctions 16 to 17 and Junctions 22 to 23. The Reading Formation lies between Junctions 20 to 21.
- 12.4.1.3 Topologically, the River Chess, located North East of Junction 18, forms a significant valley in an otherwise relatively flat area.
- 12.4.1.4 After Junction 20 the motorway crosses the Gade Valley, the course of the Grand Union Canal and a railway on the Gade Valley viaduct. The superficial geology includes alluvium associated with the River Gade.
- 12.4.1.5 The River Ver and the River Colne, West of Junction 22, meet south of the motorway, creating two converging valleys containing recent Alluvium deposits.
- 12.4.1.6 The Catharine Bourne stream valley, North West of Junction 23, runs North-East across the path of the motorway at South Mimms, containing Valley gravel.

12.4.2 Designated Resources

- 12.4.2.1 There are two Scheduled Ancient Monuments (SAMs) within the study area, both are medieval moated sites and are classified as being of very high importance. The sites

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include the “Little London” moated site and associated earthworks which is possibly the remains of a lodge in the Royal Park of King's Langley. The other is the Colney Chapel moated site (5170400/2031200). The medieval chapel of St John the Baptist is surrounded by a supposedly artificial moat, which is of an unusual oval form. The moat is known to have been 9–10 metres wide, but has been reduced within living memory to a narrow ditch.

12.4.2.2 There are two Buckinghamshire County Council Archaeological Notification Areas (ANAs) within the study area. These are designated for a series of prehistoric finds and medieval pottery kilns. The south-east part of Junction 16 partly falls within the first ANA and the second small Buckinghamshire ANA is centred on the Chalfont Viaduct, based on prehistoric finds from the area. The archaeological potential within these zones is considered by the local authority to be sufficiently high to warrant investigation prior to any development. There are eighteen Hertfordshire County Council Areas of Archaeological Significance (AASs) within the study area. Again they have been designated as areas of higher potential based on evidence from cropmarks visible on air photographs or findspots.

12.4.2.3 There are six conservation areas designated with the study area: Heronsgate, Chorleywood Common, Loudwater Estate, Abbots Langley, London Colney and South Mimms Conservation Areas. They are designated usually because of their buildings but they can also be designated because of their history, architecture, layout or private spaces, such as gardens, parks and greens; trees or street furniture. Conservation areas give broader protection than listing individual buildings and all features within the area, listed or otherwise, are recognised as part of its character.

12.4.2.4 Approximately one kilometre of the M25 passes through the most eastern part of The Chilterns Area of Outstanding Natural Beauty (AONB) in deep cutting to the north of Junction 18 at Chorleywood.

12.4.3 Previous Archaeological Investigations

12.4.3.1 The study area has been subject to limited, recent, controlled archaeological investigation. Figure 12.1 is therefore more a reflection of the current inadequate state of knowledge than the real distribution pattern of past settlement and land use and hence of archaeological potential.

12.4.3.2 Four known archaeological sites considered of high significance are present within the study area. These are:

- a Roman villa (S85) and mill (S84) in the Chess valley between Junctions 18 and 19
- an Iron Age and Roman settlement (S96) at Junction 19
- a prehistoric and Roman site (including a Neolithic boat burial) and a Saxon settlement (S154) between Junctions 21 and 22

12.4.3.3 Other archaeological investigations in the general vicinity give a broader indication of potential, as reflected in the designation of Local Authority Archaeological Priority Areas. Near Junction 16 are the medieval Denham pottery kilns (S7) and, further north, a Mesolithic flint working area (S29) in the Misbourne Valley adjacent to the motorway. Mesolithic to late Bronze Age evidence has been recovered from areas around Isle of

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Wight Farm (S28 and S30), Mopes Farm (S45-49, S53-56, S60-64) and Chalfont Lane (S69-74), including investigations carried out as part of the original motorway construction.

- 12.4.3.4 There is a possible Neolithic settlement east of the motorway, between Junctions 17 and 19, a Roman pottery north of Junction 17 (S78) and a medieval pottery kiln on the line of the M25 at Chandlers Cross (S92). Between Junctions 20 and 21, another Roman villa was excavated in the Gade valley, at King's Langley in the 1820s, 1960s and 1980s (S120).

12.4.4 Archaeological Potential

- 12.4.4.1 A much larger database of known and suspected archaeological features, ranging in date from prehistoric to the 20th century, has been considered in deriving the archaeological potential of the study area. Some are of unknown date, function or significance. In addition to chance finds in Sites and Monuments Records, they include documented but uninvestigated historic features such as villages, farms, manors and enclosures, Roman road lines, cropmarks and earthworks from maps and air photographs, industrial archaeology (eg railways, canals, factories, mills, quarries), military sites (eg airfields and WWII defences) and landscape features (eg palaeochannels, parks and gardens, ancient woodland).
- 12.4.4.2 Truncation from past intrusive land uses (especially construction of the existing motorway) also has implications for archaeological potential. Although the walkover survey provided indications, there is little direct evidence for deposit survival within the Scheme Boundary, where most of the works would occur. However, soil stripping, grading, landscaping and structural works for the original M25 mean that archaeological survival is likely to be compromised inside the existing highway boundary fence (including Junctions and slip roads). This will be most severe where the motorway lies within a cutting (with the possible exception of areas of deeper colluvium such as dry valleys). Conversely, remains may be preserved where the motorway is at grade or on an embankment; and also if there are less disturbed areas outside the highway boundary fence or if new temporary or enabling works take place outside Secretary of State land.
- 12.4.4.3 These factors have been used to define the overall archaeological potential, by period.. The potential is often unknown and has generally been assessed as low to moderate. Some of the best potential (moderate to high) is for multi period resources, from the Mesolithic onwards, which may be preserved within the alluvial river valleys that cross the line of the motorway, such as the Misbourne, Chess, Gade, Colne, Ver and Catharine Bourne. For example, the presence of Roman villas has been noted here. More generally, the gravel and chalk exposures are likely to have provided attractive landscapes for settlement and agriculture of all periods. Although the gravel in particular will also have been in demand for 19th and 20th century quarrying. Modern agricultural practice will also have caused truncation.
- 12.4.4.4 Other areas of potential (generally moderate) include concentrations of prehistoric flint work from field walking, crop marks from aerial photographs, medieval kilns and moated sites, and the hinterland of Roman roads and medieval villages. These features often form the basis of Local Authority archaeological priority areas.

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12.4.4.5 The Site of Special Scientific Interest (SSSI) at Moor Mill Quarry West provides a sequence for the diversion of the Thames during the Anglian stage of the Middle Pleistocene and is shown on Figure 7.1. Although there may be potential for early prehistoric activity at this location, there is no evidence for it and any mitigation would be alert to the possibility of early remains.

12.4.4.6 Overall it is not possible to conclude that certain sections of the study area have a greater archaeological potential than others.

12.4.5 Built Heritage

Listed Buildings

12.4.5.1 Eighty-one listed buildings lie within the study area. These are numbered in Figure 12.1. The most significant are:

- Langleybury House (LB32) between Junctions 19 and 20 is Grade II* Listed .
- All Saints Pastoral Centre (LB58) between Junctions 21A and 22 is Grade II* Listed
- Salisbury Hall (LB64), located between Junctions 22 to 23 is Grade II* Listed
- 13th-century St Giles Church (LB74) located between Junctions 22 to 23 is Grade I Listed

12.4.5.2 These are already compromised by the motorway. Other Grade II Listed Buildings are identified in the Cultural Heritage Technical Report and on Figure 12.1.

Historic Buildings (non Listed)

12.4.5.3 There are numerous non-listed structures of historic interest within the study area (Figure 12.1). The majority are 17th to 19th century cottages and farm buildings within what was then substantially a rural landscape. Later development is reflected in the Misbourne (Chalfont) railway viaduct between Junctions 16 and 17, now a striking feature over the motorway. Further details on this feature are available in Appendix B of the Cultural Heritage Technical Report. Other examples include a 19th century Chartist settlement (BH1) and WWII housing (BH10) between Junctions 18 and 19 and the Ovaltine Farm (BH11) between 20 and 21.

12.4.6 Historic Landscape

12.4.6.1 There are no statutorily designated Historic Parks and Gardens in the study area although there is the Chilterns AONB (See 12.4.2). There has been much 20th century urban and agricultural development along the motorway. It is based around the original framework of a rural landscape of roads, field systems, farms and historic villages, which (although obscured) is still apparent. Between Junctions 16 and 17, pre and post 18th-century enclosure with some areas of woodland survives in the south, although the east side of Chalfont St Peter is characterised by recent agricultural amalgamation. Between Junctions 17 and 18 the corridor is mostly occupied on the east by the expansion of Rickmansworth, but to the west (south of Chorleywood) much of the original enclosure system is retained.

- 12.4.6.2 The section between Junctions 18 and 19 illustrates a mixed historic landscape character, with a balance of pre and post 18th-century enclosure. However there is some loss of historic boundaries and other earthworks from the creation of modern prairie-style fields and this is more apparent between Junctions 19 and 20. Similarly, from Junctions 20 to 21 the motorway runs between the more recent urban expansion of Abbots Langley, Kings Langley and Bedmond and any surviving field pattern is largely modern.
- 12.4.6.3 There is better preservation of 18th-century and earlier enclosure patterns, including remnants of ancient woodland, between Junctions 21 and 22, but still a moderate degree of encroachment from the built-up areas of Bricket Wood, Colney Hatch and Chiswell Green. From Junction 22, much of the landscape character has been compromised by modern agricultural practice, but around South Mimms and west of Junction 23 much of the pre 18th-century system is still reflected in the boundaries.

12.5 Design and Mitigation

- 12.5.1.1 The aim of the Scheme would be to ensure that heritage resources are permanently protected and retained without disturbance (*preservation in situ*). The desk-based assessment for the Scheme did not identify any key areas or resources of known high archaeological sensitivity that might merit *preservation in situ* and modifications to the proposed design. The identification of any particularly significant archaeological resources (at an early stage) would be used to inform the detailed design process where feasible for example changes to foundation design or construction method.
- 12.5.1.2 In the light of this, it is considered that any environmental impact of the Scheme upon the buried heritage could be successfully mitigated by a suitable programme of archaeological investigation, prior to and during construction (*preservation by record*).
- 12.5.1.3 However, the desk-based assessment also encountered unknown significance and survival quality of buried resources in many areas, generally due to a lack of previous archaeological investigations. Here, additional archaeological field evaluation may be needed before detailed mitigation for specific locations are adequately defined. This small-scale, selective trial work would be undertaken at an early stage.
- 12.5.1.4 The resulting mitigation strategies are expected to include:

Works Within the Existing Highway Boundary Fence

- 12.5.1.5 Here remains will probably have been extensively damaged during construction of the existing motorway and associated landscaping. The recommended mitigation is therefore an Archaeological Watching Brief during construction, either a routine monitoring of construction ground works (General Watching Brief) or more specific arrangements for any areas of better potential (Targeted Watching Brief).

Works Within the Scheme Boundary but Outside the Highway Boundary Fence

- 12.5.1.6 There may be areas of better resource preservation within this zone which is still within Secretary of state land. Construction of balancing ponds and drainage works are proposed in these areas There may also be enabling and/or temporary works still to be defined by the DBFO Contractor.

12.5.1.7 Some of these areas may be suitable for a Watching Brief but where better survival can be demonstrated the preferred mitigation would be early access for Targeted Archaeological Investigations in advance of construction. In cases where early land access is not feasible, it may be possible to undertake mitigation concurrently with the temporary, enabling or main construction phases. This would involve careful integration of archaeological works into the DBFO Contractor's programming.

Works Outside the Scheme Boundary

12.5.1.8 The DBFO Contractor may need to locate localised enabling and temporary works (such as construction compounds, haul roads and spoil storage areas) outside the Scheme Boundary and outside the Secretary of State land. Once locations are known, these would be subject to a heritage review and to consultation with relevant local authority heritage officers before a mitigation strategy is finalised.

12.5.1.9 The illustrative design was continually reviewed with respect to the distance of Listed Buildings from the Scheme and the adequacy of current protection (primarily existing Environmental Barriers, environmental bunds, screening and cuttings). A number of slight visual effects have been identified by the Landscape specialist and the mitigation for these is discussed in the Chapter 6 Landscape Effects. No additional mitigation is therefore proposed.

12.5.1.10 In one further case (the non-Listed Misbourne / Chalfont Railway Viaduct) possible detrimental effects on setting would be reduced by sensitive placement/design of the proposed crash barriers.

12.6 Assessment of Effects

12.6.1 Construction

12.6.1.1 Construction work would comprises the main impact upon known and potential archaeological resources as follows.

Temporary and Enabling Works

12.6.1.2 The location of construction compounds, soil storage areas, access roads etc would be developed by the DBFO Contractor who has yet to be appointed. Consequently their impact cannot be assessed in detail. These areas would normally be stripped of topsoil and subsoil, exposing any surviving archaeological remains to weathering and possible damage from heavy plant. There may be additional impacts from localised hard standing, footings for accommodation, service trenches etc. Impacts (and mitigation) would be developed in more detail with the DBFO Contractor once the nature and location of these works is known. This would be undertaken in consultation with the local authorities.

Modifications to Existing Cuttings

12.6.1.3 Up to seven techniques would be used to widen existing cuttings. These would involve enlarging the cutting at its base but not at the top of the slope (i.e. the cutting footprint is unchanged). In most cases works would take place below the level of past human activity and hence have no archaeological impact. The exception is where the present

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cutting is shallow (e.g. at either end) and/or where archaeological deposits may be deeper than elsewhere (e.g. within alluvial or colluvial deposits in former stream valleys).

Modifications to Existing Embankments

12.6.1.4 Up to five techniques would be used, three of which have the potential to affect archaeology:

- a granular fill extension (involves regrading and extending the existing toe drainage ditch)
- fill above reinforced soil at the toe with existing toe drain (which includes a new drainage layer outputting to the existing drain, in which the original ground surface beneath the embankment is excavated to a depth of approximately 0.5–1.0 metres and soil stripping for a working width is likely)
- a contiguous piled retaining wall where a retaining wall is inserted through the existing embankment

Ponds and Associated Landscaping

12.6.1.5 New balancing ponds within the Scheme Boundary would be up to 2 metres deep. They would be connected to the existing motorway drainage system by new ditches/culverts. Construction would entail preliminary topsoil and subsoil stripping, followed by excavation of the ponds and grading/planting around the pond.

Drainage System

12.6.1.6 A range of additional measures would be used for the drainage system for the widened motorway. Additional soakaway pits would generally be adjacent to existing soakaways at the base of embankments and each approximately 3 metres in diameter by up to 8 metres deep. They would be linked by drains/channels/culverts (up to 1 metre depth assumed). A range of bio-retention facilities, swales etc would (assumed up to 1.5 metres depth) be used to augment this system. It has also been assumed that there would be preliminary soil stripping in affected areas, prior to construction, within a minimum working width of approximately 5 metres. All drainage improvements would form part of a connected system.

Environmental Barriers

12.6.1.7 These comprise a substantial wooden fence with typically 0.45 metre² posts at 3 metre intervals bored to approximately 1.5 metre depth. Preliminary soil stripping may be required, which would have an impact upon any archaeological remains located immediately beneath the topsoil.

12.6.1.8 Secondary glazing would be required at two Listed buildings, Alderbourne Cottage (LB2) And Bircham Cottage (LB11) to reduce the noise impacts of changes in traffic. This would be undertaken sensitively so that it would be a neutral change. Listed Building consent may be required.

Localised Foundations

12.6.1.9 The Scheme would include new signal gantries, lighting and modifications to existing footbridges. The foundations would be mainly concrete bases, in the case of gantries founded upon two circa 0.75 metre-diameter piles. The majority of these works would be within the footprint of the existing motorway and many would be set within cuttings and embankments. These works would in general cause minimal intervention, are within areas previously truncated or reconfigured during the motorway construction and would have no archaeological impact. The only exceptions might be at the occasional less disturbed locations e.g. if alluvial/colluvial deposits are present where the carriageway is at grade or where lighting and signage is proposed at Junctions and slip roads.

Ecological Mitigation

12.6.1.10 Ecological mitigation would potentially have an impact upon archaeological remains. These comprise reptile refuges, otter holts, water vole ponds and badger setts. These would entail small localised excavations to no more than 1.5 metres to 2 metres in depth. The location of reptile refuges is fairly flexible but otherwise the location of ecological mitigation is more restricted. As with localised foundations, these works would in general cause minimal intervention, within areas previously truncated or reconfigured during motorway construction and would have no archaeological impact. The only exceptions might be at occasional potentially less disturbed locations mentioned previously.

Archaeological Impacts

12.6.1.11 The impact upon known and possible (previously unrecorded) archaeological remains is presented in Table 12.4. The mitigation strategy would reduce any adverse effects to an acceptable level or remove them completely.

12.6.1.12 The predicted environmental effects on cultural heritage (without mitigation) are as follows:

- no known resources of very high importance, such as Scheduled Monuments, would be physically effected by the proposals, and no definite large adverse effects are predicted
- fifteen uncertain possible adverse effects upon known resources have been identified
- the Scheme has potential to impact upon possible, previously unrecorded, archaeological remains. The effect of the Scheme is uncertain where, as in most cases, it has not been possible to quantify the significance of effect. This is primarily due to the inherent limitations in using a largely desk-based assessment to predict the nature, survival and significance of buried archaeological resources. Little archaeological investigation has been carried out in the study area in the past and current understanding of the past human activity in this area is extremely limited. More general areas of good background archaeological or topographic potential have been included (as reflected for example in river valleys, Archaeological Priority Areas, known resources in the vicinity and relatively undisturbed land)

Built Heritage Impacts

12.6.1.13 Construction impacts on the built heritage are confined to temporary effects (eg from construction noise, visibility and vibration) on the setting and on historic landscape context of historic buildings in the immediate vicinity of the Scheme. The existing motorway has compromised the setting and context of such buildings and any of these temporary effects are likely to be negligible. Construction landscape and noise effects are defined in Chapters 6 and 9 respectively. In order to reduce noise secondary glazing would be fitted to two listed buildings Alderbourne Cottage (**LB2**) and Bircham Cottage (**LB11**) but the significance of effect on these would be negligible.

Historic Landscape Impacts

12.6.1.14 The M25 has added to the palimpsest of features which form the historic landscape. Since the Scheme is to be constructed within the Secretary of State land, there would be no effect on the historic landscape from construction.

12.6.2 Operation

12.6.2.1 Operational impacts would be mainly confined to effects on the setting of historic buildings and on historic landscape context (eg from increases in traffic noise and visibility). The majority of these have already been compromised by the existing motorway and suffer from levels of traffic noise and reduced visual amenity.

12.6.2.2 As stated in Section 12.6.1, secondary glazing would be fitted on Alderbourne Cottage (**LB2**) and Bircham Cottage (**LB11**) to reduce increases in noise levels to within the Scheme design aim of less than 1dB change. As a result, the Scheme would not result in a perceptible increase in noise upon any built heritage resources (refer Chapter 9 Noise and Vibration).

12.6.2.3 The Scheme would have a moderate adverse effect upon the setting of two Grade II Listed Buildings. The Scheme would have slight adverse effects upon the setting of 36 Grade II Listed Buildings and one Grade II* Listed Building. These are due to the following:

- changes in traffic flows and speeds
- removal of vegetation
- increased visibility of lighting columns and gantries and new Environmental Barriers

12.6.2.4 The Listed Buildings with an adverse effect upon their setting are outlined in Table 12.4, and further details are provided in Figure 6.10 Visual Impact Schedules (Properties).

12.6.2.5 Increased lighting columns and associated gantries would have a moderate to slight adverse effect on the setting of Chilterns AONB (refer Chapter 6 Landscape Effects).

12.6.2.6 In addition, there would be a possible operational effect upon Misbourne (Chalfont) Viaduct (S194, Chainage 4,230). Although not Listed, this is an impressive structure and forms a prominent landscape feature, particularly when viewed from the motorway. No direct physical impacts to the structure have been identified. Details of the proposals would be finalised by the DBFO Contractor during detailed design. As a minimum a

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concrete vehicle crash barrier would be cast against the existing piers, but the exact nature is not known. Any potential effect on visual appreciation of the viaduct is therefore uncertain.

12.6.2.7 There would be no cumulative effects upon built heritage or archaeological resources identified along the Scheme.

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Table 12.4: Summary of Effects - Heritage

Note: location of construction compounds and access roads is currently unknown. Refer to impacts upon 'possible archaeology' for an indication of the likely implications of such works.

Route Section	Resource type	Ref.	Description	Chainage	Importance	Magnitude of change	Description of change	Significance of Effect (without mitigation)	Mitigation	Effect (following mitigation)
Junctions 16 to 17	Known archaeology	S206	Rectilinear dark patch cropmark of unknown nature/date, cut by existing motorway	5,740 to 5,840	Unknown	Uncertain	E1 embankment modifications	Uncertain	Preservation by record	Neutral Effect
		S22	Possible line of Roman road, noted on NMR and Bucks SMR.	3,550 and 3,650	Medium	Minor to Moderate	Feature possibly lies within area of stripping and construction associated with Environmental Barrier and also within area of proposed pond and carrier drains	Uncertain, possible Moderate Adverse Effect	Preservation by record	Neutral Effect (Uncertain)
	Possible archaeology	N/a	Potential for previously unrecorded archaeological remains dating from the prehistoric period and (at J16) medieval remains associated with pottery kilns (S7 and S2).	N/a	Unknown	Uncertain	Potential impact from topsoil stripping and subsequent construction works within previously undisturbed areas (ie primarily outside the Highway boundary and within at J16).	Uncertain (potential for Slight to Large Adverse Effect)	Preservation by record	Neutral Effect (Uncertain)

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Route Section	Resource type	Ref.	Description	Chainage	Importance	Magnitude of change	Description of change	Significance of Effect (without mitigation)	Mitigation	Effect (following mitigation)
	Built heritage	LB1, LB2, LB6-10	Seven Grade II Listed Buildings	---	Medium	Minor	Visual effects on setting (already compromised by existing motorway)	Dealt with in Part 1: Landscape		
		LB2	Grade II Listed Building	2,870	Medium	Negligible	Addition of secondary glazing	Slight	LBC. Sympathetic materials	Neutral Effect
		S194	Misbourne (Chalfont) Viaduct; built 1903 to carry the railway across the valley. Impressive structure and distinctive landscape feature (not Listed)	4,230	Medium	Uncertain	Possible setting effect due to construction of crash barriers (proposals yet to be determined).	Uncertain (possible Adverse effect on setting)	Preservation by record	Uncertain Effect
Junctions 17 to 18	Possible archaeology	N/a	Potential for previously unrecorded archaeological remains dating from the prehistoric period.	N/a	Unknown	Uncertain	Potential impact from topsoil stripping and subsequent construction works within previously undisturbed areas (ie primarily outside the Highway boundary).	Uncertain (potential for Slight to Large Adverse Effect)	Preservation by record (not feasible for E5 works)	Neutral Effect (Uncertain)
	Built Heritage	LB11	Bircham Cottage Grade II Listed Building	10,310	Medium	Negligible	Addition of secondary glazing	Slight	LBC. Sympathetic materials	Neutral Effect

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Route Section	Resource type	Ref.	Description	Chainage	Importance	Magnitude of change	Description of change	Significance of Effect (without mitigation)	Mitigation	Effect (following mitigation)
Junctions 18 to 19	Known archaeology	S85	Suggested Roman villa with associated settlement/economic activity nearby.	13,550	High or Very High	Uncertain	Extent of settlement uncertain. Potential localised impact from cuttings and E5 embankment wall	Uncertain	None (not feasible for E5 works)	Uncertain Effect
	Known archaeology	S215	Long south-west to north-east aligned linear cropmark identified from air photographs. Probable boundary of unknown date.	16,000	Unknown	Moderate	Would be removed by pond excavation. Past disturbance anticipated.	Uncertain	Preservation by record	Neutral Effect
	Possible archaeology	N/a	Potential for previously unrecorded archaeological remains dating from the prehistoric period.	N/a	Unknown	Uncertain	Potential impact from topsoil stripping and subsequent construction works within previously undisturbed areas (ie primarily outside the Highway boundary).	Uncertain (potential for Slight to Large Adverse Effect)	Preservation by record (not feasible for E5 works)	Neutral Effect (Uncertain)
	Historic Landscape	Chiltern AONB	Chiltern AONB	13,800 to 14,725	High	Minor	New lighting and associated gantries	Moderate to Slight Adverse Effect	New planting	Moderate to Slight Adverse Effect

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Route Section	Resource type	Ref.	Description	Chainage	Importance	Magnitude of change	Description of change	Significance of Effect (without mitigation)	Mitigation	Effect (following mitigation)
	Built Heritage	LB19-LB22, LB24, LB25, LB27 LB28	Nine Grade II Listed Buildings	---	Medium	Minor	Visual effects on setting (already compromised by existing motorway)	Dealt with in Part 1: Landscape		
Junctions 19 to 20	Known archaeology	S216	Rectilinear cropmark of unknown nature cut by the existing motorway.	18,400 to 18,700	Unknown	Minor to Moderate	Possible survival where proposals involve works at base of the existing shallow cutting	Uncertain	Preservation by record	Neutral Effect
	Known archaeology	S96	Iron Age and Roman settlement excavated in 1979 presumably in response to quarrying. The exact extent is not known.	17,800 to 18,050	High	Uncertain probably Minor	Extent of settlement uncertain. Potential localised impact from ponds and E5 wall	Uncertain (potential for Slight Adverse Effect)	Preservation by record	Neutral Effect
	Possible archaeology	N/a	Potential for previously unrecorded archaeological remains dating from the prehistoric period.	N/a	Unknown	Uncertain	Potential impact from topsoil stripping and subsequent construction works within previously undisturbed areas (ie primarily outside the Highway boundary).	Uncertain (potential for Slight to Large Adverse Effect)	Preservation by record (not feasible for E5 works)	Neutral Effect (Uncertain)

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Route Section	Resource type	Ref.	Description	Chainage	Importance	Magnitude of change	Description of change	Significance of Effect (without mitigation)	Mitigation	Effect (following mitigation)
Junctions 20 to 21	Known archaeology	S18	Conjectured line of minor Roman road.	24,100	Low	Minor or None	Topsoil strip and construction of carrier drain.	Uncertain (potential for Slight Adverse Effect)	Preservation by record	Neutral Effect
	Known archaeology	S106	Site of Langleybury manor house, noted on Herts HER. Survival uncertain.	19,900	Low	Minor or None	Construction of ponds/landscaping would remove any surviving remains	Uncertain (potential for Slight Adverse Effect)	Preservation by record	Neutral Effect
	Known archaeology	S221	Two short linear cropmarks, approx. N-S, cut by M25. Possible undated field boundaries.	22,800 to 23,050	Unknown	Minor to Moderate	E1 and E5 embankment modifications may affect surviving remains.	Uncertain	Preservation by record (not feasible for E5 works)	Neutral Effect (Uncertain)

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Route Section	Resource type	Ref.	Description	Chainage	Importance	Magnitude of change	Description of change	Significance of Effect (without mitigation)	Mitigation	Effect (following mitigation)
	Known archaeology	S124	Rectilinear cropmarks, which possibly extend within the area of impact. The nature/date and significance is not known, although they form basis for a local authority Area of Archaeological Interest (outside area of impact).	21,500 to 21,800	Unknown	Minor to Moderate	E1 embankment modifications may affect surviving remains.	Uncertain	Preservation by record	Neutral Effect
	Possible archaeology	N/a	Potential for previously unrecorded archaeological remains dating from the prehistoric period.	N/a	Unknown	Uncertain	Potential impact from topsoil stripping and subsequent construction works within previously undisturbed areas (ie primarily outside the Highway boundary).	Uncertain	Preservation by record (not feasible for E5 works)	Neutral Effect (Uncertain)
	Built Heritage	LB35-LB37, LB42-LB46	Eight Grade II Listed Buildings	---	Medium	Minor	Visual effects on setting (already compromised by existing motorway)	Dealt with in Part 1: Landscape		

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Route Section	Resource type	Ref.	Description	Chainage	Importance	Magnitude of change	Description of change	Significance of Effect (without mitigation)	Mitigation	Effect (following mitigation)
Junctions 21 to 22	Known archaeology	S21	Possible line of Roman road from Verulamium (St Albans) to Laleham. Exact location of road is uncertain, as is survival at this point.	25,900 to 26,200	High	Uncertain	E1 or E5 type embankment modifications.	Uncertain	Preservation by record (not feasible for E5 works)	Neutral Effect (Uncertain)
	Possible archaeology	N/a	Potential for previously unrecorded archaeological remains dating from the prehistoric period.	N/a	Unknown	Uncertain	Potential impact from topsoil stripping and subsequent construction works within previously undisturbed areas (ie primarily outside the Highway boundary).	Uncertain	Preservation by record (not feasible for E5 works)	Neutral Effect (Uncertain)
	Built Heritage	LB58 LB52- LB55, LB59L B60	Grade II* Listed Building Six Grade II Listed Buildings	---	High Medium	Minor Minor	Visual effects on setting (already compromised by existing motorway)	Dealt with in Part 1: Landscape		

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Route Section	Resource type	Ref.	Description	Chainage	Importance	Magnitude of change	Description of change	Significance of Effect (without mitigation)	Mitigation	Effect (following mitigation)
Junctions 22 to 23	Known archaeology	S178	Linear cropmark on air photographs and noted on Herts HER. The nature and date of the feature is not known.	32,800 to 33,000	Unknown	Minor to Moderate	E1 embankment modifications may affect surviving remains.	Uncertain	Preservation by record	Neutral Effect
	Known archaeology	S179	Linear cropmark on air photographs and noted on Herts HER. The nature and date of the feature is not known.	33,150 and 33,550	Unknown	Minor to Moderate	E5 embankment modifications.	Uncertain	None (not feasible for E5 works)	Uncertain Effect
	Known archaeology	S235	Rectilinear cropmark, immediately south of rectangular enclosure noted on Herts HER (S180). Possible Romano-British or later enclosure, south side truncated by M25.	33,150 and 33,550	Unknown (potentially High to Very High)	Minor to Moderate	E5 embankment modifications	Uncertain	None (not feasible for E5 works)	Uncertain Effect

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Route Section	Resource type	Ref.	Description	Chainage	Importance	Magnitude of change	Description of change	Significance of Effect (without mitigation)	Mitigation	Effect (following mitigation)
	Possible archaeology	N/a	Potential for previously unrecorded archaeological remains dating from the prehistoric period.	N/a	Unknown	Uncertain	Potential impact from topsoil stripping and subsequent construction works within previously undisturbed areas (ie primarily outside the Highway boundary).	Uncertain (potential for Slight to Large Adverse Effect)	Preservation by record (not feasible for E5 works)	Neutral Effect (Uncertain)
	Built Heritage	LB67 LB72-74 LB76-80	Eight Grade II Listed Buildings	---	Medium	Minor	Visual effects on setting (already compromised by existing motorway)	Dealt with in Part 1: Landscape		

12.7 Summary

- 12.7.1.1 Assuming implementation of the recommended mitigation strategy (preservation by record), the majority of adverse cultural heritage effects would become neutral. For example, the adverse effect of the permanent removal of an archaeological feature is offset by the positive effect of increased knowledge. This may contribute to the development of strategies that assist future research, conservation and management of the historic landscape and heritage resources within it.
- 12.7.1.2 In addition, there are several locations where archaeological remains could theoretically be present beneath existing embankments, although the probability may be low (due to disturbance in the original motorway construction). Where piled retaining walls are inserted through embankments, it is not feasible to mitigate any impacts locally (along the wall line) and here the residual effect remains uncertain.
- 12.7.1.3 The Scheme would have slight adverse effect upon the setting of one Grade II* Listed Building and 36 Grade II Listed Buildings, and moderate adverse effects upon the setting of two Grade II Listed Buildings. There would be a moderate to slight adverse effect on the Chilterns AONB as a designated historic landscape.
- 12.7.1.4 There is an uncertain effect on Misbourne / Chalfont Viaduct (**S194**) as the exact nature of the proposed works would not be defined until the detailed design stage undertaken by the DBFO Contractor. However the scale of the works are unlikely to cause more than a slight adverse effect.

13 Vehicle Travellers

13.1 Introduction

13.1.1.1 The purpose of this chapter is to assess the potential effect of the Scheme on travellers' views and drivers' stress. The assessment considers the differences in scheme design characteristics and forecast traffic volumes.

13.1.1.2 The assessment has been carried out in accordance to the guidance provided in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 9¹ and Interim Advice Note 81/06)² A detailed assessment on Vehicle Travellers on a Junction by Junction basis can be found in the Vehicle Travellers Technical Report³.

13.2 Regulatory Framework

The following legislation and guidance was used in the assessment:

- Guidelines for Landscape and Visual Impact Assessment⁴
- Traffic Signs Regulations and General Directions⁵
- Traffic Signs Manual⁶
- Areas of Outstanding Natural Beauty (National Parks and Access to the Countryside) Act 1949⁷
- South Bucks District Local Plan, 1999⁸
- The Chilterns ANOB Management Plan⁹
- Planning Policy Statement 7: Sustainable Development in Rural Areas¹⁰

13.3 Methodology

13.3.1 Study Area

The study area for travellers' views is represented by the views experienced from the mainline existing and widened motorway from Junctions 16 to Junction 23. There is no defined study area for the assessment of travellers' stress.

13.3.2 Establishment of Baseline Conditions

For both travellers' views and drivers' stress relative levels of sensitivity was not assigned to the receptors, in this case vehicle travellers, as it was not possible to distinguish between the types of vehicle users.

Travellers' Views

Existing data was obtained from:

- the Landscape Effects Chapter 6 of this ES which provides insight into the intrinsic values attached to landscape within the visual envelope and the quality of landscape surrounding the Scheme
- site visits undertaken in December 2005 to establish the extent of view available from the motorway on both the clockwise and anti-clockwise carriageways
- M25 Video Road Show DVD11 filmed in October 2004¹²

Drivers' Stress

Traffic data for the base year (2004) (Section 3.3) was used to assess the degree of drivers' stress under existing conditions. Site visits were undertaken in December 2005 and January 2006 to establish the spacing and quality of facilities and signage information along the existing motorway.

13.3.3 Assessment of Effects

Travellers' Views

The assessment for travellers' views has been based on guidance in DMRB Volume 11, Part 9 Vehicle Travellers¹. The view from the motorway was assessed using the following categories:

- No View – road in deep cutting or contained by earth bunds, Environmental Barriers or adjacent structures
- Restricted View – frequent cuttings or structures blocking the view
- Intermittent View – road generally at ground level but with shallow cuttings or barriers at intervals
- Open View – view extending over many miles, or only restricted by existing landscape features

The assessment of the Scheme's potential effects upon views from the motorway was confined to the potential change in the nature and availability of views from the motorway. For example, if new planting would block a view from the motorway that was previously open, then this was considered to be an impact of the Scheme. The assessment describes any part of the Scheme that would increase or decrease the extent of landscape visible to vehicle travellers. The effects of the Scheme on travellers' views were assessed using the following:

Neutral: Assessment is neutral for most views from the road, or improvements on some views are generally balanced by deterioration on others

Beneficial: Assessment on views from the road presents, on balance, a change for the better

Adverse: Assessment on views from the road presents, on balance, a change for the worse

The significance of effects categories from IAN 81/06 have been defined for travellers' views in Table 13.1.

Table 13.1: Description of Significance of Effects on Travellers' Views

Significance Category	Description
Very large beneficial* or adverse	where the number of travellers affected is high (more than 10,000 per day, for example)
Large beneficial or adverse	where the number of travellers is between 500 to 10,000 travelers affected per day
Moderate beneficial or adverse	where the number of travellers affected is low (less than 500 a day, for example)
Slight beneficial or adverse	where the number of travellers affected is very low (less than 100 a day, for example)
Neutral	where no effects would be experienced by any travellers

* IAN81/06 states that very large significance is normally only assigned to adverse effects For the M25, it is considered appropriate to also assign very large significance to beneficial effects, where appropriate, due to the high number of vehicles using the road each day.

Where a change is identified for travellers' views this always qualified as a very large beneficial or very large adverse effect as the M25 carries approximately 195,000 vehicles per day. Where no change is expected, or the beneficial and adverse effects are considered balanced, the significance of effects would be neutral.

Drivers' Stress

The assessment of drivers' stress was based on three main factors¹:

- Frustration
- Fear of Accidents
- Uncertainty of Route

As an indicator of drivers' stress, DMRB tabulates the relationship between average peak hourly flow per lane and average journey speed to describe levels of drivers' stress on a three point descriptive scale: low, moderate or high (Table 13.2).

Table 13.2: Description of Drivers' Stress on Motorways

Average peak hourly flow per lane in flow units/ 1 hour	Average Journey Speed km/hour		
	Under 75	75-95	Over 95
Under 1200	High	Moderate	Low
1200-1600	High	Moderate	Moderate
Over 1600	High	High	High

Data on Annual Average Daily Traffic (AADT) flows, traffic speeds and percentage of Heavy Good Vehicles (HGVs) from the SATURN traffic model were used to assess the degree of drivers' stress as a result of the Scheme. Traffic data was available for 2004, 2012, 2015, 2021 and 2027. DMRB requires an assessment of driver stress to

be made for the worst year in the first fifteen years after opening (the design year). The following was used for this assessment:

- 2004 base year
- 2027 Do Minimum (this provides a forecast of traffic growth in the absence of the Scheme)
- 2027 Do Something (Scheme only)
- 2027 Do Something (with all committed widening schemes in place)

There are no significance criteria within DMRB relating to the effect stress has upon vehicle travellers. Therefore the assessment was based on the change in circumstances between the baseline conditions (2004) and with or without the Scheme in operation in 2027. Comparisons of present and future conditions were made using the criteria outlined Table 13.2 and defined as neutral, beneficial or adverse.

The assessment of drivers' stress also considered traveller care and how it could be affected by the provision of facilities and information along the Scheme and by their spacing and quality. The assessment considered signage and distances between the Scheme and the last available junction where drivers could leave the motorway and access rest facilities.

13.4 Baseline Conditions

13.4.1 Travellers' Views

The extent of traveller's views has been summarised below into those views experienced by clockwise travellers and those views experienced by anti-clockwise travellers.

The surrounding landscape quality relates to the physical state of the landscape and its intactness from visual, functional, and ecological perspectives. The criteria used to award each category is discussed in Table 6.1 of this ES.

A detailed discussion on the baseline by Chainage and surrounding landscape quality is presented in the Vehicle Travellers Technical Report³.

Clockwise Extents of View

Cutting slopes, woodland and shrubs restrict travellers' views from the existing motorway clockwise carriageway. The view from the road opens out towards Chorleywood as travellers approach Junction 17. As travellers continue towards Kings Langley, deep cuttings and dense motorway planting obscure the view from the road. Existing structures and Environmental Barriers adjacent to the clockwise carriageway compound travellers' sense of enclosure.

The concrete parapets of Gade Valley Viaduct restrict views over Kings Langley. However, the wind turbine at Ovaltine Farm provides a point of visual interest. Clockwise travellers experience a sense of enclosure as they pass Bedmond;

however long distance views open out towards Frogmore. Vegetation along the motorway disrupts views over London Colney. Dense pockets of planting and small cutting slopes continue to disrupt traveller's views. However, travellers experience long distance views towards Cobs Ash, the village of Ridge and Wortham Park at points where the carriageway is elevated on low embankments and there is limited dense vegetation.

Anti-clockwise Extents of View

- 13.4.1.1 Anticlockwise travellers, travelling from Junctions 23 to 16, experience restricted views at South Mimms due to dense vegetation along the motorway. The view opens out, providing long distance views towards Redwell Farm and Salisbury Hall; however the views are periodically restricted by dense pockets of planting. Dense planting and low cut slopes obscure the view towards Shenley as vehicle travellers pass Junction 22. Vehicle travellers experience restricted views at Radlett due to low cuttings and vegetation at verge. Traveller's views remain obscured by dense woodland planting and steep cutting slopes until the carriageway approaches Kings Langley.
- 13.4.1.2 The concrete parapets of the Gade Valley Viaduct restrict sidelong views over Kings Langley. However travellers experience long distance views ahead to Juniper Hill. The view from the road becomes obscured as the carriageway passes beyond Juniper Hill, with travellers experiencing a sense of enclosure at points with high cuttings and dense vegetation at verge. The view does open, intermittently, at Junction 17 and provides travellers with a view towards Woodcock Hill. The remainder of the motorway is characterised by low cuttings and pockets of dense vegetation, which restrict the view from the road. The view from the road becomes obscured as the carriageway enters a deep cutting at Junction 16.

13.4.2 Drivers' Stress

Frustration

- 13.4.2.1 The main factors contributing towards driver frustration along the motorway relate to the existing carrying capacity of the carriageway. Vehicles are forced to reduce speed considerably during peak traffic flows. Congestion can become acute when an accident or breakdown closes one or more lanes.

Fear of Accidents

- 13.4.2.2 The fear of accidents on the motorway can become particularly acute when driving in adverse weather conditions when the spray from vehicles reduces visibility. Adverse weather conditions coupled with the presence of HGVs on the motorway make overtaking more stressful and risky, and thus increase the fear of accidents.

Uncertainty of Route

- 13.4.2.3 Junctions and destinations are adequately sign posted.

Traveller Care

13.4.2.4 Five traveller-orientated facilities are situated in close proximity to the Junctions of the motorway and provide the vehicle traveller with areas to stop, rest and re-fuel.

Summary of Existing Drivers' Stress Levels

13.4.2.5 Drivers travelling clockwise are likely to experience high levels of stress between Junctions 17 and Junction 19 due to the high volume of traffic per lane (over 1600 vehicles per hour). Anti-clockwise drivers are likely to experience high levels of stress between Junctions 17 and Junction 18 because the average Journey speed is low (below 75 km/hr) meanwhile drivers travelling between Junctions 19 and 20, and Junctions 22 and 23 will experience low driver stress due to the low volume of traffic (under 1200 vehicles per hour) and high average speed (over 95 km/hr).

13.5 Design and Mitigation

13.5.1 Construction

13.5.1.1 Traffic management would be in place during construction and restrictions on the existing motorway would, where possible, be minimised. Three lanes would be maintained during peak times but access to the hard shoulder may be periodically restricted. A 24-hour recovery service would be provided over the complete length of the traffic management area.

13.5.2 Design

13.5.2.1 A variety of new planting proposals are included as part of the design mitigation for the Scheme. These are designed to satisfy a number of environmental parameters such as ecological enhancement, visual screening and amenity. These would also affect travellers' views.

13.5.2.2 A number of factors can help in mitigating high driver stress levels over and above changes in traffic volume and speed. The following aspects of the Scheme would help reduce driver stress:

- the Scheme would satisfy current design standards
- resurfacing the existing carriageway with a low noise surfacing would improve passenger comfort
- improved alignment of Junction 18 slip road
- relocation of some existing signage to reduce driver uncertainty
- new signal gantries working with a Controlled Motorway Operation (which deploys variable mandatory speed settings) would manage greater traffic flow
- the Scheme would be lit throughout
- rumble strips would be used between the hard shoulder and lane one and between lane four and the central reservation

- the lane markings at sections with reduced width lanes would be shown as hazard lines (i.e. 6 metres mark 3 metres gap rather than 2 metres mark 7 metres gap)

13.5.2.3 No new or upgraded traveller care facilities are included in the Scheme.

13.6 Assessment of Effects

13.6.1 Construction

Travellers' Views

13.6.1.1 The extent of view from the road would decrease slightly during the construction period because of equipment, stockpiles and compounds within the Scheme Boundary. Construction compounds, plant and temporary mounds located outside the Secretary of State land could partially obscure views from the road but these would be assessed by the DBFO Contractor and discussed with the local planning authority. The temporary construction activities would possibly attract the attention of vehicle travellers more than the view beyond the Scheme Boundary.

13.6.1.2 A temporary very large adverse impact is predicted upon travellers' views during the construction period because of the numbers of travellers affected.

Drivers' Stress

13.6.1.3 There is the potential that the stress levels for drivers using this part of the M25 during the construction period would be temporarily elevated, in comparison to the existing levels. This is due to traffic management measures altering lane widths and reducing lane speeds, leading to temporary increases in congestion. The lower speeds, greater frustration, possible delay and queuing could further exacerbate the levels of stress currently experienced by vehicle travellers.

13.6.2 Operation

Travellers' Views

13.6.2.1 The assessment of effects on traveller's views describes the extent to which the surrounding landscape would be visible to clockwise and anti-clockwise vehicle travellers at both the opening year and 15 years hence (design year). The baseline conditions identified 35 separate views from the road. Only seven of these views would undergo change as a result of the Scheme. The extent of view would, for the most part remain unchanged as the profile of the Scheme mimics the profile of the existing motorway. However, any change in view from the road is considered to be significant due to the high volume of travellers (receptors) using the Scheme on a daily basis.

13.6.2.2 The view from the road, experienced by clockwise travellers, would change at five locations:

- the extension of an Environmental Barrier at Chalfont Viaduct would obscure views towards Higher Denham

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- open views towards Chorley bottom would become restricted by the introduction of highways planting at verge
- screening vegetation would be reduced as the carriageway approaches Junction 19 and the reduction in screening vegetation would open views towards Juniper Hill
- in the opening year, travellers would experience views over the countryside surrounding Sheppey's Lane but views from the road would become obscured as a new boundary hedgerow matures
- at the year of opening planting proposals would not be established and travellers would continue to experience an open view towards Frogmore but there would be some reduction in view as the new boundary hedge matures by year 15

13.6.2.3 The view from the road, experienced by anti-clockwise travellers, would change at three locations:

- at the year of opening planting proposals would not be established and travellers would continue to experience an open view towards Earls Farm but by year 15 the view from the road would become intermittent as the new boundary hedge matures
- the extent of views towards Mansion House Farm would gradually diminish from being intermittent in the opening year to obscured in year 15 as the proposed boundary hedge matures
- views towards Woodcock Hill would continue to be interrupted by retained highways planting and the extent of views would be reduced in Year 15 as a proposed hedge matures

Drivers' Stress

13.6.2.4 A comparison of the baseline traffic data and the Do Minimum and the Do Something scenarios revealed that overall, drivers' stress would decrease from current levels with the Scheme in place.

13.6.2.5 A comparison of the Do Minimum scenario and the Do Something scenarios (the scheme only and the cumulative effect of all committed M25 widening schemes) indicated that drivers' stress would improve by implementing the Scheme. The full assessment of driver stress is provided in the Vehicle Travellers Technical Report². Without the Scheme in place, the total traffic volume would be divided across the existing lanes, however the Scheme would increase the carriageway's carrying capacity on both the clockwise and anti-clockwise carriageway and the forecast increase in total traffic volume would be spread across a greater number of lanes. As a result, the traffic flow per lane would be reduced.

13.6.2.6 The Scheme would necessitate reduced lane widths at points where land is constrained or the carriageway passes an existing structure. Drivers would experience reduced lane widths at 26 points along the clockwise and anticlockwise carriageway.

Travellers' Care

13.6.2.7 The Scheme would have no influence on the provision and quality of driver facilities along the motorway in the future and would have a neutral effect on traveller care in terms of driver facilities.

13.7 Summary

13.7.1.1 The view from the road would not significantly change because the profile of the Scheme would be accommodated within the Secretary of State owned land and so the profile of the Scheme mirrors that of the existing carriageway. The proportion of vegetation that would be removed would increase the extent of the view from the road at one location. The extent of the view from the road would diminish at six other locations with the extension of Environmental Barriers and as vegetation matures. However, the locations where the view from the road would change, represents a small proportion of the overall view from the road, representing very slight changes. As a result, the impact of the Scheme upon travellers' views is considered neutral.

13.7.1.2 The Scheme would improve driver stress levels compared to the Do Minimum in 2027. In addition the Scheme would incorporate modern design specifications, low noise surfacing, improved signage, improved alignment of Junction 18 slip road and street lighting which would help alleviate fear of accidents, uncertainty of route and improve ride comfort. However, the Scheme would involve reduced lanes widths at 26 locations where Secretary of State owned land is constrained or the carriageway passes an existing structure. The lanes are not less safe than standard lane widths and the change of lane width has been designed to be very gradual so it is not noticeable by drivers. The overall effect of the Scheme on drivers' stress is therefore considered to be beneficial.

13.7.1.3 The overall assessment score for the Scheme's effect on vehicle travellers is beneficial.

14 Policies and Plans

14.1 Introduction

14.1.1.1 This chapter provides a review of national, regional and local planning policies, objectives and guidance in order to assess how the Scheme is integrated with existing transport, land-use and other relevant government policies, and to determine the significance of effects arising from the construction and operation of the Scheme on the achievement of these objectives. This is in accordance with guidance provided in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 12¹ for Stage 3 (i.e. EIA level) Assessment.

14.1.1.2 A detailed discussion on policies and plans is available in the Policies and Plans Technical Report².

14.1.1.3 There are two dimensions to the study area. Firstly there is the consideration of strategic policies and objectives at national, regional and local level, which do not relate to a specific study area boundary. Secondly, there are location specific policies and proposals that the Scheme may have an impact upon, either directly, or indirectly.

14.1.1.4 The Scheme lies within the South East and East of England Regions, the counties of Buckinghamshire and Hertfordshire, and the following local authorities:

- South Buckinghamshire District Council (SBDC)
- Chiltern District Council (CDC)
- Three Rivers District Council (TRDC)
- Dacorum Borough Council (DBC)
- St. Albans District Council (SADC)
- Hertsmere Borough Council (HBC)

14.1.1.5 County and district boundaries are shown on Figure 1.1.

14.2 Regulatory Framework

14.2.1.1 The UK has a comprehensive planning system that operates on three levels: national, regional and local. National planning policy provides the overall framework that contributes to the formulation of regional policy. County and Borough level development plans are formulated by Local Authorities using guidance from national and regional policies and strategic planning guidance.

14.3 Methodology

14.3.1.1 The methodology used in this assessment is derived from the DMRB and supplemented by current best practice. Paragraph 1.2 in Volume 11, Section 3, Part 12 of the DMRB states that a Stage 3 assessment requires an assessment of the 'wider context of

national, regional, strategic and detailed planning policies. There are important interactions between transport and land use policy. It is therefore important to assess the impact of a proposed road scheme on land-use policies and proposals at all levels of the planning process'. Paragraph 1.3 continues by stating that 'it is not intended that work on identifying development constraints, described elsewhere in this Section, should be summarised or duplicated in considering the impact of a proposed scheme on policies and plans. The purpose is rather to assess how the achievement of policy objectives would be hindered or facilitated if a scheme were to be constructed'.

- 14.3.1.2 Whilst Paragraph 1.2 of the Volume 11, Section 3, Part 12 of the DMRB states that it is planning policy that is of central importance in the assessment, Paragraphs 1.2, 2.3, 2.5 and 2.8 of Volume 11, Section 3, Part 12 of the DMRB all imply that the assessment should go beyond traditional planning policy to include transport and 'other' (i.e. non planning and transport) government policy at all three levels of government, including central government White Papers. This implication has been applied in this assessment by a scope that includes an extensive range of transport, planning and 'other' policies affected by the Scheme, including transport policy at all three levels of government. Transport policy is principally detailed at the local and regional levels in Local Transport Plans (LTPs) and Regional Transport Strategies (RTSs). National transport policy is detailed in White Papers and a range of other official documents.
- 14.3.1.3 The guidance in Volume 11, Section 3, Part 12 of the DMRB was written in 1993 and reflected the framework of planning policy at that time in England and Wales. As such, it focuses on both the two-tier (Structure and Local Plans) and unitary systems, Unitary Development Plans (UDPs) governance and planning policy. Whilst these systems of governance remain, the two-tier and unitary systems of planning policy have now been replaced by a new system of Local Development Frameworks (LDFs). LDFs comprise a range of documents collectively referred to as Local Development Documents (LDDs). Some LDDs form part of the Development Plan and are referred to as Development Plan Documents (DPDs). At present, the situation in England is that of a mixed framework of new style (commonly draft) LDF planning policy and old style (commonly adopted) Structure Plans, Local Plans and UDPs. However, where Volume 11, Section 3, Part 12 of the DMRB refers to the old style of planning policy, this has been taken to include the new style of planning policy, where relevant and appropriate.
- 14.3.1.4 Paragraphs 3.6 and 4.5 of Volume 11, Section 3, Part 12 of the DMRB clearly imply that the assessment should include a review of emerging draft policy. This assessment therefore focused both on policy contained within the adopted and emerging draft policy documents.
- 14.3.1.5 A number of other aspects have been included in the assessment that are not required in Volume 11, Section 3, Part 12 of the DMRB. These comprise an assessment of the Scheme's effect on Tree Preservation Orders (TPOs) and relevant development opportunities (extant planning permissions and allocated sites) within the study area for the Policies and Plans Assessment for the Scheme. This additional assessment is considered to represent best practice, given that the guidance in Volume 11, Section 3, Part 12 of the DMRB is over 10 years old and because it expands the assessment in a way that is considered helpful to the decision-maker.
- 14.3.1.6 A number of other points concerning the scope of the assessment require clarification.

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- 14.3.1.7 Firstly, listed buildings and conservation areas are only dealt with in terms of generic planning policy (at all levels). Specific planning information and statements on particular listed buildings and conservation areas are not, therefore, reviewed.
- 14.3.1.8 Secondly, policies in DPDs that relate exclusively to Regional Spatial Strategies (RSSs), LDFs and other plans and strategies, rather than development proposals, have been excluded from the assessment or scored as neutral, if included for completeness or reference purposes only. Equally, policies in DPDs that relate exclusively to demands on bodies other than the Highways Agency (as a 'public body' or applicant for planning permission in general) have been excluded from the assessment or scored as neutral, if included for completeness or reference purposes.
- 14.3.1.9 Thirdly, the assessment is not designed to be an entirely exhaustive examination of every aspect of the Scheme and every policy which might conceivably be relevant to the area. This caveat is required because a review of all national, regional and local policy, in all areas would be very broad indeed and insufficiently focused to be of assistance to the decision-maker. For the same reason, the assessment has not considered English Government Executive Agencies' policy (such as that from the Environment Agency, English Heritage or Natural England), since this is not considered to constitute 'government policy'. It has, however, considered Highways Agency documents.
- 14.3.1.10 Finally, the assessment does not include a review of international policy in any context.
- 14.3.1.11 The assessment has reviewed all relevant local plan allocations for major development and planning applications for the Study Area, based upon information supplied by South Buckinghamshire District Council (SBDC), Chiltern District Council (CDC), Three Rivers District Council (TRDC), Dacorum Borough Council (DBC), St. Albans District Council (SADC), Hertsmere Borough Council (HBC) in April 2007.
- 14.3.1.12 The assessment has reviewed all TPOs in the study area for the Policies and Plans Assessment for the Scheme, based upon information supplied by South Buckinghamshire District Council (SBDC), Chiltern District Council (CDC), Three Rivers District Council (TRDC), Dacorum Borough Council (DBC), St. Albans District Council (SADC), Hertsmere Borough Council (HBC).
- 14.3.1.13 In terms of the derivation of the assessment scoring and impact assessment, Paragraph 4.13 of Volume 11, Section 3, Part 12 of the DMRB states that, for a Stage 3 Assessment, 'the result of the assessment at this Stage should be described in the Environmental Statement and should consist of (a) a schedule of the relevant national, regional, county and local policies; (b) a commentary setting out the significance of the impact of the preferred route on each policy objective; (c) a note of the views of the relevant planning authorities, on the impact of the preferred route on planning policy objectives'.
- 14.3.1.14 The assessment includes schedules of relevant policies and plans for the three levels of government policy (aspect (a) above). Aspect (b) above has been dealt with by assessing the degree to which individual policies and policy objectives would be facilitated, hindered or unaffected by the Scheme. The likely significance of impact of the Scheme on the policies and plan objectives is assessed in terms of a three-point scale, described in Table 14.1. This is supplemented by comments for each policy affected and, collectively, this is considered to fulfil aspect b) above. The assessment of the

Scheme’s effect on TPOs and relevant development opportunities (extant planning permissions and allocated sites) within the study area followed the same approach as that for national, regional and local planning policies. Finally, a note of the views of the relevant planning authorities on the impact of the preferred route on planning policy objectives is provided to fulfil aspect (c) above.

14.3.1.15 Table 14.1: Significance Criteria on Policies and Plans

Score	Contribution to Policies
Beneficial	The Scheme contributes to, or is consistent with, the policy
Neutral	The Scheme does not affect the policy, or equally benefits and hinders the policy
Adverse	The Scheme hinders, or is inconsistent with, the policy

14.4 Baseline Conditions and Impact Assessment

14.4.1.1 The Scheme context and main planning constraints are illustrated in Figure 3.2. In addition, the following figures illustrate planning policy areas relevant to each environmental topic:

- Figure 6.1 Landscape Planning Designations (Regional and Local)
- Figure 6.3 Landscape Character Areas (County and Regional)
- Figure 7.1 Designated Sites of Ecological Interest
- Figure 8.1 Water Baseline Conditions
- Figure 10.10 Air Quality Management Areas and Monitoring Locations
- Figure 11.2 Geological and Soil Features and Potentially Contaminated Land
- Figure 12.1 Cultural Heritage Features Mapping
- Figure 15.1 Pedestrians and Others

14.4.2 National

14.4.2.1 National transport policy relating to road schemes has been developed from the Integrated Transport White Paper in 1998³, the daughter document relating A New Deal for Trunk Roads in England, 1998⁴ and the 10 Year National Plan (2000)⁵. These gave priority to improving the maintenance and management of existing roads before building new ones and seek to improve journey time reliability and improve safety whilst having regard for the environment. The Highways Agency takes their lead from these documents and subsequent Ministerial announcements in preparing their Strategic Plan for Improving the Network (Targeted Programme of Improvements)⁶. The Highways Agency also have Strategic Plans relating to Environment, Accessibility, Safety and Integration. The national transport policy documents reviewed are detailed in the Policies and Plans Technical Report.

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14.4.2.2 Overall, it is considered that the Scheme has been developed through an integrated transport strategy, an approach consistent with national government transport policy. In addition, the Scheme addresses one of the most serious and pressing problems on the strategic road network according to A New Deal for Trunk Roads in England and presents a 'scheme to widen motorways and other major trunk roads at particularly highly stressed points'.

14.4.2.3 National planning policy is set out in a number of Planning Policy Guidance Notes (PPGs). However, the Government is currently pursuing reforms to the planning system, with Planning Policy Statements (PPSs) replacing PPGs, which perform the same function as PPGs. The PPGs and PPSs most relevant to the Scheme are outlined below:

- PPS1 – Delivering Sustainable Development (2005)⁷
- PPG2 – Green Belts (2001)⁸
- PPS7 – Sustainable Development in Rural Areas (2005)⁹
- PPS9 – Biodiversity and Geological Conservation (2005)¹⁰
- PPG13 – Transport (2001)¹¹
- PPG15 – Planning and the Historic Environment (1995)¹²
- PPG16 – Archaeology and Planning (1991)¹³
- PPG23 – Planning and Pollution Control (2004)¹⁴
- PPG24 – Planning and Noise (1994)¹⁵
- PPG25 – Development and Flood Risk (2001)¹⁶

14.4.2.4 The Scheme would affect the implementation of a wide range of national policies, creating a mixture of benefits, disbenefits and neutral effects. The Scheme has been developed through an integrated transport strategy, an approach consistent with PPG13. The Scheme sets out to improve journey time reliability and safety on the M25, which is a generic HA Business Plan objective for 2007/2008 for the entire Trunk Road Network and is also consistent with PPG13, although it is acknowledged that it would not contribute to another PPG13 objective (reducing travel by private car).

14.4.2.5 In terms of the protection of the green belt (as set out in PPG2), the Scheme is considered to constitute appropriate development, for which very special circumstances are not required to be justified. This is because the Scheme is not considered to significantly adversely affect any of the five specific purposes for including land in Green Belts nor any of the six objectives for the use of land in the Green Belt.

14.4.2.6 Other (i.e. non transport / planning) national policy is set out in a large range of policy documents, as detailed in the Policies and Plans Technical Report. They comprise a series of Government White Papers and other policy documents and focus on a variety of policies on issues such as the economy, sustainable development, biodiversity, urban and rural development, energy, climate change, sport and recreation, the historic environment and air quality. The Scheme would affect the implementation of a wide range of policies and there would be a mix of neutral, beneficial and adverse effects.

14.4.3 Regional Planning Policy and Guidance

14.4.3.1 Regional transport policy is set out in the following:

- Buckinghamshire Local Transport Plan 2 2006/07 - 2010/11¹⁷
- Hertfordshire Local Transport Plan 2 2006/07 - 2010/11¹⁸

14.4.3.2 Both Local Transport Plans (LTPs) provide some policy support for the Scheme (Policy Objectives A and B of the Buckinghamshire LTP2 Theme 1 and Section 3.8 of the Herefordshire LTP2).

14.4.3.3 Regional planning policy is set out in a number of Regional Policy Guidance Notes (RPGs). However, Regional Spatial Strategies (RSS) are currently replacing RPGs. Given that the Scheme study area encompasses two regions and counties of England, the regional planning policy framework is set out in a large range of policy documents which are detailed in the Policies and Plans Technical Report.

14.4.3.4 Overall, at a regional level, there is explicit support, in principle, for some kind of improvement. Both regional planning bodies have signed up to the Scheme, which is reflected by specific policy support, in principle, for the Scheme in adopted regional planning policy (Policy TR8A of the adopted Buckinghamshire Structure Plan¹⁹ and Policies 26 and 33 of the adopted Herefordshire Structure Plan²⁰).

14.4.4 Local Planning Policy and Guidance

14.4.4.1 Given that the Scheme study area encompasses six Local Authorities, the local transport / planning policy framework is set out in extensive policy documents which are presented in the Policies and Plans Technical Report.

14.4.4.2 Overall, the Scheme would affect the implementation of a wide range of local policies and there would be a mix of neutral, beneficial and adverse effects. However, there are a number of key specific policies in the relevant local plans which provide explicit support, in principle, for the Scheme (Policy TR5 of the adopted South Buckinghamshire District Local Plan²¹, Policy 53 of the adopted Dacorum Borough Local Plan²² and Policy 28 of the adopted City and District of St Albans District Local Plan Review²³). These policies reflect the importance of the Scheme in providing a range of local transport and environmental benefits.

14.4.4.3 For South Buckinghamshire District, Dacorum Borough and St Albans District, the Scheme would assist in achieving a number of key road and transport policy aims. In respect of Three Rivers District Council, however, the Scheme would conflict with adopted local plan policy that specifically opposes any proposals to widen the M25 (Policy T6 of the adopted Three Rivers Local Plan²⁴). In general, there is neutral effect on policies concerning archaeology and listed building protection, pedestrians, cyclists, bridleways and the public rights of way network. There is an adverse effect on air and landscape local policies.

14.4.4.4 The Scheme would support all policies relating to the limitation of noise in the environment since any increase in noise levels would be indiscernable due to installation of low noise surfacing and central reserve concrete barriers throughout the Scheme, and Environmental Barriers where required. The Scheme would also support all policies

relating to the protection of water quality and would have no change to flood risk related policies due to the new drainage design and the maintenance of existing flow rates.

14.4.5 Tree Preservation Orders

14.4.5.1 Section 198 of the Town and County Planning Act 1990²⁵ enables Local Planning Authorities to make provision for the preservation of individual trees, groups of trees or woodland, in the interests of amenity. These TPOs prohibit the felling, topping, lopping, uprooting, pruning, wilful damage or destruction of trees without prior consent of the Local Planning Authority. Carrying out unauthorised works to a tree subject to a TPO is a criminal offence.

14.4.5.2 Table 9.2 provides a summary of the TPOs relating to trees or groups of trees in the study area. None of these are unlikely to be directly affected in terms of land take or indirect effects due to dewatering.

14.4.5.3 **Table 9.2: Summary of Tree Preservation Orders in the Study Area**

TPO type	Number of Receptors	Distance to Outer Limit of Site
Individual TPOs	368	50 - 500
Group TPOs	166	50 - 500

14.4.6 Planning Applications/Consents and Allocated Sites for Major Development

14.4.6.1 The Policies and Plans Technical Report provides details of allocated sites for major development within the relevant local plans/UDPs. There are seven major sites in the area, although in the main they are located outside the study area. None of these are likely to be directly affected by the Scheme in terms of land take or viability of the sites. Furthermore, the Scheme would not compromise the objectives of the allocations.

14.4.6.2 All the relevant major (i.e. in terms of traffic generation) applications submitted within the last five years (2002 - 2007) and located within the study area have been identified in the Plans and Policies Technical Report. These would be expected to give rise to only minimal traffic and thus are not expected to have any notable impact upon the Scheme. Furthermore, the Scheme would not comprise the objectives of the applications.

14.4.7 The Views Of The Relevant Planning Authorities On The Impact Of The Scheme On Planning Policy Objectives

14.4.7.1 The views of the local authorities on the impact of the Scheme on planning policy objectives have been expressed at a number of meetings throughout the Scheme design process and recorded in official minutes to those meetings. More recently, views were expressed in their formal responses to consultation on the Draft Environmental Statement, submitted in September 2006.

14.4.7.2 In summary, only one of the six planning authorities has a policy directly opposing the Scheme. Main concerns from the other five planning authorities are related to temporary construction impacts. The detailed construction methods and controls would be agreed between the DBFO Contractor and the local authorities. They acknowledge the serious

nature of the existing problems on the M25 and the need for some sort of intervention to address those problems.

14.4.7.3 However, Three Rivers District Council is against the Scheme in principle, as outlined in Policy T6 of the adopted Three Rivers Local Plan.

14.5 Summary

14.5.1.1 At the national level, the Scheme would affect the implementation of a wide range of policies, creating a mixture of benefits, disbenefits and neutral effects. The Scheme would be in compliance with various DfT, Highways Agency and (former) ODPM policies that promote improvements to the existing trunk road network/freight corridor including those that improve journey time reliability; increase road capacity in areas of severe constraint, and improve safety and accessibility.

14.5.1.2 Specifically, the Scheme has been developed through an integrated transport strategy, an approach consistent with national transport policy documents and PPG13. The Scheme sets out to relieve a specific problem area in the trunk road network, which is also consistent with a range of national transport policy documents and PPG13, although it would not contribute to another national transport policy PPG13's objective of reducing travel by private car.

14.5.1.3 However, due to the loss of habitat and vegetation within the Scheme Boundary, the Scheme would have adverse impact on the biodiversity and landscape aims of various Highways Agency, (DEFRA), (former) ODPM and DCLG policies. There would also be adverse impacts upon air quality policies in the short term, but no exceedances of the EU Limit Values are predicted in opening year (2012) scenarios for NO₂ and PM₁₀. However, traffic flows would increase along the motorway with the Scheme.

14.5.1.4 Both regional planning bodies have signed up to the Scheme, which is reflected in adopted regional planning policy. Since the Scheme would contribute to a safe and efficient transport system and improve journey time reliability it would be in general compliance with regional transport policy (i.e. current RPGs / RSSs, LTPs and Structure Plans). There would also be no change to flooding risk and beneficial effects on water quality. However, there would be adverse effects on air quality and landscape policies, although air quality is not predicted to exceed any of the EU Limit Values for NO₂ and PM₁₀ in the opening year.

14.5.1.5 At both the national and regional levels, there is a neutral impact on policies relating to waste and contaminated land, archaeology and built heritage, provisions for pedestrians and cyclists and public rights of way.

14.5.1.6 There are a number of key specific policies in the relevant local plans which provide explicit support, in principle, for the Scheme reflecting the importance of the Scheme in providing a range of local transport and environmental benefits.

14.5.1.7 For South Buckinghamshire District, Dacorum Borough and St Albans District, the Scheme would assist in achieving a number of key road and transport policy aims. In respect of Three Rivers District Council, however, the Scheme would conflict with adopted local plan policy that specifically opposes any proposals to widen the M25 (Policy T6 of the adopted Three Rivers Local Plan). In general, there is neutral effect on policy concerning archaeology and listed building protection, pedestrians, cyclists,

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bridleways and the public rights of way network. Again, there is an adverse effect on air and landscape policies.

- 14.5.1.8 The Scheme would support all policies relating to the limitation of noise in the environment since any increase in noise levels would be indiscernable due to installation of low noise surfacing and central reserve concrete barriers throughout the Scheme, and Environmental Barriers where required. The Scheme would also support all policies relating to the protection of water quality and has no change to flood risk related policies.
- 14.5.1.9 No allocated sites for major development within the study area would be directly affected by the Scheme in terms of land take or viability of the sites, although the Scheme is likely to result in some beneficial indirect effects in terms of reduced congestion in the local network.
- 14.5.1.10 No local planning applications submitted within the last five years (2002 - 2007) would generate sufficient traffic to adversely affect the Scheme design.

15 Pedestrians, Cyclists, Equestrians and Community Effects

15.1 Introduction

- 15.1.1.1 This chapter assesses the potential effects on pedestrians, cyclists and equestrians (referred to as pedestrians and others, or Non Motorised Users (NMUs)) resulting from the Scheme. Pedestrians and others are prohibited from using motorways for safety reasons. However, the local area contains a network of Public Rights of Way (PRoW), several of which cross the M25. The assessment also looks at the overall effect on community accessibility, and therefore considers local traffic.
- 15.1.1.2 The chapter investigates the ways in which the Scheme would affect journey patterns, length, amenity and overall community severance.
- 15.1.1.3 Further information on Pedestrians, Cyclists, Equestrians and Community Effects can be found within the Pedestrians and Others Technical Report¹.

15.2 Regulatory Framework

- 15.2.1.1 The assessment has been carried out in accordance with the following legislation and best practice guidance:
- The Countryside and Rights of Way Act 2000 (CRoW Act)²
 - Design Manual for Roads and Bridges (DMRB), Volumes 11 and 5^{3,4}
 - Interim Advice Note 81/06, Assessment And Management Of Environmental Effects⁵

15.3 Methodology

15.3.1 Study Area

- 15.3.1.1 The study area is defined as a 500 metre corridor either side of the middle of the carriageway. Since the Scheme is a widening of an existing motorway within Secretary of State land, this 500 metre corridor would encompass the area where most significant impacts upon NMU activity are likely to occur. The study has focused on those routes that cross the motorway, and their connections with community facilities. The study area included all Public Rights of Way (PRoW), and other routes used by pedestrians and others within this corridor.
- 15.3.1.2 When the motorway is crossed by a bridge that is not a PRoW they have been included in the study only when pedestrians and others can use it. Major Junctions along this section of motorway have not been examined since these do not have crossing points for non-motorised users.

15.3.2 Establishment of Baseline Conditions

15.3.2.1 The following sources were used to establish the baseline conditions:

- Ordnance surveys maps for Chiltern Hills East⁶, and St Albans and Hatfield⁷
- Non-Motorised Users Surveys, Area 5⁸
- Definitive Map and Statement for Buckinghamshire County Council Public Rights of Way⁹
- Definitive Map and Statement for Hertfordshire County Council Public Rights of Way¹⁰
- Hertfordshire County Council Rights of Way Improvement Plan Draft Statement of Action¹¹
- Hertfordshire County Council Local Transport Plan 2006/07 – 2010/11: Rights of Way Improvement Plan¹²
- Three Rivers Local Plan for 1996-2011. Adopted July 2001¹³
- M25 Road Widening Effects on Rights of Way Junctions 16 to 25. Letter by Richard Cuthbert 16 September 2005¹⁴
- Pedestrian counts of footpaths under the Berry Lane Viaduct and over the Park Avenue Footbridge in 2005/6 (methodology and outputs included in Technical Report 0323-GD00701-LNR-RD¹)
- Traffic data from the M25 North of Thames SATURN Local Area Model (LAM)

15.3.3 Assessment of Effects

15.3.3.1 The assessment methodology used for this assessment follows guidance for a Stage 3 Assessment in the DMRB Volume 11 Part 8³, adapted to comply with the requirements of Interim Advice Note 81/06⁵. The methodology also aims to comply with requirements of DMRB Volume 5, Section 2, Part 5, for Non Motorised User (NMU) Audits⁴.

15.3.3.2 An assessment has been made of:

- changes in journey lengths and travel patterns
- changes in amenity

15.3.3.3 From these assessments, the magnitude of impact on community severance has been defined in Table 15.1.

Table 15.1: Magnitude of Impact on Community Severance (Adapted from DMRB Vol. 11 Part 8², and IAN 81/06¹⁴)

Severance Level:	Description:
Negligible / No change	Little or no hindrance to pedestrian movement compared to existing situation.
Minor	All people wishing to make pedestrian movements would be able to do so, but there would probably be some hindrance to movement compared to existing situation. Journeys increased by up to 250 metres.
Moderate	Some people, particularly children and elderly people, are likely to be dissuaded from making journeys on foot. For others, pedestrian journeys would be longer or less attractive compared to existing situation. Journeys increased by 250-500 metres.
Major	People are likely to be deterred from making pedestrian journeys to an extent sufficient to induce a reorganisation of their habits. In some cases, this could lead to a change in the location of centres of activity or to permanent loss of access to certain facilities for a particular community. Those who do make journeys on foot would experience considerable hindrance compared to existing situation. An increase in length of journeys of over 500 metres.

15.3.3.4 The assessment of the significance of severance impact has been based on the standard significance matrix in the Highways Agency Interim Advice Note 81/06⁵, and is presented in Table 15.2.

Table 15.2: Assessment Matrix for Significance of Severance Effect

		Magnitude of Impact				
		No Change	Negligible	Minor	Moderate	Major
Value of Receptor (Based on estimated Level of Use where available)	Negligible (Level of Use – None)	Neutral	Neutral	Neutral	Neutral	Slight
	Low (Light Usage)	Neutral	Neutral	Neutral	Slight	Moderate
	Medium (Medium Usage)	Neutral	Neutral	Slight	Moderate	Moderate
	High (Significant Usage)	Neutral	Slight	Moderate	Moderate	Large
	Very High (Heavy Use)	Neutral	Slight	Moderate	Large	Very Large

Note: For details of “level of use” assessment, refer to Pedestrians and Others Technical Report 0323-GD00701-LNR-RD¹

- 15.3.3.5 The DMRB states that 'Although the physical severance due to roads is permanent, the perceived disbenefit from the new road diminishes with time as people move in or out of the area affected. Thus the disbenefits are most evident during construction and in the first few years of operation'. The assessment of operational impacts has therefore been limited to the opening year of the Scheme in 2012.
- 15.3.3.6 The visual effect from the Scheme on footpaths has been addressed in the Landscape Effects Chapter 6.

15.4 Baseline Conditions

Detailed baseline conditions are presented in the Pedestrians and Others Technical Report.

15.4.1 Community and Recreational Facilities

- 15.4.1.1 There are numerous small and medium sized towns located within the study area. Due to the rural nature of the area, provision of community and recreational facilities are important to those that live in the area. The facilities located in and around these towns are presented in Table 15.3.

Table 15.3: Community and Recreational Facilities

Town Name	Local Facilities
Tatling End	A public house, police station and fire station
Gerrards Cross	A primary school, college, leisure centre, hospital, hotel, train station, two churches and a number of public houses
Maple Cross	A primary school, community centre, public house and playing fields
Herons Gate	The nearest facilities are located in Rickmansworth to the east
Mill End	Two primary schools, a leisure centre, multisports arena and a public house
Rickmansworth (on both sides of the M25 carriageway)	A Masonic school for girls, two secondary schools, three primary schools, a cricket ground, golf course, railway station, underground station, church and a number of public houses
Kings Langley	A church, railway station, community centre, primary school, fishing club, post office, fire station and public house
Abbots Langley	A leisure centre, church, college, school and a railway station
Bricket Wood	A primary school, post office, railway station, leisure centre, business park, sports ground and public house
How Wood	A railway station, two primary schools, lido and a sports ground
Frogmore	A post office, primary school and a sports ground
London Colney	A post office, library, recreation centre, sports ground, a primary school and a number of superstores
South Mimms	A public house primary school and a church

15.4.2 Public Transport

15.4.2.1 Most of the larger settlements along the motorway are connected to railway lines that converge on central London and provide a regular service. There are also a large number of bus routes in and around the area, which also maintain an efficient service.

15.4.3 Non-Motorised Users Routes

15.4.3.1 All M25 non motorised user crossing points (number C1 to C48) and all PRoWs within the study area are presented in Figure 15.1. Out of 48 crossing points, only 19 crossing

points serve as PRowS, and 5 are not accessible for pedestrians and others (they are major junctions or rail tracks).

15.4.3.2 There are good connections between all communities identified within the 500 metres corridor of M25. No major hindrances in terms of existing amenity were observed during the site visits of PRow in the study area during 2005/6, but poor maintenance of some PRowS is considered to pose a slight hindrance to pedestrians and others movements.

15.5 Design and Mitigation

15.5.1.1 The Scheme design has included measures to minimise the effects on community facilities and PRowS and to make use of screening, planting and Environmental Barriers to minimise effects on the setting of community facilities. Existing vegetation has been retained where appropriate, and in the long-term, landscape planting would assist in mitigating amenity effects on routes used by pedestrians and others near to the Scheme. A schedule of potential effects on PRowS from the M25 widening between Junctions 16 to 25 prepared by Hertfordshire County Council¹⁴ was also considered as part of the Scheme design.

15.5.1.2 Most pedestrians and others, and crossing points, would not be directly affected by the Scheme. Of the numerous crossing points over and under the M25, only two would be directly affected by the Scheme.

- Berry Lane Viaduct would be widened by four metres on both sides to incorporate four full width lanes and a hard shoulder on each carriageway. This would involve additional piles and bridge decks to be installed, and the gap between the two decks (each supporting one carriageway of the M25) would be infilled. The widened decks would be supported by additional columns, in the same relative positions as the columns supporting the existing decks. This would require the temporary closure of the footpath (C15) under the viaduct at times when potentially dangerous engineering activities were taking place. Construction activities would allow for a temporary crossing point to be established away from the active work areas, or the footpath would be temporarily diverted inside the railway fenceline during construction. Careful construction planning would allow this crossing to be totally closed for only short periods of time
- the abutments of the Park Avenue Footbridge (C16) are currently too close to the existing motorway edge to allow for widening of the motorway to four lanes. As such, this footbridge would have to be demolished and replaced (in the same location) with a wider gap between abutments. Pedestrians and others using this crossing point would be redirected to the Berry Lane Viaduct (C15) or Chorleywood Road Overbridge (C17)

15.5.1.3 The amenity of routes for pedestrians and others would be protected, as far as is practicably possible during construction. Throughout the construction area, mitigation measures would include:

- advance works to safeguard routes used by pedestrians and others
- signage alerting pedestrians and others to forthcoming work and an alternative route(s)

- barriers screening pedestrians and others from construction areas/traffic
- walking boards where necessary, to reduce potential trip hazards
- road sweeping and dust suppression on roads used by construction traffic

15.6 Assessment of Effects

15.6.1 Construction

15.6.1.1 The construction would be phased over a period of approximately four years. Landscape planting would take place in the first available planting season following completion.

15.6.1.2 Construction work would be confined within the existing Secretary of State land with offsite movement of plant and materials. Pedestrians and others have hindered access to the highways verge because the M25 is an existing motorway with no at-grade crossings. Pedestrians would not have access within the Secretary of State land, unless using a designated crossing point.

Changes in Journey Lengths and Travel Patterns

15.6.1.3 During the construction period, two crossing points would be affected. The construction programme would be developed to ensure that both crossings would not be closed at the same time, which would minimise the diversion lengths.

- **Berry Lane Viaduct (C15)** - The duration of the construction works associated with Berry Lane Viaduct is likely to be between 12 and 15 months. This would require the temporary closure of the footpath (C15) under the viaduct at times when potentially dangerous engineering activities were taking place. By implementing the mitigation described above only a minor, temporary, impact is envisaged. However the usage of this path was established by the pedestrian survey to be light, and therefore the significance of the effect would be neutral
- **Park Avenue Footbridge (C16)** - It is estimated that this crossing point might be closed for 4 to 6 months for demolition and construction of the new footbridge. During this time, pedestrians and others would be redirected to the Berry Lane Viaduct (C15) or Chorleywood Road Overbridge (C17). These are both approximately 400 metres away in either direction, and would therefore require a total diversion of approximately 800 metres. This is a major, but temporary, magnitude of impact. However the usage of this path was established by pedestrian survey to be light, and therefore the significance of the effect would be moderate adverse

Changes in Amenity

15.6.1.4 Access for pedestrians and others on routes surrounding the Scheme would not be directly affected, except for those instances described above. However there would be an increase in construction plant, construction workers' vehicles, and haulage on roads surrounding the Scheme. This would lead to a general level of disruption and reduction in amenity of journeys undertaken by pedestrians and others where the route is shared

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by construction vehicles. There would also be an adverse impact on amenity on routes adjacent to the M25.

15.6.1.5 The amenity of routes for pedestrians and others would be protected, as far as is practicably possible during construction.

15.6.1.6 Overall, the effects on amenity during construction is likely to have a minor severance impact, i.e. 'All people wishing to make pedestrian movements would be able to do so, but there would probably be some hindrance to movement compared to existing situation.' (see Table 3.2). The large area covered by the Scheme means that a large number of people would be affected, causing a moderate adverse temporary effect.

Overall Community Severance

15.6.1.7 The community severance impact of Scheme construction was assessed as a combination of the changes in journey lengths and patterns and changes in amenity discussed above.

15.6.1.8 Taking into account the severance impacts and numbers of people affected, the overall severance effect during construction would be moderate adverse.

15.6.2 Operation

Changes in Journey Lengths and Travel Patterns

15.6.2.1 The operation of the Scheme would not have a permanent direct impact on any routes used by pedestrians and others. However, there would be changes in traffic flows on roads that are used by pedestrians and others. In general, these changes in traffic flows are small (less than 30%), and unlikely to have a significant impact on the time taken by pedestrians to cross the road. A few roads in the study area have large increases in traffic flows of more than 30%, which could have an effect on the ability of pedestrians to cross the road. However, the majority of these are motorway link-roads so are not usually crossed by pedestrians.

15.6.2.2 The exception is a modelled link to the north-east of Kings Langley (representing Primrose Hill / Railway Terrace and surrounding roads). This link is predicted to experience a 38% increase in traffic flows in the southbound direction compared to the Do Minimum scenario, which represents an additional 107 vehicles AADT (Annual Average Daily Traffic). However, this would be a very small amount of additional traffic in the context of the traffic on the corresponding northbound link (3,401 AADT, 3% increase compared to Do Minimum). The total (both ways) increase in traffic flows on this link would only be 5%. Therefore, the overall significance of effects would be neutral.

Changes in Amenity

15.6.2.3 Changes in amenity have been assessed in terms of changes in exposure to traffic, perception of safety, quality of landscape, and ease of access:

Traffic Flows

15.6.2.4 An increase in traffic flows can lead to reduced amenity due to perception of safety, exposure to noise and dirt, reduced air quality, and visual intrusion. It is considered that a >30% increase in traffic can have a potential to affect amenity. The following areas along the Scheme would be expected to have an increase in AADT traffic flows of more than 30% between the Do Minimum and the Do Something in the Opening Year (2012):

- at Junction 16, some of the link roads would have a >30% increase in traffic flows. These roads do not have access to pedestrians and others, but the traffic changes could have an impact on the amenity of journeys on the public footpath (F1/F28) and bridleway (B46) that run nearby. Existing vegetation between the bridleway and the Junction provides some screening from the adverse impacts of the traffic, and would be retained, so the magnitude of impact would be minor adverse. Usage of these routes is estimated to be light, giving an overall neutral effect
- at Junction 17, some of the slip-roads would have a >30% increase in traffic flows. These roads do not have access to pedestrians and others, but the traffic changes would affect the amenity on adjacent public footpaths (F11a, F19, F20 and F21) and bridleways (B10, B61 and B62). Existing vegetation between the footpaths and the link-roads provides some screening from the adverse impacts of the traffic, and would be retained, so the magnitude of impact would be minor adverse. Usage of these routes is estimated to be light, giving an overall neutral effect
- the southbound direction of the link representing Primrose Hill / Railway Terrace and surrounding roads to the north-east of Kings Langley would receive a 38% increase in traffic flows. However, as described previously, the total flows (two-way) on this link would only receive a 5% increase, therefore the effect would be neutral

Perception of Safety

15.6.2.5 Safety impacts from traffic increases were discussed previously. The only proposed changes that could have a direct impact on perception of safety would occur at the Berry Lane Viaduct and Park Avenue Footbridge.

- widening of the Berry Lane Viaduct by a total of 8 metres would lead to a longer underpass, which may increase fear of crime. However, the impact is likely to be negligible, resulting in a neutral effect
- at Park Avenue Footbridge, the parapets would be maintained at 1.4 metres, which is appropriate for use by cyclists. This would mean no significant change in the perception of safety, and a neutral effect

15.6.2.6 In all other cases, the Scheme would not have a direct impact on routes used by pedestrians and others and would therefore have no impact on their perception of safety.

Landscape / Visual Impact

15.6.2.7 The local landscape types would be directly and adversely impacted by the Scheme as a result of the increased width of carriageway resulting in permanent removal of vegetation (woodland, scrub, grass, grass verges) from within the Secretary of State land. Replacement planting (hedges, scrub, shrubs, grass) appropriate to the local context would aid in compensating for this loss and aid in integration of the Scheme into the local landscape context. Therefore it is expected that the operation of the Scheme would have an adverse impact on the amenity experienced by pedestrians and others due to landscape quality. For an assessment of these effects, refer to Chapter 6 Landscape Effects.

Ease of Access

15.6.2.8 The only direct impact on ease of access would occur at the Park Avenue Footbridge. The new structure would be to current standards and would allow for shared use by pedestrians and cyclists. The ramp slopes would be to current standards and would therefore provide easier access to the bridge. This would be a minor beneficial impact, but the usage of this crossing is estimated to be light, so the overall effect would be neutral.

Community Severance

15.6.2.9 The community severance impact of the Scheme is assessed as a combination of the changes in journey lengths and patterns and changes in amenity that are discussed previously.

15.6.2.10 There are numerous communities in the vicinity of the Scheme, and therefore a large number of people have the potential to be affected. However, following implementation of the Scheme there would be no overall change in community severance. The severance effect during operation of the Scheme is therefore neutral.

15.7 Summary

15.7.1.1 All M25 crossing points used by pedestrians and others, and all PRowS within the study area are presented in Figure 15.1. Of these crossing points, only two would be directly affected by the Scheme.

15.7.2 Construction

15.7.2.1 The works at Berry Lane would run for between 12 to 15 months but careful construction planning would ensure the path along Berry Lane would be closed for only short periods of time. A temporary crossing point would be established away from the active work areas, or the path would be temporarily diverted inside the railway fenceline during construction.

15.7.2.2 The abutments of the Park Avenue Footbridge are currently too close to the existing motorway edge to allow the widening of the motorway to four lanes. This footbridge would have to be demolished and replaced (in the same location) with a wider gap between abutments. It is estimated that this crossing point could be closed for between

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4 to 6 months. In that time pedestrians and others would be forced to use alternative crossing points, resulting in increased journey length of approximately 800 metres.

15.7.2.3 Construction activities would lead to a reduction in amenity of journeys undertaken by pedestrians and others where the route is shared by construction vehicles.

15.7.2.4 The temporary effect on community severance during construction would be moderate adverse.

15.7.3 Operation

15.7.3.1 The operation of the Scheme would not have a permanent direct impact on any routes used by pedestrians and others. There would be some adverse impacts on ease of crossing resulting from changes in traffic flows, but overall, the Scheme would have a neutral impact on travel patterns and journey times.

15.7.3.2 Changes in traffic flows on some routes used by pedestrians and others, or roads adjacent to routes used by pedestrians and others, would have a minor adverse impact on amenity experienced by NMUs, but these impacts are localised. Loss of vegetation would have an adverse impact on the amenity experienced by pedestrians and others in the immediate vicinity of the Scheme (for an assessment of this aspect, refer to Chapter 6 Landscape Effects).

15.7.3.3 There are numerous communities in the vicinity of the Scheme, and therefore a large number of people have the potential to be affected. The impact on pedestrians and others would not be significant enough to deter any journeys, and therefore there would be no overall change in community severance following implementation of the Scheme. The severance effect during operation of the Scheme would therefore be neutral.

16 Disruption Due to Construction

16.1 Introduction

- 16.1.1.1 The actual construction methods, locations of compounds and access roads would be developed by the DBFO Contractor. All works outside Secretary of State land would be discussed with the local planning authority and would avoid the sensitive sites identified in Section 3.6.3. Therefore only general construction activities are described in this chapter together with an assessment of the potential disruption likely to be caused during construction. The assumptions described below are the current best estimate of the works that would be required to build the Scheme. The intention is that any subsequent changes to these assumptions would not create any worse environmental effects than those described in this ES.
- 16.1.1.2 The construction effects on each environmental topic are addressed in the preceding chapters and this chapter assesses any additional potential disruption resulting from the construction phase.
- 16.1.1.3 All works on site would be undertaken in compliance with the DBFO Contractor's Construction Environmental Management Plan (CEMP).

16.2 Construction Programme

- 16.2.1.1 The phasing of the construction works would be developed by the DBFO Contractor. Construction is planned to commence in 2009 and the entire section would be constructed by 2012 (the opening year for the Scheme).

16.3 Key Construction Activities

16.3.1 Advance Works

- 16.3.1.1 Before the main construction starts it would be necessary to carry out a programme of advance works. This work is dependent on seasonal and licensing requirements and would involve:
- ecological surveys
 - water vole mitigation
 - translocation of reptiles and great crested newts
 - badger mitigation
 - restricted site clearance works associated with the above
- 16.3.1.2 These are described in Chapter 7. As part of the pond excavations required for water vole mitigation archaeological investigation and recording would be undertaken.

16.3.2 Site Clearance and Topsoil Strip

- 16.3.2.1 General site clearance works are programmed to start in 2009. This would involve felling of large trees, removal of hedges and scrub and rank grassland. Clearance works would be completed under ecological supervision and would take account of seasonal constraints.
- 16.3.2.2 Site clearance would occur within the construction zone which includes the area needed for the new carriageway, associated earthworks and facilities and generally an additional three metre working easement. A five metre easement is required for pond construction. Vegetation to be retained would be fenced.
- 16.3.2.3 Topsoil would be stripped from areas within the zone of construction. Limited areas of stripping would be subject to archaeological supervision as detailed in Chapter 12.

16.3.3 Earthworks

- 16.3.3.1 Earthworks would involve excavation and import of materials for the following main activities:
- creation of new pavement
 - slope regrade
 - regrade in chalk with soil nailing
 - regrade in chalk without soil nailing
 - granular toe replacement
 - soil nailing and soil reinforcement
 - bored piling
 - sheet piling
 - creation of gravity wall
 - fill extension
 - creation of attenuation ponds
 - installation of filter drains, grass channels, gullies, drainage channels and manhole chambers
 - construction of drainage bioretention facilities
 - installation of soakaways
- 16.3.3.2 The earthworks strategy would be to
- maximise reuse of material
 - minimise import and export of material
 - minimise disposal of waste in landfill

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- 16.3.3.3 The excavated material arising from earthworks and structures construction is likely to comprise of general granular and cohesive soils, chalk fill and selected granular fill materials which could be reused on site for example for backfilling. A major recycling programme could be implemented but processing and screening would be required to produce compliant materials. Materials would generally have to be taken off site prior to processing.
- 16.3.3.4 The amount of excavated material that could be re-used would be determined by the DBFO Contractor and would be dependent upon the space available, the nature of the excavated material and detailed design.
- 16.3.3.5 Material removed from cuttings or made/natural ground for off site disposal would need to be Waste Acceptance Criteria (WAC) tested in order to determine the suitability for disposal in landfill. The disposal of materials in landfill, however, would be minimised in accordance with the Highway Agency's Sustainable Construction objectives¹. An alternative would be to identify off site exempt activities where the material could be taken for recycling and reuse.
- 16.3.3.6 The reuse of material would also be maximised by keeping contaminated and clean material separate so the clean material could be reused. Furthermore, preventing granular material from becoming contaminated by clay material would also allow it to be reused.

16.3.4 Carriageway Surface Construction

- 16.3.4.1 Pavement construction would require the import of material in the form of pavement surfacing, roadbase, subbase and capping layer materials and the excavation of pavement materials, including cold milling and planing.
- 16.3.4.2 Road planings and roadbase are exempt from waste licensing if they are reused for the purposes of relevant work carried on elsewhere if:
- no more than 50,000 tonnes of such waste are stored at the site
 - the waste is stored there for no longer than six months
- 16.3.4.3 Therefore, road planings and roadbase could be reused for the 'construction, maintenance or improvement of a highway' as stated in the Waste Management Licensing Regulations (No.2)².

16.3.5 Piling Operations

- 16.3.5.1 Retaining walls would be constructed using bored and sheet piling techniques. Bored piling would be undertaken along 8 kilometres of the existing embankments and along 5 kilometres of existing cuttings. Of the total length of the Scheme approximately 5 kilometres of driven sheet piling would be required primarily in the cuttings at landfills to minimise the disturbance and removal of contaminated material.

16.3.6 Concrete Batching

- 16.3.6.1 The need for and location of concrete batching facilities are currently unknown and would be decided by the DBFO Contractor. However any batching plants would be

designed and operated to accredited industry standards and the drainage water associated with it would be controlled through best practice techniques detailed in the CEMP.

16.3.7 Temporary lighting

16.3.7.1 During construction, the whole Scheme would be lit with temporary road lighting. Temporary lighting would be required where reduced width lanes are to be used for traffic management or at crossovers. This temporary lighting would most likely consist of verge mounted lighting columns for the main carriageway and mobile telescopic lighting rigs at traffic management crossover points.

16.3.8 Construction Workforce and Working Hours

16.3.8.1 The workforce would be suitably trained and experienced. Workers and motorway users' safety would be ensured by compliance with the Construction (Design and Management) Regulations³, other appropriate Health and Safety Regulations, and general good site practice. A Construction Phase Plan would be produced by the DBFO Contractor. The aim of this would be to make the site as safe as reasonably practicable for both workers and people travelling along the motorway.

16.3.8.2 Working hours would generally be 0700 – 1900 from Monday to Friday and 0700 – 1230 on Saturdays. However, the contractor may work longer hours and weekends on certain operations to reduce the overall duration of the works. Some night-time working would be required to accommodate specific construction activities, such as alterations to traffic management measures and means of providing cabling for connecting to future traffic management and information systems.

16.3.8.3 There would be 24 hours breakdown cover by the traffic management maintenance crew, which would include the recovery of vehicles.

16.4 Construction Effects

16.4.1 Introduction

16.4.1.1 This section assesses any additional potential disruption resulting from the construction phase of the Scheme that has not already been covered in the preceding chapters of this ES. The assessment of the effects during construction follows the methodology set out in the DMRB Volume 11, Section 3, Part 3, Chapter 3 and IAN 81/06⁴. However an assessment cannot be made of the effects of the contractor's compounds, storage areas and haul routes since these would be the responsibility of the DBFO.

16.4.1.2 Traffic management and construction traffic effects are covered.

16.4.2 Traffic Management

16.4.2.1 The motorway would remain open to traffic during the construction period. Traffic management would be implemented so that the works could be carried out ensuring the safety of the travelling public and the workforce. The traffic management measures

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would be similar to those used for the M25 Junctions 12 to 15 widening. Key aspects of the traffic management would be:

- a temporary speed limit
- the existing number of lanes would be maintained in both directions on the M25 during daytime working hours
- a temporary vehicle restraint system (VRS) would be used between contra-flow lanes and between traffic lanes and work areas. Traffic cones would be used at traffic merges and diverges
- a 1.2 metre safety zone would be generally provided except where the existing cross-section is sub-standard e.g. through Chalfont Railway Viaduct, where the safety zone is reduced to 0.9 metres. Where the zone is reduced to 0.9 metre additional anchorages would be used to minimise deflection of the temporary VRS
- the width of the contra-flow buffer zone would be 0.9 metre
- minimum lane widths would be accordance with Chapter 8 of the Traffic Signs Manual⁵
- where possible, lane widths would be maintained through the different sub-phases to minimise relocation of the VRS

16.4.2.2 Assuming work commences at the verge area, traffic management would be phased as outlined below:

- establish traffic management to both carriageways to allow temporary or modified existing crossovers to be constructed with lane 3 closed
- establish contra-flow to allow construction of verge side widened carriageway, drainage, retaining walls, merge/diverge and other works. Construct sufficient overlay to allow narrow 3-lane running on new works and contra-flow lane on existing pavement in the next sub-phase
- establish contra-flow to allow construction of verge side widened carriageway, drainage, retaining walls, merge/diverge and other works to the opposing carriageway
- establish narrow 3-lane running on outer side of both carriageways and establish working areas to construct the inner carriageway extensions and central reserve VRS, lighting etc
- establish traffic management to both carriageways to allow temporary or modified existing crossovers to be removed or closed
- establish traffic management to both carriageways to allow road markings and traffic studs to be laid

16.4.2.3 Variations to this approach would be necessary at particular carriageway and structures constraints.

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16.4.2.4 Traffic management during construction on the M25 may cause travellers to use other roads as an alternative to the M25. An assessment of how alternative routes may be affected by the traffic management was undertaken using the M25 North of Thames Traffic Model assuming traffic flows in 2010, the mid-point of the construction programmes for Sections 1 and 4. The outcome of this assessment is shown in Figure 16.1.

16.4.2.5 The 'Before' and 'After' flows are indicative of those that will be on the on the network before any construction work takes place and after the scheme opening, respectively. The Min/Max flows are indicative of the maximum and minimum flows that will be on the network whilst the traffic management changes during the construction period.

16.4.2.6 Figure 16.1 illustrates the predicted construction traffic flows on the M25 and surrounding road network:

- Sheets 1 and 2 show the changes in flows on the mainline
- Sheets 3 to 6 show the changes along the alternative routes whilst construction takes place between the whole of the section of motorway between Junctions 16 – 19 and the whole of the section of motorway between Junctions 19 - 23 respectively
- Sheets 7 to 14 show the changes on alternative routes during the various construction phases between junctions

16.4.2.7 For the purposes of the assessment, it was assumed that the speed restriction within the construction areas on the M25 would be 40mph with 3 lanes operating continually in each direction. Where there is no construction work taking place, or where the widening has been completed, the speed restriction was assumed to be 70mph.

16.4.2.8 To encourage traffic to remain on the motorway during normal operations diversion routes will be signposted. However, for planned events when the roadworks are taking place, discussions will take place with the local highway authorities and diversion routes would be signed in accordance with the current diversion route strategy.

16.4.2.9 The assessment shows traffic flows on the M25 would in general decrease during the construction period, but in no place by more than 10%. Traffic flows on the local roads would vary across the network depending upon which section of motorway is under construction, with maximum flows generally being higher during construction than after. In many cases, as the various sections are opened up, the minimum traffic flows would be lower during the construction periods than 'before' or 'after' construction.

16.4.2.10 The noise and air quality effects of these traffic changes were assessed in Chapters 9 and 10 respectively.

16.4.2.11 Although reduced speed limits and safety requirements would be required, the same number of lanes would be maintained in both directions on the M25 during daytime working hours and therefore the overall disruption effect would be slight adverse.

16.4.3 Construction Traffic

16.4.3.1 The earthworks and pavement construction would produce material some of which would be reused on site and some which would have to be exported off site. Although

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the reuse of materials would be maximised, raw materials would still be needed for the construction of the new carriageway, drainage, improvements to structures, gantries, communication and lighting. The following principal raw materials would be required:

- lime, cement and additives would be procured and delivered in bulk tankers by road at the rate of 1 to 2 per day
- concrete would either be manufactured on site or would be delivered from local suppliers via truck mixers
- structural steel and steel for reinforcement
- aggregates for concrete manufacture and for the construction of the road surface
- structural granular backfill and drainage stone
- timber for shuttering, fencing and environmental protection measures
- pre-cast concrete components
- geotextile material for surface stabilisation

16.4.3.2 The sourcing of raw materials would be the responsibility of the DBFO Contractor. Generally, no raw materials would be stored on site due to lack of available space, but instead would be delivered direct to site for immediate use. All materials would be brought to the site and removed from it along the motorway network and site access would be from the motorway.

16.4.3.3 The bulk of the HGV movements would be generated by earthworks, pavement, drainage and other items with large quantities such as importing concrete. The estimated volumes of these materials that would be exported and imported to the construction area are presented in Table 16.1 and 16.2 respectively.

Table 16.1 Bulk Material Generated

Activity	Volume (m³)
Excavation for Pavement	293,000
Excavation for Geotechnical Solutions	271,000
Spoil From Piling & Drilling	32,000
Pavement Milling	97,000
Drainage	114,000
Total	807,000

16.4.3.4 The worst case would be that all this material would have to be exported off site which would involve 100,900 HGV movements at 8m³ per HGV (approximately 85 – 100 HGV movements per day). This is unlikely but the extent of material to be reused would have to be defined by the DBFO Contractor.

Table 16.2 Bulk Material Required

Activity	Volume (m³)
Import for Geotechnical solutions	194,000
Pavement Materials	313,000
Concrete for VRS	30,000
Concrete for Retaining Walls	31,000
Topsoil	32,000
Drainage Materials	65,000
Total	665,000

16.4.3.5 The worst case would be that all this material would have to be imported to site rather than sourced from reused material generated and processed on site. The worst case would involve 83,100 HGV movements at 8m³ per HGV which would be between 70 – 85 HGV movements per day.

16.4.3.6 The total movements, as a result of imported and exported material, is likely to be between 155 – 185 HGV movements per day in the worst case.

16.4.3.7 A number of private vehicles would be used to get construction workers to and from the site. A Travel Plan would be included in the CEMP to address site working parking and travel arrangements to minimise the impact of worker traffic on the local road network.

16.4.3.8 A public communication and complaints procedure would be established, and any issues raised would be addressed. The road surface would be maintained in a clean and safe condition at all times.

16.4.3.9 Given the location of the works, it is not envisaged that construction traffic would significantly affect volumes or lead to traffic congestion. The overall effect of construction traffic is considered slight adverse.

16.5 Construction Environmental Management Plan

16.5.1.1 A Construction Environmental Management Plan (CEMP) would be in place before the start of construction, and would be a mandatory requirement for the contractor, to ensure best practice for all the work and to safeguard the environment.

16.5.1.2 The CEMP would comprise detailed statements for the methods and controls proposed to safeguard the environment and mitigate the adverse effects of the Scheme and its construction.

16.5.1.3 The CEMP would integrate the construction activities with the requirements of environmental legislation. It would include the following:

- register of environmental aspects and assessment of impacts of activities
- definition of roles and responsibilities with regards to environmental management

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- communication and co-ordination processes with statutory authorities, non-statutory authorities, interests groups and the public
- training and awareness requirements
- environmental control measures to reduce adverse impacts from construction activities using a risk based approach
- management of environmental incidents

16.5.1.4 The CEMP would comprise a Landscape Management Plan to cover the initial five year maintenance period. The plan would include matters such as:

- grass cutting
- tree surgery
- the use of herbicides
- protection, management and maintenance of existing retained vegetation
- protection, management and maintenance of new planting, seeding and habitat creation areas

16.5.1.5 The biodiversity of the soft estate would be affected by its future management, so the manner, timing and frequency of maintenance operations would be taken into account in an Ecological Management Plan within the CEMP through an ecological management plan. General considerations that would be addressed are:

- detail how sensitive areas are to be protected during the construction of the Scheme
- avoiding damage to nesting birds during the breeding season (end February to mid-August)
- work would not be undertaken without first checking by an ecologist for the presence of protected species
- reinstatement of habitats
- maintenance should use appropriate methods at the least damaging time of the year for both protected species and as 'good practice' for conservation purposes
- ecological enhancements detailed in Chapter 7

16.5.1.6 As well as the landscape and ecological management plans above the CEMP would also include specific environmental control measures for the following:

- excavation and soil storage (including soil handling and reinstatement)
- waste management
- noise prevention and abatement
- dust

- footpath diversions
- use of hazardous materials on site
- consents required for working on or near to watercourses
- surface and groundwater pollution control
- site housekeeping
- the control of mud and dust on highway
- artificial light spillage

16.5.2 Summary

- 16.5.2.1 Construction of the Scheme is planned to commence in 2009 and the entire section would be constructed by 2012. The construction methods, locations of compounds and access roads would be developed by the DBFO Contractor.
- 16.5.2.2 The motorway would remain open to traffic during the construction period. Traffic management would be implemented using similar methods to those used for the M25 Junctions 12 to 15 widening. An assessment of traffic management during construction on the M25 shows traffic flows on the M25 would in general decrease during the construction period, but in no place by more than 10%. Traffic flows on the local roads would vary across the network depending upon which section of motorway is under construction, with maximum flows generally being higher during construction than after. Although reduced speed limits and safety requirements would be required, the same number of lanes would be maintained in both directions on the M25 during daytime working hours and therefore the overall disruption effect would be slight adverse.
- 16.5.2.3 Material produced from the earthworks and pavement construction would be reused on site, where possible. Although reuse of materials would be maximised, raw materials would still be needed and other materials would need to be exported off site. Importing of materials is estimated to involve 70 – 85 HGV movements per day in the worst case scenario. Exporting of materials generated by the construction works would involve, as a worst case scenario, approximately 85 – 100 HGV movements per day. Overall, this would equate to between 155 – 185 HGV movements per day in the worst case.
- 16.5.2.4 A CEMP would be in place before the start of construction to ensure best practice for all the work and to safeguard the environment. The CEMP would integrate the construction activities with the requirements of environmental legislation, and would include a Landscape Management Plan, Ecological Management Plan and Travel Plan. Other issues covered by the CEMP include specific environmental control measures to minimise disruption to the local communities and the surrounding environment.

17 Cumulative Effects

17.1 Introduction

17.1.1.1 This chapter describes the potential cumulative effects that could arise from the interaction between the construction and operation of the Scheme with the other M25 widening schemes detailed in Section 1.2, with other relevant HA scheme and other major land development projects in the area. The EIA Regulations¹ and the DMRB (updated by Interim Advice Note [IAN] 81/06 2) seek that, as part of the environmental assessment process, projects should identify the potential for and assess where present the beneficial or adverse impact of cumulative effects in the wider environmental context.

17.1.1.2 The assessment aims to identify the potential for cumulative effects to occur during construction and operation, and where possible, identify the possibility of significant impacts. In determining the possible significance of such cumulative effects the location and timing of potential developments has been taken into account.

17.2 Methodology

17.2.1.1 The assessment of cumulative effects has been undertaken using the guidance contained in IAN 81/06. However, there is no established methodology defined in DMRB Volume 11 for assessing cumulative impacts, thus the assessment made here is purely qualitative.

17.2.1.2 The prediction and evaluation of cumulative effects is not straightforward as the interaction between schemes is potentially complex and subject to change if development projects are delayed or postponed.

17.2.1.3 Cumulative effects could be experienced at a specific location within the Scheme environmental assessment study area, or may occur in a wider context. Furthermore the significance of individual impacts would play a role in the overall significance of the cumulative effect; a cumulative effect is likely to be at least as significant as the most significant contributory environmental impact.

17.2.1.4 The assessment included the cumulative effect that could arise from the same scheme, or from different schemes in the area as follows:

- Multiple Effects: were determined by combining the same type of impacts arising from this and other schemes, which occur at the same or similar time and impact upon the same resource(s) or receptor(s). For example, by combining the air quality impact of this Scheme with the air quality impacts of other schemes it should be possible to determine the collective air quality impact on a particular resource or receptor. Non-significant individual air quality impacts at different sites may collectively result in an overall significant cumulative air quality impact in a route-wide context
- Different Multiple Effects: were determined by combining multiple different environmental impacts arising from this and other schemes, which occur at the

same or similar time and impact upon a particular receptor or community. For example, it is considered that combined noise, air quality, ecological and visual impacts from the scheme and/or a multitude of currently developing schemes would have a greater overall cumulative impact on a receptor or resource than if each impact were assessed individually. This impact could be described as the collective (total) environmental impact upon a receptor and is often defined as a 'synergistic' or 'holistic' impact

- Incremental Effects: relate to the impact of a multitude of schemes (including maintenance operations) that have developed over a longer period of time. These individual impacts may be insignificant, but when considered together could be significant. For example, a widening scheme considered on its own may not have a large adverse impact on the environment. However, if the impacts of the Section 1 widening are considered in addition to the impacts of the other widening schemes and other schemes, the continuing development of the motorway could be considered to have had a large combined (cumulative) impact on the environment

17.2.1.5 The assessment focused upon major developments that are likely to occur and thus have some form of planning/land use approval. It considered the other M25 widening schemes and other relevant highway schemes. HA schemes which would be complete by 2008 were not considered because combined construction effects would not occur. Also, the traffic forecasting used in this ES included these schemes and therefore associated traffic related effects have already been assessed. Hypothetical developments have not been considered given the uncertainty that they would happen.

17.2.1.6 Information on the potential location and timing of nearby developments was obtained from the documents listed in Table 17.1.

Table 17.1: Documents used to determine likely developments

Authority	Relevant documents
Highways Agency	A Targeted Programme of Improvements – Highways Agency Strategic Plan for Improving the Network, undated, accessed via website http://www.highways.gov.uk/aboutus/965.aspx
County Council	Buckinghamshire County Council, March 1996, (Adopted) Buckinghamshire County Structure Plan 2001 – 2011 Buckinghamshire County Council, September 2003, (Draft) Replacement Buckinghamshire County Structure Plan 2001 – 2016 Hertfordshire County Council, April 1998, (Adopted) Hertfordshire Structure Plan Review 1991 – 2011 Hertfordshire County Council, February 2003, (Deposit Draft) Hertfordshire Structure Plan Alterations 2001 – 2016
District / Borough Councils	South Buckinghamshire District Council, March 1999, (Adopted) South Buckinghamshire District Local Plan South Buckinghamshire District Council, September 2006, (Adopted) South Buckinghamshire Local Development Framework Core Strategy Preferred Options Document Chiltern District Council, September 1997, (Adopted) Chiltern District

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Authority	Relevant documents
	Local Plan Chiltern District Council, May 2006, (Adopted) Core Strategy Preferred Options Paper Three Rivers District Council, 2002, (Adopted) Three Rivers Local Plan 1996-2011 Three Rivers District Council, June 2006, (Adopted) Core Strategy Issue and Options Paper Dacorum Borough Council, April 2004, (Adopted) Dacorum Borough Local Plan Dacorum Borough Council, May 2004, (Adopted) Dacorum Borough Local Plan Supplementary Planning Guidance "Area Based Policies" St Albans District Council, November 1994, (Adopted) City and District of St Albans District Local Plan Review St Albans District Council, May 2006 (Adopted) Joint Issues and Options Consultation Hertsmere Borough Council, May 2003, (Adopted) Hertsmere Local Plan – Through to 2011 All Councils – Information on Planning Applications, March 2007

17.2.1.7 Most of the developments referred to would require a separate assessment of their environmental effects to be undertaken by the project sponsor. The combined effects from land development projects upon environmental policies would also be considered through the strategic environment assessment (SEA) process³.

17.3 Transportation Schemes

17.3.1.1 Table 17.2 lists the current transportation proposals that are included in local authority and transport plans.

Table 17. 2: Transportation Schemes included in the Assessment of Cumulative Effects

Scale of Development	Transport Schemes	Timing
National Road Projects	M25 Widening Junctions 1b to 3 (Section 3) - widening within Secretary of State land with same objectives of the Scheme. Part of A2 / A282 Dartford Improvement Scheme ECI.	Construction start summer 2007 Operational in Autumn 2008
	M25 Bell Common Tunnel Refurbishment – located between Junctions 26 and 27 replacement of lighting and ventilation systems and the removal of the raised walkways.	Construction start summer 2008 Operational in winter 2009
	M25 Widening Junctions 27 to 30 (Section 4) – widening within Secretary of State land with same objectives of the Scheme	Construction start spring 2010 Operational in winter 2011

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Scale of Development	Transport Schemes	Timing
	M25 Widening Junctions 23 to 27 (Section 5) – widening within Secretary of State land with same objectives of the Scheme	Construction start autumn 2012 Operational in summer 2015
	M25 Widening Junctions 5 to 7 (Section 2) – widening within Secretary of State land with same objectives of the Scheme	Construction start autumn 2012 Operational in summer 2014
	M1 Widening Junctions 10 to 13. Approx 20km north along the M1 from Junction 21. Widening of approximately 25km of the M1 motorway between Junction 10, south of Luton, and Junction 13 where it joins with the A421 from 3 to 4 lanes. There will also be improvements to Junctions 11, 12 and 13.	Construction start 2008 Operational start 2011
	M11 Junctions 6 to 8 Improvements	Construction start 2015 Operational start tbc
	A5 – M1 Link (Dunstable Northern Bypass). Approx 25km north along the M1 from Junction 21	Construction start 2013 Operational start 2014
Key Local Road Projects	Watford Junction Interchange. Improved access and inter-modal interchange at Watford Junction Interchange	Unknown
Public Transport Schemes	Croxley Rail Link: Hertfordshire County Council (HCC) in conjunction with London Underground Ltd (LUL) is developing plans to re-route and extend the Metropolitan line to Watford Junction. Potential for cumulative impacts. The link would extend from Croxley to Watford; approximately 3km east of M25 Junction 18 – connected by A404/A412	Unknown

17.4 Land Development Schemes

17.4.1.1 There are numerous development proposals around this section of the M25, and details are included in the Planning Policy Technical Report. The majority of these are small relative to the scale of the M25, and are therefore unlikely to have any significant cumulative effects in combination with the Scheme. Table 17.3 lists the current major land development proposals that would be relevant to the Scheme.

Table 17.3: Major Land Development Schemes Considered in the Assessment of Cumulative Effects

Scale of Development	Major Future Land Development Schemes	Timing in relation to this scheme
LOCAL DEVELOPMENT PROJECTS	Upper Colne Valley – sites to accommodate pressures for leisure development and to promote the enjoyment of the countryside – low and medium intensity leisure uses with extensive landscaping.	Unknown – identified in 1994 Local Plan Review (Policy 143).
	NW part of Colney Street industrial / warehousing estate – 2.0Ha Employment Area.	Unknown – identified in 1994 Local Plan Review.
	Kwik Save, Watling Street, Frogmore – 3.4Ha Employment Area.	Unknown – identified in 1994 Local Plan Review.
	Tythenhanger Quarry Southern Extension. South of Coursers Road from Bell Roundabout London Colney, to Coursers Farm Colney Heath.	Construction start 2003 – existing planning permission for 15 years Operational start 2018 – quarry extension.

17.5 Assessment of Effects

17.5.1.1 Certain chapters have included indirect effects from the Scheme in their assessment. For example, cultural heritage has addressed the visual and noise effects on the setting of built heritage. The ecological assessment has included the effects of the drainage design on the aquatic ecology. This section identifies where receptors may experience combined effects from different environmental impacts of the Scheme or other schemes where they have not been addressed in individual chapters.

17.5.1.2 The type and probability of cumulative effects from the schemes listed in Tables 17.2 and 17.3 are presented in Table 17.4.

17.5.2 Multiple Effects

17.5.2.1 This section addresses multiple effects from the project, and from different projects of the same or similar type, upon the same resource.

17.5.2.2 Other proposed projects have the potential to affect resources and receptors in the vicinity of the Scheme, combining with effects from the Scheme. Using traffic forecasts for the Scheme and with other widening projects in place, the combined effects of the other widening projects were assessed for those topics which consider traffic changes – noise and vibration, air quality, drainage and the water environment and vehicle travellers. This information is presented in these chapters of the ES, and summarised below.

17.5.2.3 The summary below also considers multiple effects from other planned projects listed in Tables 17.2 and 17.3.

Landscape Effects

- 17.5.2.4 The M25 widening schemes and the M1 widening would have adverse effects on the landscape character around the M25 corridor during construction and operation. The multiple effects would result in a more urbanised route corridor around the whole of the M25 due to lighting and a net loss of vegetation within Secretary of State land used for screening and integration. More receptors around the M25 would experience adverse visual effects but this would improve as vegetation matures.
- 17.5.2.5 There are numerous small development proposals around this section of the M25, which could have additional visual effects on receptors affected by the Scheme. However, the size and nature of the development proposals mean that the cumulative effects are unlikely to be significant.
- 17.5.2.6 Areas within the Upper Colne Valley (e.g. around Frogmore, see Table 17.3) are designated by the Local Planning Authority for low and medium leisure uses with extensive landscaping, which may change the effect of the Scheme by increasing or decreasing the vegetation screening in the area. However, the nature of the proposals are not known.

Ecology and Nature Conservation

- 17.5.2.7 All the M25 and the M1 widening schemes would result in multiple habitat effects due to the temporary and net loss of habitats within the Secretary of State land. Through habitat enhancement and compensation, certain parts of the Highways Agency Biodiversity Action Plan (HABAP) would be promoted. The use of 'connective planting' (for example species rich hedgerows) to join otherwise isolated habitats would also promote several HABAP targets.
- 17.5.2.8 There are numerous small development proposals around this section of the M25, which could have additional effects on receptors affected by the Scheme. However, the size and nature of these development proposals mean that the cumulative effects are unlikely to be significant.
- 17.5.2.9 Areas within the Upper Colne Valley (e.g. around Frogmore, see Table 17.3) are designated by the Local Planning Authority for low and medium leisure uses with extensive landscaping, which may have beneficial or adverse cumulative effects with the Scheme by increasing or reducing the ecological resource in the area. However, no specific proposals are known at present.

Road Drainage and the Water Environment

- 17.5.2.10 Spillage calculations showed that the effect on traffic on spillage risk with the other widening schemes in operation would not be significantly different from just the Scheme in operation. All the widening schemes include improved drainage facilities. The extent of impervious hard standing and therefore the volume of drainage entering the surrounding watercourses would increase due to the widening schemes, but additional attenuation has been included in the designs to ensure flow rates are maintained and therefore the risk of flooding is not considered significant.
- 17.5.2.11 There are numerous small development proposals around this section of the M25, which could have additional effects on water quality and flooding on resources affected

by the Scheme. However, the size and nature of these development proposals mean that the cumulative effects are unlikely to be significant.

Traffic Noise and Vibration

- 17.5.2.12 As well as looking at the proposed Scheme, the noise assessment in Chapter 9 considered a scenario with other proposed schemes also in operation in 2027. Across the whole study area there would be 568 fewer dwellings subject to an increase in traffic noise levels with other schemes in place compared to the scheme-only scenario. There would also be 55 fewer dwellings with a decrease in traffic noise levels in the cumulative assessment compared to the S1 only assessment. All differences are in the lowest noise change band of 1-2.9 dB LA10,18-hour where the impact is considered to be minimal.
- 17.5.2.13 During construction of the Scheme, receptors around Junction 21 would experience multiple noise effects from construction activities from this Scheme and the M1. Section 5 would be constructed following the construction of Section 1, so although the construction periods would not overlap there will be a lengthening of the period of construction noise and vibration experienced by receptors at the boundary between the two schemes. The Scheme and Section 4 (Junctions 27 – 30) are far enough removed not to have multiple effects on the same receptors.
- 17.5.2.14 There are numerous small development proposals around this section of the M25, which could have additional noise effects on receptors affected by the Scheme. However, the size and nature of these development proposals mean that the cumulative effects are unlikely to be significant.

Air Quality

- 17.5.2.15 As well as looking at the proposed Scheme, the air quality assessment in Chapter 10 considered local air quality scenarios with other proposed schemes also in operation. In the opening year of the Scheme small changes in concentration are predicted within the study area, between the Do-Something scenario and the Do-Something with additional widening. This is because traffic growth, in addition to that for Section 1 widening, is typically small within the study area. In 2015, the pattern described for 2012 is typically repeated.
- 17.5.2.16 This is not the situation for parts of Section 5 (Junctions 23 to 27), which is due to be widened in 2015. Traffic flows are predicted to increase with the widening of Section 5 in addition to growth from Section 1 widening. This increase in flows is reflected by increased predicted pollutant concentrations in the Do-Something with additional widening, primarily between Junctions 25 and 27. However no exceedances of air quality thresholds were predicted due to the anticipated additional traffic flows with the additional widening.
- 17.5.2.17 There are numerous small development proposals around this section of the M25, which could have additional air quality effects on receptors affected by the Scheme. However, the size and nature of these development proposals mean that the cumulative effects are unlikely to be significant.

Geology and Soils

17.5.2.18 The cumulative effects of all the widening schemes on the geological and soil resource is not significant because the Schemes are all within Secretary of State land which is not an important geological or soil resource. An extension to Tyttenhanger Quarry is under-way, but it is not anticipated that there would be any significant interactions with the geological and soil effects arising from this, and therefore no cumulative effects arising.

Cultural Heritage

17.5.2.19 Although there are unlikely to be significant effects on cultural heritage as a result of the individual M25 and M1 widening schemes, the multiple effect on this resource could be significant. In addition, there are numerous small development proposals around this section of the M25, which could have additional effects on the cultural heritage resource in the area. The overall setting of the built heritage in the region would be adversely affected. Effects on the buried archaeological resource within the M25 corridor could be significant if artefacts of current unknown value transpire as important. Vehicle Travellers.

17.5.2.20 Although vehicle travellers currently experience high volumes of traffic on the motorway, vehicle travellers, and especially driver stress, is likely to be continually adversely affected from the construction of a multitude of schemes and construction maintenance over a period of time.

Pedestrians and Others

17.5.2.21 The M25 and M1 schemes would have limited impacts on crossing points and severance and therefore the effects on pedestrians and others within the M25 sphere during the operation of the schemes is unlikely to be significant.

17.5.3 Different Multiple Effects

Introduction

17.5.3.1 Certain topics have included indirect effects from the Scheme in their assessment. For example cultural heritage has addressed the visual and noise effects on the setting of built heritage. The ecological assessment has included the effects of the drainage design on the aquatic ecology. This section identifies where receptors may experience combined effects from different environmental impacts where they have not been addressed in individual chapters.

Construction

17.5.3.2 The construction of Section 4 between Junctions 27 to 30 would coincide with the construction of this Scheme. The widening of Junctions 23 to 27 (Section 5) would begin after completion of this Scheme. The widening schemes between Junctions 1b to 3 (Section 3) and Junctions 5 to 7 (Section 2) are far enough away not to have an impact.

17.5.3.3 The different multiple effects experienced by receptors during the construction period would be temporary, and would cease to exist following completion of the Schemes. These include effects on receptors from dust, noise and visual intrusion from construction. Because of the temporary nature, and because effects will be experienced by receptors at different times during the construction phase, a property-by-property analysis has not been undertaken. For visual, heritage and air quality effects on individual properties arising during construction, these have been addressed in the individual chapters. It is not possible to identify the noise impact on individual properties, arising during the construction stage.

Operation

17.5.3.4 During the operation of the Scheme, the total environmental effects upon receptors would alter to include noise and vehicle emissions generated by traffic on the M25 and surrounding road network and long term visual impacts.

17.5.3.5 Chiltern Drive, near Maple Cross, would suffer an increase in noise levels and increased visual impact. Although once new planting is established in the design year the visual effects would reduce.

17.5.3.6 Blanche Lane properties immediately adjacent to the M25 would experience increases in NO₂ and visual impact in the opening year, but reduced noise levels in the design year would lessen the overall perception of intrusion on the properties.

17.5.3.7 The following receptors would experience a slight or major adverse visual effect but benefit from a predicted reduction in traffic noise levels of greater than 1dB 15 years after opening, which would improve the overall perception of intrusion:

- Blanch Farm Cottage
- Berrybushes Cottage
- Cottage Farm
- Flint Cottage
- Gallows Hill
- Great Wood Cottage
- The Lodge , Chandler's Cross
- Longlea, on East Lane
- North Lodge, Sarratt Road

17.5.3.8 The following receptors would experience a slight adverse or major adverse visual effect in addition to a predicted increase in traffic noise levels of greater than 1 dB, 15 years after opening:

- Alderbourne Cottage (Listed Building)
- Isle of Wight Farm

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- Owls Hoot Cottage
- Westholme Manor

17.5.4 Incremental Effects

17.5.4.1 Incremental effects, such as maintenance operations and improvement schemes, have been common occurrences on the M25 since it was built in the 1970's.

17.5.4.2 Although the Scheme would not have many significant effects when considered in isolation, when other widening schemes and developments and the associated long term maintenance and improvements, incremental effects (beneficial or adverse) on resources and receptors would be greater.

17.5.4.3 In addition, any future land developments in the area would introduce new receptors into the area which would experience effects.

Table 17.4: Probability and Definition of Cumulative Effects

Schemes	Timing	Construction Effects	Operational Effects
National Road Projects			
M25 Widening Junctions 1b to 3 (Section 3)	Construction start Summer 2007 Operational in Autumn 2008	Low probability of construction effects because schemes are far away from each other and timings are different.	Any changes in traffic on Section 1 from implementation of Section 3 have already been included in the traffic model, therefore there should be no additional effects from traffic changes. Scheme is far enough away that direct effects are unlikely.
M25 Bell Common Tunnel Refurbishment	Construction start Summer 2008 Operational in Winter 2009	Low probability of construction effects because schemes are far away from each other.	Low probability that there would be any multiple effects because schemes are far away from each other.
M25 Widening Junctions 27 to 30 (Section 4)	Construction start Spring 2010 Operational in Winter 2011	Low probability that dust, noise, visual intrusion and disruption due to different multiple construction effects would affect same receptors.	Moderate probability that traffic changes from Sections 4 and 5 would have multiple effects – on air quality and noise at the eastern end of the Scheme.

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Schemes	Timing	Construction Effects	Operational Effects
M25 Widening Junctions 23 to 27 (Section 5)	Construction start Autumn 2012 Operational in Summer 2015	Moderate probability of incremental effects because although construction is at different time and in different place receptors around Junction 23 and M25 drivers would be affected by continued disruption over a longer period.	
M25 Widening Junctions 5 to 7 (Section 2)	Construction start Autumn 2012 Operational in Summer 2014	Low probability of construction effects because of distance between schemes and different timing of construction programmes.	Any changes in traffic on Section 1 from implementation of Section 2 have already been included in the traffic model, therefore there should be no additional effects from traffic changes. Scheme is far enough away that direct effects are unlikely.
M1 Widening Junctions 10 to 13.	Construction start 2008 Operational start 2011	Moderate probability of incremental effects because although schemes are separated by distance, the roads are directly linked and the construction periods would coincide. Drivers would be affected by continued disruption over a larger area.	Any changes in traffic on Section 1 from M1 widening have already been included in the traffic model, therefore there should be no additional effects from traffic changes. Scheme is far enough away that direct effects are unlikely.
A5 – M1 Link (Dunstable Northern Bypass)	Construction start 2013 Operational start 2014	Low probability of construction effects because of distance between schemes and different timing of construction programmes.	No direct interactions due to distance between schemes, but moderate probability that changes in traffic from A5-M1 link would affect Section 1 traffic related impacts.
M11 Junctions 6 to 8 Improvements	Construction start 2015 Operational start tbc	Low probability of construction effects because of distance between schemes and different timing of construction programmes.	No direct interactions due to distance between schemes, but moderate probability that changes in traffic from M11 improvements would affect Section 1 traffic related impacts.

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Schemes	Timing	Construction Effects	Operational Effects
Local Road Projects			
Watford Junction Interchange	Unknown	If there is an overlap in construction period, there would be a moderate probability of combined construction effects, causing disruption to drivers over a larger area.	No direct interactions due to distance between schemes, but low probability that changes in traffic from Watford Junction interchange would affect Section 1 traffic related impacts.
Public Transport Projects			
Croxley Rail Link	Unknown	If there is an overlap in construction period, there would be a moderate probability of combined construction effects causing disruption to drivers over a larger area.	No direct interactions due to distance between schemes, but low probability that changes in traffic from Croxley rail link would affect Section 1 traffic related impacts.
Land Developments			
Upper Colne Valley	No specific proposals - identified in 1994 Local Plan Review.	Timescale unknown	Possible that change in vegetation could have a cumulative effect (beneficial or adverse depending on proposals) in combination with the Scheme
NW part of Colney Street industrial / warehousing estate	No specific proposals - identified in 1994 Local Plan Review.	Timescale unknown	Land is already developed so any changes are unlikely to have a significant cumulative effect.
Kwik Save, Watling Street, Frogmore	No specific proposals - identified in 1994 Local Plan Review.	Timescale unknown	Land is already developed so any changes are unlikely to have a significant cumulative effect.
Tythenhanger Quarry Southern Extension	Construction start 2003 – existing planning permission for 15 years Operational start 2018 – quarry extension	If there is an overlap in construction period, there would be a moderate probability of combined construction effects causing additional disruption to drivers and residents over a localised area.	Quarry is already in existence, so it is unlikely that any effects would have a significant cumulative effects in combination with the Scheme.

18 Conclusions

This ES has provided an environmental assessment on the potential effects resulting from construction and operation of the Scheme. A summary of the main environmental effects for each topic is provided in Section 18.1.1, and the Appraisal Summary Table (AST) is shown in Section 18.1.2.

18.1.1 Summary of Environmental Effects

Landscape Effects

- 18.1.1.1 Landscape impacts would generally result from the loss of vegetation within the Scheme Boundary, introduction of new elements such as gantries and lighting columns and new lighting in the currently unlit sections. The Scheme would result in moderate adverse landscape effects in year 15 in three main areas: the landscape character areas between Junctions 16 and 17, the Chilterns Area of Outstanding Natural Beauty, Chorleywood settlement and the landscape character areas between Junctions 21A and 22.
- 18.1.1.2 The key visual effects on receptors resulting from the Scheme would be from the loss of existing vegetation and the introduction of signage, gantries and lighting. During the Summer, the impacts would be broadly reduced due to the screening provided by the surrounding woodland, trees, shrubs and hedgerows in leaf. However, this would largely not reduce the significance of effects.
- 18.1.1.3 The key night-time effects resulting from the Scheme would be from the loss of existing vegetation and the introduction of signage, gantries and lighting. This would include lighting in currently un-lit areas and the movement of lighting columns from central reserve lighting to verge lighting.
- 18.1.1.4 Overall, effects on landscape, visual receptors and at night-time would range from moderate adverse during construction, slight adverse to moderate adverse at year 1, reducing generally to slight adverse with the maturing of the Scheme planting by year 15. Visual effects would experience a moderate to slight adverse effect at year 1.

Ecology and Nature Conservation

- 18.1.1.5 Designated sites would remain largely unaffected by the Scheme. Construction activities would involve some loss of habitat although this would be minor or of lower quality habitat. Reinstatement and, where possible, improved connectivity and habitat structure would reduce the impact on designated sites to slight adverse during operation of the Scheme.
- 18.1.1.6 Approximately one third of the habitats within the Scheme Boundary would be affected during construction, including grasslands, plantation woodland and hedgerows. A small amount of ancient woodland would also be lost, but the majority of these habitats are of lower value for biodiversity. Construction of the Scheme would have a moderate (adverse) effect upon habitats.

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- 18.1.1.7 Once operational, the Scheme reinstatement would replace lost habitats leading to an overall reduction in terrestrial habitat of approximately 14%. However, these habitats would comprise more diverse communities than are currently present, and mitigation would further improve this diversity. Overall, the Scheme would have a slight (adverse) effect upon habitats.
- 18.1.1.8 Impacts on species from construction include the loss of habitats together with disturbances such as noise and lighting, which would all result in displacement and/or disruption to normal activities. The overall impact of the construction phase upon species is considered to be major adverse due to disturbance of water vole and bats. This equates to a large (adverse) effect.
- 18.1.1.9 Operational effects would vary between species although many of the effects from the current situation would remain. The Scheme would include lighting, which would have more long-term effects, especially for species such as bats, birds, fish and invertebrates (this is of particular note in areas that are currently unlit). Reinstatement of habitats together with mitigation, enhancement and compensation would offset adverse effects on most species. The Scheme would therefore have a slight (adverse) effect upon species.

Road Drainage and the Water Environment

- 18.1.1.10 The Scheme would include a new drainage design, incorporating treatment, containment and attenuation through the use of filter drains, swales, bio-retention systems and ponds. These features would counteract the adverse impacts to be expected from the increase in motorway area and has been designed to prevent a deterioration compared to the current situation, and where possible provide an improvement.
- 18.1.1.11 There would be minor improvements in water quality at 5 watercourses, and a neutral effect on routine surface water runoff with the Scheme. Accidental spillage risk would be less than 1% without mitigation. By incorporating spillage containment, the Scheme would result in a slight beneficial effect on accidental runoff. The Scheme would not encroach further onto floodplains, resulting in a neutral effect upon floodplain conveyance.
- 18.1.1.12 There would be a neutral effect upon groundwater as a result of the Scheme, with a moderate to large beneficial effect experienced between Junctions 18 to 19 and Junctions 19 to 20. Relocation of existing soakaways that are within Inner SPZs, or are located close to the groundwater table, to sites that are less sensitive would provide further benefits.
- 18.1.1.13 Overall, combining the surface and groundwater effects there would be a slight beneficial effect on the water environment.

Traffic Noise and Vibration

- 18.1.1.14 The design aim of the Scheme was to provide a benefit by way of a reduction in noise and where this was not practicable the aim was to limit any increase in noise, wherever possible, to 1 dB LA10 18hr.

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18.1.1.15 Noise mitigation measures with the Scheme include low noise surfacing on both carriageways, a concrete barrier in the central reserve, and provision of new Environmental Barriers where necessary.

18.1.1.16 Overall, the majority of residential properties within 300 metres of the Scheme would benefit from a reduction in the noise levels as a result of the Scheme, and there would therefore be a general reduction in the number of people bothered by noise. In the wider area (beyond 300 metres), there would be more properties with an increase in noise and noise nuisance in the Do-Something compared to the Do-Minimum. However, a number of other properties beyond 300 metres would also experience a decrease in noise and noise nuisance in the Do-Something compared with the Do-Minimum.

18.1.1.17 The noise calculations identified four properties, including two Listed Buildings, that qualify for offer of noise insulation under Regulation 3 Noise Insulation Regulations 1975 (as amended 1988).

Air Quality

18.1.1.18 In the baseline year, forty nine NO₂ annual average AQS exceedances have been predicted, together with thirty eight PM₁₀ 24 hour mean EU Limit Value exceedances and one annual average PM₁₀ EU Limit Value exceedances.

18.1.1.19 No exceedances of the EU Limit Values are predicted in any of the opening year (2012) scenarios with respect to any of the pollutants modelled, except for R54 with respect to annual average NO₂ in the Do-Minimum scenario. The opening year is predicted to be the worst-case air quality year of the two forecast years assessed (2012 and 2015). A localised assessment of traffic re-routing did not predict any exceedances of the EU Limit Values, except for at two locations R322 and R323. During construction air quality improved at R322 and deteriorated at R323 by the same margin for annual average NO₂ (0.4 µg/m³).

18.1.1.20 Therefore, the Scheme can be promoted in accordance with the 2005/2006 Highways Agency objectives for air quality.

Geology and Soils

18.1.1.21 No geological or geomorphological SSSIs, RIGS or active quarries would be affected by the Scheme.

18.1.1.22 Eighteen operating and former landfills have been identified within the study area, many of which are located immediately adjacent to, or within, the Scheme Boundary. There are a number of potentially contaminated land areas that lie within the study area. Chemical tests have indicated the existence of a number of contaminants of differing concentrations, including PAH, TPH and heavy metals in the soil at some locations. This often confirms contamination at known landfills.

18.1.1.23 Some of the landfills present a potential risk of flammable landfill gas (including methane and carbon dioxide), gas migration and asbestos risks during the construction period. Best practice procedures would minimise these risks to the environment and site workers.

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18.1.1.24 The overall effect of the Scheme in terms of geology and soils is neutral.

Cultural Heritage

18.1.1.25 Assuming implementation of the recommended mitigation strategy (preservation by record), the majority of adverse cultural heritage effects would be neutral. There are several locations where archaeological remains could be present beneath existing embankments, although the probability is low due to disturbance during the original M25 construction. Where piled retaining walls are inserted through embankments, it would not be feasible to mitigate any impacts locally, therefore the residual effect remains uncertain.

18.1.1.26 The Scheme would have a slight adverse effect upon the setting of one Grade II* Listed Building and 36 Grade II Listed Buildings. There would be a moderate adverse effect upon the setting of two Grade II Listed Buildings. In addition, there would be a moderate to slight adverse effect on the historic aspects of the Chilterns AONB as a designated historic landscape.

18.1.1.27 There is an uncertain effect upon Misbourne/Chalfont Viaduct as the exact nature of the proposed works would not be defined until the detailed design stage undertaken by the DBFO Contractor. It is not expected to cause more than a slight adverse effect.

Vehicle Travellers

18.1.1.28 The Scheme would be accommodated within Secretary of State owned land, therefore the changes in views from the road would be very slight. As a result, there would be a neutral effect upon travellers' views with the Scheme.

18.1.1.29 Driver stress levels would improve with the Scheme in 2027, as would the fear of accidents, uncertainty of route and rider comfort. Reduced lane widths would occur at 26 locations, but this would be a gradual reduction in width so it would not be noticeable to drivers. The overall effect of the Scheme on driver stress would be beneficial.

18.1.1.30 Overall, the Scheme would have a beneficial effect on vehicle travellers.

Plans and Policies

18.1.1.31 At the national level, the Scheme would promote policies related to improvements to the existing trunk road network and freight corridor. However, it would not support policies with the objective of reducing travel by private car.

18.1.1.32 Both regional planning bodies have expressed support for the Scheme, which is reflected in adopted regional planning policy. Since the Scheme would contribute to a safe and efficient transport system and improve journey time reliability it would be in general compliance with regional transport policy.

18.1.1.33 At a local level, the Scheme would support all policies related to the limitation of noise in the environment, as any increase in noise levels would be indiscernible following installation of noise mitigation measures. The Scheme would also support all policies relating to the protection of water quality and has no change to flood risk related policies.

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There are a number of key specific policies in the relevant local plans which provide explicit support, in principle, for the Scheme reflecting the importance of the Scheme in providing a range of local transport and environmental benefits. However, the Scheme would conflict with a specific Three Rivers Local Plan policy that opposes widening of the M25.

18.1.1.34 At all levels of planning policy, there would be a neutral impact on policies relating to waste and contaminated land, archaeology and built heritage, provisions for pedestrians and cyclists and public rights of way. Due to the loss of habitat and vegetation within the Scheme Boundary, the Scheme would have an adverse impact upon biodiversity and landscape aims in some national, regional and local policy documents. There would also be adverse impacts upon air quality policies in the short term, but no exceedances of the EU Limit Values are predicted in opening year (2012) scenarios for NO₂ and PM₁₀. However, traffic flows would increase along the motorway with the Scheme.

18.1.1.35 No allocated sites for major developments within the study area would be directly affected by the Scheme, and no local planning applications submitted within the last five years (2002 – 2007) would generate sufficient traffic to adversely affect the Scheme design.

Pedestrians and Others

18.1.1.36 There would be two temporary crossing point closures during the construction period, at Berry Lane and Park Avenue Footbridge. This would result in a temporary moderate adverse effect on community severance.

18.1.1.37 During the operation of the Scheme, there would be no permanent direct impacts upon any routes used by pedestrians and others. There would be some localised adverse impacts on ease of crossing resulting from changes in traffic flows, but overall, the Scheme would have a neutral impact on travel patterns and journey times. Loss of vegetation would have an adverse impact on the amenity experienced by pedestrians and others in the immediate vicinity of the Scheme.

18.1.1.38 Overall, there would be a neutral effect upon pedestrians and others as a result of the Scheme.

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Appendix A : Non Technical Summary Text

Explanation of the M25 Widening Schemes

The Highways Agency is to widen approximately 102 kilometres of the M25 by adding a lane in each direction to make generally a 4-lane motorway. The widening is to be undertaken around the north side of London between Junctions 16 (M40) and 30 (A13 Interchange) and between Junctions 5 (M26) and 7 (M23) around south-east London. The works will take place over approximately 7 years starting in 2009. Currently the Highways Agency is widening the M25 between Junctions 1b (Dartford Crossing) and 3 (A20/M20) south of the Thames. These works began in Spring 2007 and will be completed in 2008.

The Highways Agency's proposals for the M25 are developed from the London Orbital Multi-Modal Study (ORBIT) published in 2002. This study looked at the most appropriate transport strategy for the M25 corridor. The Secretary of State for Transport accepted the ORBIT study recommendation to widen most of the remaining 3-lane sections of the motorway and to manage traffic demand to ensure that the benefits of the additional capacity are retained.

Why improvement is needed?

High levels of traffic flow lead to increased congestion and unpredictability of travel times. Congestion on the M25 is caused by a number of factors including:

- journeys to and from work which account for approximately 50% of traffic in the peak periods
- the M25 is used for a small part of many longer journeys
- average occupancies of vehicles are low
- traffic consists of a high proportion of heavy goods vehicles

Nearly 20% of UK road freight either starts or ends its journey in the South East (SE) of England. Thus, improvement of the M25 through widening of the road is essential to secure the long-term economic prosperity of SE England and the country as a whole.

What are the benefits?

The Scheme provides the following benefits:

- improved reliability of the time it takes to make a journey
- improved safety on the motorway
- reduced congestion
- improved driver information

How is the Highways Agency going to build these improvements?

For construction purposes, the remaining widening works are divided into four sections. These are:

Section 1: From Junctions 16 (M40) to 23 (A1(M))

Section 2: From Junctions 5 (M26) to 7 (M23)

Section 4: From Junctions 27 (M11) to 30 (Thurrock)

Section 5: From Junctions 23 (A1(M)) to 27 (M11)

Section 1 is the first to be widened.

Non-Technical Summary of the Environmental Statement

This Non-Technical Summary details the widening of Section 1 between Junctions 16 and 23, which has an overall length of 35.6km. The Non-Technical Summary acts as a summary of the Environmental Statement, which is published in accordance with European Directive 85/337/ECC amended by Directive 97/11/EEC and Directive 2003/35/EC as applied by Section 105A of the Highways Act 1980, as amended.

The Environmental Statement presents in detail the findings of the Environmental Impact Assessment. There is a legal requirement to provide a Non-Technical Summary to ensure that the non-technical reader can fully appreciate the likely environmental effects of the new development before a decision is made by the Secretary of State.

Description of Section 1 (Junctions 16 to 23) Widening

One of the key objectives is to avoid, reduce and mitigate significant environmental impacts where necessary. The Scheme is constructed within the Secretary of State's land by making the existing side slopes steeper or by constructing new retaining structures. It is necessary to remove some of the existing vegetation, but this is replaced and improved in the finished works.

New road lighting is provided along the whole length of the Scheme together with new traffic sign gantries and better vehicle and incident detection, to ensure that breakdowns and congestion on the motorway can be more effectively managed. The new gantries and signals enable the extension of the current system of variable speed limits that exist between M25 Junctions 10 and 16. These measures help to manage the flow of traffic and ease any congestion that might occur.

Landscape Effects

The existing motorway is visible in many views from the surrounding landscape. The landscape surrounding the Scheme includes the Chilterns Area of Outstanding Natural Beauty (AONB), Colne Valley Park, Watling Chase Community Forest and numerous towns, villages and scattered houses.

The impact of the Scheme on the landscape and views results from loss of vegetation within the motorway fence line and because of new gantries, signs and lighting.

Impacts will be reduced in the long term by new planting and enhancement of the existing vegetation. This helps to screen the Scheme from sensitive viewpoints and assist with its wider visual integration in the landscape.

Ecology and Nature Conservation

Disturbance from the motorway already impacts on the existing habitats and species. The use of low noise surfacing, enhanced environmental barriers and improved drainage ensures that these effects are not made worse by the Scheme. The Scheme includes new planting and habitat reinstatement in line with the Highways Agency Biodiversity Action Plan; however, in some locations new lighting has a negative effect on certain species, such as bats and fish.

No Statutory Designated Ecological Sites are affected by the Scheme.

A programme of mitigation and the Construction Environmental Management Plan controls construction impacts and ensures improvements are implemented. Advance mitigation work, prior to construction, minimises impacts on protected species during the construction phase.

Road Drainage and Water Environment

The new drainage collects rainfall from the motorway, treats the quality of the water and manages its flow by the use of a number of drainage features, such as filter drains and ponds. These measures minimise the adverse effects from the Scheme because water quality and discharge are no worse than in the existing situation and provide an improvement where possible.

Traffic Noise and Vibration

On completion of the widening, the full width of carriageway is surfaced with low noise surfacing. When the Scheme opens, new environmental barriers and improvements to existing barriers result in 170 residential properties receiving a reduction in noise levels of more than 1dB(A), of which 70 receive decreases of 2 – 3 dB(A) and 21 receive decreases of 3 – 6 dB(A). 125 properties receive an increase of between 1 and 2 dB(A). Four residential properties qualify for noise insulation, including two Listed Buildings.

During the construction phase, noise control measures will be in place and the contractor will agree permissible noise levels with the local authority Environmental Health Officers.

Air Quality

Changes in traffic flows and speeds do not result in any of the relevant air quality standards being exceeded.

During construction, temporary air quality effects caused by dust are controlled to ensure that there is no nuisance to neighbouring properties.

Geology and Soils

Where the motorway crosses contaminated land, the contractor will employ best practice procedures to minimise the risk of any harmful effects.

New retaining walls minimise the exposure of contaminated landfill material, minimise the quantity of soil excavated and act as a barrier to the migration of any contaminants.

Cultural Heritage

No negative archaeological effects are expected during the construction of the Scheme. The Scheme has limited adverse visual effects on some Listed Buildings.

Minor works are proposed to protect the piers of Chalfont Viaduct, which is an important local heritage feature; however, the visual impact is not significant.

Vehicle Travellers

The view from the road is not significantly changed because the Scheme is constructed within the existing Secretary of State owned land. Rising traffic levels will increase driver stress, whether the Scheme is built or not. With the Scheme in place this stress will be lower due to improved driver information, smoother traffic flow and reduced congestion.

Policies and Plans

The Scheme is in compliance with various national, regional and local Government transport and planning policies that promote improvements to the existing trunk road network/freight corridors. The Scheme has no effect on planning and other policies relating to waste and contaminated land, archaeology and built heritage, provisions for pedestrians and cyclists and public rights of way.

In the short term, the removal of habitat and vegetation for the Scheme does not promote planning policies on biodiversity and landscape protection. However, the Scheme's proposed long-term enhancement measures encourage biodiversity and landscape improvements. The Scheme does not promote various national, regional and local Government transport and planning policies that aim for reductions in car usage. The Scheme is constructed within land owned and controlled by the Secretary of State and non-vehicular modes of transport are not affected.

Pedestrians, Cyclists, Equestrians and Community Effects

Two M25 crossing points are temporarily affected by the Scheme. During construction, Park Avenue Footbridge and the paths passing under Berry Lane Viaduct will be closed temporarily; however, diversions ensure that disruption is minimised.

Following completion of the Scheme, impacts to pedestrians and others are not significant enough to deter any journeys and there is no overall change in community severance.

Disruption Due to Construction

A Construction Environmental Management Plan will be in place before the start of construction. The Plan comprises detailed methods and controls to safeguard the environment, ensure best practice and mitigate the adverse effects of the Scheme during construction.

The Plan details measures to reduce the effects of excavated materials, noise, dust, waste, temporary lighting and traffic management on the community including watercourses, habitats and protected species.

Frequently Asked Questions

Q. When will construction start and how long will it last?

A. Construction is planned to start in 2009, subject to the Secretary of State deciding to proceed with the Scheme. The construction between Junctions 16 and 23 will be carried out in phases and is planned to be completed by 2012.

Q. Will traffic divert off the M25 onto the local roads?

A. The works are planned so as to maintain the existing number of traffic lanes during the day time and thus minimise any potential for traffic diversion.

Q. Will noise levels increase?

A. Low noise surfacing and new environmental barriers ensure that surrounding properties do not experience noticeable increases in noise levels.

Q. What are the benefits to road users?

A. The main benefit is that journey times for the road user are more reliable, safer and less stressful. Road users will be better informed of road conditions by means of new message signs.

Q. Why is it necessary to light the motorway?

A. The additional lighting of the M25 improves road safety. Research has shown that lighting leads to a reduction in night-time accidents.

Appendix B : Consultations

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Scoping Report

Organisation	Contact	Date Received	Key Consultee Comments	Response
Hertsmere Borough Council	Richard Grove Head of Planning, Transport and Building Control	02/03/2005 - These comments are specifically for section 5 but general apply to section 1. Email 22/04/05 - no comments on section 1.	Section 5.2.1 - noise impact assessment is restricted to 300m either side of the motorway. Hertsmere question whether this is too limited.	Addressed in Noise and Vibration Assessment chapter of the draft ES.
Three Rivers District Council	Peter Brooker/ Christian Brady	6/10/2004	Air Quality - Council supports the suggestion in s5.3.1 for development of an air quality management plan for the M25 sphere. Three Rivers would like to be closely involved in the development and implementation of this scheme within their District. The Council would be prepared to move the continuous air pollution monitoring station from its current location to within the AQMA at J18, Chorleywood. A reasonably suitable site on SoS land has been identified adjacent to the anticlockwise on-slip, but active co-operation of the HA has still not been obtained. The council consider it urgent to monitor dust falling on Park Avenue and Chestnut Avenue near J18.	This was investigated and the area of land in question was not owned by HA. A large amount of diffusion tube monitoring was undertaken for the assessment.
			Local Wildlife Sites - main focus here is corridor of land between J17 to J20. It would be important to ascertain the extent (hectarage) of new land-take falling in-District.	The Scheme is located within Secretary of State owned land. No land take is required for the operation phase of the new road. Ecological impacts are addressed in the draft ES. Site Compound locations will be determined by the DBFO contractor. These have not been assessed in the draft ES. Where possible these will be located on Secretary of State owned land and if not these would be agreed with the local planning authority.

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Organisation	Contact	Date Received	Key Consultee Comments	Response
			In addition to the above, there are several sites within very close range of M25 route - detailed Ecological Profiling information is available. Avoid impinging on Wildlife Site's gross area and ecological integrity/ additional habitat fragmentation.	Phase 1 Habitat Surveys, Protected Species surveys and baseline data collection exercises have been undertaken to identify any potentially sensitive ecological areas. Impact upon these have been assessed using the DMRB and TAG methodologies and presented in draft ES. No designated sites outside the highway boundary would be directly affected by the Scheme.
			Baseline Conditions Drawing - two listed buildings (Buildings ref 474/5/98 at Chorleywood Common and 474/5/333 at Loudwater) appear to have been missed near the margins of the study corridor (sheet 2).	All baseline information presented with the Scoping Report was updated as part of the EIA and in the draft ES.
			Some of the locations indicated contain a group rather than a single Listed Building. It is suggested that these groups be shown with a different symbol to make this apparent on the drawings.	All listed buildings are shown on Cultural Heritage baseline drawings in the draft ES.
			Customer Services Centre Implications - although M25 is an HA project, it is expected that the Council will receive many queries. Close liaison with the HA will be required to ensure the Council is fully briefed on the proposal	The HA have acknowledged this and liaison is ongoing.
			Website Implications - Council would like a link to the HA website	M25 widening website has not been developed yet.
Three Rivers District Council	John Kingsbury	27/09/2004	Would appreciate ability to use Ecological Field Data arising from M25 Scoping Report to inform and hopefully develop the District's Biodiversity Action Plan in the future. They will not breach any copyright and will give 'credit where credit is due'!	The HA have confirmed that this data can be used.

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Junctions 16 to 23 Environmental Statement

Organisation	Contact	Date Received	Key Consultee Comments	Response
			Regarding public rights of way, a brief has been sent to County Public Rights of Way Officer Ms Dawn Grocock at Hertfordshire County Hall who has expressed interest in being included in developments. Junction 17 and 20 are of significant interest, and Junctions 18 and 19 are also of interest but of less concern	Ms Dawn Grocock has been included on the Draft ES consultation list. Meeting held with Herts CC on 13 th March 2006 to discuss impacts on footbridges. HCC provided information from Richard Cuthbert.
Buckinghamshire County Council	Jon Shapley	06/10/2004	M25 crosses the A413 on a very prominent bridge, and threads its way through two viaduct arches on the Marylebone to High Wycombe railway line. The scale of impact would depend critically on the ability to utilise the existing structures in these locations, and JS would not have been confident that no significant modifications will be required.	The Scheme would involve only minor structural changes but Berry Lane Viaduct would be widened. Chapter 3 Scheme Description explains the extent of works that would be required and impacts assessed in the draft ES.
			Change to the baseline conditions set out in paragraph 5.3.2, following the declaration of an Air Quality Management Area over the full length of the M25 in South Bucks District. Although there appears to be only a very small number of residential properties in the area experiencing annual mean NO2 concentrations above 40 micrograms/m3, and a similarly small number close enough to that concentration to be taken over it as a result of M25 widening, the HA still need to take the AQMA into account.	All scoping report information has been updated in the draft ES. South Bucks AQMA has been included in the assessment and is illustrated on the air quality figures.
English Nature, Essex, Herts and London Region	Gordon Wyatt	1/09/2004	SSSI - 2 geological SSSIs are marked on dwgs 3054 and 3055 but are not labelled - could be overlooked.	Geological SSSIs have been included in the drawings and effects assessed in Chapter 11 Geology and Soils of the draft ES.
			Other matters - although not shown on dwg 3105, EN understand that the land between Westwood Quarry SSSI and the M25 has also been subject to landfill in the past. This area represents the northwestern corner of the former quarry, which was severed by construction of the M25.	All potentially contaminated land and landfill information has been updated from local authorities for the draft ES.

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Organisation	Contact	Date Received	Key Consultee Comments	Response
Countryside Agency, South East Region	Michael Cowsill	5/01/2005	NMU Mitigation: Request that detailed design of replacement footpaths/ NMU traffic routes ensure accessibility for pedestrians/ those with mobility issues, and that due reference is made to the issues being dealt with by local highways authorities, Local Transport Planning and accessibility currently in hand.	Temporary mitigation measures would be implemented during the construction period at crossings C34 and C35. Detailed design of replacement footpaths and traffic routes would be the responsibility of the DBFO contractor.
			Visual Impressions at AONB: Essential that 3D artist impressions/ photomontage/ video showing landscape in do-minimum and do-something is completed. Countryside Agency specifically ask that these are supplied from views within the Chiltern AONB and from areas looking into the AONB across the M25	Photomontages have been created for Year 1 and Year 15 of the Scheme, including one located within the Chilterns AONB. This are presented n the draft ES.
			Lighting BAT: Likely to be an impact from lighting of this scheme on the local habitat and environment. Use best available technology for lighting, noise reduction surfaces/ techniques (inc traffic management) and air quality management	New lighting along the mainline would be 12 or 15 metre columns with SON-T high pressure sodium lamps and full cut-off lanterns with flat glass enclosures to eliminate any direct light being emitted. The assessment of lighting on the landscape and ecology is included in the draft ES. Low noise surfacing has been included as part of the design.
			Traffic Data: Currently no traffic volume figures or road layout information has been provided. Can these be provided? Nature and volume of traffic flow for this and the adjoining sections (and their implementation sequence) will affect the net results of air quality, traffic noise and pollutants	Scheme plans and traffic forecasts have been included in the Scheme Description in the draft ES. Traffic data has been utilised in the air quality and traffic noise assessments, as per DMRB methodology. The extent of the study area is defined in the relevant chapter.

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Junctions 16 to 23 Environmental Statement

Organisation	Contact	Date Received	Key Consultee Comments	Response
			Information on High Pressure Sodium lamps: Mr Cowsill has taken note of differences between no lighting, low pressure sodium and high pressure sodium type lighting across the motorway network. Whilst he feels that the views of our expert colleagues in the meeting of the high pressure sodium lamps are very well founded, he has asked if it is possible to have some more information on the improvement in light spill reduction achieved by these new lamps, at the optimum 15m height quoted.	The draft ES assesses the impacts of changes in lighting. More details can be provided separately.
			Contact: Continue to closely consult with AONB planning officer Colin White: Chilterns AONB Planning Officer, 8 Summerleys Road, Princes Risborough, Buckinghamshire, HP27 9DT. Tel 01844 271307	Chilterns AONB Planning Officer is included in the Draft ES consultation exercise.
			Site Visit: Mr Cowsill was hoping to take a site visit in early February - wondered if it would be useful to do that together, and possibly with Colin White (Chilterns AONB Planning Officer)	Landscape architects undertook extensive site surveys but not with CA or AONB officer. This can be undertaken prior to issue of final ES.
Environment Agency	Rob McCarthy (& Sarah Scott)	18/10/2004	Scope of aquatic surveys	Methodologies agreed with EA at meeting in August 2005.
Groundwork (Colne Valley Park Centre)	Steward Pomeroy	10/11/2004	Would like to become involved with mitigation measures, along with Groundwork Hertfordshire	Both Groundwork Colne Valley Park Centre and Groundwork Hertfordshire are included in the Draft ES consultation exercise.
Hertfordshire County Council	Rosalinde Shaw (Definitive Map Team Leader)	16/02/2005	Potters Bar BR 71 - connects Wash Lane with Dancers Lane via an underpass. Assuming underpass will be retained, this would significantly extend the length of underpass. Is length/lighting of the underpass an issue for equestrians and/or other users? Will need diverting under SRO.	This underpass is not part of Section 1 Scheme. It will be included in Section 5.

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Junctions 16 to 23 Environmental Statement

Organisation	Contact	Date Received	Key Consultee Comments	Response
Chiltern District Council	Carol Castle; Head of Planning Services	07/06/2005	Landfill: Land surrounding the M25 within Chiltern District (Warren Farm) was formerly a household waste landfill site. Impacts from disturbance to this land (directly or indirectly) should be considered and addressed within the EAR. If the widening proposals require former landfill land to be used, the EAR should detail where this 'fill' material will be relocated to, and the impacts it may have on waste management in Buckinghamshire.	Warren Farm former landfill site has been included in the Geology and Soils assessment. The Scheme is within the Highways Boundary and on Secretary of State owned land. Temporary site compounds have not been identified yet, but some may be required outside SoS land and would be agreed with the Local Planning Authority. The DBFO contractor would be required to prepare a Construction Environmental Management Plan which would address waste import and export in detail.
			West Hyde Lane, Gypsy site, Chalfont St Peter: existing static Gypsy Site is within 50m of existing M25 boundary. Impacts on these residents within this area should be addressed in the report. Given the nature of this residential accommodation, impacts from noise and fumes (air quality issues) may be different to the impacts on standard brick built houses.	Impacts of air quality and noise predicts concentrations at representative receptors along the Scheme.

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Junctions 16 to 23 Environmental Statement

Draft ES Consultation

Buckinghamshire County Council

Contact	Date Received	Issue	Consultee Comments	Response
David Radford, Archaeological Officer	26 October 2006	Heritage	ES does not show whether the landform next to the highway has been built up or terraced down, so it is difficult to assess whether archaeological recording would be appropriate. Also, no site-by-site assessment has been made.	A site by site assessment of archaeological effect has been made in 6.2-6.8 of the Technical Report. Archaeological recording would be appropriate in areas where the landform has been built up, but not where it has been terraced down. Figure 3.1 illustrates where the M25 would be in cutting or embankment.
		Heritage	Request further information as part of the archaeological assessment, giving consideration to where archaeological mitigation may not be appropriate (e.g. where sites have been clearly truncated) or where a precautionary approach should be adopted.	This information has been assessed in the Technical Report, which provides greater detail than the Environmental Statement.
		Heritage	Targeted archaeological investigations once development has commenced might be appropriate to identify whether archaeological sites survive under existing mounding where evaluation is impractical.	Appropriate mitigation for Targeted Watching Briefs has been proposed in Section 5 of the Cultural Heritage Technical Report and Section 12.5 of the Environmental Statement .
		Heritage	Develop a clear working methodology for soil moving and tracking of vehicles to avoid unnecessary damage to archaeological sites (e.g. strip map and sample approach).	DBFO Company's archaeologist would incorporate this in their detailed archaeological design as part of the DBFO company's Environmental Master Plan.

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Contact	Date Received	Issue	Consultee Comments	Response
David Radford, Archaeological Officer	26 October 2006	Heritage	Junction 16: known presence of medieval kilns at 2 sites in and around the junctions (CAS5242 and CAS5241) . Recommend early evaluation of areas within J16 affected by significant tracking of vehicles, new planting or other groundworks (J16 landscape enhancement/new vegetation works) as time consuming to excavate.	Targeted Archaeological Investigations are outlined in Section 5 of Technical Report and section 12.5 of Environmental Statement.
		Heritage	Compounds and other works outside the existing highway boundary should avoid known archaeological sites - early consultation on these areas is welcomed.	This will be the responsibility of the DBFO Company and included in the DBFO Contract. It is highlighted in the Environmental Statement. Outlined in Section 5 of the Technical Report and section 12.5 of Environmental Statement.
		Heritage	Request for further archaeological assessment to be undertaken to inform final draft of ES to: specify effects of the development on cultural heritage and, where necessary, define appropriate mitigation. PPG16 states desirability to preserve in situ, or where not possible to make arrangements to excavate, record and publish info.	The Technical Report has correctly identified the impacts and assessed the effects. With such a scheme there is limited scope for alterations. The impacts are limited and the significance of the receptors is limited. It is considered that the mitigation proposed is the best way forward.

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Junctions 16 to 23 Environmental Statement

Hertfordshire County Council

Contact	Date Received	Issue	Consultee Comments	Response
Laura Langley, Head of Forward Planning	30 October 2006	Consultation Workshop	Concern about management of Workshop as colleagues from Environmental Department arrived and no one was left at the workshop.	This issue has been resolved with Hertfordshire CC. Concern was raised by Herts CC, but as no confirmation email was sent by the Council individuals concerned the Workshop organisers did not know that additional attendees were expected later in the day.
		Vehicle Travellers	Speed restrictions, safety measures, narrow lanes and no hard shoulder will increase stress levels.	Reduced lane widths are part of widening a road within existing boundaries. Text has been amended in the Environmental Statement and Technical Report to clarify that reduced lane widths are not significantly less safe than standard lane widths. Further, the change of lane width has been designed to be very gradual and would be barely distinguishable by most drivers. Hard shoulder running will not be introduced as part of this Scheme. Driver stress levels would be improved with the Scheme (Do Something), compared to without the Scheme (Do Minimum). The Scheme would incorporate modern design specifications which would alleviate uncertainty of routes and improve ride comfort. Street lighting would enhance traveller sight lines in the dark/adverse weather conditions, thus reducing the fear of accidents.
		Vehicle Travellers	Construction works will coincide with Bell Common and Hatfield Tunnel refurbishments - this will increase stress levels and may create problems if diversions are needed. HA need to ensure no conflicts with diverted traffic, especially with extensive diversions being experienced with Holmesdale Tunnel.	Hatfield Tunnel - slip roads will need to be closed to allow the work to be carried out safely. A diversion route is readily available on the A1001 over the tunnel - however the DBFO Company will need to ensure that he liaises fully with Herts CC to ensure the diversion routes are as efficient as possible. Bell Common tunnel - the proposal designed would ensure that three lanes in both directions could be maintained on the M25 during the daytime operation with night-time reductions. This is to ensure that traffic is retained on the motorway network as far as possible

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Junctions 16 to 23 Environmental Statement

Contact	Date Received	Issue	Consultee Comments	Response
				and thereby reducing the risk of traffic diverting onto the local road network.
Laura Langley, Head of Forward Planning	30 October 2006	Vehicle Travellers	Concern that assessment has not considered the impact of widening on the section of the A405 between M25 J21A and M1 J6 at Bricketwood. This is seen as part of the M25/M1 junction arrangements so should be subject to assessment.	All roads which would affect air quality and noise within 5 miles of the Scheme have been considered in the ES. The traffic model includes all committed schemes. Integrated Demand Management (which is not part of this ES) will consider local roads.
		Noise & Vibration	Environmental Barriers at 3 metres high in places, there must be sufficient space within the highway boundary to plant vegetation that can mitigate the visual impact.	Planting proposals have been reviewed and all opportunities for screening and planting within Secretary of State land have been maximised.
		Noise & Vibration	During construction, contractors must use best practicable means to keep noise and vibration to a minimum (e.g. minimise night-time working)	A statement relating to best practicable means has been included in the ES and Technical Report, to minimise noise and vibration effects during construction. The DBFO Company will be required to liaise with Environmental Health Officers to agree working time restrictions.
		Noise & Vibration	Create detailed method statements for each component of construction for the contractor, to fully assess the noise impact.	The Department's Nominee would aim to check and supervise Method Statements written by the DBFO Company before construction.
		Noise & Vibration	Long term noise benefits of the Low Noise Surfacing need to be assured through an appropriate maintenance regime.	Low Noise Surfacing (LNS) would use best available product on the market and maintenance would be to replace LNS when it is needed in the future. Replacement of LNS would typically be at 12 - 15 year intervals.

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Contact	Date Received	Issue	Consultee Comments	Response
Laura Langley, Head of Forward Planning	30 October 2006	Construction	Impact of waste disposal arising from works is not assessed - instead saying it is for the contractor. Council recognise this is a contractor issue, but feel the requirement is to assess the impacts of the project as a whole, not looking at contractual arrangements. Need to see information on how much waste would arise and its nature before Herts CC can determine significance of impact from the Scheme.	The DBFO Company will identify a suitable location for disposal of waste, and will liaise with the local planning authorities and Environment Agency (if required) on appropriate locations. The DBFO Company will assess the impacts of their waste disposal.
		Construction	Waste information requested as landfill may be disturbed and need information on the duration of the waste arising. Previous road schemes planning applications in Herts CC have been submitted after the contract has been let so applications didn't represent the best option for waste disposal due to time constraints. Please advise Herts CC asap about plans for disposal and winning of materials that will require a planning application and/or traffic management arrangements.	The DBFO company has not been appointed yet, therefore detailed construction methods and proposals have not been formulated. However, this request will be passed to the DBFO Contractor who would liaise with Hertfordshire County Council.
		Landscape / Ecology	Comprehensive ES, both in terms of scoping study information and new surveys & ecological data e.g. with over 1,000 Target Notes for Phase 1 survey of the motorway corridor. Good assessment of effects on the landscape between J16 - 23 during construction and operation phases. All relevant Landscape Character work has been referenced/described with impacts evaluated against major considerations	Comments relating to the comprehensive nature of the Environmental Statement have been noted and the Highways Agency is pleased that ecological and landscape assessments have been well received.

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Junctions 16 to 23 Environmental Statement

Contact	Date Received	Issue	Consultee Comments	Response
Laura Langley, Head of Forward Planning	30 October 2006	Landscape	Landscaping is needed to mitigate negative impacts from more urbanised carriageway (more retaining walls and concrete central reserve barriers).	All landscaping opportunities within guidelines have been maximised. Opportunities to improve planting in some areas have been further identified in response to this request and can be achieved with the loss of grassland agreed with the ecological specialists.
		Landscape	Where embankment retaining walls are required or other tree planting features proposed, these should take account of existing landscape features locally - seek to enhance and link them wherever possible. This will create habitat continuation and link with immediately adjacent countryside.	The landscape and ecological design for the Scheme has taken fully into account the adjacent landscape land cover and pattern, where it has been possible within the land and engineering constraints of the project.
		Landscape	Herts CC want to be fully involved as the Scheme is developed to ensure opportunities to mitigate the impact on the landscape are fully exploited.	The ES will be published in July 2007 when there will be a further consultation period. Consultation will continue between the DBFO Company and Hertfordshire County Council, along with other local authorities, to ensure that opportunities for mitigation are maximised where possible.
		Ecology	Confident all important ecological data has been included, detailed mitigation strategies for affected habitats and species, and a general assumption of overall improvement in habitat quality.	No action required. Comments have been noted relating to contentment about ecological work.
		Water & Drainage	Comprehensive plans to deal with water and drainage issues - note that a maintenance manual is also going to be produced to help with subsequent management	No action required. Comments have been noted relating to contentment about water and drainage work.
		Ecology	Acknowledge considerable short term impact upon habitats and species, but in year 15 they assume any losses would be balanced out.	No action required. Comment have been noted relating to short term effects reducing over time to the Design Year effects (Year 15).

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Contact	Date Received	Issue	Consultee Comments	Response
Laura Langley, Head of Forward Planning	30 October 2006	Ecology	Deer records have been made but no major proposals for deer fencing are included - Herts CC believe this to be because fallow are not considered a major issue in this area, unlike other sections of the M25. Fallow and other species of deer are continuing to increase at present, and this issue may need revisiting in due course.	The feasibility for deer fencing has been considered. Assessment determined that there would be significant risks of deer becoming trapped on the wrong side of the fence (I.e. the motorway side) would cause considerably more risk to drivers. As such, deer fencing has not been included in the Scheme at present.
		Ecology	Habitat gains: concerns. Very low productivity seeding could be lost due to abundance of coarse vegetation and a lack of appropriate verge management (cutting and removal of cuttings). This is not likely to be achievable on any such verge, so long term habitat quality gains are unlikely to accrue with respect to grasslands, or at least those needing that management.	A comment relating to proposed planting strategies and habitat enhancement proposals have been included in the final Environment Statement and Ecology Technical Report.
		Ecology	Lighting: concerns. Urge careful consideration to reduce light spill by using appropriate directional lighting where possible. This would also serve to increase light availability on the motorway itself.	The proposed lighting equipment uses 15 metre high lighting columns with full cut-off high pressure sodium lanterns with flat glass enclosures, which represents the optimum column height to meet the carriageway lighting requirements and best current technology to minimise light spill.
		Ped, Cyc, Eq & Comm	Detailed visual impact assessment schedules were welcomed.	Highways Agency notes the comments and is pleased the visual impact schedules were useful.

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Contact	Date Received	Issue	Consultee Comments	Response
Laura Langley, Head of Forward Planning	30 October 2006	Ped, Cyc, Eq & Comm	Herts CC has already provided Hyder Consulting with in depth written comments about the impact of the scheme on Hertfordshire's Rights of Way.	Hertfordshire County Councils' in-depth comments were considered whilst writing the draft ES and have been reviewed again to ensure all opportunities for mitigation have been considered. A number of the aspirations expressed by Herts CC are not at locations which would be affected by the Widening. Additionally, other features, such as proposing Environmental Barriers to specifically shield PRow have been considered, but the predicted impact upon the receptor is not deemed large enough to necessitate the installation of noise and visual attenuation. Planting proposals have been recommended where possible to minimise visual impacts upon the PRow and surrounding countryside.
		Ped, Cyc, Eq & Comm	Each issues needs to be discussed in detail with Hyder Consulting, and Herts CC request a meeting rather than reiterating these concerns in writing. Please arrange a suitable time before draft ES is published for public consultation in early 2007.	A meeting will be organised with Hertfordshire County Council PRow Officer, along with the PRow Officers from Buckinghamshire County Council and Hertsmere Borough Council.
		General	The ES is the only statutory process through which Herts CC can raise issues with the widening scheme. As such, it's essential that liaison arrangements are set up between the HA and Herts CC at a technical level to consider design issues as they affect the County Councils' responsibility as the Local Highways Authority.	Highways Agency and Hertfordshire County Council have been involved in two highways meetings and two presentations to Councillors. This level of engagement will continue.

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Contact	Date Received	Issue	Consultee Comments	Response
Andy Instone, County Planning Archaeologist	27 October 2006	Heritage	Good assessment of heritage with useful points, and acknowledges absence of recorded archaeology remains when previous M25 was built, rather than saying there's a lack of archaeology.	No action required. Comments have been noted relating to contentment about heritage work.
		Heritage	Request for copies of the reports compiled by MoLAS which are cited in the assessment.	The MoLAS reports will be provided, as requested.
		Heritage	Consult with Simon West (St Albans) to gain access to information regarding archaeological surveys undertaken in advance of M25 construction.	A meeting took place with St Albans District Council on 26 October 2006 to review the Council's records.
		Heritage	Jim Hunter has agreed that all historic buildings along the route will be assessed for any impact, in addition to designated Listed Buildings, and that archaeological preservation in situ continues to be an option for all parts of the route	Non-listed historic buildings are included in the Cultural Heritage Technical Report. As discussed at the workshop, it is not in the HA's interest to excavate archaeological remains unnecessarily so preservation in situ will certainly be considered as a first option in each case. However, there will be cases where it is simply impractical because of the nature of the development.

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Contact	Date Received	Issue	Consultee Comments	Response
Andy Instone, County Planning Archaeologist	27 October 2006	Heritage	Methodology for archaeological work should include assessment of wider landscape as well as immediate area of M25. Refers to recent archaeological investigation in advance of M1 widening in St Albans District - multi period remains right up to existing roads.	The Cultural Heritage Technical Report includes an assessment of the Historic Landscape. Any impacts on remains will be mitigated in accordance with the methodology set out. The M1 widening includes disturbance of and outside the Secretary of State owned land.
		Heritage	Construction compounds would have a significant impact.	This has been flagged up in the Cultural Heritage Technical Report (Section 5) and Environmental Statement (Section 12.5). The location of construction compounds will be the responsibility of the DBFO contractor who will agree these with the local authority.
		Heritage	Advise that a programme of archaeological impact assessment and appropriate mitigation for any tree planting is put in place (including land outside highway boundary).	The Environmental Statement (ES) only deals with land inside the Highway Boundary where such works will be mitigated as described in the ES and Cultural Heritage Technical Report. Outside the Highway Boundary this will be a matter for the DBFO contractor but this requirement has been drawn to their attention in the ES.
		Heritage	Objective to better understand what archaeological remains were, or may have been, destroyed without record during original construction of M25 (1980s).	These remains would be fragmentary in nature, but speculation will not be countenanced. This Scheme cannot mitigate the impact of a previous Scheme and the ES cannot include this an objective.

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Contact	Date Received	Issue	Consultee Comments	Response
Andy Instone, County Planning Archaeologist	27 October 2006	Heritage	Consult with English Heritage document investigating the effects of embankments on archaeological remains.	Mitigation addresses all areas of potential. The English Heritage document will be considered although the Scheme deals with altered rather than new embankments.
		Heritage	Clearly assess location of existing and proposed cuttings and embankments - archaeological assessment needs to investigate this, use it to identify extent of archaeological investigation and look at mitigating the effects.	This has been done in the Cultural Heritage Technical Report. Figure 3.1 Scheme Context illustrates whether the M25 will be in cutting or on embankment. In general, the widening scheme will not change to original ground at the toes of embankments and tops of cuttings.
		Heritage	Consider all river valleys as having archaeological potential, not just Colne Valley, - colluvium may mark deeper archaeological deposits. Palaeochannels and palaeoarchaeological remains may be present.	The proposed mitigation would achieve this - it considers the potential for archaeological potential across each of the rivers crossed by the Scheme.
		Heritage	Assess the Roman villa at Solesbridge (north of J18) - it is yet to be located - and Catlips Farm near Chorleywood.	This has been assessed in the Cultural Heritage Technical Report Table 6.18 site S85 & Catlips Farm S80

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Junctions 16 to 23 Environmental Statement

Contact	Date Received	Issue	Consultee Comments	Response
Andy Instone, County Planning Archaeologist	27 October 2006	Heritage	Assess field boundaries, e.g. parish boundary at London Colney, which may originate in Saxon period, and other early boundaries which may be Roman or prehistoric.	These have been assessed in the Cultural Heritage Technical Report and any impact would be avoided.

City and District of St Albans

Contact	Date Received	Issue	Consultee Comments	Response
Dean Goodman, Head of Planning and Building Control	27 October 2006	Traffic flows	Additional pressure likely on local road network leading to M25, as it will encourage more local traffic to use the M25 network for short journeys.	The widening scheme aims to improve journey time reliability on the M25. Integrated Demand Management is a separate scheme being developed by the Highways Agency which aims to address the interface between the motorway network and the local road network but the main issue will be to achieve the balance between attracting traffic onto the motorway and not clogging up the local roads as a result.
		Traffic flows	Current proposals are limited to within existing land, but should be extended to undertake mitigation works on the local network. Even if no accommodation works, there should be smart advance information signs to warn motorists in advance of them reaching the junctions	Driver information systems on the local roads is being considered under the Integrated Demand Management (IDM) programme, which is a separate project to the Widening Scheme.

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Contact	Date Received	Issue	Consultee Comments	Response
Dean Goodman, Head of Planning and Building Control	27 October 2006	Traffic flows	Queuing at peak times on access slips and surrounding area will render demand management ineffective.	If this comment is relating to IDM, then the purpose of IDM is to deal with congestion on the slip roads and/or surrounding area. However, feasible IDM measures will be limited by the space that is available at the junctions with the road network. The ES only assesses the effects of the widening between Junctions 16 to 23 and not IDM.
		Junctions	M25 ignores critical movement of vehicles using A405 to join M1 (south) - Noke Roundabout will continue to clog with traffic at peak times if no works are proposed in this area.	The traffic model includes the movement of vehicles using the A405 to join the M1 (south). The ES assesses the impacts of traffic on local on noise and air quality.
		Noise & Vibration	Request assurance that, as M25 is DBFO contract, Low Noise Surfacing will be a core requirement of the Scheme.	Low Noise Surfacing is proposed in the Scheme Description chapter of the ES and therefore has been included in the DBFO contract. It is now Highways Agency policy that materials like Low Noise Surfacing (LNS) are used for surfacing motorways and it can therefore be expected that LNS (or equivalent) would be used in future maintenance works after the widening.
		Noise & Vibration	Seek assurance that methods of working will minimise noise e.g. Council does not want percussion piling near residential properties. Also no works should interfere with people's sleeping or normal life.	Noise levels would be minimised wherever possible to reduce disturbance to local receptors. Method Statements and working times would be agreed between DBFO Contractor and Local Authority Environmental Health Officers. A balance must be met with the aim of getting the project built as quickly as possible.
		Air Quality	Area through Bricket Wood is no longer an AQMA, but results are marginal and every effort should be made to mitigate all aspects of pollution in this area.	This area is still technically an AQMA as DEFRA have not relinquished this designation. Air quality levels according to the Council are below the AQMA limit level. It will remain as an AQMA in the ES document.
		Air Quality	Demand management will help maintain air quality but only if monitored and results acted upon.	Demand Management is not assessed in the ES. An air quality monitoring programme has been implemented for the environmental impact assessment of the widening Scheme. A programme of air quality monitoring for IDM will be considered by the Highways Agency.

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Contact	Date Received	Issue	Consultee Comments	Response
Dean Goodman, Head of Planning and Building Control	27 October 2006	Air Quality	Respiratory problems and asthma are higher in this area than other areas of St Albans - elected Members in this area have raised this issue.	This information has been noted so the team is now aware of the health problems in this specific area.
		Lighting	Seeks assurance that lighting design will be as low impact as possible, with strict control of light spread to minimise spillage and visual intrusion.	Every care will be taken through the specification of equipment to keep the impact of the lighting to a minimum. The proposed lighting equipment uses 15m high lighting columns with full cut-off high pressure sodium lanterns with flat glass enclosures, which represents the optimum column height to meet the carriageway lighting requirements and best current technology to minimise light spill.
		Gantries	Minimise the use of overhead gantries in open areas, but it is fine in cuttings. Please place gantries according to topography rather than fixed distances between gantries.	The spacing criteria of the signal and signage gantries provided in the design is based on the Department for Transport standards. These have been developed over several years to ensure the safety of the display of driver information to the travelling public. The design proposals have, where possible taken into account the local area and geography to minimise the impact on the surrounding environment. However there are instances where gantries and signage are mandated to be placed at the proposed locations.

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Junctions 16 to 23 Environmental Statement

Contact	Date Received	Issue	Consultee Comments	Response
Dean Goodman, Head of Planning and Building Control	27 October 2006	General	Implement traffic management during construction to minimise impacts of occasional problems on M25 whereby diversions off motorway will lead to North Orbital Road.	<p>The DBFO Contract will require the contractor to maintain the existing number of lanes in both directions during normal daytime working.</p> <p>Traffic will not be encouraged to use the local road network except when special closures of the motorway are required to allow the safe installation of structures and the like or are essential for the safe construction of the widening. Where these are necessary the contractor will be required to plan and liaise with the local highway authority in advance.</p>
		General	Limit the works to one side of the carriageway at a time, to minimise noise and pollution experienced by residents living close to motorway in Bricket Wood.	A DBFO company has not been appointed yet, therefore exact construction methods have not been devised. It is likely that Contractors cannot do both sides of the carriageway at the same time. However, the contractor will need to operate crossovers/contra-flow traffic management due to the need for maintained traffic flows.
		Landscape	Substantial net loss of trees and woodland for screening is a serious concern. Will accentuate harshness of motorway landscape and increased area of hard landscape elements.	Comments have been noted. The loss of vegetation and the reinforcement of the existing M25, with the introduction of new gantry and lighting proposals has been taken into account in the assessment. Notes added to the Landscape Effects Design and Mitigation chapter.
		Landscape	Considerable period of time between clearance and reinstatement of planting after construction - impact on adjacent properties and communities will be significant	The phasing of the works will be the responsibility of the DBFO contractor. He may clear Junctions 16 - 17, complete the works and replant, and then move on to Junctions 17 - 18, etc. We have had to assume the worst case scenario for the ES, but this is unlikely to be the preferred approach by the contractor.

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Contact	Date Received	Issue	Consultee Comments	Response
Dean Goodman, Head of Planning and Building Control	27 October 2006	Landscape	Loss of trees between J21a-22 in Watling Chase Community Forest. Council wants to have additional off-site planting given that the existing highway land cannot accommodate this. Net gain in tree cover would be in line with WCCF and District policies, and objectives of Trees Against Pollution (TAP) project. Off-site planting is preferred early in the construction phase to secure benefits as soon as possible.	Off site planting is not part of the Scheme. Recommended off-site planting areas, such as this, will be provided to the DBFO Company, who may pursue any off site opportunities.
		Ecology	Loss of trees and woodland habitat is serious concern - main habitat losses appear to be trees, woodland and scrub. No figures for St Albans area provided, but overall appears to be 29% net loss plantation (Yr 15), 53% scattered trees, and 16% dense scrub (Yr 15).	The engineering requirements means that replacement of plantation is not always possible and this is reflected in the ecology and landscape impact score in the ES. Typically plantation that would be lost is of low quality. Where possible linear features and connectivity would be retained or improved. In response to this comment increased screening provision would be provided which will partly resolve this issue.
		Ecology	States that the ES accepts there will be net loss of habitats and the scheme would not generally contribute to the aims and objectives of HABAP. No opinion was stated on this by the Council.	This comment has been noted. However, the Scheme would be in line with 10 HABAP targets for habitats and 18 HABAP targets for species.
		Landscape	Dominance of M25 in the landscape (day and night time) is increased by the new visually intrusive hard elements and soft structures, such as gantries, barriers and lighting, and the reduction of soft elements - trees and woodland planting. More open views are created and more receptors are adversely affected due to lack of screening.	This comment has been noted. This potential effect has been presented in the assessment and reinstatement planting has been recommended where feasible. Three Environmental Barriers for landscape screening purposes have also been recommended along the Scheme. However, due to widening within the Secretary of State land, the limited land available for screening means that some areas would experience reduced screening from the M25.

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Contact	Date Received	Issue	Consultee Comments	Response
Dean Goodman, Head of Planning and Building Control	27 October 2006	Landscape	Loss of existing trees screening and softening views of the motorway and installation of large visually intrusive structures, together have a significant adverse impact. The lack of effective replacement soft screening in mitigation is unacceptable.	All opportunities within best practice and Highways Agency guidelines have been maximised within the space constraints of a widening Scheme. In response to this comment further opportunities to improve planting in some areas have been identified although the loss of grassland previously set aside for ecological mitigation.
		Construction	Not possible to assess effects of offsite works during construction phase as details are not available. It is stated these will not be located on designated sites of nature conservation or archaeological importance, and that the local planning authority will be consulted on the arrangements.	No information about these off-site locations is currently available as the DBFO Company has not yet been appointed. The DBFO contractor will agree locations It will be the responsibility of the local planning authorities to deal with these applications when they are made.
		General	Concern that the adverse impacts identified in the ES are rated of lower importance because of the existing presence and impact of the motorway corridor. Whilst this is inevitable, it should not be used as justification for reducing mitigation measures that are required to minimise the impacts on adjacent properties and communities.	The ES assesses the changes to the baseline landscape character and visual amenity brought about by the introduction of the Scheme. The baseline conditions have been assessed with reference to the existing M25, in accordance with DMRB Vol 11.
		Heritage	All Saints Pastoral Centre (including Chapel), Shenley Lane, London Colney is Grade II*, not Grade II Listed Building.	This has been corrected and updated in the ES and Cultural Heritage Technical Report.
		Heritage	Lighting and gantries, along with loss of vegetation, will exacerbate the detrimental impact and effects of the M25 on the setting of Listed Buildings.	The visual impact and setting of Listed Buildings has been assessed in the ES and in more detail in both the Cultural Heritage and Landscape Effects Technical Reports. Visual impact schedules are provided in Figure 6.10 of the Environmental Statement, and state whether a property is a Listed Building. Two Listed Buildings are expected to have a moderate adverse visual effect with the Scheme in Year 15.

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Contact	Date Received	Issue	Consultee Comments	Response
Dean Goodman, Head of Planning and Building Control	27 October 2006	Heritage	All Saints Pastoral Centre (inc Chapel) Grade II* and adjoining Grade II Voluntary Missionary Movement buildings - loss of vegetation and introduction of lighting, more prominent gantries and barriers will have a detrimental effect on the setting of the group of ecclesiastical buildings (despite being in slight cutting).	This has been assessed correctly in the ES and in detail in Section 6.7.2 of the Landscape Effects Technical Report. A slight adverse visual effect has been predicted for Year 15 at All Saints Pastoral Centre in Figure 6.10 Visual Impact Schedules: Properties.
		Heritage	Moor Mill (Grade II) - carriageway is raised above the listed building. Setting of the building will be detrimentally affected, even though it's already badly affected by M25 - lighting will make it worse. Relocation of the anti-clockwise gantry will give possibility for improving the aspect.	The carriageway will be at approximately the same level as the existing road, but with the edge of the carriageway located 3 metres closer to the building. Gantry locations have been fixed in accordance Highways Agency standards. There is flexibility in the exact location to allow for deviation of 15 - 20 m, this will not be sufficient to reduce visual effects.
		Heritage	For both Moor Mill and All Saints Pastoral Centre, provide equivalent replacement screen planting, more attractive barriers and appropriate heights/design of lighting columns. Gantries near the Pastoral Centre need considering too (size, design and location). Mitigation by screening flanking barriers from view by banked earth and planting.	The detailed design of Environmental Barriers and gantries will be a subject for the DBFO contractor. However, there is very little scope to move the anti-clockwise gantry facing Morr Mill, as it is the 1 mile Advanced Directional Signage (ADS) for Junction 21A. The Scheme maximises all opportunities for planting within the Secretary of State land.
		Lighting	Reduce the height of lighting where the carriageway is not in cutting and especially where it is on a bank.	This is not a practical solution, as the proposed column height of 15m is necessary to achieve the lighting requirements for the widened carriageway. Initial investigations using 12m columns showed that it will only be possible to achieve the necessary carriageway lighting requirements if the spacing between columns is greatly reduced, which in turn will significantly increase the number of lighting points.

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Contact	Date Received	Issue	Consultee Comments	Response
Dean Goodman, Head of Planning and Building Control	27 October 2006	Heritage	Preservation in situ is welcomed, as a nationally important site is still nationally important if part of it is lost, and is more imperative to protect what remains because some of it is gone.	This comment has been noted and preservation in situ would be applied where feasible.
		Heritage	Previous M25 scheme was more ad hoc, but some field walking was undertaken and interesting results obtained. Jim Hunter visited St Albans on 26 October 2006 (after consultation workshop) to view these documents, including potentially significant Roman and Anglo-Saxon field boundaries and field systems.	Information obtained during Hyder Consulting's visit to St Albans on 26 October 2006 has been incorporated in the ES and the Cultural Heritage Technical Report.
		Heritage	Results of MoLAS walkover surveys/ geotechnical pits suggest no 'significant' archaeology. However, this implies archaeology was revealed and access to the report might help inform on a mitigation strategy.	MoLAS information will be provided, as requested.
		Heritage	Incorrect status of at least one Listed Building - this was downgraded from Grade II* to Grade II, which may have implications for any mitigation strategies.	This comment has been noted and Listed Building status has been reviewed. All other Listed Buildings are considered to be correct.
		Heritage	Lack of early consultation with St Albans District has led to missing out several sites - Moor Mill Quarry SSSI - Geological SSSI 23. These provide the location for earlier prehistoric artefacts and palaeo-environmental evidence, which are subject to loss or degradation by desiccation or inundation. This project does pass through significant geological deposits and these need mitigation as much as the actual archaeology, as they will inform on the wider landscape and therefore the context of archaeological areas.	Reference to Moor Mill Quarry SSSI has been included in the cultural heritage and geology and soils chapters and Technical Reports.

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Contact	Date Received	Issue	Consultee Comments	Response
Dean Goodman, Head of Planning and Building Control	27 October 2006	Heritage	Moor Mill Quarry West TL 145027 - citation provided with details and SSSI information (legal basis). See letter from St Albans.	Moor Mill Quarry has now been included in the cultural heritage text. Previously it had only be included under geology and soils chapter.
		Heritage	Have as wide a study area as possible for the environmental assessment and any proposed archaeological mitigation - this may help inform on targeted mitigation strategies. Recent M1 works showed archaeological deposits do survive even to the edge of the motorway, so proves loss in the past was not total.	The Cultural Heritage Technical Report includes an assessment of the Historic Landscape and the study area is appropriate. Any impacts on remains will be mitigated in accordance with the methodology set out. Also, in general the works would not extend beyond the highway fenceline. The full width of the motorway has been considered to have been cleared when it was originally constructed. As such, it is unlikely that any other archaeology should be 'disturbed' by the widening works within the highway fenceline. Only the very few Secretary of State owned land areas, required for mitigation, may affect existing archaeology.
		Heritage	Mapped location plan of all know archaeology in relation to different threats would be useful to help improve understanding of the archaeological impact of the Scheme (and to help target mitigation). At present it is difficult to navigate between all the different drawings.	The Zone of Construction has been incorporated into the Cultural Heritage Features figure to help improve the clarity of the drawings.
		Heritage	ES will not contain off-site works, so it is vital that mapping is provided to better inform on the location and sensitivity of sites chosen for landscaping, ponds and compounds/depots.	Works outside the boundary will be the responsibility of the DBFO contractor. The 500 metre study area is well-defined and some sites outside it have been included. But the DBFO contractor must assess off-site works to ensure that impacts on Cultural Heritage is properly mitigated. This has been outlined in section 12.5 of the ES.

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Contact	Date Received	Issue	Consultee Comments	Response
Dean Goodman, Head of Planning and Building Control	27 October 2006	Heritage	Need to ensure forward planning is done as much as possible, even for landscape mitigation planting, to identify any potential adverse impacts upon archaeology.	The DBFO Contract states that work cannot start until the archaeology is signed off. However, it is assumed that land within the highway fenceline was previously disturbed during construction of the original M25. As such, mitigation works within the highway fenceline are unlikely to disturb existing archaeology.

Three Rivers District Council

Contact	Date Received	Issue	Consultee Comment	Response
Peter Kerr, Chief Development Plans and Transportation Officer	31 October 2006	General	Council requests the HA to make a presentation on the scheme.	The Highways Agency have been informed of this request.
		General	Council requests a consultation process be set up between HA and Council.	Three Rivers District Council is being consulted, along with the other local authorities within the study corridor. This consultation has included attendance of workshops and reviewing the Environmental Statement to date. This consultation process will continue as the Scheme progresses.
		General	Council is very concerned that the introduction of traffic light controls on motorway slip roads will cause local congestion to the detriment of local communities. I would be grateful if this concern can be forwarded to the Highways Agency since I understand it is beyond the remit of the Environmental Statement	This Scheme does not include for traffic light controls on motorway slip roads. This ES assesses the widening Scheme only. Traffic light controls may be an outcome of the Integrated Demand Management study. This comment has been forwarded on to the Highways Agency, as requested.

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Contact	Date Received	Issue	Consultee Comment	Response
Peter Kerr, Chief Development Plans and Transportation Officer	31 October 2006	General	Council is concerned that traffic on local roads will increase during the construction period to the detriment of the local environment and requests that safeguarding measures are taken to prevent this.	The Contract will require the contractor to maintain the existing number of lanes in both directions during normal daytime working. Traffic will not be encouraged to use the local road network except when special closures of the motorway are required to allow the safe installation of structures and the like or are essential for the safe construction of the widening. Where these are necessary the contractor will be required to plan and liaise with the local highway authority in advance. The final ES will include an indicative assessment of traffic movements as a result of traffic management during construction.
		Landscape	Maximise the opportunity for new tree, shrub and wild flower planting. Council registers disappointment in the landscape for the original M25.	All opportunities within best practice and Highways Agency guidelines have been maximised. Opportunities to improve planting in some areas have been further identified and can be achieved with the loss of grassland for mitigation.
		Lighting	New lighting columns must minimise light spillage and be less intrusive than existing. Signage clutter must be avoided.	The proposed lighting equipment uses 15m high lighting columns with full cut-off high pressure sodium lanterns with flat glass enclosures, which represents the optimum column height to meet the carriageway lighting requirements and best current technology to minimise light spill. This is essentially the same equipment as used in the currently lit section of motorway within the Three Rivers D.C. area.
		Ecology	Maximum retention and provision of habitats.	Retention and provision of habitats has been maximised.
		RD & Water	Design must avoid flood exacerbation.	The drainage design has aimed to maintain or reduce discharge rates from highway run off. The Environment Agency has approved the drainage design.

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Contact	Date Received	Issue	Consultee Comment	Response
Peter Kerr, Chief Development Plans and Transportation Officer	31 October 2006	RD & Water	Scheme must prevent pollution through run-off and contamination of streams, rivers and waterbodies. The Environment Agency, British Waterways and other relevant bodies must comment.	Discharges into all watercourses has been designed to ensure that the rate of discharge is not increased (reduced where possible) and that water quality is improved wherever possible. In particular, the design will include spillage retention resulting from incidents and this improvement has been welcomed as a major benefit for water quality by the Environment Agency.
		Noise & Vibration	During construction, use best practicable means to keep noise and vibration to a minimum. Detailed method statements are expected. New low noise road surfaces and upgraded env barriers must be included.	Low noise Surfacing and environmental barriers are part of the Scheme and are defined in the ES. The DBFO contractor will be required to use best practicable means to reduce noise and vibration during construction and will agree method statements with the local authorities.
		Air Quality	Council monitors air quality within the AQMA using passive monitoring methods. Council has requested the station be moved to a HA site at Jn 18. Council requests this station move be included the scheme or the HA install their own station and make the data publicly available.	HCL understand that negotiation is ongoing between Three Rivers District Council and the Highways Agency to re-locate a Three Rivers District Council continuous monitor to a compound close to the southbound (anti-clockwise) on-slip road at Junction 18. Therefore there is currently no continuous monitoring data, which HCL could incorporate in the ES for Junction 18.
		Geology & Soils	Ensure no damage to underlying geology or contamination of soils.	The assessment predicts that no significant damage would occur to geology or from soil contamination as a result of the Scheme. This has been addressed in the Geology and Soils chapter of the Environmental Statement.
		Cultural Heritage	No damage to Listed Buildings or their settings, historic monuments, sites of archaeological interest. Council is concerned that impact to properties in close proximity will be greater than existing.	Although there will be impacts as a result of the Scheme, it is considered that, in the context of the existing M25, the effects have been correctly assessed and appraised.

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Contact	Date Received	Issue	Consultee Comment	Response
Peter Kerr, Chief Development Plans and Transportation Officer	31 October 2006	Vehicle Travellers	Council opposes narrow carriageway lanes, the use of hard shoulder as carriageway and confusing entry/exit lanes as contributing to driver stress.	Hard shoulder running will not be introduced as part of this Scheme. Reduced lane widths are part of widening a road within existing boundaries. Text has been amended in the Environmental Statement and Technical Report to clarify that reduced lane widths are not significantly less safe than standard lane widths. Further, the change of lane width has been designed to be very gradual and would be barely distinguishable by most drivers.
		Vehicle Travellers	Council is concerned about the capacity of existing junctions and the likelihood that queuing on approach roads will worsen.	The traffic assessment undertaken to date indicates that there would be less queuing at the existing junctions after the M25 widening scheme has been implemented than if the widening did not take place.
		Policy	Council's objections from Orbit Study are reaffirmed. Council strongly urges HA to adopt an integrated approach to the transport needs of the area. HA needs to consider further traffic management measures to ensure the 'benefit of a 4th lane is retained' in practice.	Integrated Demand Management (IDM) will consider further traffic management measures to ensure retention of benefits from the 4th lane. Although not part of this ES, the IDM study is being undertaken by the HA.

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Contact	Date Received	Issue	Consultee Comment	Response
Peter Kerr, Chief Development Plans and Transportation Officer	31 October 2006	Disruption during Construction	Council is concerned about the disruption to surrounding area. Safeguards should include limited construction hours, limitations to noisy machinery (detailed list of equipment & sound power levels must accompany method statements), restrictions on access roads (large vehicles on country lanes), measures to prevent traffic seeking alternative routes because of congestion and measures to keep the motorway open.	Working times would be agreed with Local Authority's Environmental Health Officers and the DBFO contractor. A balance needs to be met with the aim of getting the project built as quickly as possible. General information will be included in the Construction chapter. Detailed Method Statements would be drawn up by the DBFO contractor, and these would include more information than is currently available for the Construction Chapter. The DBFO Contract will require the contractor to maintain the existing number of lanes in both directions during normal daytime working. Traffic will not be encouraged to use the local road network except when special closures of the motorway are required to allow the safe installation of structures and the like or are essential for the safe construction of the widening. Where these are necessary the contractor will be required to plan and liaise with the local highway authority in advance.

Hertsmere Borough Council

Contact	Date Received	Issue	Consultee Comments	Response
Nigel Smith, Planning Officer	November 2006	Landscape	There could be a significant impact on the landscape from Shenley Ridge due to the introduction of gantries and lighting on the Junction 22-23 section through Hertsmere which is currently unlit and has a relatively limited number of signs visible from a distance.	Comments have been noted. The potential landscape and visual effects within the landscape character area of Shenley Ridge have been assessed in the Environmental Statement. Intermittent views of the Scheme through woodland planting would result in a moderate adverse impact for individual properties north east of Shenley and properties at Ridge. This is mainly due to the open nature of agricultural land in this area, with limited off-site screening to help mitigate the visibility of the motorway and associated infrastructure.

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Contact	Date Received	Issue	Consultee Comments	Response
Nigel Smith, Planning Officer	November 2006	Landscape	The assessment of impact upon the landscape is made with reference to majority and minority viewers. It is acknowledged that, numerically, users of the M25 will form a significant proportion of those individuals who experience the landscape. However, minority viewers are more likely to view any changes on a day to day basis (lower speed, longer exposure), so please put greater emphasis on the impact on the minority viewer group in the ES.	The methodology in the ES sets out the sensitivity of receptors. Residential receptors have been judged to be of the highest sensitivity and this has been fully considered in the assessment.
		IDM	Request that demand management measures should be implemented either at the time of widening or as soon as practicable afterwards. Worried that there will be impacts on local roads following the Scheme as traffic approaches the M25. Additionally, local roads, notably in the vicinity of South Mimms and Potters Bar, are already often used as alternative routes if there are delays on the M25.	Integrated Demand Management (IDM) is not part of the Scheme being assessed in this ES. The concerns on IDM have been passed to the HA. IDM would address the interface between the motorway network and the local road network but the main issue will be to achieve the balance between attracting traffic onto the motorway and not clogging up the local roads as a result.
		Traffic	ES should give consideration to the impact of increased volumes on the local road network, especially if the widened M25 is diverted (e.g. due to closures or individuals taking alternative routes to avoid accidents).	The ES assesses the environmental effects of traffic changes on the mainline and local roads. The final ES will also now assess the air and noise effects of potential traffic movements on local roads during construction.
		Landscape / Ecology	Provision of additional planting within the Watling Chase Community Forest would help to reduce the overall net loss in plantation forest that will occur across the scheme as well as contributing to aims of increased woodland cover expressed in the Panel Report into the East of England Plan (policies ENV1 and ENV4), the Watling Chase Community Forest Plan Review and the Hertsmere Local Plan and associated Supplementary Planning Guidance.	The ES does not consider off-site planting as mitigation. However this request will be passed to the DBFO Company who will be in a position to negotiate off-site planting.

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Contact	Date Received	Issue	Consultee Comments	Response
Nigel Smith, Planning Officer	November 2006	Ped, Cyc, Eq & Comm	Welcomes the fact that rights of way are being kept open for the duration of works but is disappointed that no apparent mitigation or compensation for inconvenience and disturbance for rights of way users has been offered given the admitted adverse effects of dust and noise. The Council would welcome the opportunity to discuss potential projects to which the M25 scheme could contribute.	Compensation would only be applicable to permanent residences. A meeting will be organised to discuss concerns in more detail.
		General	Question the draft Statement's conclusion that the widening of the M25 will only have a slight impact on the surrounding environment.	The Environmental Statement does not state that the overall impact would be slight adverse on the surrounding environment. There is no overall assessment score for the whole Scheme. There are overall impact scores for each of the environmental topics assessed which range from slight beneficial to moderate adverse.
Sarah Hoggett, Senior Environmental Health Officer	10 November 2006	Noise & Vibration	Appendix A is missing from the report (Road Traffic Data). Do you not need to have road traffic data for using DMRB? If you have the data, it would be useful for us to have it.	Traffic forecasts used for noise calculations will be added as an Appendix to the Noise and Vibration Technical Report.
		Air Quality	Confusion over the distances for receptors and sensitive receptors. Are the receptors defined in the technical guidance note 0064? Chapter 10, Section 10.4.6 - is very confusing. At what distance were the receptors for the air pollution measured?	These are default distances described in the air quality Transport Analysis Guidance. This has now been stated in the text in both the Technical Report & Environmental Statement.
		Noise & Vibration	Confusion over the measurements for receptors and sensitive receptors in Chapter 9 (sections 9.3.1 and 9.3.2). Were receptors measured at 300 metres or 500-600 metres? Richard Grove from Planning mentioned these measurements in the consultations.	Representative receptors were selected up to 500-600 metres from the M25, but only those within 300 metres are included in the Environmental Statement noise assessment.

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Contact	Date Received	Issue	Consultee Comments	Response
Sarah Hoggett, Senior Environmental Health Officer	10 November 2006	General	Planning has already commented on the draft statement's conclusion that the M25 widening will only have a slight impact on the surrounding environment. Environmental Health, on behalf of Hertsmere Council, would also question the statement of slight impact on the surrounding environment during construction and after opening.	The Environmental Statement does not state that the overall impact would be slight adverse on the surrounding environment. There is no overall assessment score for the whole Scheme. There are overall impact scores for each of the environmental topics assessed which range from slight beneficial to moderate adverse.

Environment Agency

Contact	Date Received	Issue	Consultee Comments	Response
Keira Murphy, Planning Liaison Officer	26 October 2006	Biodiversity	Light spill is identified as the major factor affecting fish and running water macroinvertebrates. Need to consider reductions in light-spill, and identify areas of significant light pollution so mitigation can be investigated.	The full cut-off high pressure sodium lanterns proposed provides good control of spill light beyond the highway boundary. Where lighting columns are located close to rivers, additional screening such as internal louvres or shields fitted to the lanterns or columns can be considered providing they provide a worthwhile reduction in the localised light spill and the reduction to the carriageway lighting levels is not significant.
		Biodiversity	Direct lighting away from the river corridor and focus it with cowlings (recommended under Institute of Lighting Engineers 'Guidance Notes for the Reduction of Lighting Pollution'.)	The reference to cowlings in the ILE guidance notes is usually associated with floodlights and not road lighting lanterns. A cowling cannot focus light onto the carriageway, but it can be effective in screening light from being emitted in a particular direction in some situations. Internal louvres and shields attached to the lantern or outreach bracket can also be considered providing they provide a worthwhile reduction in the localised light spill and the reduction to the carriageway lighting levels is not significant.
		Biodiversity	Follow guidelines for relocation of water voles from 'The Water Vole Conservation Handbook (Second	References have been updated to Second Edition in the Environmental Statement.

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Contact	Date Received	Issue	Consultee Comments	Response
Keira Murphy, Planning Liaison Officer	26 October 2006		Edition)'. 	
		Biodiversity	Section 7.5.5, subsection Aquatic Fauna - page 176: should make reference to the fact that pollution to water bodies is not limited to surface water discharge inputs, but encompasses other pollutants such as light.	The Environmental Statement has been updated to include other pollutants such as light.
		Biodiversity	Localised impact on aquatic watercourses and the wider green corridors linking watercourses should be noted. As consequence to these foreseeable localised impacts, a compensatory 'fish pass' scheme at Moor Mill, between J21 - 22, was put forward by Environment Agency. EA and acting consultants agreed this scheme would be mentioned in the ES to fully reflect the scope of impacts to watercourses but also to satisfy HABAP target.	This land is not owned by the Highways Agency so the fish pass scheme cannot be considered as part of the M25 Widening mitigation measures.
		Contaminated Land	All works must be carried out in accordance with legislation listed in Section 8.2 of Draft ES, especially PPS23: Planning and Pollution Control.	Reference to PPS23 has been inserted in the geology text in the ES, and cross references with further details provided in the water chapter.
		Water & Drainage	Several groundwater abstractions lie close to the Scheme Boundary. These abstractions may be disrupted by the development works. This should be addressed in the ES.	This has been addressed in the road Drainage and Water Environment Technical Report on the junction by junction basis in Section 6.2, and addressed in the Environmental Statement Chapter in Section 8.4.5. The Environmental Statement has taken into account changes made to the drainage design in order to address the Environment Agency's concerns with respect to Source Protection Zones 1 and 2. In particular, the provision of the new pumping station at Junction 21 will avoid the SPZ1 site that feeds the Brickets Wood abstraction point.

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Contact	Date Received	Issue	Consultee Comments	Response
Keira Murphy, Planning Liaison Officer	26 October 2006	Water & Drainage	Proposed treatment of soakaway discharge - please note that balancing ponds should be built on the understanding that they might go dry under drought conditions.	In general, it has not been possible to provide balancing ponds specifically for soakaways. However, the point is still valid where we have provided balancing ponds for other discharges and this concern will be passed to the DBFO contractor to ensure the effectiveness of the vegetative treatment in the event of a prolonged drought is considered in the detailed design.

Natural England

Contact	Date Received	Issue	Consultee Comments	Response
Gordon Wyatt, Conservation Officer	24 October 2006	Contractor	The locations of the contractor's compound and storage areas are a matter for the DBFO contractor. We trust however, that the DBFO tender package will include a clear statement that such areas are not to be located within any areas which the draft ES has identified as being of significant importance.	The ES states that designated sites and important sites would not be used for construction activities. The DBFO contractor will agree locations with the local planning authority.
		Lighting	The provision of verge mounted lighting represents significant visual intrusion. All reasonable measures should be taken to reduce both light-spill beyond the target areas and visual glare when seen from distant viewpoints.	Whilst it is true that the visual impact by day and the light spill at night will be greater using verge mounted columns than columns located on the central reserve, the proposed lighting equipment uses 15m high lighting columns with full cut-off high pressure sodium lanterns with flat glass enclosures, which given the safety constraints represents the optimum column height to meet the carriageway lighting requirements and best current technology to minimise light spill.

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Contact	Date Received	Issue	Consultee Comments	Response
Gordon Wyatt, Conservation Officer	24 October 2006	Landscape	Where retaining structures or environmental barriers are installed, the visual impact should be reduced by tree or shrub planting to provide screening. Such planting may also have the secondary benefit in providing linear habitat features for foraging bats.	Environmental barriers near boundary have been located, where feasible, to allow hedge or linear planting to be planted along the boundary between the barrier and visual receptors. Text in the ES has been clarified to reflect this.
		Visual	Where possible, gantries should be positioned to be at least partially screened from most distant views by the presence of trees or other features. Efforts should also be made to avoid placing gantries on the brow of a hill where they are most likely to affect views.	The spacing criteria of the signal and signage gantries provided in the design is based on the Department for Transport's standards to ensure the safety of the display of driver information to the travelling public. The design proposals have, where possible taken into account the local area and geography to minimise the impact on the surrounding environment, there are however instances where gantries and signage are mandated to be placed at the proposed locations.
		Conservation Areas	This is a need to ensure that there is adequate supervision of construction works in the vicinity of SSSIs which might be damaged by illicit spoil disposal by sub-contractors.	Adequate supervision of construction works around SSSIs would be enforced. Fly tipping is not just a problem at SSSIs and will have to be monitored everywhere.
		Ecology	Adjacent to the motorway and in close proximity, are numerous non-statutory Wildlife Sites and other areas of relatively high nature conservation. There is also numerous records of protected species. Some of these will be inevitably impacted by the works. Natural England is satisfied that the package of mitigation measures is practicable.	The Highways Agency appreciate this comment.
		Ecology	Licences are required for works to Chalfont Viaduct and the exclusion of badgers. Natural England welcomes the comprehensive package of measures designed to mitigate against impacts upon water voles.	The Highways Agency appreciates this comment.

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Junctions 16 to 23 Environmental Statement

Contact	Date Received	Issue	Consultee Comments	Response
Gordon Wyatt, Conservation Officer	24 October 2006	Landscape	New planting of trees and shrubs should utilise primarily those native species which are already prevalent in the local area. In some areas, it may be necessary to use non-native species to provide rapid visual or acoustic screening. These species should be non invasive and temporary, where possible.	The Landscape Reinstatement figures and the ES propose native planting for trees and shrubs in accordance with DMRB Vol 10. A comment on Forestry Commission Practice Note 8 Using Local Stock for Planting Native trees and shrubs has been added to the ES.
		Landscape	Wherever possible, any trees, shrubs or wildflower see should be of local origin in order to reduce the risk of introducing inappropriate genetic material.	The HA agree and native species have been proposed in the ES.
		RD & Water	Natural England welcomes the intent that the net overall result would be neutral or slightly beneficial for water quality. Natural England welcomes the proposed containment measures to reduce the risk of contamination of watercourses.	The Highways Agency appreciate this comment.
		Noise & Vibration	LNS should offset any increase in noise arising from increased traffic volumes.	Low Noise Surfacing is included as part of the Scheme design.
		Air Quality	Natural England notes that the scheme is unlikely to have a large overall impact in terms of air quality.	Based on traffic data used in the draft ES the Scheme would not result in the exceedance of EU Limit Values for the opening year (2012). An overall improvement in air quality is predicted under the generalised assessment. This is set out in the Chapter 10 of the Environmental Statement and in the Air Quality Technical Report.
		Geology & Soils	Construction works in areas where the motorway crosses former landfill sites may result in a need to dispose of contaminated arisings and to safeguard nearby watercourses.	Measures to prevent contamination of watercourses from soil contamination have been recommended. This has been addressed in the Environmental Statement and Geology and Soils Technical Report.

M25 WIDENING

Junctions 16 to 23 Environmental Statement

Contact	Date Received	Issue	Consultee Comments	Response
Gordon Wyatt, Conservation Officer	24 October 2006	Ped, Cyc, Eq & Comm	Regarding the closures of Berry Lane Viaduct and the Park Avenue Footbridge during construction, Natural England recognises the need for the temporary closures and notes the assurance that the two Rights of Way will not be closed simultaneously.	The Highways Agency appreciates this comment. Footpath closures would not occur simultaneously.

Chilterns Conservation Board

Contact	Date Received	Issue	Consultee Comment	Response
Colin White, Chilterns Conservation Officer	20 October 2006	Conservation Areas	All public bodies have a duty of conserving and enhancing the natural beauty of the Chilterns AONB. All public bodies shall have regard to the purpose of conserving and enhancing the natural beauty of the AONB in exercising or performing any functions in that may affect land in an AONB.	This comment has been noted and landscaping mitigation plans have sought to conserve the natural beauty of Chilterns AONB where possible.
		Conservation Areas	The Board welcomes the prominence & detail given to Chilterns AONB.	Highways Agency recognises the importance of the Chilterns AONB in the assessment.
		Noise & Vibration	The Board welcomes the use of low noise surfacing and trusts that LNS would be used in future maintenance, particularly in the area within and adjacent to Chilterns AONB (Jn 18 to 19)	It is now Highway Agency policy that materials like Low Noise Surfacing (LNS) are used for surfacing motorways and it can therefore be expected that LNS (or equivalent) would be used in future maintenance works after the widening.
		RD & Water	Drainage into chalk streams should be strictly controlled with the involvement from the Environment Agency. Provision must be made for safe passage of species using streams.	Discharges into all watercourses has been designed to ensure that the rate of discharge is not increased (reduced where possible) and that water quality is improved wherever possible. In particular, the design would include spillage retention resulting from incidents and this improvement has been welcomed as a major benefit for water quality by the Environment Agency. no new culverts or structures in watercourses are required as part of the Scheme.

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Junctions 16 to 23 Environmental Statement

Contact	Date Received	Issue	Consultee Comment	Response
Colin White, Chilterns Conservation Officer	20 October 2006	Landscape	The Board has no further comments.	No action required
		Lighting	The Board prefers no lighting of the M25 in the vicinity of the AONB. The Board requests the best form of lamp to reduce light spillage taking into account advances in lighting design in the future.	The proposed lighting equipment uses 15 metre high lighting columns with full cut-off high pressure sodium lanterns with flat glass enclosures, which represents the optimum column height to meet the carriageway lighting requirements and best current technology to minimise light spill.
		General	Would like to return the 2 hard copy volumes sent. Can drop them off when next in London?	These reports have been returned to HCL London offices.

Groundwork (Hertfordshire)

Contact	Date Received	Issue	Consultee Comments	Response
Emma Norrington, Operations Manager	30 October 2006	Air Quality	Groundwork has been working with local partners and landowners over the last few years to develop and deliver an air quality tree planting strategy on sites adjacent to the M25 between J21a & J22.	This information will be reviewed by HCL, and the DBFO company will be informed of Groundwork's strategy adjacent to the M25. This will enable the contractor to continue consultation with Groundwork as the Scheme develops.
		Landscape	Identify potential planting schemes and other proposals to develop 'environmental barriers' between the motorway and the places where people live, work and take recreation. Both HA and Mouchel have been involved in the development of the strategy, and discussions of potential on-site and off-site planting opportunities.	Comments have been noted and will be passed on to the Highways Agency. The ES does not include off site planting. However, once the DBFO company has been appointed, they can pursue off site mitigation opportunities.

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Junctions 16 to 23 Environmental Statement

Contact	Date Received	Issue	Consultee Comments	Response
Emma Norrington, Operations Manager	30 October 2006	Heritage /Noise	Priority: Add All Saints Pastoral Centre at London Colney (an important cultural heritage site) to the list of those put forward for mitigation works. It has no existing protection from the noise or pollution from the road, the historic buildings have suffered for some time from the affects of this and as such the levels of pollution on the site are being monitored. We suggest that this site would benefit from installation of environmental barriers (sound barrier fencing) as part of the M25 Widening. This work could carried out alongside Mouchel off-site tree planting works providing long term address to the current pollution and noise impacts on the site from the M25.	Additional planting has been introduced within Secretary of state land as part of the Scheme, but there is no requirement to provide an Environmental Barrier for noise attenuation. There is an earth bund at present, and the noise increase is <1dB so no additional environmental barriers are required.
		Air Quality	Request that replacement and new planting proposals within the M25 boundary are designed in accordance with the guidance given in our document 'TAP – A Strategy for Air Quality Tree Planting', to ensure maximum air quality benefit. A copy of the strategy can be downloaded from our website - http://www.groundwork-herts.org.uk/upload/documents/document32.pdf	HCL are aware of the Trees Against Pollution (T.A.P) A strategy for tree planting and air quality report published by Groundwork Hertfordshire (April 2004) and the promotion of tree planting around highways therein to improve air quality. Hyder Consulting are also aware of the work undertaken by Lancaster University and the Centre for Ecology and Hydrology and have reviewed a report entitled Trees and Sustainable Urban Air Quality. Furthermore HCL have contacted Professor Nick Hewitt at Lancaster University who provided an Environmental Science and Technology paper entitled the development and application of an urban tree quality score for photochemical pollution episodes using the Birmingham, United Kingdom, Area as a case study (dated 2005, vol 39, pages 6730 to 6738). The work undertaken by Lancaster University and the Centre for Ecology and Hydrology primarily investigates the role of trees as deposition sinks and their use in large scale planting to improve urban air quality. Unfortunately data is not currently available to substantiate the effectiveness of

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Junctions 16 to 23 Environmental Statement

Contact	Date Received	Issue	Consultee Comments	Response
Emma Norrington, Operations Manager	30 October 2006			tree planting along motorway environments to enable any potential air quality benefits to be quantified or for the effects of trees planting with distance to be quantified. Therefore, the Hyder Consulting are unable to use tree planting as a mitigation measure with respect to air quality improvements in the ES. However, under a separate research contract Hyder Consulting have been instructed by the Highways Agency to investigate concentrations of oxides of nitrogen (NO _x) and nitrogen dioxide (NO ₂) in a variety of environments, including vegetated areas along the motorway network. This research will progress our understanding of how vegetation interacts with NO _x and NO ₂ adjacent to motorways and therefore increase our understanding of the potential for planting to be used as a mitigation measure for highways related NO ₂ pollution.
		Air Quality/ Waste	Aim of the TAP Strategy is to enable the delivery of air quality tree planting schemes on appropriate sites adjacent to the M25. Many of the potential sites are former landfill / quarry sites, as identified in the draft ES, and require re-restoration with importation of suitable cover material to bring them to a sufficient standard to support large-scale planting schemes. Real opportunity for M25 widening contract to make use of these sites for disposal of waste arisings. Will meet HA requirements to show practical efforts towards environmental sustainability by finding a local or nearby destination for waste and a positive use (i.e. not to landfill). It is requested that the chosen contractor the M25 widening works is made aware of this opportunity at an early stage to allow for negotiation with landowners to take place.	The work undertaken by Lancaster University and the Centre for Ecology and Hydrology primarily investigates the role of trees as deposition sinks and their use in large scale planting to improve urban air quality. Unfortunately data is not currently available to substantiate the effectiveness of tree planting along motorway environments to enable any potential air quality benefits to be quantified or for the effects of trees planting with distance to be quantified. Therefore, we cannot use tree planting as a mitigation measure with respect to air quality improvements in the ES.

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Transport for London

Contact	Date Received	Consultee Comments	Response
Mike McCrory, Director of Road Network Development	30 March 2007	TfL understand that a fundamental principle of the project to widen the M25, is that this would be undertaken hand-in-hand with measures to improve the management of traffic flow, in order to lock in the benefits that capacity would provide in terms of improved traffic flow and more reliable journey times. This is regarded as critical by TfL.	The fundamental principle of the M25 widening project is to reduce congestion and improve journey times by providing greater capacity. In his response to the Orbit multi-modal study the Secretary of State confirmed that <i>“our decisions to increase capacity on the strategic network are taken with a parallel commitment <u>to consider</u> what is necessary to ensure that effective measures are in place to lock in the benefits”</i> . The locking-in of the benefits of the capacity increase may, subject to such consideration, derive from any subsequent scheme of demand management currently being investigated by the Highways Agency under a separate brief.
		It is noted in the ES that one of the schemes' main objectives is to develop and incorporate Integrated Demand Management (IDM) measures to provide some constraint on induced traffic and to lock in the benefits from widening. We suggest that the ES should be strengthened to provide more information and assessment in relation to these measures, or at least of the overall objectives of the use of IDM.	The ES does not state that one of the Scheme's objectives is to develop IDM. The ES states that 'Orbit MMS also identified that an essential part of the sustained success of the widening schemes would be the management of traffic demand through the use of a suitable traffic demand and control strategy'. The ES is of the Scheme and IDM would have its own separate assessment: this separation is recognised by the Secretary of State in his response to the Orbit recommendations. Ideally we would include some text on IDM in cumulative effects chapter but there is limited information currently available on IDM options.

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Junctions 16 to 23 Environmental Statement

Contact	Date Received	Consultee Comments	Response
<p>Mike McCrory, Director of Road Network Development</p>	<p>30 March 2007</p>	<p>At a general level it is noted that the ES does not refer explicitly to the recommendation of the ORBIT Multi Modal Study in terms of implementing the scheme in conjunction with an area-wide road user charging system.</p>	<p>The Environmental Statement is written with respect to the environmental effects of the Secretary of States’ scheme to widen the M25 as adopted following his response to the Orbit multi-modal study, and only considers committed schemes as part of its assessment. Area wide road user charging is one of the demand measures that the Secretary of State accepted he would consider further, however as there is currently no guidance on the adoption of road user charges and road user charging is not a committed scheme, it cannot be consider as part of this ES.</p> <p>Furthermore, it is not what Orbit said that is important, it is the Secretary of States response of 9 July 2003 that is critical. This confirmed the commitment to widen the M25, he went on to confirm that the Agency would “<i>work up more detailed proposals for improving the management of the M25</i>”. The SoS identified clear separation between these two strands of Orbit in his statement “<i>Our decisions to increase capacity on the strategic network are taken with a parallel commitment to consider what is necessary to ensure that effective measures are in place to lock in the benefits. We have asked the Highways Agency to consider these matters further as it continues to develop proposals for capacity increases</i>”. As part of our final drafting of the ES we will review the wording of any mention of ORBIT to avoid confusion.</p>
		<p>We suggest that the ES could provide more discussion in relation to its approach to ‘locking in’ benefits without prejudicing the operation of TfL’s road network. These roads tend to support a mixture of more sustainable modes and to reflect this network performance needs to be considered with regard to all modes of transport (e.g. impact on buses). The ES should be able to demonstrate</p>	<p>The IDM measures do not form part of the scheme, nor are they a committed development that could be considered as part of the scheme, therefore the ES should not address these issues. IDM is being taken forward by Network Strategy in consultation with the local authorities.</p>

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Contact	Date Received	Consultee Comments	Response
<p>Mike McCrory, Director of Road Network Development</p>	<p>30 March 2007</p>	<p>that consideration has been given to more general issues such as entry controls which have the potential to lock up a wider network; queues at on-slips which can quickly affect the surrounding road network with knock on congestion and safety implications.</p>	
		<p>It is noted that the scheme seeks to provide noticeable improvements to the reliability and overall journey times for the majority of road users when compared with the option of no widening. Average speeds are forecast to be increased and the additional capacity will help mitigate the effects of incidents. We suggest that the ES should provide more detailed information in relation to the assessment undertaken and the measures proposed to help justify these findings.</p>	<p>Reliability of journey times is a scheme objective that is distinct from the requirements of the ES. These issues are dealt with in other scheme reports, notably Part 2 of the SAR and in turn on more detailed reports such as the Operational Assessment Report (currently in preparation). All reports can be made available upon request.</p>
		<p>We recommend that the ES should seek to provide sufficient detail or have a separate Chapter on the assessment of traffic and transport related issues. We suggest that the traffic impact assessment should include estimates, not only of the traffic on the motorway itself, but also the projection of traffic volumes along key routes leading to the motorway, particularly those providing access to London, such as the TRLN and the SRN. Estimates of heavy goods vehicles movements should also be provided. TfL's Directorate of Road Network Development</p>	<p>The ES follows DMRB guidance that does not include a separate environmental assessment topic on traffic and transport that is often required in Town and Country Planning ESs. Such details will be included in supplementary reports to the ES and are not material to the purpose of an ES, eg as contained in Part 2 of the Scheme Assessment Report or other stand-alone reports. All reports can be made available upon request.</p>

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Contact	Date Received	Consultee Comments	Response
Mike McCrory, Director of Road Network Development	30 March 2007	(DRND) would be able to provide more useful comments once this is provided	
		The A12 and A127, which are a part of the Transport for London Road Network Road Network (TLRN), provide a direct connection to the M25 at Junctions 28 and 29 respectively. These roads also feed into the A118, which although is a Borough Road is classified as being on the Strategic Road Network (SRN) which TfL have an overseeing role on. The A13 is linked to the M25 at Junction 30. The A13 from the Havering/Thurrock boundary is part of the TLRN. The ES does not note the likely impact of the scheme on the TLRN and SRN and information on this would be extremely useful.	The traffic model incorporates strategic roads within its network and the effects of traffic changes on environmental aspects are assessed as part of the ES as required by DMRB guidance.
		We suggest that the ES should seek to provide information relating to the effects of construction traffic on TfL roads, including such things as work compounds, mode of travel of construction workers, Construction Code of Practice and Travel Plans.	The final ES will include an assessment of the effect of any traffic displaced during construction (if any). The effect of construction workers travel or movement between compounds is not known at this stage and will be developed by the DBFO Contractor. We have estimated vehicle movements associated with spoil movements.
		The ES does not appear to provide much information on the methodologies used and modelling undertaken in the assessment of the traffic and transport impact of the development, for example if the modelling assumes IDM, and it so what type. It would be helpful to have access to	The ES follows DMRB guidance, which does not require such information to be included within the ES. Such details will be included in supplementary reports to the ES including the LMVR and Forecasting Reports, which can be made available upon request. The LMVR and Forecasting Reports have been reviewed by HA and signed off therefore little benefit would derive from TfL having access to them. The IDM team

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Contact	Date Received	Consultee Comments	Response
Mike McCrory, Director of Road Network Development	30 March 2007	the traffic modelling to review the scope, assumptions and forecasting methodology used. Access to the Local Model Validation Report (LMVR) and Forecasting Reports would also be helpful.	has offered to discuss its modelling methodologies with the local authorities, as this uses the same model this request will be met, but not actively by the M25 team.
		Any works outside HA land should not only be discussed with the local planning authority but with TfL as well.	Works outside the Secretary of State land boundary will be subject to local planning authority approval who, as necessary, will consult with TfL and local highway authorities.
		If any compounds are proposed within the GLA boundary, traffic assessments would need to be carried out and the appropriate mitigation discussed with TfL.	Works within the GLA land boundary will be subject to local planning authority approval who, as necessary, will consult with TfL.
		I wish to highlight to you TfL's Network Management Duty under the Traffic Management Act (TMA) 2004 and our expectation that you would wish to engage with TfL where any construction impacts of the M25 widening programme affect the performance of the adjoining TLRN / SRN roads and may require mitigation measures.	This is not an issue for the ES but is a coordination activity for the DBFO Co. Liaison requirements are drafted into the current procurement document currently being tendered.
		It would be helpful if the Policies and Plan section of the ES (Chapter 14) makes reference to the Mayor's Transport Strategy and other pan-London Strategies.	We can amend the ES to address this.

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Junctions 16 to 23 Environmental Statement

Summary of Consultation Workshops and Meetings

EIA Scoping Workshop : 22 September 2004

Attendees :

David Humby, Hertfordshire County Council
Brain Peers, St Albans City and District Council
Leigh Newman, Three Rivers District Council
John Kingsbury, Three Rivers District Council
John Scott, Three Rivers District Council
Rob McCarthy, Environment Agency
Graham Thomas, Highways Agency
Henry Penner, Highways Agency
John Timms, Highways Agency
Steve Davies, Hyder Consulting
Angela Mulgrew, Hyder Consulting
John Spiers, Hyder Consulting
Emily Low, Hyder Consulting.

Summary of Discussions:

The workshop involved a presentation on the background to the Scheme, the programme and approach to the EIA. Views were sought on each DMRB environmental topic. Areas of greatest discussion included landscape and visual impacts; air quality; ecological impacts; and construction noise. Pollution/spillage containment and PRoW crossing facilities were also highlighted as issues of concern.

Ecological Issues - Environmental Scoping: 20th October 2004

Attendees

Rob McCarthy, Environment Agency
Sarah Scott, Environment Agency
Pauline Oliver, HMWT
Michelle Henley, HMWT
Matthew Jackson, BBOWT
Gordon Wyatt, English Nature
Emma Norrington, Groundwork
Graham Thomas, Highways Agency
Henry Penner, Highways Agency
Angela Mulgrew, Hyder Consulting
Guy Stone, Hyder Consulting
Helen Folkard-Ward, Hyder Consulting

Summary of Discussions:

A background presentation was carried out, providing information on the Scheme and the work completed to date. Concern was raised by the Wildlife Trusts over motorway moving closer to London Colney site, and discussions over un-proven emissions impact

upon Epping Forest. Issues raised by Wildlife Trusts over hydro-ecological surveying, which Hyder Consulting are going to look at the potential requirement for. Baseline data, including Water Level Management Plan, will be made available to Hyder Consulting.

Countryside Agency and Chilterns AONB Workshop: 14 January 2005

Attendees

Michael Cowsill, Countryside Agency
Colin White, Chilterns AONB
Simon Fisher, Chilterns AONB
Graham Thomas, Highway Agency
Julia Wassell, Highway Agency
Henry Penner, Highway Agency
Emily Low, Hyder Consulting
Katie Lewis, Hyder Consulting
David Kelly, Hyder Consulting
Richard Moore, Hyder Consulting
Peter Trustram, Hyder Consulting
Mike Hayward, Hyder Consulting

Summary

A presentation on the findings of the Scoping Report and discussion on environmental baseline, key issues and potential impacts. Discussions on lighting, gantries and signage strategies for the M25 ensued, and also discussion on opportunities and mitigation measures. The next steps of the Illustrative Design process were outlined along with details of the proposed baseline data collection.

Environmental Consultee Workshop : 25 July 2005

Attendees :

Steve Bailes, Hertfordshire County Council
Ben Coakley and Deborah Ferady, Chilterns District Council
John Kempen, Buckinghamshire County Council
Richard Grove, Hertsmere District Council
Peter Kerr, Three Rivers District Council
Gareth Noble, South Buckinghamshire District Council
Gordon Wyatt, English Nature
Mark Chessell, Countryside Agency
Rob McCarthy, Environment Agency
Colin White, Chilterns AONB Officer
Emma Norrington, Groundwork
Pauline Holmes, Hertfordshire and Middlesex Wildlife Trust
Graham Thomas, Highways Agency
Peter Cole, Highways Agency
Julia Wassell, Highways Agency
Steve Davies, Hyder Consulting
Angela Mulgrew, Hyder Consulting
Emily Low, Hyder Consulting

Summary of Workshop Discussions :

The workshop included a presentation on the background of the Scheme, discussion on the progress of the EIA, and design considerations made for rapid widening of the M25. Discussions were made as to the assessment approach being adopted for the Environmental Statement and an outline of future work and consultation exercises.

Hertfordshire County Council Coordination Meeting: 28th July 2005

Attendees

Rob Smith, Hertfordshire County Council
Mike Younghusband, Hertfordshire County Council
Bob Hall, Hertfordshire County Council
Martin Stagg, Hertfordshire County Council
Keith Williams, Hertfordshire County Council
Jon Prince, Hertfordshire County Council
Graham Thomas, Highways Agency
Steve Davies Hyder Consulting
Paul Thomas Hyder Consulting
Martin Emery Hyder Consulting

Summary

An outline presentation on the Scheme, including the Indicative Programme, was carried out. Design issues associated with the widening were discussed followed by discussion on crossing points and Rights of Way affected by the widening. Emergency services access route maintenance was raised by the Council and potential development around Junction 25 was highlighted.

Drainage Design, Water Quality and Flood Risk Meetings - Environment Agency

24th August 2004
26th October 2004
25th May 2006
11th September 2006

Attendees

Various from Environment Agency; Highways Agency; and Hyder Consulting.

Summary

Discussions about drainage; discharges to 'receiving waters', data collection/sharing; water quality and flooding impact issues. General discussions about the Scheme.

Potential Impacts of Drainage Design on Watercourses and Scope of Aquatic Ecology Survey Work: 26 August 2005

Attendees :

Sarah Scott, Environment Agency
Phil Belfield, Environment Agency
Angela Mulgrew, Hyder Consulting
Bob Sargent, Hyder Consulting
Guy Stone, Hyder Consulting

Summary of Meeting Discussions :

Discussions on each watercourse located within the Scheme corridor, including Environment Agency giving details of available information and identification of potential areas of conflict/concern both from a water quality and ecological perspective. Potential drainage solutions were discussed for specific locations.

Heritage Consultation Meeting with Local Authorities: 11 April 2006

Attendees :

Richard Havis, Essex County Council
Vanessa Clarke, Essex County Council
Andy Instone, Hertfordshire County Council
Jon Chandler, Hyder Consulting – Museum of London Archaeological Services
Alan Ford, Parsons Brinkerhoff - Oxford Archaeology
Grant Sainsbery, Hyder Consulting
Jim Hunter, Hyder Consulting
Anita Mehra, Hyder Consulting

Summary of Meeting Discussions :

During the meeting the level of archaeological assessment was discussed, including concerns raised about previous DBFO contracts and their archaeological assessments. Methodologies for watching briefs and walkover surveys were outlined and discussed.

Hertfordshire County Council Meeting: 13th March 2006

Attendees

Terry Williams, Highways Agency
Graham Thomas, Highways Agency
Rob Smith, Hertfordshire County Council
Bob Hall, Hertfordshire County Council
Martin Stagg, Hertfordshire County Council
Keith Williams, Hertfordshire County Council
Mike Younghusband, Hertfordshire County Council
Julian Thornton, Hertfordshire County Council (Public Rights of Way Officer)
Bryony Whittle, Hertfordshire County Council
Steve Davies, Hyder Consulting

Paul Thomas, Hyder Consulting

Summary

Issues related to the Illustrative Design for widened schemes were raised. The affects of the widening project to the following landmarks were discussed: Hatfield Tunnel; Berry Lane Viaduct; Park Avenue Footbridge; Whitewebbs Footbridge; HA Schemes in Area 5 of interest to HCC were mentioned.

Ecological Mitigation Meeting with EA and EN 4 September 2006

Attendees :

Gordan Wyatt, English Nature
Charles Thompson, Environment Agency
Sarah Scott, Environment Agency
Angela Mulgrew, Hyder Consulting
Guy Stone, Hyder Consulting

Summary of Meeting Discussions :

The ecological mitigation for habitat and protected species approach and design were presented. It was agreed that correct speed mixes would be used but these will be responsibility of DBFO Contractor. Badger fencing would be in place during construction but not afterwards because not severing territories. Agreed that due to the abundance of deer along the motorway and risk of enclosing them in deer fencing would not be included in the Scheme. It was agreed that creation of new ponds was best approach for translocated species rather than moving the animals elsewhere. Also the EA would prefer that water vole habitat improvements were restricted to the ditches around Junction 16 and not the Alder Bourne so as to protect the mature alders along the river. Agreed that licence would be required for disturbance of bat roost at Chalfont viaduct but that there is natural roosting habitat very close in Chorley Wood. Agreed that introduction of lighting would have impact particularly on bat commuting areas but there is limited mitigation. Agreed that planting buffer zones with trees may not always be the preferred ecological option and this mitigation would be considered on a case by case basis. Agreed that discouraging important terrestrial invertebrates from key habitats would be considered as part of mitigation.

Sarratt Parish Council Meeting 19 September 2006

Attendees :

Sarratt Parish Council members
Residents within Sarratt Parish
Terry Williams, Highways Agency
Angela Mulgrew, Hyder Consulting

Summary of Meeting Discussions :

Discussions were mainly focused around lighting concerns for properties located adjacent to the M25, implementing traffic restrictions on side roads to stop traffic from

rat-running during the construction period, and predicted noise levels around Old Solesbridge Lane with the Scheme.

Ridge Parish Council Meeting 22 September 2006

Attendees :

Ridge Parish Council members
Residents within Ridge Parish
Graham Thomas, Highways Agency
Angela Mulgrew, Hyder Consulting

Summary of Meeting Discussions :

Discussions included traffic implications during the construction period and the location of site compounds. Traffic issues were raised relating to permanent use of enforcement cameras, provision of a controlled motorway and signage improvements. Noise was discussed in relation to the RSPCA centre near Blanche Lane Bridge.

Abbots Langley and Kings Langley Parish Council Meeting 25 September 2006

Attendees :

Abbots Langley Parish Council members
Kings Langley Parish Council members
Residents within Abbots Langley parish
Residents within Kings Langley Parish
Steve Wrenn, Highways Agency
Angela Mulgrew, Hyder Consulting

Summary of Meeting Discussions :

Discussions included queries relating to provision of a controlled motorway. They also raised queries relating to consultation, including organisations that would be included in the consultation process.

Chorleywood Parish Council Meeting 26 September 2006

Attendees :

Chorleywood Parish Council members
Residents within Chorleywood Parish
Terry Williams, Highways Agency
Angela Mulgrew, Hyder Consulting

Summary of Meeting Discussions :

Discussions included queries about traffic impacts during construction and what plans there are within the Scheme to improve noise levels along the M25. They also raised the potential relocation of an air quality monitoring station around Junction 18.

Chalfont St Peter, Denham, Fulmer, Gerrards Cross and Iver Parish Councils Meeting 3 October 2006

Attendees :

Parish Council members
Residents
Graham Thomas, Highways Agency
Angela Mulgrew, Hyder Consulting

Summary of Meeting Discussions :

Traffic issues during construction around the A413/A421 were of concern, and queries over hard shoulder running were voiced. The source of construction materials was raised – including whether gravel would be sourced from Chalfont St Peter. A communications plan was requested, with a permanent hotline to contact the contractor. Noise was highlighted as the biggest concern for the public, and the Parish Councils were keen for the Highways Agency to resolve current noise problems, as well as those created by the Scheme. Planting commitments that were not implemented when the road was originally constructed have been raised, with a request that the situation be improved with the Scheme. Other issues discussed included the controlled use of Emergency Access Lanes, off-site land purchase to accommodate Chalfont Viaduct, and the plans for woodland areas to the northeast of Junction 16.

St Stevens Parish Council Meeting 5 October 2006

Attendees :

St Stevens Parish Council members
Residents within St Stevens Parish
Graham Thomas, Highways Agency
Angela Mulgrew, Hyder Consulting

Summary of Meeting Discussions :

Discussions covered lighting proposals around Moor Mill, and Environmental Barriers for noise protection around Park Street. Traffic issues included discussions around Junction 21 which provides the interchange between the M25 and M1 (via the A405). The Parish suggested a potential location for public exhibition, along with an additional consultee group.

London Colney Parish Council Meeting 6 October 2006

Attendees :

London Colney Parish Council members
Residents within London Colney Parish
Graham Thomas, Highways Agency
Angela Mulgrew, Hyder Consulting

Summary of Meeting Discussions :

Issues raised in the meeting included predicted impacts during the construction period, and measures set out to minimise disruption, particularly around Junction 22. An existing drainage discharge problem was highlighted near Shenley Lane and District Council environmental planting initiatives were raised. Existing poor signage was raised around pedestrian crossing facilities along a slip road. Queries relating to additional screening planting and consideration for moving Junction 22 due to proposals for a rail freight terminal on Radlett aerodrome were raised.

Shenley Parish Council Meeting 10 October 2006

Attendees :

Shenley Parish Council members
Residents within Shenley Parish
Angela Mulgrew, Hyder Consulting
Graham Thomas, Highways Agency

Summary of Meeting Discussions :

Discussions included queries about construction details, including location of construction compounds and associated landtake, congestion during construction, junction/road closures during construction, 24 hour working details and which local roads have been identified as haulage routes. They also discussed hard shoulder running, and requested ongoing consultation about the Scheme.

Draft ES Environmental Workshop 13 October 2006

Attendees :

Gordon Wyatt, Natural England
Charles Thompson, Environment Agency
Katharine Fletcher, English Heritage
Buckinghamshire County Council
David Humby, Hertfordshire County Council
Andy Instone, Hertfordshire County Council
Ian Gibbon, Hertfordshire County Council
Olu Sokoya, South Bucks District Council
Ben Coakley, Chilterns District Council
Sarah Hoggett, Hertsmere Borough Council
Nigel Smith, Hertsmere Borough Council
Peter Kerr, Three Rivers District Council
Claire Betts, Three Rivers District Council
Cerys Williams, City and District of St Albans Council
Brian Peers, City and District of St Albans Council
Simon West, City and District of St Albans Council
Tim Button, Dacorum Borough Council
Colin White, Chilterns Conservation Board
Emma Norrington, Groundwork
Terry Williams, Highways Agency

Henry Penner, Highways Agency
Hyder Consulting Ltd (various)

Summary of Meeting Discussions :

Provided the Statutory Environmental Bodies, Local Authorities and other consulted groups with an update on the Scheme, including progress since the last workshop, mitigation measures being recommended and the residual impacts resulting from implementation of the Scheme. Discussions ensued on each environmental discipline, with attendees highlighting their major concerns. Where feasible, the Highways Agency and Hyder Consulting answered these queries/concerns. Where further work was required, these were noted for further review by specialists. Main points of concern included traffic related issues, which also encompassed air quality and noise. Drainage design, geology and soils, cultural heritage and landscape were also discussed in detail, whilst no major issues were raised with regards to ecology and public rights of way. Following this Workshop, the consultees submitted formal consultation responses to the Draft ES.

Public Rights of Way (PRoW) Meeting 21 May 2007

Attendees :

Richard Cuthbert, Hertfordshire County Council
Julian Thornton, Hertfordshire County Council
Dawn Grocock, Hertfordshire County Council
Mike Walker, Buckinghamshire County Council
Paul Thomas, Hyder Consulting Ltd
Julia Bentley, Hyder Consulting Ltd

Summary of Meeting Discussions :

Provided an update on the Scheme and discussed how Hertfordshire County Council's consultation comments had been addressed, where appropriate, in the ES. Discussions also covered feasible diversion routes during the construction period for temporary closure of two PRoW crossings.

Appendix C : Plan and Policies Schedule

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Table C1: National Policy

Policy	Objectives	Impact Assessment	Comment
National Transport Policy			
Transport White Paper (The Future of Transport: A Network for 2030) , Department for Transport (DfT) (September 2004)	Builds upon the progress that has already been made since the implementation of the 10 Year Plan, and extends the Government's investment plans until 2014-15. The paper has a strategy of, firstly, sustained investment, secondly, improvements in traffic management and thirdly, planning ahead	Beneficial	The Scheme is included in the TPI, and sets out to relieve communities of the results of traffic congestion and is an integral requirement for the associated Glossop Spur road improvement scheme. It has been appraised according to the relevant DfT/DCLG/ODPM/DTLR/DETR criteria
Tomorrow's Roads - Safer For Everyone: The First Three Year Review , DfT (April 2004)	Reported on progress made towards the objectives in the 2000 DETR document Tomorrow's Roads: Safer For Everyone	Beneficial	As stated for the 2004 Transport White Paper above
Delivering Better Transport: Progress Report (Progress report on the 10 Year Plan), DfT (December 2002)	Reported on the Government's Ten Year Plan set out what has been achieved in the first 18 months since April 2001. Stresses that long-term commitment and planning is essential if we are to rebuild and maintain the transport infrastructure we need for continued growth and prosperity	Beneficial	As stated for the 2004 Transport White Paper above
Transport 2010 – The 10 Year Plan , (former) Department of the Environment, Transport and the Regions (former) DETR) (July 2000)	Outlines the levels of transport investment to be made over the ten-year period, between 2000-2010	Beneficial	As stated for the 2004 Transport White Paper above

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<p>Tomorrow's Roads: Safer For Everyone, (former) DETR (March 2000)</p>	<p>Outlines safety objectives for designing, building, operating and maintaining trunk and local roads</p>	<p>Beneficial</p>	<p>As stated for the 2004 Transport White Paper above</p>
<p>Sustainable Distribution: Strategy, A (former) DETR (1999)</p>	<p>Outlines the Government's strategy for the sustainable distribution of goods and services in the UK</p> <p>Seeks to ensure that the management and development of trunk roads takes place within the context of our integrated transport policy and land use planning policies</p> <p>States that where new facilities or expansion involving new land take are required, the criteria for appraising transport projects will be rigorously applied. These criteria are set out in A New Deal for Trunk Roads (DETR, September 1998)</p>	<p>Beneficial</p>	<p>The Scheme would comply with the majority of integrated transport policy and land use planning policies and has been appraised according to the relevant criteria in the DETR publication A New Deal for Trunk Roads (September 1998)</p>
<p>Integrated Transport White Paper (A New Deal for Transport: Better for Everyone), (former) DETR (July 1998)</p>	<p>States that priority will be given to investing in network control, traffic management and in minor improvements, which promote carefully targeted capacity improvements to address existing congestion</p>	<p>Beneficial</p>	<p>As stated for the 2004 Transport White Paper above</p>
<p>A New Deal for Trunk Roads in England – Understanding the New Approach to Appraisal, (former) DETR (September 1998)</p>	<p>Introduces a carefully targeted programme of larger scale improvements designed to address a variety of problems ranging from acute congestion, safety problems to environmental damage</p> <p>(Note: In this document, the Scheme is not included in the Targeted Programme of Improvements (TPI) - only junctions 12-15 are listed for widening in this document. However following the Minister's announcement in April 2004, the five M25 Widening Schemes have now entered the Highways Agency's TPI)</p>	<p>Beneficial</p>	<p>As stated for the 2004 Transport White Paper above</p>

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<p>A New Deal for Trunk Roads in England – Guidance on the New Approach to Appraisal, (former) DETR (September 1998)</p>	<p>Sets out the basic approach to the New Approach to transport Appraisal set out in the 1988 Integrated Transport White Paper</p>	<p>Beneficial</p>	<p>As stated for the 2004 Transport White Paper above</p>
<p>National Planning Policy</p>			
<p>PPS1: Delivering Sustainable Development, (former) Office of the Deputy Prime Minister (former) ODPM) (2004)</p>	<p>Seeks to ensure that the Government’s four aims of sustainable development are pursued in an integrated way, through a sustainable, innovative and productive economy that delivers high levels of employment, and a just society that promotes social inclusion, sustainable communities and personal well being, in ways that protect and enhance the physical environment and optimise resource and energy use</p> <p>Planning should facilitate and promote sustainable and inclusive patterns of urban and rural development by 1) making suitable land available for development in line with economic, social and environmental objectives to improve people’s quality of life; 2) contributing to sustainable economic development; 3) protecting and enhancing the natural and historic environment, the quality and character of the countryside, and existing communities; 4) ensuring high quality development through good and inclusive design, and the efficient use of resources; and, 5) ensuring that development supports existing communities and contributes to the creation of safe, sustainable, liveable and mixed communities with good access to jobs and key services for all members of the community</p>	<p>Adverse</p>	<p>The Scheme does not reduce the need to travel, but would help improve journey time reliability and allow vehicles to work more efficiently. However, the increase in traffic volume would also increase overall traffic emissions over the longer term</p>

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	<p>Good design should 1) address the connections between people and places by considering the needs of people to access jobs and key services; 2) be integrated into the existing urban form and the natural and built environments; 3) be an integral part of the processes for ensuring successful, safe and inclusive villages, towns and cities; 4) create an environment where everyone can access and benefit from the full range of opportunities available to members of society; and 5) consider the direct and indirect impacts on the natural environment</p>		
<p>PPG2: Green Belts, (former) DETR (1995)</p>	<p>Provides guidance on the Government's objectives for protecting land designated within green belt boundaries and guards against inappropriate development in the countryside. Sets the framework for the Greater Manchester Green Belt and the green belt around Barnsley and Sheffield in the main and extended study area</p>	<p>Neutral</p>	<p>The Scheme is considered to constitute <u>appropriate</u> development, for which very special circumstances are <u>not</u> required to be justified. This is due to the fact that the Scheme is not considered to significantly adversely affect any of the five specific purposes of including land in Green Belts nor any of the six objectives for the use of land in the Green Belt</p>
<p>PPS7: Sustainable Development in Rural Areas, (former) ODPM (2004)</p>	<p>Sets out sustainable development principles for rural communities, and affords the highest level of protection for National Parks and AONBs in relation to their landscape scenic beauty, biodiversity and cultural heritage resources. PPS7 discourages major development from being constructed within National Park areas except in exceptional circumstances, and where it is balanced with supporting appropriate local rural economic development strategies</p>	<p>Neutral</p>	<p>The Scheme passes through an extremely small portion of the extreme eastern edge of the Chilterns AONB between Junctions 18 and 19. However, the effect of the Scheme on views from the AONB would not be significantly adversely affected.</p>

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<p>PPS9: Biodiversity and Geological Conservation, (former) ODPM (2004)</p>	<p>Gives guidance on how the Government's objectives for the conservation of our natural heritage are to be reflected in land use planning</p> <p>Sets out the Government's broad objectives in relation to biodiversity and geological conservation, ensuring that these sites are protected in the same way as other conservation interests</p>	<p>Adverse</p>	<p>No SSSIs (biological, geomorphology or geological) would be affected by the Scheme. However there would be indirect impacts on adjacent ancient woodland through removal of buffer vegetation and new lighting. There would be a net loss of habitat in the highway estate</p> <p>The Scheme would result in a net loss of habitat. Mitigation measures, such as translocation of species and replacement of vegetation within Secretary of State land, are proposed. These mitigation measures directly relate to UK BAP species. However, they are limited by the amount of land available to the Highways Agency. There is also potential for indirect impact on adjacent sites due to changes in local conditions. The Scheme would contribute towards 18 HABAP targets for species and 10 HABAP targets for habitats</p>
<p>PPG13: Transport, (former) DETR (2001)</p>	<p>Seeks to integrate planning and transport at the national, regional, county and local level, reduce the length and number of journeys by car, reduce the environmental impact of travel, and advocates improvements to existing road network where necessary</p> <p>Objectives are 1) to promote more sustainable transport choices for both people and for moving freight; 2) to promote accessibility to jobs, shopping, leisure facilities and services by public transport, walking and cycling, and 3) to reduce the need to travel, especially by car</p>	<p>Beneficial</p>	<p>Whilst the Scheme does not contribute to reducing the need to travel by private car, it is proposed within existing Secretary of State land and constitutes an improvement to the existing road network</p> <p>The Scheme sets out to improve journey reliability and have wider economic impacts due to the importance of the M25 to strategic trunk road network and freight corridor</p> <p>The Scheme includes mitigation measures in order to minimise its impact on the surrounding environment</p>

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<p>PPG15: Planning And The Historic Environment, (former) Department of the Environment (DoE) (1994)</p>	<p>Sets out Government guidance on historic buildings, conservation areas and other elements of the historic environment, but not archaeology</p>	<p>Neutral</p>	<p>The Scheme would have a direct adverse effect on one listed building since the building would require insulation as a result of the Scheme under the Noise Insulation Regulations. The Scheme would not have direct effects on SAMs or Conservation Areas. The Scheme design mitigates significant effects on the setting of built heritage features</p>
<p>PPG16: Archaeology and Planning, (former) DoE (1990)</p>	<p>Emphasises the importance and vulnerability of archaeological areas and states how they should be conserved</p>	<p>Neutral</p>	<p>In general, the Scheme mitigation strategy for dealing with excavation in known and unknown areas of archaeological potential would eliminate or severely reduce any significant effects</p>
<p>PPS23: Planning and Pollution Control, (former) ODPM (2004)</p>	<p>Sets out policies on pollution control and on land affected by contamination</p>	<p>Adverse</p>	<p>The Scheme would maintain and enhance the existing drainage quality through the use of attenuation ponds and bio retention swales/ditches</p> <p>AQMAs have been declared in South Bucks; Three Rivers; St Albans and Hertsmere along the M25. The Scheme would improve time journey reliability and ease congestion and would allow vehicles to operate more efficiently. However, traffic volumes would increase with the Scheme and this would increase air pollution</p> <p>The Scheme crosses some landfills and temporary adverse impacts during construction would occur</p>

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<p>PPG24: Planning and Noise, (former) DoE (1994)</p>	<p>Gives guidance on acceptable noise levels for new dwellings from a variety of noise sources, including road traffic</p>	<p>Neutral</p>	<p>The Scheme is broadly in compliance with the policy objectives. In locations where traffic noise levels are expected to increase to a threshold triggering mitigation measures, additional Environmental Barriers would be provided as appropriate to the situation. Low noise road surfacing would be provided in the new carriageway and where it does not exist in the current carriageway. Noise insulation would be provided for 7 individual properties along the Scheme, where Environmental Barriers have not been proposed</p>
<p>PPS25: Development and Flood Risk, Department for Communities and Local Government (DCLG) (2006)</p>	<p>Sets out guidance on how flood risk should be assessed at all stages of the planning process. The planning system aims to ensure that new developments are safe and not exposed unnecessarily to flooding. Flood risk to developments or additional risk arising from new development should be managed with minimum environmental impact to ensure that sites can be developed and occupied safely</p>	<p>Neutral</p>	<p>The Scheme is broadly in compliance with the policy objectives due to the provision of attenuation ponds and maintenance of existing flow rates</p>
<p>National “Other” Policy</p>			
<p>Securing the Future: The UK Government Sustainable Development Strategy, Department for the Environment, Food and Rural Affairs (DEFRA) (2005)</p>	<p>Recognises the fundamental importance of good quality water to health and the environment, and identifies the major challenges to water quality. It also recognises that the protection and enhancement of wildlife and designated landscapes are a key component of sustainable development, and that size reduction and habitat fragmentation is a threat to biodiversity</p>	<p>Adverse</p>	<p>The Scheme would result in some beneficial effects on water resources and air quality but would result in some adverse effects on wildlife and heritage</p>

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<p>The Communities Plan- Sustainable Communities: Building for the Future, (former) ODPM (2003)</p>	<p>Key Action 4.10 – to protect the countryside through a target for each region to maintain or increase the current area of land designated as green belt land in local plans. We will use green belt and countryside protection tools to maintain the openness of the countryside around areas of growth and prevent urban sprawl. Designated areas such as National Parks and Areas of Outstanding Natural Beauty will continue to enjoy the greatest level of protection afforded by the planning system</p>	<p>Adverse</p>	<p>The Scheme would adversely affect a range of natural resources which would be partially offset by beneficial local environmental and economic effects in the villages of Mottram, Hollingworth and Tintwistle where traffic congestion would be reduced leading to improved air quality, reduced noise and severance and improvements to the townscape</p>
	<p>Key Action 4.11 – to enhance green belt land by encouraging local authorities to identify ways to raise its quality and utility, for example by improving its accessibility, biodiversity and amenity value</p>	<p>Neutral</p>	<p>The Scheme would not adversely affect the green belt in terms of quality, utility, biodiversity and amenity value, but it would improve its accessibility in the locality</p>
	<p>Key Action 4.12 – to promote more and better publicly accessible green space in and around our communities, for example through the creation of new country parks and networks of green spaces within towns and cities. 'Green wedges' and 'green corridors' will be given further protection through the planning system</p>	<p>Beneficial</p>	<p>The Scheme would improve the accessibility of the greenspaces in the green belt</p>
<p>Sustainable Communities in the South East: Building for the Future, (former) ODPM (2003)</p>	<p>Transport Action Plan Measure 2: to work with the Highways Agency and the Strategic Rail Authority to bring forward schemes to improve travel within and through the region</p>	<p>Beneficial</p>	<p>The Scheme is a scheme that seeks to improve travel within and through the region</p>
	<p>Transport Action Plan Measure 3: to take forward the findings of the multi modal studies undertaken to tackle serious congestion problems. The London Orbital Study, South Coast Multi Modal Study and Thames Valley Multi Modal Study are helping us devise effective transport strategies for the long term</p>	<p>Beneficial</p>	<p>The Scheme was a key recommendation in the published London Orbital (Multi-Modal) Study Final report</p>

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<p>Sustainable Communities in the East of England: Building for the Future, (former) ODPM (2003)</p>	<p>Strategic Challenge Key Issue 2: improving transport infrastructure – railways, roads, airports and ports to meet the needs of economic growth</p>	<p>Beneficial</p>	<p>The Scheme is a scheme that seeks to improve transport infrastructure to meet the needs of economic growth</p>
	<p>Transport Action Plan Measure 1: we will work with the Highways Agency and railway industry stakeholders (including the Strategic Rail Authority) to deliver improvements to trunk road and rail networks and in particular address the transport needs of growth areas</p>	<p>Beneficial</p>	<p>The Scheme is a scheme that seeks to improve travel within and through the region</p>
	<p>Transport Action Plan Measure 2: as part of the review of the Government's 10 Year Transport Plan, consideration will be given to the longer-term infrastructure needs of the growth areas</p>	<p>Beneficial</p>	<p>The Scheme would help to provide a longer-term infrastructure need of the growth areas (in the East of England Region)</p>
<p>Creating Sustainable Communities: Making it Happen: The Northern Way, (former) ODPM (2004)</p>	<p>None of relevance.</p>	<p>Neutral</p>	<p>None.</p>
<p>Creating Sustainable Communities in the South East: Making it Happen, (former) ODPM (2004)</p>	<p>"The Future" - the region is actively taking forward the growth agenda within the South East and this will remain a key regional priority for the future. At the same time it is important to address the disparities in economic performance and levels of prosperity between different parts of the region, raising the skills base, improving the supply and quality of housing and infrastructure. Social exclusion and quality of life in the widest sense will also be tackled</p>	<p>Beneficial</p>	<p>The Scheme would help to improve the infrastructure in the South East Region</p>

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<p>Creating Sustainable Communities in the East of England: Making it Happen, (former) ODPM (2004)</p>	<p>“The Future” - Government funding will be used to unlock development, improve transport, enhance health and education services, and improve local environments – to assist delivery of the three growth areas in the East of England (London-Stansted-Cambridge, Milton Keynes/South Midlands and Thames Gateway South Essex).</p>	<p>Beneficial</p>	<p>The Scheme would help to improve transport in the East of England Region</p>
<p>The Urban White Paper - Our Towns and Cities, the Future: Delivering an Urban Renaissance, (former) DETR (2000)</p>	<p>Seeks to enable all towns and cities to create and share prosperity by providing an efficient transport system. Also seeks reliable and safe transport system to contribute to business efficiency and improve peoples access to jobs and services</p>	<p>Beneficial</p>	<p>The Scheme would help to provide a reliable and safe transport system to contribute to business efficiency and improve peoples access to jobs and services</p>
	<p>Key Issue 8 (“Enabling all towns and cities to create and share prosperity”): Key Measure 7: Investing £180 billion in a 10 year plan for transport to modernise and up-grade our transport networks</p>	<p>Beneficial</p>	<p>The Scheme would help to modernise and up-grade the UK’s transport networks</p>

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<p>The Rural White Paper - Our Countryside: The Future - A Fair Deal for Rural England, (former) DETR (2000)</p>	<p>This document sets out the vision for a living, working, protected and vibrant countryside – and includes similar issues to the “Better Quality of Life” White Paper in terms of undermining habitats by fragmentation and needing to protect special landscape character areas (as well as AONBs). It also has regard to conserving biological diversity</p>	<p>Adverse</p>	<p>The Scheme would result in a net loss of land that is inconsistent with biodiversity conservation, but additional biodiversity enhancements are proposed. The Scheme passes through an extremely small portion of the extreme eastern edge of the Chilterns AONB between Junctions 18 and 19. The section of the M25 passing through the AONB is located in a cutting and some widening has already occurred; Environmental Barriers are not proposed here; existing planting would be enhanced and new works would be planted out as the Scheme corridor width allows. However, earthworks are required in order to construct a retaining wall, new gantries would be introduced, and the visual impact would be greatest immediately after construction due to loss of screening vegetation</p> <p>The Scheme passes through the Colne Valley Park from Junction 16 to 17, here the motorway is raised, and the replacement of screening vegetation is constrained by the width of the transport corridor</p> <p>The Scheme passes through Watling Chase Community Forest between Junctions 21 to 24. It does not reduce the area of forest, but would decrease the amount of vegetation buffer alongside it</p>
<p>Public Health White Paper – Choosing Health: Making Healthy Choices Easier, Department of Health (2004)</p>	<p>Seeks to encourage walking and cycling</p>	<p>Neutral</p>	<p>The Scheme would not assist significantly with this policy objective</p>

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<p>The Energy White Paper - Our Energy Future - Creating a Low Carbon Economy, DTI (2003)</p>	<p>Reducing carbon dioxide emissions by 60% by 2050</p>	<p>Adverse</p>	<p>The Scheme would not assist in reducing carbon dioxide emissions</p>
<p>Climate Change - the UK Programme, (former) DETR (2000)</p>	<p>Aims to bring about a reduction in UK emissions of greenhouse gases, including carbon dioxide, methane, nitrous oxide, hydrofluorocarbons, perfluorocarbons and sulphur hexafluoride</p>	<p>Adverse</p>	<p>The Scheme would result in an overall increase in greenhouse gas emissions</p>
<p>Air Quality Strategy for England, Scotland, Wales and Northern Ireland, (former) DETR (2001)</p>	<p>Sets out health-based standards for the main air pollutants and objectives for their achievement throughout the UK Sets objectives for 8 main air pollutants to protect health under Local Air Quality Management</p>	<p>Adverse</p>	<p>AQMAs have been declared in South Bucks; Three Rivers; St Albans and Hertsmere along the M25. The Scheme would increase journey reliability and improved journey time reliability and would allow vehicles to operate more efficiently. However in the opening year of the Scheme (2012) air quality is predicted to reduce, although not to pollutant concentrations in excess of EU Limit Values. Traffic flows would increase with the Scheme and this would increase air pollution.</p>
<p>The Air Quality Strategy for England, Scotland, Wales and Northern Ireland - Addendum, DEFRA (2003)</p>	<p>Introduces tighter objectives for the pollutants in the 2001 Air Quality Strategy, but does not alter the main policy objectives of the 2001 Strategy</p>	<p>Neutral</p>	<p>None</p>

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<p>Working with the Grain of Nature: A Biodiversity Strategy for England, DEFRA (2002)</p>	<p>Seeks to ensure biodiversity considerations become embedded in all main sectors of public policy, and sets out a programme for the next five years to make the changes necessary to conserve, enhance and work with the grain of nature and ecosystems rather than against them</p>	<p>Adverse</p>	<p>The Scheme would result in a net loss of habitat. Mitigation measures, such as translocation of species and replacement of vegetation within Secretary of State land, are proposed. These mitigation measures directly relate to UK BAP species. However, they are limited by the amount of land available to the Highways Agency. There is also potential for indirect impact on adjacent sites due to changes in local conditions.</p>
<p>Biodiversity: The UK Action Plan (UKBAP), (former) DoE et al (January 1994)</p>	<p>Seeks to develop national strategies for the conservation of biological diversity and the sustainable use of biological resources. It contains a number of Species and Habitat Action Plans (SAP and HAPS).</p>	<p>Adverse</p>	<p>The Scheme would result in a net loss of habitat. Mitigation measures, such as translocation of species and replacement of vegetation within Secretary of State land, are proposed. These mitigation measures directly relate to UK BAP species. However, they are limited by the amount of land available to the Highways Agency. There is also potential for indirect impact on adjacent sites due to changes in local conditions.</p>
<p>Strategy for Sustainable Farming and Food: Facing the Future in England, DEFRA (2002)</p>	<p>None of relevance</p>	<p>Neutral</p>	<p>None.</p>
<p>Code of Good Agricultural Practice for the Protection of Soils ("The Soil Code"), (former) Ministry of Agriculture, Food and Fisheries (MAFF) (October 1998)</p>	<p>Soil compaction restricts the growth of crops and can lead to run-off and soil erosion. Avoid damaging soil structure during arable cropping and by grazing stock. If soil structure is damaged, take positive steps to correct the problem</p>	<p>Neutral</p>	<p>The Scheme mitigation measures include measures to avoid damage to the structure of soil that is stored.</p>

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	Reduce erosion by increasing the stability of soils, maximising crop cover and avoiding runoff. Prepare a plan to highlight where erosion occurs and develop strategies to prevent further problems	Neutral	The Scheme mitigation measures include measures to avoid erosion of soil that is stored including coverage.
	Whenever land disturbed by mineral working or laying pipelines is restored to agriculture, detailed plans should be prepared and any necessary approval obtained before work starts. Ensure these plans are followed during site operations	Neutral	No land is to be resorted to agriculture.
	Soils should be stripped, stored and replaced to the highest standards to ensure that they are reinstated in good condition	Neutral	The Scheme mitigation measures include measures to ensure the soil is reinstated in good condition
Code of Good Agricultural Practice for the Handling of Soils ("The Soil Code"), DEFRA (April 2000)	Gives advice on soil stripping, the forming and taking down of soil storage mounds, and soil replacement operations using excavators, earth scrapers or bulldozers. There is also guidance on remedial works involving the removal of stones and damaging materials, and decompaction during the replacement operations	Neutral	The Scheme mitigation measures include measures to ensure the soil is removed, stored and reinstated in a way that safeguards the soil resource
First Soil Action Plan for England 2004-2006 , DEFRA (May 2004)	Seeks to develop a strategy to protect soils	Neutral	The Scheme mitigation measures include measures to ensure the soil is removed, stored and reinstated in a way that safeguards the soil resource
Government's Statement on the Historic Environment - A Force for Our Future , Department for Culture, Media and Sport (DCMS) (2001)	Protecting and sustaining the historic environment for the benefit of our own and future generations.	Neutral	The Scheme would have a direct adverse effect on one listed building since the building would require insulation as a result of the Scheme under the Noise Insulation Regulations. The Scheme would not have direct effects on SAMs or Conservation Areas. The Scheme design mitigates significant effects on the setting of built heritage features

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<p>Productivity in the UK: the Evidence and the Government's Approach, HM Treasury (2000)</p>	<p>Seeks to improve transport infrastructure to enhance regional and local economic performance.</p>	<p>Beneficial</p>	<p>The Scheme provides improved transport infrastructure that is likely to enhance regional and local economic performance.</p>
<p>Towards A Balance With Nature: Highways Agency Environmental Strategic Plan; Highways Agency (1999)</p>	<p>To minimise the impact of the trunk road network on natural and built environment. To manage the network in a way which promotes the maintenance and enhancement of biodiversity</p>	<p>Adverse</p>	<p>The Scheme would result in a net loss of land that is inconsistent with the policy aspirations. Mitigation measures, such as translocation of species and replacement of vegetation within Secretary of State land are proposed. However, such measures are limited by the amount of land available to the Highways Agency. There is also potential for indirect impact on adjacent sites due to changes in local conditions.</p>
<p>Encouraging Sustainable Travel: Highways Agency Strategic Plan for Accessibility, Highways Agency (undated)</p>	<p>Seeks to promote accessibility to everyday facilities for all, especially those without a car. The impact of the trunk road network on other modes of transport is recognised</p>	<p>Neutral</p>	<p>The Scheme would not contribute to improving accessibility for those without a car. However, it is located within an existing route corridor, therefore does not further interfere with other non-vehicular modes of transport.</p>
<p>Working in Partnership: Highways Agency Strategic Plan for Integration, Highways Agency (undated)</p>	<p>Seeks to widen the choice of transport available by facilitating interchanges between roads and public transport, walking or cycling</p>	<p>Neutral</p>	<p>The Scheme is located within an existing route corridor. However, it does not widen the choice of transport available.</p>
<p>Making the Network Safer: Highways Agency Strategic Plan for Safety, Highways Agency (2000)</p>	<p>States the Highway Agency's commitment to contributing to the Government's targets for reducing road deaths and casualties, and identifies actions to help achieve casualty reductions</p>	<p>Beneficial</p>	<p>The Scheme would contribute to improved safety over the long term.</p>

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<p>Better Value from Busy Roads - Highways Agency Economy Strategic Plan, Highways Agency (undated)</p>	<p>Seeks to reduce overall travel costs, increase journey time reliability and minimise construction and maintenance costs</p>	<p>Beneficial</p>	<p>The Scheme would contribute to the reduction of congestion and greater journey-time reliability.</p>
<p>Highways Agency: Biodiversity Action Plan, Highways Agency (undated)</p>	<p>Aims to minimise the impact of the trunk road network on the natural and built environment, and conserve habitat and species on motorway verges</p>	<p>Adverse</p>	<p>The Scheme would result in a net loss of land, and mitigation measures are limited by land available to the Highways Agency.</p> <p>There is also potential for indirect impact on adjacent sites (SSSI; ancient woodlands etc) due to changes in local conditions.</p> <p>However, the Scheme would have a beneficial impact upon 18 HABAP targets for species, including provision of otter holts and bat/bird boxes, and 10 HABAP targets for habitats, including management of woodland, hedgerows and new species-rich grassland.</p>
<p>A Targeted Programme of Improvements: the HA Strategic Plan for Improving the Network, Highways Agency (undated)</p>	<p>Outlines the strategic plan to carry out the Government's Targeted Program of Investment (TPI) in trunk road improvements. It also sets out the agency's role in taking forward new schemes emerging from the Regional Transport Strategy that will be added to the TPI</p>	<p>Neutral</p>	<p>In this document, Map 1 Targeted Programme of Investments includes only Junctions 12-15 of the M25 for widening. Table 1 – Multi-modal Studies notes 'London Orbital' as a study that is underway</p> <p>However following the Minister's announcement in April 2004, the five M25 Widening Schemes have entered the Highways Agency's TPI</p>

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Table C2: Regional Policy

Policy	Objectives	Impact Assessment	Comment
Regional Transport Policy			
Buckinghamshire Local Transport Plan 2 2006/07 –20010/11, 2006			
LTP2 Congestion Strategy Objective 1	To keep traffic moving by maximising the use of existing road infrastructure to increase travel capacity	Beneficial	The Scheme would maximise the use of existing road infrastructure to increase travel capacity
LTP2 Congestion Strategy Objective 2	To achieve modal shift from the private car to more sustainable travel modes	Adverse	The Scheme would encourage car use
LTP2 Congestion Strategy Objective 3	To manage demand and reduce the need to travel	Adverse	The Scheme would increase demand
LTP2 Congestion Strategy Objective 4	To increase or build new transport capacity where appropriate	Beneficial	The Scheme would build new transport capacity in an appropriate way, given its recommendation in the ORBIT MMS.
Policy Objective A of LTP2 Theme 1: Transport, Growth And The Economy	To deliver the strategic transport infrastructure to support sustainable growth, balance housing and employment growth, and minimise growth in commuting	Beneficial	The Scheme would deliver a key piece of strategic transport infrastructure to support sustainable growth, balance housing and employment growth, but it might encourage growth in commuting
Policy Objective B of LTP2 Theme 1: Transport, Growth And The Economy	To ease or prevent congestion to enable the efficient movement of people and goods and support sustainable economic development	Beneficial	The Scheme would ease congestion on the M25 to enable the efficient movement of people and goods and support sustainable economic development

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Hertfordshire Local Transport Plan 2 2006/07 – 2010/11, March 2006			
Vision	To provide a safe, efficient and affordable transport system that allows access for all to everyday facilities. Everyone will have the opportunity and information to choose the most appropriate form of transport and time of travel. By making best use of the existing network we will work towards a transport system that balances economic prosperity with personal health and environmental well being	Beneficial	The Scheme would help to provide a safe, efficient and affordable transport system that allows access for all to everyday facilities. It also makes the best use of the existing network
Local Transport Plan Objective 1	To improve safety for all by giving the highest priority to minimising the number of collisions and injuries occurring as a result of the transport system	Beneficial	The Scheme would reduce accidents and improve safety
Local Transport Plan Objective 2	To obtain the best use of the existing network through effective design, maintenance and management	Beneficial	The Scheme would make the best use of the existing network by widening the M25 within highway land limits
Local Transport Plan Objective 3	To manage the growth of transport and travel volumes across the county, and thereby secure improvements in the predictability of travel time	Adverse	The Scheme would not manage the growth of transport and travel volumes across the county and it might encourage growth in commuting
Local Transport Plan Objective 4	To develop an efficient, safe, affordable and enhanced transport system which is attractive, reliable, integrated and makes best use of resources.	Beneficial	The Scheme would help to develop an efficient, safe, affordable and enhanced transport system which is attractive, reliable, integrated and makes best use of resources
Local Transport Plan Objective 5	To develop a transport system that provides access to employment, shopping, education, leisure and health facilities for all, including those without a car and those with impaired mobility	Beneficial	The Scheme would improve access to employment, shopping, education, leisure and health facilities, but not for those without a car and those with impaired mobility

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Local Transport Plan Objective 6	To ensure that the transport system contributes towards improving the efficiency of commerce and industry and the provision of sustainable economic development in appropriate locations	Beneficial	The Scheme would contribute towards improving the efficiency of commerce and industry and the provision of sustainable economic development in appropriate locations
Local Transport Plan Objective 7	To mitigate the effect of the transport system on the built and natural environment and on personal health	Beneficial	The Scheme design seeks to mitigate the effect of the transport system on the built and natural environment and on personal health
Local Transport Plan Objective 8	To raise awareness and encourage use of more sustainable modes of transport through effective promotion, publicity, information and education	Neutral	The Scheme does not assist with this policy objective.
Local Transport Plan Objective 9	To reduce the need for the movement of people and goods through integrated land use planning, the promotion of sustainable distribution and the use of telecommunications.	Neutral	The Scheme does not assist with this policy objective.
Regional Planning Policy			
Government Office for the South East (GoSE), March 2001, (Adopted) Regional Planning Guidance for the South East (RPG9)			
Policy Q6: Management and the Provision of Services	Key agencies throughout the Region can improve the environment by a variety of measures including: management of local air quality and reducing incidents of noise pollution	Adverse	There are five Air Quality Management Areas along this section of the M25. The Scheme aims to improve journey time reliability and would allow vehicles to work more efficiently. An increase in traffic flows would occur with the Scheme. No exceedances of the EU Limit Values are predicted in either opening year (2012) scenarios for NO ₂ and PM10. Low noise road surfacing would be provided throughout the Scheme. In locations where traffic noise levels are expected to increase to a threshold triggering mitigation measures, additional Environmental Barriers or home insulation would be provided.

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<p>Policy E1: Areas of International and National Importance for Nature Conservation, Landscape and Cultural Value</p>	<p>Priority should be given to protecting areas designated at international/national level for their nature conservation value, landscape quality, or their cultural importance.</p> <p>Development plans should accord with guidance in PPG7 in protecting/enhancing areas designated for their landscape value – Areas of Outstanding Natural Beauty (AONB); or cultural importance</p>	<p>Neutral</p>	<p>The Scheme would not have significant effects on areas of international and national importance for nature conservation or cultural value. The Scheme passes through an extremely small portion of the extreme eastern edge of the Chilterns AONB between Junctions 18 and 19. Although slight adverse impacts on the Chilterns AONB are anticipated at the opening year due to loss of screening vegetation, these would not be apparent in the design year.</p>
<p>Policy E2: Biodiversity</p>	<p>The Region's biodiversity should be maintained and enhanced with positive action to achieve the targets set in national and local biodiversity action plans</p>	<p>Adverse</p>	<p>The Scheme would result in a net loss of habitat. Mitigation measures, such as translocation of species and replacement of vegetation within Secretary of State land, are proposed. Mitigation measures largely relate directly to BAP species. However, they are limited by the amount of land available to the Highways Agency. There is also potential for indirect impact on adjacent sites (due to changes in local conditions). The Scheme would contribute to 18 HABAP targets for species and 10 HABAP targets for habitats. However the Scheme is within an existing route corridor and the overall impact on these policies would not be significant.</p>
<p>Policy E5: Wider Countryside</p>	<p>Woodland habitats in the Region should be increased whilst protecting the biodiversity and character of existing woodland resources</p>	<p>Adverse</p>	<p>Ancient woodlands are located adjacent to the Scheme. Buffer vegetation would be retained and be provided to protect the woodlands and minimise secondary effects. As the Scheme is located in an existing route corridor, and works are confined to the existing highway boundary, any potential adverse impacts on the woodlands would be indirect and would not be significant.</p>

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<p>Policy E7: Air and Water Quality</p>	<p>Local authorities should work with the Environment Agency and others to play a positive part in pollution control and encourage measures to improve air quality.</p> <p>Local authorities should ensure at the planning application stage, that air quality is taken into account where appropriate.</p>	<p>Adverse</p>	<p>The Scheme would maintain and improve overall existing drainage quality and flow rates through the use of attenuation ponds and bio retention swales/ditches.</p> <p>AQMAs have been declared in South Bucks; Three Rivers; St Albans and Hertsmere along the M25. The Scheme would improve journey time reliability and ease congestion and would allow vehicles to operate more efficiently. No exceedances of the EU Limit Values are predicted in either opening year (2012) scenarios for NO₂ and PM10. However, traffic flows would increase with the Scheme.</p>
<p>Policy RE3: Economic Success and Human Resources</p>	<p>Development plans should take account of local economic development strategies, which need to reflect local capacity in terms of ... transport capacity.</p>	<p>Beneficial</p>	<p>The Scheme would ease current levels of congestion, and increase the capacity of the transport corridor.</p>
<p>Policy INF1: Flooding</p>	<p>Development should be guided away from areas at risk from flooding</p>	<p>Neutral</p>	<p>The Scheme would maintain existing flow rates and includes attenuation ponds to mitigate risk of flooding.</p>
<p>Policy MON1: Monitoring</p>	<p>Regular and effective monitoring of regional circumstances should be undertaken involving the use of targets and indicators to measure the effectiveness of policies.</p> <p>Potential Target: Year on year improvements in pollution levels</p> <p>Potential Indicator: Air and Noise pollution levels</p>	<p>Adverse</p>	<p>The Scheme would result in increased traffic flows.</p> <p>The Scheme would lead to an overall reduction in noise levels by the design year. In locations where levels are expected to increase to a threshold triggering mitigation measures, additional Environmental Barriers and home insulation would be provide as appropriate. Low noise road surfacing would generally be provided.</p> <p>No exceedances of the EU Limit Values are predicted in either opening year (2012) scenarios for NO₂ and PM10.</p>

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Government Office for the South East (GoSE), July 2004, (Adopted) Regional Transport Strategy (Chapter 9 of Regional Planning Guidance for the South East (RPG9))			
Policy T1: Manage and Invest	Investment in upgrading the transport system should be prioritised to support the delivery of the spatial strategy by 1) supporting the function of the region's international gateways and inter-regional movement corridors.....(policy continues)	Beneficial	The Scheme would support the delivery of the spatial strategy by supporting the function of the region's international gateways and inter-regional movement corridors.....
Policy T17: Priorities for Investment	The investment programmes of delivery agencies as they affect the South East are set out in Tables 1-7, together with the potential projects that are considered to be of regional importance by the Regional Assembly....As far as possible, the location, design and construction of all new transport infrastructure projects should enhance the environment and communities affected	Beneficial	The Scheme is listed in Table 7 of Chapter 9
Government Office for the South East (GoSE), June 2006, (Adopted) Regional Planning Guidance for the South East (RPG9) – Waste and Minerals			
Policy W2: Sustainable Design, Construction and Demolition	States that development in the Region's strategic growth areas should demonstrate and employ best practice in design and construction for waste minimisation and recycling	Beneficial	Whilst not entirely located in the South East Region's strategic growth areas, the Scheme does, however, demonstrate and employs best practice in design and construction for waste minimisation and recycling

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<p>Policy W16: Waste Transport Infrastructure Waste Development</p>	<p>Documents should identify infrastructure facilities, including sites for waste transfer and bulking facilities, essential for the sustainable transport of waste materials. These sites and facilities should be safeguarded in Local Development Documents. Policies should aim to reduce the transport and associated impacts of waste movement. Use of rail and water borne transport with appropriate depot and wharf provision should be encouraged wherever possible, particularly for large facilities.</p>	<p>Neutral</p>	<p>The predominant mode of transport afforded for by the Scheme is not of a type encouraged by this Policy. Nonetheless, the Scheme does provide infrastructure that is might be considered to be essential for at least some waste transport</p>
<p>South East England Regional Assembly (SEERA), March 2006, (Draft) Regional Spatial Strategy for the South East of England (the draft "South East Plan", RSS9)</p>			
<p>Policy T1: Manage and Invest</p>	<p>States that investment in upgrading the transport system should be prioritised to support delivery of the spatial strategy by: 1) supporting the function of the region's international gateways and inter-regional movement corridors; 2) developing the network of regional hubs and spokes; 3) facilitating urban renewal and urban renaissance as a means of achieving a more sustainable pattern of development; and 4) improving overall levels of accessibility</p>	<p>Neutral</p>	<p>The Scheme would support the function of the region's international gateways and inter-regional movement corridors and would improve overall levels of accessibility. However, it would not achieving a more sustainable pattern of development</p>

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East of England Regional Assembly (EERA), December 2004 (Draft) Regional Spatial Strategy for the East of England (the draft “East of England Plan”, RSS14)			
Policy SS1: Achieving Sustainable Development	The demand for transport and other services will be managed to make the best use of existing infrastructure rather than relying upon major new infrastructure development	Beneficial	The Scheme would increase the capacity of the existing transport corridor and does not involve a major new development and therefore promotes this policy.
Policy SS6: Transport Strategy	Accessibility will be improved through maintenance, management and improvement of a multi-modal strategic transport network	Beneficial	The Scheme would increase the capacity of an existing strategic transport network.
Policy LA1: The London Arc	Development pressures will be managed to promote transport management measures to deliver sustainable patterns of movement within the Arc, particularly for major commuting flows to and from London.	Beneficial	The Scheme would increase the capacity of the existing transport corridor.
Policy TG/SE3: Transport Infrastructure	Related regional strategies, local development documents and local transport plans serving Thames Gateway/South Essex will address present and future needs to 2021, by supporting a ‘step-change’ in the provision of transportation infrastructure and accessibility as a precondition for achieving the regeneration and additional development:.....By 2011: 1) upgrades to the M25, A127 and A13, (including links with the A130 and strategic improvement on the Saddlers Farm junction) which form a strategic transport ‘loop’ serving the sub-region.....	Beneficial	The Scheme constitutes an upgrade to the M25 transport ‘loop’

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<p>Policy T1: Regional Transport Strategy</p>	<p>Transport policy will seek to:</p> <p>Improve access to jobs and services</p> <p>Enable infrastructure programmes to support existing development (addressing problems of congestion)</p> <p>Reduce the need to travel</p> <p>Minimise the environmental impact of transport provision and travel, protecting and enhancing the natural, built and historic environment</p> <p>Improve safety</p>	<p>Adverse</p>	<p>The Scheme would help improve safety and access, and improve journey time reliability, although it would not reduce the need to travel.</p> <p>In terms of the environmental impact of travel; biodiversity would be adversely affected due to removal of vegetation. The Scheme is not expected to impact on the built or historic environment.</p>
<p>Policy T8: Maintenance and management of strategic road network</p>	<p>Maintenance and management of strategic road network will seek to improve safety; enhance the environment and reduce congestion</p>	<p>Beneficial</p>	<p>The Scheme would increase the capacity of the existing transport corridor, improve journey time reliability and improve safety. Existing planting would be replaced or enhanced where the width of the Scheme corridor permits.</p>
<p>Policy T11: Environment and safety</p>	<p>Development of transport infrastructure will seek to protect and enhance the natural, built and historic environment; minimise environmental impact and improve safety.</p>	<p>Adverse</p>	<p>The Scheme would help improve safety and access, and improve journey time reliability.</p> <p>The Scheme minimises environmental impacts through enhanced and new planting. There would not be significant impacts on the built or historic environment. However adverse impacts on habitats, through net loss of land, and on visual receptors would occur.</p>
<p>Policy T17: Investment Priorities”</p>	<p>Policy T17: investment priorities Investment will be sought for the regional and sub-regional proposals in Table 8.3, as reviewed from time to time.</p>	<p>Beneficial</p>	<p>The Scheme is listed in section J (“London Arc sub-area”) of Table 8.3 as an “Investment Priority” under Policy T17 of draft RSS14.</p>

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<p>Policy ENV2: Landscape Character</p>	<p>Planning authorities will provide the strongest levels of landscape character protection for the East of England's finest landscapes and areas of national importance – including the Chilterns Area of Outstanding Natural Beauty.</p>	<p>Adverse</p>	<p>The Scheme passes through an extremely small portion of the extreme eastern edge of the Chilterns AONB between Junctions 18 and 19. The section of the M25, passing through the AONB, is located in a cutting. However, earthworks are required to construct a retaining wall, new gantries would be introduced, and adverse impacts would occur immediately after construction due to loss of screening vegetation.</p>
<p>Policy ENV4: Woodlands</p>	<p>There will be a general presumption against conversion of any woodlands to other land uses unless there are overriding public benefits.</p>	<p>Adverse</p>	<p>Ancient woodlands are located adjacent to the Scheme in a number of areas. Buffer vegetation would be retained and provided to protect the woodlands and minimise secondary effects. As the Scheme is located in an existing route corridor, and works are confined to the existing Secretary of State owned land, any potential adverse impacts on the woodlands would be indirect, and would not be significant.</p>
<p>Policy ENV5: The Historic Environment</p>	<p>Identify, protect, conserve and enhance the historic environment of the region (archaeology, historic buildings and landscapes).</p>	<p>Neutral</p>	<p>The Scheme mitigation strategy for dealing with excavation in known and unknown areas of archaeological potential would reduce any significant effects. However the effects from construction compounds, haul roads and stockpiles is currently unknown.</p> <p>The Scheme would result in noise insulation requirements at 1 Listed Building. The Scheme would not have direct effects on SAs or Conservation Areas. The Scheme design mitigates significant effects on the setting of built heritage features. Therefore the Scheme largely complies with this guidance.</p>

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Policy ENV7: Air Quality	Local Development Documents and Local Transport Plans will include policies that seek to 1) reduce or reverse the growth of motor traffic; and 2) seek to mitigate existing and potential air quality pollution problems	Adverse	AQMAs have been declared in South Bucks; Three Rivers; St Albans and Hertsmere along the M25. The Scheme would improve journey time reliability and would allow vehicles to operate more efficiently. No exceedances of the EU Limit Values are predicted in either opening year (2012) scenarios for NO ₂ and PM10. However, the Scheme would result in increased traffic flows.
East of England Regional Assembly (EERA), June 2006, East of England Plan December 2004 Examination in Public - Report of the Panel			
Recommendation R8.1	To recast and replace the RTS Policies T1 to T17 with a set of revised set of policies (Policies T1 to T15).	Neutral	None.
New Policy T15 ("Transport Investment Priorities")	States that investment in transport schemes in the region will be prioritised according to the contribution they make to achieving the RTS objectives in Policy T1, and to achieving the priorities and objectives set out in (a) Policies T2 to T14 and (b) the transport priorities contained in the policies for sub-regions and Key Centres for Development and Change (as recommended in Chapter 5). Revisions of Local Transport Plans and future prioritisation exercises for regional transport investment should be based on these priorities. Appendix XXXX [sic] lists the regionally significant transport investment currently programmed for the region, which will be subject to review from time to time"	Beneficial	The Scheme would make a significant to achieving the RTS objectives in Policy T1, and to achieving the priorities and objectives set out in Policies T2 to T14 and the transport priorities contained in the policies for sub-regions and Key Centres for Development and Change. The Scheme also appears in the Appendix as a regionally significant transport investment currently programmed for the region
Government Office for the East of England (GoEE), December 2006, Secretary of State's Proposed Changes to the Draft Revision to the Regional Spatial Strategy for the East of England and Statement of Reasons			
Acceptance of the EIP Recommendation R8.1.	See above	Neutral	None.

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Buckinghamshire County Council, March 1996, (Adopted) Buckinghamshire County Structure Plan 2001 – 2011			
Policy BS1	States that new development will be planned so as to reduce the need to travel, in so far as this is consistent with the protection of areas of designated land-use importance such as Metropolitan Green Belt and the Chilterns Area of Outstanding Natural Beauty. To this end, a close correlation will be sought between new homes, jobs, community facilities and supporting infrastructure, with most new urban development at Milton Keynes, Aylesbury Town and High Wycombe.	Adverse	The Scheme would not reduce the need to travel
Policy BS3	New transport infrastructure will be integrated with the national and regional transport system. Through the concentration of most new development on existing urban centres and appropriate traffic management measures, particular emphasis will be placed on improving the viability of the more energy-efficient modes of transport than private cars.	Beneficial	The Scheme would be fully integrated with the national and regional trunk road transport system
Policy TR6	New road proposals will be designed to minimise the effect on nearby development of traffic noise and air pollution and to integrate the road into its surroundings with hard and soft landscaping features.....	Beneficial	The Scheme has been designed to minimise the effect on nearby development of traffic noise and air pollution and to integrate the road into its surroundings with hard and soft landscaping features

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<p>Policy TR8A</p>	<p>Proposals for trunk roads and motorways in Buckinghamshire, as determined by central government, are as follows.....b) Main Programme - M25 Junction 15-16 widening; c) to be reviewed as potentially smaller scale improvements (inter alia) - M25 Junction 16-19 widening.....</p>	<p>Beneficial</p>	<p>The Scheme implements the two proposals for the M25 in this Policy</p>
<p>Buckinghamshire County Council, June 2006, (Adopted) Buckinghamshire Minerals and Waste Local Plan 2004-2016</p>			
<p>Policy 30</p>	<p>States that, wherever practicable, the County Council will seek the use of rail, waterways, conveyors or pipelines in preference to the use of roads for the transport of bulk materials. Proposals must therefore demonstrate that alternative means of transport to roads have been considered, and will be used where practicable. Where a proposal can only be served by road, the County Council will only grant planning permission for minerals and waste development where the material is capable of being transported to and from sites by the Strategic Highway Network (SHN) as defined in the adopted County Structure Plan and Local Transport Plan.....</p>	<p>Neutral</p>	<p>The Scheme improves a section of the Strategic Highway Network that might be considered to be a key alternative to rail, waterways, conveyors or pipelines for the transportation of bulk materials</p>

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Hertfordshire County Council, April 1998, (Adopted) Hertfordshire Structure Plan Review 1991 – 2011			
Policy 26: Primary Routes and Through Traffic	States that the aim will be to secure the most efficient and effective use of primary routes through traffic will be encouraged to use these routes and capacity improvements may be made to this end, so long as they are environmentally acceptable and in the context of a package approach designed to optimise overall use of the network without significantly increasing the overall capacity of the system. Formation of vehicular access to primary routes to facilitate development will be permitted only in very special circumstances. Heavy goods vehicles will be encouraged to use the primary route network	Beneficial	The Scheme would be a capacity improvements to a primary route that would be environmentally acceptable and in the context of a package approach designed to optimise overall use of the network without significantly increasing the overall capacity of the system
Policy 33: Trunk Road Programme”	States that the Secretary Of State for the Department Of Environment, Transport And The Regions proposes to carry out the following schemes - 1996 Trunk Road Programme: M1 Junctions 6a - 10 Widening; M25 Junctions 16-19 Widening; A1 (A) Junctions 6-8 Widening	Beneficial	The Scheme implements the proposal for the M25 in this Policy
Hertfordshire County Council, February 2003, (Deposit Draft) Hertfordshire Structure Plan Alterations 2001 – 2016			
Policy 1: Sustainable Development	The general aim will be to (inter alia): iv) avoid pollution in all its forms v) reduce road traffic growth, and encourage walking, cycling and passenger transport in preference to the private car	Adverse	Pedestrians and cyclists are prohibited from using the motorway, and so the nature of the Scheme does not require provisions to be made for them. A number of public rights of way cross the Scheme corridor, and would be retained. However the Scheme does not comply with the objective to encourage alternative methods of transport.

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<p>Policy 5: The Green Belt</p>	<p>In the green belt there is a presumption against inappropriate development, permission will not be given, except in special circumstances, for purposes other than in PPG2</p>	<p>Neutral</p>	<p>The Scheme is considered to constitute appropriate development, for which very special circumstances are not required to be justified. This is due to the fact that the Scheme is not considered to significantly adversely affect any of the five specific purposes of including land in Green Belts nor any of the six objectives for the use of land in the Green Belt.</p>
<p>Policy 22: Reduction of Travel Need and Car Usage</p>	<p>Aim is to reduce growth in road traffic, and: ii) Make full use of the existing road network iv) increase the proportion of journeys made by alternative modes of transport to the car</p>	<p>Adverse</p>	<p>The Scheme would improve journey time reliability within an existing transport corridor. As a result, it would also facilitate a corresponding growth in traffic volume. The nature of the Scheme does not contribute to non-car based journeys, but it would maximise the capacity of the existing road network.</p>
<p>Policy 26: Primary Routes and Through Traffic</p>	<p>Aims to make most efficient and effective use of primary routes. Capacity improvements may be made so long as they are environmentally acceptable</p>	<p>Beneficial</p>	<p>The Scheme would improve the capacity, and therefore the efficiency and effectiveness, of a primary route.</p>
<p>Policy 38: Critical Capital and other Important Environmental Assets</p>	<p>The Chilterns AONB will be given protection from development and other proposals which would cause loss, permanent damage or significant and irreversible change to those particular characteristics and features that define their special quality. The degree of protection given will be appropriate to status.</p>	<p>Adverse</p>	<p>The Scheme passes through an extremely small portion of the extreme eastern edge of the Chilterns AONB between Junctions 18 and 19. The section of the M25 passing through the AONB is located in a cutting and some widening has already occurred and new planting is proposed. However, earthworks are required in order to construct a retaining wall, new gantries would be introduced, and the visual impact would be greatest immediately after construction due to temporary loss of screening vegetation. Introduction of continuous lighting would have an adverse nighttime effect.</p>

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<p>Policy 39: The Water Environment</p>	<p>Development proposals should protect/enhance water resources. Development proposals are acceptable where:</p> <p>would not have adverse impact on quality of ground water</p> <p>development is not at risk from flooding / does not increase flooding anywhere else</p>	<p>Beneficial</p>	<p>The existing drainage system provides minimal treatment. The new Scheme proposes attenuation ponds and bioretention swales/ditches. The quality of motorway discharge would be maintained with the Scheme in place and improved in some locations. The Scheme would maintain existing flow rates.</p>
<p>Policy 41: Tree and Hedge cover</p>	<p>To protect existing tree and hedge cover.</p>	<p>Adverse Not Significant</p>	<p>The Scheme would result in a net loss of habitat. Mitigation measures, such as the translocation of species and the replacement of vegetation within Secretary of State land are proposed. However, they are limited by the amount of land available to the Highways Agency. Where feasible, existing tree and hedge cover is retained.</p>
<p>Policy 42: Chilterns Area of Outstanding Natural Beauty</p>	<p>Any development proposal which would adversely affect the special character, appearance and conservation of the AONB will not be permitted. Major development proposals, including road proposals, will be considered inconsistent with the aims of the designation as AONB, except where it is proven that the development is in the national interest and no alternative site is available.</p> <p>Within the AONB the following aims will be supported:</p> <p>vii) resist external development pressures for major roads unless there is an over-riding national need, but it is essential to seek the highest possible environmental standards and compensating improvements</p>	<p>Adverse</p>	<p>The M25 is an integral part of the strategic trunk road network and freight corridor. The Scheme is proposed to enhance this existing transport network, improving its efficiency and safety.</p> <p>The Scheme passes through an extremely small portion of the extreme eastern edge of the Chilterns AONB between Junctions 18 and 19. The section of the M25 passing through the AONB is located in a cutting and some widening has already occurred and new planting is proposed. However, earthworks are required in order to construct a retaining wall, new gantries would be introduced, and the visual impact would be greatest immediately after construction due to temporary loss of screening vegetation. Introduction of continuous lighting would have an adverse nighttime effect.</p>

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Policy 48: Rights of Way	Development proposals required to take into account need to protect / enhance the public rights of way network and safeguard its amenity value	Neutral	A number of existing rights of way – footpaths, bridleways and national/recreational trails cross the Scheme corridor. Whilst there would be a temporary closure of Park Avenue footbridge during the construction period, it would be fully reinstated. The footpath beneath Berry Lane Viaduct would be diverted . Other PRowS would not be affected by the widening Scheme.
Policy 49: Access to the Countryside	Enhancement of public rights of way network and creation of new routes for pedestrians, cyclists and/or horse-riders	Neutral	A number of existing rights of way cross the Scheme corridor. Whilst there would be temporary severance of two bridges across the M25 during the construction period, they would be fully reinstated.
Policy 51: Watling Chase Community Forest	The objectives of Watling Chase Community Forest will be supported for the purposes of landscape improvement, recreation, nature conservation, forestry and farming	Adverse	The route corridor passes through Watling Chase Community Forest. Buffer vegetation would be retained or new planting provided to protect the woodlands and minimise secondary effects of the Scheme. However, as the Scheme is located in an existing route corridor, and works are confined to the existing highway boundary, potential adverse impacts on the woodlands would not be significant.

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<p>Policy 57: Potentially Polluting Development</p>	<p>Local plans should contain policies to ensure that development proposals that would be likely to result in or significantly contribute to unacceptable levels of noise, air, light or other pollution will not be permitted.</p>	<p>Adverse</p>	<p>Increases in pollution generated by the Scheme would have suitable mitigation measures applied.</p> <p>Noise: The Scheme is likely to increase noise levels slightly. In locations where levels are expected to increase to a threshold triggering mitigation measures, additional Environmental Barriers or home insulation would be provide as appropriate</p> <p>Air: An Air Quality Management Area is declared along the M25, in South Bucks. No exceedances of the EU Limit Values are predicted in either opening year (2012) scenarios for NO₂ and PM10.</p> <p>Light: Continuous lighting would be installed with the Scheme, using efficient lanterns with less spill. Overall visual impacts on receptors are considered to be moderately adverse, and there would be a slight adverse impact on the local ecology, including protected species. However, the safety and economic benefits of lighting the currently unlit section is considered to outweigh the environmental disbenefits.</p> <p>Water: The existing situation provides minimal treatment. The new Scheme proposes attenuation ponds and bioretention swales/ditches, to maintain and improve the overall drainage water quality.</p> <p>Soil: There are a number of operating and (former) landfill sites and potentially contaminated sites, consisting of backfilled quarries, in the vicinity of the Scheme. With the adoption of appropriate mitigation no significant adverse impacts are anticipated.</p>
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Hertfordshire County Council, March 2007, (Adopted) Hertfordshire Minerals Local Plan Review 2002 – 2016			
Minerals Policy 16	States that transport proposals which include the transport of minerals to or from the development site by non-road transport such as water or rail will be supported. Mineral development will only be permitted when the provision for vehicle movement within the site, the access to the site, and the conditions of the local highways network are such that the traffic movements likely to be generated by the development including the proposed afteruse would not have an unacceptable impact on highway safety, the effective operation of the road network, residential amenity or the local environment. In assessing the likely impact of traffic movements, account will be taken of any highway improvements, traffic management or other mitigating measures that may be provided in association with the development.....	Neutral	The Scheme improves a section of the road network that might be considered to be a key alternative to rail, waterways, conveyors or pipelines for the transportation of bulk materials
Hertfordshire County Council, January 1999, (Adopted) Hertfordshire Waste Local Plan 1995-2005			
Waste Policy 8	States that in considering proposals for development, the County Council will have regard to the extent to which the development provides for the use of recycled materials where appropriate and, in particular, will seek, encourage and support the increased use of recycled waste materials in place of natural aggregates	Beneficial	The Scheme would use recycled materials where appropriate and seek to use recycled waste materials in place of natural aggregates.

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<p>Waste Policy 9</p>	<p>States that the provision of temporary inert recycling facilities will be encouraged at demolition, dredging, construction and highway projects subject to other development plan policies, particularly those relating to environmental and other effects</p>	<p>Beneficial</p>	<p>The Scheme would utilise temporary inert recycling facilities during construction subject to other environmental and other effects</p>
<p>Regional “Other” Policy</p>			
<p>South East England Development Agency (SEEDA), March 2006, The Regional Economic Strategy for the South East 2006-2016 – A Framework for Sustainable Prosperity</p>			
<p>Objective 1: Global Competitiveness</p>	<p>Investing in success through assisting more businesses to operate internationally and maximising the South East’s share of foreign direct investment; increasing business expenditure on research and development, and encouraging greater collaboration with the region’s knowledge base; increasing the percentage of total South East business turnover attributable to new and improved products and services; and securing the infrastructure needed to secure continued prosperity</p>	<p>Beneficial</p>	<p>The Scheme would assist this policy objective because it would improve accessibility and reduce journey times, thereby improving business operations</p>

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Objective 2: Growth	Smart	Lifting underperformance through increasing the region's stock of businesses; maximising the number of people ready for employment at all skill levels, and ensuring they are equipped to progress in the labour market; increasing the participation of South East businesses (especially small businesses and social enterprises) in tendering for public sector contracts; reducing road congestion and pollution levels by improving travel choice, promoting public transport, managing demand and facilitating modal shifts; ensuring sufficient and affordable housing and employment space of the right type and size to meet the needs of the region and create the climate for long-term investment through efficient use of land resources, including mixed-use developments; and improving the productivity of the workforce and increasing economic activity	Beneficial	The Scheme would assist this policy objective because it would help to maximise the number of people ready for employment at all skill levels and help to improve travel choice, the productivity of the workforce and increasing economic activity
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<p>Objective 3: Sustainable Prosperity</p>	<p>Supporting quality of life through reducing CO₂ emissions attributable to the South East and increasing the contribution of renewable energy to overall energy supply in the region; reducing per capita water consumption and increasing the Gross Value Added per tonne of materials entering the waste stream; achieving measurable improvements in the quality, biodiversity and accessibility of green space, open space and green infrastructure; and enabling more people to benefit from sustainable prosperity across the region and reducing polarisation between communities.</p>	<p>Neutral</p>	<p>The Scheme would not assist this policy objective because it would increase CO₂ emissions attributable to the South East. However, it might enable more people to benefit from sustainable prosperity across the region and reducing polarisation between communities</p>
<p>Transformational Action 5</p>	<p>Raising economic activity rates by addressing barriers to employment and increasing incentives to work</p>	<p>Beneficial</p>	<p>The Scheme would assist this policy objective because it would improve accessibility and reduce journey times, thereby addressing barriers to employment and increasing incentives to work</p>
<p>South East England Development Agency (SEEDA), June 2001, The Regional Sustainable Development Framework for the South East - A Better Quality of Life in the South East</p>			
<p>Vision</p>	<p>A prosperous Region delivering a high quality of life and environment for everyone, now and in the future.</p>	<p>Beneficial</p>	<p>The Scheme would assist this policy objective because directs needed transport infrastructure to an existing route, thereby minimising land take and a range of other adverse environmental effects</p>
<p>Regional Objective 2</p>	<p>To improve the health and well-being of the population and reduce inequalities in health</p>	<p>Adverse</p>	<p>The Scheme would not assist this policy objective because it would increase traffic flows leading to atmospheric pollutants linked to poor health.</p>
<p>Regional Objective 4</p>	<p>To stimulate economic revival in priority regeneration areas</p>	<p>Beneficial</p>	<p>The Scheme would assist this policy objective because it would improve accessibility and reduce journey times, thereby stimulating economic revival in priority regeneration areas</p>

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Regional Objective 9	To improve efficiency in land use, through the re-use of previously developed land and existing buildings, and encourage urban renaissance	Beneficial	The Scheme would assist this policy objective because directs needed transport infrastructure to an existing route, thereby minimising land take and a range of other adverse environmental effects
Regional Objective 10	To reduce air pollution and ensure air quality continues to improve	Adverse	The Scheme would not assist this policy objective because there would be increased traffic flows with the Scheme.
Regional Objective 11	To maintain and improve the water quality of the Region's rivers and coast	Neutral	The Scheme would not significantly assist this policy objective
Regional Objective 12	To address the causes of climate change through reducing emissions of greenhouse gases	Adverse	The Scheme would not assist this policy objective because it would increase greenhouse gases emissions
Regional Objective 13	To conserve and enhance the Region's biodiversity	Adverse	The Scheme would result in a net loss of habitat. There is also potential for indirect impact on adjacent sites due to changes in local conditions
Regional Objective 14	To protect, enhance and encourage enjoyment of the countryside	Adverse	The Scheme passes through an extremely small portion of the extreme eastern edge of the Chilterns AONB between Junctions 18 and 19. However, the effect of the Scheme on views from the AONB would not be significantly adversely affected and neither would the wider countryside around the Scheme. However, introduction of continuous lighting would have an adverse nighttime effect.
Regional Objective 15	To reduce road traffic and congestion through reducing the need to travel by car and improving travel choice	Neutral	The Scheme would help to improve travel choice and reduce road traffic and congestion but not by reducing the need to travel by car
Regional Objective 22	To ensure high and stable levels of employment so everyone can benefit from the economic growth of the Region	Beneficial	The Scheme would assist this policy objective because it would improve accessibility and reduce journey times, thereby addressing barriers to employment and increasing incentives to work

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Regional Objective 23	To sustain economic growth and competitiveness, and ensure a better distribution of economic activity across the Region	Beneficial	The Scheme would assist this policy objective because it would improve accessibility and reduce journey times, thereby ensuring a better distribution of economic activity across the Region
Regional Objective 24	To invest to secure our future prosperity and quality of life	Beneficial	The Scheme would assist this policy objective because it would help to support economic activity across the Region, thereby helping to secure future prosperity and quality of life in the Region
East of England Regional Assembly (EERA), December 2004, The Regional Economic Strategy for the East Of England - A Shared Vision			
Vision for the Region	A leading economy, founded on our world-class knowledge base and the creativity and enterprise of our people, in order to improve the quality of life of all who live and work here	Beneficial	
Goal 2	Growing competitiveness, productivity and entrepreneurship	Beneficial	The Scheme would assist this policy objective because it would help to support economic activity across the Region, thereby helping to secure future prosperity and quality of life in the Region
Goal 5	Social inclusion and broad participation in the regional economy	Beneficial	The Scheme would assist this policy objective because it would improve accessibility and reduce journey times, thereby stimulating economic revival in priority regeneration areas
Goal 6	Making the most from the development of international gateways and national and regional transport corridors	Beneficial	The Scheme would assist this policy objective because it would improve accessibility and reduce journey times, thereby making the most of the M25 regional transport corridor
Goal 8	An exemplar for the efficient use of resources	Beneficial	The Scheme would assist this policy objective because it directs needed transport infrastructure to an existing route, thereby minimising land take and a range of other adverse environmental effects

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East of England Regional Assembly (EERA), October 2001, A Sustainable Development Framework for the East Of England				
Vision		To plan for an improving quality of life for the people of the East of England which is sustainable for the long-term future and, in particular: 1) to enable its potential for economic growth to be achieved in a balanced way, in the interests of all the people of the region and the UK and beyond; 2) to spread the benefits of growth more equally, so as to reduce poverty, crime, ill health and social exclusion and reduce inequalities; 3) to foster a sense of well-being and self-worth by enabling people to achieve their full potential, and providing for rewarding employment, learning and leisure; 4) to protect and enhance the quality of the region's natural and built environment; 5) to manage the use of resources sustainably and innovatively, in order to minimise the region's global environmental impact.	Beneficial	The Scheme would improve the quality of life for the people of the East of England which is sustainable for the long-term future
Transport Objective 1	Key	To plan for a pattern of settlement and economic activity that reduces dependence on the car and maintains access to work and essential services for non-car-owners	Adverse	The Scheme would not encourage economic activity that reduces dependence on the car and maintains access to work and essential services for non-car-owners
Transport Objective 2	Key	To reduce the need to travel by car through a combination of high quality transport alternatives, particularly public transport, walking and cycling networks, but also light rail, taxi, and water	Adverse	The Scheme would not reduce the need to travel by car

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Transport Objective 7	Key	To encourage intelligent freight practices to transfer movements to rail and water, minimise empty lorry journeys, and promote local distribution of local food products	Adverse	The Scheme would not encourage intelligent freight practices to transfer movements to rail and water, or minimise empty lorry journeys, or promote local distribution of local food products
Transport Objective 9	Key	To address radial (from London) dominance of routes and promote east-west links, including rail	Neutral	The Scheme would not significantly assist this policy objective
Transport Objective 10	Key	To make best use of and support adequate maintenance of existing strategic road and rail infrastructure, to overcome congestion	Beneficial	The Scheme would assist this policy objective because directs needed transport infrastructure to an existing route, thereby making the best use of an existing strategic road

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Table C3: Local Policy

Policy	Objectives	Impact Assessment	Comment
Local Transport and Planning Policy			
South Buckinghamshire District Council, March 1999, (Adopted) South Buckinghamshire District Local Plan			
Policy GB1: Control over Development in the Green Belt	Permission will not be granted for development other than changes of use of existing buildings/land; or construction of new buildings or extensions as set out in policy.	Adverse	Much of the Scheme is contained in the green belt. Introduction of continuous lighting, new gantries and reduced vegetation cover would adversely affect the setting of the green belt. However, changes of land use are not required as the Scheme is contained in Secretary of State (SoS) land. Also, as the Scheme is proposed within an existing route corridor, the potential impact would not be significant.
Policy L6: Colne Valley Park	Proposals will only be permitted where they: 1) maintain/enhance the landscape, waterscape and townscape of the Park; and 2) safeguard existing areas of countryside from inappropriate development	Adverse	The Scheme passes through the Colne Valley Park from Junction 16 to 17, in this area the motorway is raised, and the replacement of screening vegetation is constrained. Also, new lighting is also proposed along this currently unlit section. However the Scheme is proposed within an existing route corridor, the potential impact would not be considerable.
Policy L9: Woodlands	Council will oppose proposals for clear felling which would result in the loss of woodland	Adverse	No felling of trees outside the SoS land is proposed. Ancient woodlands are located adjacent to the Scheme in the South Buckinghamshire region. Buffer vegetation would be retained and provided to protect the woodlands and minimise secondary effects. As the Scheme is located in an existing route corridor, and works are confined to the existing highway boundary, any potential adverse impacts on the woodlands would not be significant.

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Policy	Objectives	Impact Assessment	Comment
<p>Policy L10: Works Affecting Trees Covered by a Tree Preservation Order</p>	<p>Applications to fell or carry out works to trees subject to TPOs will be assessed in regard to: 1) health and stability of tree; 2) tree's contribution to character of area; 3) felling that would harm public character may be granted consent where special circumstances can be demonstrated, and alternative planting agreed.</p>	<p>Adverse</p>	<p>Tree Preservation Orders (TPOs) are designated on woodland and trees within the study corridor in South Bucks. Some areas containing TPOs would lie within the scope of works, therefore mitigation would be required to minimise the impacts. Only where it is unavoidable would the works directly impact upon a TPO.</p> <p>However, due to the online nature of the widening, the majority of the Scheme would not have a significant adverse impact.</p>
<p>Policy C8: Proposals Affecting the Setting of a Listed Building</p>	<p>Consent will not be granted for proposals which would adversely affect the setting of a Listed Building</p>	<p>Neutral</p>	<p>There are a small number of listed buildings within the 500m study corridor in this district. Noise insulation would be required at 1 Listed Building, but no other direct impacts are anticipated. Some effects on setting may occur from loss of screening and increased traffic.</p> <p>Additional planting would be provided near Junction 16 for landscaping, in order to mitigate the visual impact on the setting of Alderbourne Manor.</p>
<p>Policy C13: Nationally Important Archaeological Remains</p>	<p>Development will not be permitted where it may cause harm to a site of Nationally Important Archaeological Remains, whether scheduled or not</p>	<p>Neutral</p>	<p>There are no areas of Nationally Important Archaeological Remains in this region.</p>

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Policy	Objectives	Impact Assessment	Comment
Policy C14: Other Archaeological Remains	Proposals affecting other remains will be assessed in regard to: 1) impact of development on remains; and 2) mitigation measures	Neutral	As a result of the works being located within the existing highway boundary, and earthworks limited to that required for construction and operation, the majority of archaeological remains are likely to have been disturbed during the construction of the current M25. However there may be some disturbance to unknown archaeological remains during modifications to embankments and cutting and construction of new ponds. Impacts would be mitigated through a watching brief and programme of recording during construction.
Policy EP9: Noise Generating Development	Development which would, or have the potential to, cause noise disturbance to adjacent uses or the locality in general will not be permitted unless it can be established that the predicted ambient noise levels could be kept to acceptable levels either through the design or insulation of a structure to form a sound barrier by limitations on the type and duration of the activities to take place within or outside of any buildings on site	Beneficial	The Scheme would slightly reduce overall noise levels. Low noise road surfacing would be used, but in locations where noise levels are expected to increase to a threshold triggering mitigation measures, additional Environmental Barriers or home insulation would be provide as appropriate.
Policy EP10: Air Pollution	Development which would, or have the potential to, result in significant pollution of the air, either by itself or cumulatively together with other generators of pollution, will not be permitted.	Adverse	An Air Quality Management Area is declared along the M25, in South Buckinghamshire. The Scheme is proposed to improve journey time reliability, and therefore contribute to air quality improvements. No exceedances of the EU Limit Values are predicted in either opening year (2012) scenarios for NO ₂ and PM10. The Scheme would result in increased traffic flows.

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Policy	Objectives	Impact Assessment	Comment
Policy TR3: Pedestrian Facilities	Permission will not be granted for proposals which have adverse effects on safety and attractiveness of footpaths (including bridleways)	Neutral	A number of existing public rights of way – footpaths, bridleways and national/recreational trails – cross the Scheme corridor. Although adjacent to the motorway, there might be a slight decline in amenity, all public rights of way would be maintained.
Policy TR5: Accesses, Highway Works And Traffic Generation	States that in considering proposals involving a new or altered access onto the highway, works on the highway, the creation of a new highway or the generation of additional traffic the District Council will have regard to their effect on safety, congestion and the environment. Development will only be permitted where (a) the proposal complies with the standards of the relevant Highway Authority; and (b) the operational capacity of the highway would not be exceeded, or where the proposal would not exacerbate the situation on a highway where the operational capacity had already been exceeded; and (c) traffic movements, or the provision of transport infrastructure, would not have an adverse effect on the amenities of nearby properties on the use, quality or character of the locality in general, including rural lanes.....	Beneficial	The Scheme is proposed by the Highways Agency and aims to increase the operational capacity of the M25. Measures are included to mitigate adverse impacts of the Scheme.
Policy TR6: Traffic Calming	Council will promote opportunities for implementing road safety measures which will improve road safety and minimise the impact of traffic on the environment	Beneficial	The Scheme aims to improve journey time reliability and therefore improve safety. Mitigation measures would minimise the impact on the surrounding environment.

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Policy	Objectives	Impact Assessment	Comment
South Buckinghamshire District Council, 2003, (Adopted) South Bucks Landscape Character Assessment Report			
<p>5. River Misbourne Landscape Character Area (LCA)</p>	<p>Key common features include: • Dissection of area by two major transport corridors; east-west by the rail-line, and north-south by the M25 • The River Misbourne which descends through the valley in a series of weirs which form the main field boundaries to the medium scale field patterns in this area • The two main areas of settlement located on both sides of the valley slopes toward the south-east of the area; both Higher Denham and Baker’s Wood were built between 1938 and 1960 and display housing types typical of the 1950s.</p>	<p>Neutral</p>	<p>The Scheme would not significantly affect this LCA</p>

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Policy	Objectives	Impact Assessment	Comment
<p>6. Iver/Denham Landscape Character Area (LCA)</p>	<p>Key characteristics include: • Mixed land use of agriculture and settlement • Field patterns vary in scale across the area with small scale field patterns evident around the settlements of Denham, New Denham and Iver Heath. Medium scale field patterns surround the areas of settlement to the north and south. • Typical field boundaries are formed with ditches and hedgerows. • Medium scale town developments of Denham Green, Denham, New Denham, Iver Heath, Iver and Richings Park are located across the area; the major growth of these areas occurred in the 1930s and 1950s and were aided by rail services to and from London and by the establishment of Denham Film Studios. • Denham has been settled since Saxon times, the 14th century hall at Savay Farm still exists. • Iver is one of the district's largest parishes. The village has pre-Domesday foundations and there are numerous 16th and 17th century houses still evident within the historic core. • Dissection of area by major infrastructure corridors. The M25 and M40, two rail-lines to the north and the south, together with the Grand Union Canal. • Minimal woodland cover, primarily associated with the golf courses</p>	<p>Neutral</p>	<p>The Scheme would not significantly affect this LCA</p>

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Policy	Objectives	Impact Assessment	Comment
South Buckinghamshire District Council, September 2006, (Adopted) South Buckinghamshire Local Development Framework Core Strategy Preferred Options Document			
Preferred Policy Approach 23: Encouraging Sustainable Transport	States that “the preferred approach is to 1) encourage developments that are located to minimise the distance people need to travel; 2) improve opportunities to walk, cycle and use public transport; 3) focus non-local transport movements in South Bucks on strategic routes.....	Adverse	The Scheme would not assist with this policy
Chiltern District Council, September 1997, (Adopted) Chiltern District Local Plan			
Policy GC9: Prevention of Pollution Throughout the District	Throughout the District, Council will not grant permission for any development likely to generate unacceptable levels of air, water or ground pollution	Adverse	<p>Increases in pollution generated by the Scheme would have suitable mitigation measures applied.</p> <p>Air: No Air Quality Management Areas are declared along the M25 in Chilterns District. The Scheme is proposed to improve journey time reliability. The Scheme would result in increased traffic flows.</p> <p>Water: The existing situation provides minimal treatment. The Scheme proposes attenuation ponds and bioretention swales/ditches, to maintain and improve the overall drainage water quality.</p> <p>Soil: There are a number of operating and (former) landfill sites and potentially contaminated sites, consisting of backfilled quarries, in the vicinity of the Scheme. With the adoption of appropriate mitigation no significant adverse impacts are anticipated.</p>

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Policy	Objectives	Impact Assessment	Comment
<p>Policy GC7: Noise-generating Development Throughout the District</p>	<p>Noise-generating development will not be permitted where the noise levels resulting from that development would cause an unacceptable degree of disturbance in the vicinity of the application site.</p> <p>Council will also not permit any potentially noisy development which would adversely affect the quiet enjoyment by visitors of: 1) areas which have remained relatively undisturbed by noise nuisance and are valued for recreation and/or 2) areas of importance for nature conservation; and 3) areas containing identified features of heritage value</p>	<p>Beneficial</p>	<p>The Scheme would slightly reduce overall noise levels. Low noise road surfacing would be used, but in locations where noise levels are expected to increase to a threshold triggering mitigation measures, additional Environmental Barriers or home insulation would be provide as appropriate.</p> <p>In this region of the 500 metre study corridor, there are no areas of importance for nature conservation, or areas valued for quiet recreation.</p>
<p>Policy GB2: Development in General in the Green Belt</p>	<p>Most development in the green belt is inappropriate and there is a general presumption against such development. Permission will be refused for inappropriate development in the Green Belt.</p>	<p>Neutral</p>	<p>The Scheme is considered to constitute <u>appropriate</u> development, for which very special circumstances are <u>not</u> required to be justified. This is due to the fact that the Scheme is not considered to significantly adversely affect any of the five specific purposes of including land in Green Belts nor any of the six objectives for the use of land in the Green Belt.</p>
<p>Policy AS1: Scheduled Monuments and Other Nationally Important Unscheduled Archaeological Remains</p>	<p>Planning permission will not be granted for proposed development that would damage a scheduled monument or any other nationally important archaeological remains, or its setting</p>	<p>Neutral</p>	<p>There are no Scheduled Ancient Monuments or nationally important archaeological remains in this part of the study corridor</p>

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Policy	Objectives	Impact Assessment	Comment
Policy AS2: Other Unscheduled Archaeological Remains	Planning permission will not be granted for proposed development that would damage unscheduled archaeological remains, considered of local importance	Neutral	There are no Archaeological Notification Areas in this part of the study corridor. As a result of the works being located within the existing highway boundary, and earthworks limited to that required for construction and operation, the majority of archaeological remains are likely to have been disturbed during the construction of the current M25. However there may be some disturbance to unknown archaeological remains during modifications to embankments and cutting and construction of new ponds. Impacts would be mitigated through a watching brief and programme of recording during construction.
Policy LB1: Protection of Listed Buildings	In assessing the effects of proposals on listed buildings, regard will be had to: 1) the buildings setting and its contribution to the local scene; 2) whether the proposed works would bring substantial planning benefits for the community.	Neutral	There are a small number of listed buildings in this part of the study corridor. No direct impacts are anticipated but effects on setting would be mitigated.
Policy TW2: Consent for Works to Trees Covered by a Tree Preservation Order	Applications to carry out works to trees covered by TPOs will be assessed in regard to (inter alia) the relationship with highways....	Neutral	There are two areas designated as TPOs within the study corridor within the Chilterns District. Neither of these areas would be directly affected by the proposed widening as they lie beyond the existing highway boundary, therefore the impact on this policy is perceived to be neutral.
Policy TR1	States that all major development and, as far as is practicable, all other development should be located in areas which are served by public transport. Where development proposals are acceptable in accordance with this Policy, other policies in this Local Plan should also be complied with. This Policy applies throughout the District	Neutral	The Scheme would not significantly assist with this policy.

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Policy	Objectives	Impact Assessment	Comment
Chiltern District Council, May 2006, (Adopted) Core Strategy Preferred Options Paper			
Preferred Option 33: Improving Transport and Accessibility	States that.....ii) the Council will work with partners to provide a range of transport choices for local residents, aimed at reducing the reliance on the private car. Within the rural areas of the District, where traditional forms of public transport are no longer viable, the Council will work with partners to ensure appropriate transport alternatives are provided.....	Adverse	The Scheme would not reduce the reliance on the private car
Three Rivers District Council, 2002, (Adopted) Three Rivers Local Plan 1996-2011			
Policy N5: Flood Prevention and River Corridors	In areas at risk from flooding, the proposal must include appropriate flood protection measures that will mitigate the risk of flooding and not exacerbate the risk elsewhere	Neutral	The Scheme proposes attenuation ponds to reduce the risk of flooding and existing flow rates from outfalls would be maintained.
Policy N12: Air Quality	Where there is likely to be a significant adverse impact on air quality resulting from the operational characteristics of a proposed development, Council will consult with the appropriate pollution control authorities and have regard to their views. The Council may seek to enter into a planning obligation with the developer in order to mitigate the impact of a development.	Adverse	Air Quality Management Areas are declared along the M25 in Three Rivers. The Scheme is proposed to reduce journey time reliability. However, the Scheme would result in increased traffic flows.

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Policy	Objectives	Impact Assessment	Comment
<p>Policy N13: Light Pollution</p>	<p>Council will seek to minimise light pollution. Light pollution from glare and spillage should be minimised</p>	<p>Adverse</p>	<p>The motorway in this district is lit, except the link between Junctions 16 and 17, and the link between Junctions 17 and 18. The unlit section would be lit with more efficient lanterns with less spill. Overall visual impacts on receptors are considered to be moderately adverse, and there would be a slight adverse impact on the local ecology, including protected species. However, the safety and economic benefits of lighting the currently unlit section is considered to outweigh the environmental disbenefits.</p>
<p>Policy N14: Noise Pollution</p>	<p>Applications for noise-generating uses should not be sited where they are likely to cause significant disturbance to nearby noise-sensitive uses.</p> <p>Where noise-sensitive uses cannot be separated from noise-generating uses, the Council may grant consent subject to conditions, or seek to enter into a planning obligation to mitigate the effects of noise by reduction at source, or by design and layout.</p>	<p>Beneficial</p>	<p>The Scheme would reduce overall noise levels experienced by receptors. Low noise road surfacing would be used, but in locations where noise levels are expected to increase to a threshold triggering mitigation measures, additional Environmental Barriers or home insulation would be provided as appropriate.</p>
<p>Policy N18: Landscape Management</p>	<p>Development which may affect a particular feature of the landscape require management proposals to be submitted that enhance the site's contribution to the landscape</p>	<p>Adverse</p>	<p>Existing vegetation would be retained, replaced and enhanced where possible. However, the extent of mitigation measures are restricted as all work must be within Secretary of State owned land.</p>

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Policy	Objectives	Impact Assessment	Comment
Policy N19: Woodland Planting and Management	In areas of ancient semi-natural woodland, nature conservation will be afforded a high priority	Adverse	A number of areas of ancient woodland are located adjacent to the motorway, or within the 500 metre study corridor in this district. Buffer vegetation would be retained or provided to protect the woodlands and minimise secondary effects. As the Scheme is located in an existing route corridor, and works are confined to the existing highway boundary, any potential adverse impacts on the woodlands would not be significant.
Policy N20: Protection of the Chilterns AONB	Within the Chilterns AONB, Council will give priority to conservation/enhancement of the existing landscape. Major development proposals affecting the Chilterns AONB will be regarded as inconsistent with the aims of the designation, except where it is proven that the development is in the national interest and no alternative site outside the AONB is available. Development will only be permitted in the Chilterns AONB where there is no harm to the natural beauty of the landscape	Adverse	The Scheme passes through an extremely small portion of the extreme eastern edge of the Chilterns AONB between Junctions 18 and 19. The section of the M25 passing through the AONB is located in a cutting and some widening has already occurred and new planting is proposed. However, earthworks are required in order to construct a retaining wall, new gantries would be introduced, and the visual impact would be greatest immediately after construction due to temporary loss of screening vegetation.
Policy N22: Colne Valley Regional Park	Council will have regard to the following aims: Enhancement of the landscape in term of scenic and conservation value, and public amenity	Adverse	The Scheme is within an existing route corridor. The Scheme would require the removal of screening vegetation. Existing vegetation would be enhanced, and replaced where possible, but the extent of this work is restricted by the width of the Scheme corridor.

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Policy	Objectives	Impact Assessment	Comment
Policy N23: Landscape Regions	<p>Within the Chilterns, Council expects development to make a positive contribution to the protection and enhancement of the high quality landscape.</p> <p>Within the Central River Valleys Region, Council encourages proposals which lead to reduction of impact of structures and land use detrimental to the landscape</p>	Adverse	Existing vegetation would be enhanced and replaced where possible. The impact would be greatest immediately after construction due to removal of screening vegetation required to accommodate the Scheme. New gantries and continuous lighting would affect the landscape but the Scheme is located within an existing transport corridor, and therefore potential impacts on landscape quality are not significant.
Policy C2: The Setting of Conservation Areas	Proposals outside the boundary of a Conservation Area should not adversely affect the setting, character, appearance of the Conservation Area	Neutral	There are three conservation areas in this region of the study corridor. These resources have already been partly compromised by the existing motorway. This is taken into account in the assessment along with existing mitigation, such as environmental barriers and no adverse impacts are envisaged.
Policy C9: The Setting of Listed Buildings	Planning permission will not be granted for development which adversely affects the setting of a Listed Building	Neutral	There are a number of Listed Buildings in this part of the study corridor. No direct impacts are anticipated but effects on setting would be mitigated.
Policy C14: Archaeology and Development	Development will not be permitted which is likely to adversely affect Scheduled Ancient Monuments, other national ancient monuments and their settings	Neutral	There are no Scheduled Ancient Monuments, or other national ancient monuments in this region of the study corridor
Policy GB1: Development within the Green Belt	Approval will not be given for engineering and other operations and the making of any material change in the use of land, except where these do not conflict with the purposes of including land in the green belt, and the openness of the green belt is maintained	Adverse	<p>Most of the Scheme is within the green belt in this region. Changes of land use are not generally required as the Scheme is contained in Secretary of State land.</p> <p>The setting of the green belt would be adversely affected with introduction of continuous lighting, new gantries and loss of screening vegetation. However, the potential impact would not be significant as the Scheme is proposed within an existing route corridor.</p>

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Policy	Objectives	Impact Assessment	Comment
Policy T4: New Road Schemes	<p>Council will not support any major new road schemes designed to increase capacity or reduce journey times. Works intended to reduce accidents on existing roads are welcomed, provided that net increase in traffic levels is not likely to result.</p> <p>The design of all new road schemes should provide for buses, pedestrians, cyclists and equestrians</p>	Adverse	<p>The Scheme is not a new road scheme. However it is aimed at increasing capacity in an existing transport corridor.</p> <p>As pedestrians, cyclists and horses are prohibited from using the motorway, no provisions are required for them.</p>
Policy T6: M25 Motorway	<p>States that (1) the Council is opposed to any proposal to widen the M25 motorway or construct feeder roads. (2) The Council will press for measures to reduce the environmental impact of the M25, including: (i) the use of noise-reducing surfacing and sensitively designed and sited acoustic screening; (ii) the continued monitoring of air and water pollution levels around the motorway, with remedial measures to be taken where necessary; (iii) improved landscaping adjacent to the motorway including screening tree belts of locally native species</p>	Adverse	<p>The Scheme involves widening the M25, and therefore opposes the intent of this policy.</p> <p>Low noise surfacing would be installed across the Scheme, and Environmental Barriers or home insulation would be provided where required.</p> <p>Existing planting would be retained, replanted or enhanced where available land permits. The visual impact of works would be greatest immediately after construction due to loss of screening vegetation.</p>
Policy T10: Cycling	<p>Council seeks to ensure that those responsible for the design of road improvements take the safety and needs of cyclists into account</p>	Neutral	<p>As cyclists are prohibited from using the motorway, no provisions are required for them. All public rights of way would be maintained, although those adjacent to the motorway may suffer a slight decrease in amenity.</p>

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Policy	Objectives	Impact Assessment	Comment
Policy T11: Walking	In order to encourage walking, pedestrian routes should be as direct as possible. Council may seek developers improve the local pedestrian environment when proposals may adversely affect existing pedestrian routes	Neutral	As pedestrians are prohibited from using the motorway, no provisions are required for them. All public rights of way would be maintained, although those adjacent to the motorway may suffer a slight decrease in amenity.
Policy L14: Rights of Way	All existing public rights of way will be protected. In all cases, the right of way must be kept open and safe during all during all stages of development, if necessary by a temporary diversion or by phasing of development	Neutral	A number of existing public rights of way – footpaths, bridleways and national/recreational trails cross the motorway. Although adjacent to the motorway, there might be a slight decline in amenity, all rights of way would be maintained.
Three Rivers District Council, June 2006, (Adopted) Core Strategy Issue and Options Paper			
Key Issue 7	Delivering improved and more integrated transport systems	Neutral	The Scheme would not significantly assist this policy
Dacorum Borough Council, April 2004, (Adopted) Dacorum Borough Local Plan			
Policy 4: The Green Belt	Within the Green Belt there is a presumption against inappropriate development. Inappropriate development will only be allowed where it can be demonstrated that very special circumstances exist which clearly outweigh the harm to the Green Belt	Neutral	The Scheme is considered to constitute <u>appropriate</u> development, for which very special circumstances are <u>not</u> required to be justified. This is due to the fact that the Scheme is not considered to significantly adversely affect any of the five specific purposes of including land in Green Belts nor any of the six objectives for the use of land in the Green Belt

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Policy	Objectives	Impact Assessment	Comment
<p>Policy 49: Transport Planning Strategy</p>	<p>Motor traffic volume and impacts should be reduced. Through traffic will be restricted to the Primary Road Network</p> <p>Road improvement measures will only be permitted where they meet safety, environmental or local access requirements. Schemes will not be supported solely to provide additional capacity for private cars</p> <p>Transport measures which minimise adverse environmental impact will be encouraged</p>	<p>Neutral</p>	<p>The Scheme would promote safety and primary road network objectives but would hinder reduction in traffic and capacity objectives. The proposal provides additional capacity for both private cars and freight on the M25 - an integral part of the strategic trunk road network and freight corridor. Additional capacity would encourage through traffic to use this Primary Road Network</p> <p>Over the longer term, additional capacity would facilitate increased traffic volumes. This would lead to a slight increase in air pollution in the short term. The Scheme includes mitigation measures to minimise predicted environmental impacts</p>
<p>Policy 50: Transport Schemes And Safeguarding Of Land</p>	<p>States that transport schemes are listed in the Schedule of Transport Proposal Sites and Schemes. New development proposals should take account of all schemes listed in this schedule. The land required, or expected to be required, for these schemes will be safeguarded against development for alternative uses, although some temporary uses may be acceptable. Planning permission will not be given for development which would prejudice the construction or effective operation of these schemes. New development adjacent to land required for a transport scheme should be carefully designed in relation to that scheme, having regard to matters such as building layout, noise insulation, landscaping and means of access</p>	<p>Neutral</p>	<p>The Scheme constitutes Transport Proposal</p>

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Policy	Objectives	Impact Assessment	Comment
Policy 53: Road Improvement Strategy	States that land use and road transport planning decisions will be taken in the context of the following road improvement strategy: (a) improvements to the highway network will be planned and designed in accordance with the principles in Policy 49 and the County Council's more detailed transportation objectives and policies; (b) improvements to the network and all traffic management measures will be designed to channel long distance through traffic onto the motorway and trunk roads (i.e. M1, M25, A5 and A41).....	Beneficial	The proposal provides additional capacity for the M25 - an integral part of the strategic trunk road network. Additional capacity would encourage through traffic to use this Primary Road Network
Policy 61: Pedestrians	Pedestrian route network and improvement strategies will be prepared in conjunction with the Highway Authority to create more direct, safe and secure walking routes.	Neutral	As pedestrians are prohibited from using the motorway, no provisions are required for them. All public rights of way crossings would be maintained, although those adjacent to the motorway may suffer a slight decrease in amenity
Policy 62: Cyclists	Cycle route network improvement strategies will be prepared in conjunction with the Highway Authority	Neutral	As cyclists are prohibited from using the motorway, no provisions are required for them. All public rights of way would be maintained, although those adjacent to the motorway may suffer a slight decrease in amenity
Policy 79: Footpath Network	The public footpath network will be protected, improved and promoted through joint action with the Highways Authority etc.	Neutral	A number of existing public rights of way – including footpaths and national/recreational trails – cross the Scheme corridor. All public rights of way would be maintained
Policy 80: Bridleway Network	The network of public bridleways will be protected, improved and promoted through joint action with the Highways Authority etc.	Neutral	A number of existing public rights of way, including bridleways, cross the Scheme corridor. All public rights of way would be maintained

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Policy	Objectives	Impact Assessment	Comment
Policy 96: Landscape Strategy	An attractive landscape character is sought throughout the Borough. Special regard will be paid to the effect of development proposals on views, visual impact on the countryside will be minimised.	Adverse	Existing planting would be retained, enhanced or replaced where land availability permits. The visual impact of works would be greatest immediately after construction due to loss of screening vegetation. The potential impact is lessened as the Scheme is proposed within an existing transport corridor
Policy 118: Important Archaeological Remains	Planning permission will not be granted for development which will adversely affect Scheduled Ancient Monuments	Neutral	Scheduled Ancient Monument 'Little London moated site and surrounding earthwork enclosure, Kings Langley', which also incorporates an Area of Archaeological Significance, is located in the study corridor, adjacent to Junction 20. As a result of the works being located within the existing highway boundary, and earthworks limited to that required for construction and operation, the majority of archaeological remains are likely to have been disturbed during the construction of the current M25. However there may be some disturbance to archaeological remains during modifications to embankments and cutting and construction of new ponds. Impacts would be mitigated through a watching brief and programme of recording during construction
Policy 124: Sustainable Drainage Systems	Applicants will be expected to demonstrate that they have incorporated sustainable drainage practices into their proposals. This may include: - Encouraging run-off to infiltrate the ground and the inclusion of water holding facilities	Beneficial	Availability of land limits the extent of drainage systems that would be implemented. However the Scheme would include attenuation ponds and bio retention facilities to maintain and improve the overall water quality and flow rates

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Policy	Objectives	Impact Assessment	Comment
Dacorum Borough Council, May 2004, (Adopted) Dacorum Borough Local Plan Supplementary Planning Guidance “Environmental Guidelines”			
Chapter 3: Landscaping on Development Sites	Paragraph 3.1 states that the spaces around buildings are as important as the buildings themselves to the character and amenity of an area and should be designed to a high standard. This includes the retention and enhancement of existing trees and landscaping	Beneficial	The Scheme’s landscaped spaces have been designed to a high standard
	Paragraph 3.2 states that trees, shrubs and other plants provide a setting for the building and a buffer between the development and adjoining land, and they can provide an attractive contrast to hard materials and surfaces. They may also be used to reduce noise intrusion and to screen or enhance particular views	Beneficial	The Scheme’s landscaped spaces have been designed to a high standard to provide a contrast and to seek to reduce noise intrusion and to screen or enhance particular views
	Paragraph 3.3 states that elements of the existing and proposed landscape should be an integral part of layouts, especially for residential developments.	Beneficial	The Scheme’s landscaped spaces have been designed to be an integral part of the layout
	Paragraph 3.4 states that natural boundaries comprising hedgerows and trees should be retained, as should more scattered trees throughout a site wherever appropriate	Beneficial	The Scheme’s seeks to retain as many natural boundaries (hedgerows and trees) as possible.
	Paragraph 3.5 states that applicants should consider the practicality of retaining trees at an early stage in formulating their development proposals	Beneficial	The Scheme design has taken account of this policy

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Policy	Objectives	Impact Assessment	Comment
	Paragraph 3.7 states that ground levels around trees to be retained should not normally be altered	Beneficial	The Scheme design has taken account of this policy
	Paragraph 3.9 states that very few building developments can rely solely on the retention of existing trees to create an acceptable overall appearance. The existing vegetation, along with water features and even man made features such as old walls, helps to give the site a feeling of maturity, and links past and present. New planting is also necessary	Beneficial	The Scheme design has taken account of this policy
	Paragraph 3.10 states that planting schemes should generally use species of trees and shrubs which are similar to those occurring adjacent to the development site to help buildings to blend in with their surroundings to help maintain and enhance local distinctiveness (also see the guidance on Landscape Character). Wherever possible plant species should be native to the area and local provenance and/or important for native wildlife....	Beneficial	The Scheme design has taken account of this policy
	Paragraph 3.11 states that the location of parking provision and nature of hard surfaces should be carefully chosen to enable existing trees and shrubs to survive and new planting to flourish. Planting should, however, not be positioned where landscaping can obscure cars to avoid potential car thieves to be hidden from view	Beneficial	The Scheme design has taken account of this policy

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Policy	Objectives	Impact Assessment	Comment
	Paragraph 3.12 states that landscaped areas should be designed to ensure that maintenance is straightforward and does not become a future problem. Rates of growth and ultimate size of different species and their contribution to the scene at all seasons should be borne in mind	Beneficial	The Scheme design has taken account of this policy
	Paragraph 3.14 states that landscaping also includes details of the street scene (hard landscaping) such as seats, bollards, litter bins, paving. Subtler means of delineating parking spaces than white lines on tarmac, and innovative design solutions will be encouraged.	Beneficial	The Scheme design has taken account of this policy
	Paragraph 3.15 states that care should be taken in siting street furniture, tree planting etc, so that it does not impede the movement of disabled people.	Beneficial	The Scheme design has taken account of this policy
Dacorum Borough Council, May 2004, (Adopted) Dacorum Borough Local Plan Supplementary Planning Guidance “Landscape Character Assessment for Dacorum”			
Areas 7: Sarratt Plateau	Strategy and guidelines for managing change: improve and conserve: (inter alia) promote the creation of new woodlands in the open arable landscape to provide mitigation for the M25	Beneficial	The Scheme would improve the mitigation for the M25
Area 8: Upper Gade Valley	Strategy and guidelines for managing change: improve and conserve: (inter alia) promote a clear strategy for the visual and noise mitigation of the M25 and A41	Neutral	The Scheme would not significantly assist with this policy objective

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Policy	Objectives	Impact Assessment	Comment
St Albans District Council, November 1994, (Adopted) City and District of St Albans District Local Plan Review			
Policy 1: Metropolitan Green Belt	<p>Within the Green Belt, permission will not be given for development for purposes other than: mineral extraction; agriculture; sport and recreation and other uses appropriate to rural areas.</p> <p>New development within the Green Belt shall integrate with the existing landscape. Significant harm to the ecological value of the countryside must be avoided.</p>	Adverse	<p>The Scheme is contained within the green belt in this region. Changes of land use are not generally required as the Scheme is contained in Secretary of State land</p> <p>The setting of the green belt would be adversely affected due to introduction of continuous lighting, new gantries and loss of screening vegetation with the Scheme. However, the potential impact would not be significant as the Scheme is proposed within an existing route corridor</p>
Policy 28: M1, M25, A1(M) and A5 Widening	Includes the Scheme as a “road widening scheme”. – the M25 is to be widened through the district to 4 lanes in each direction	Beneficial	This policy encompasses the aim of the M25 Scheme
Policy 82: Noise Generating Uses	All development proposals (including roads) are required to be planned so as to minimise the impact of noise nuisance both during and after development.	Beneficial	The proposed Scheme would slightly reduce overall noise levels at receptors. Low noise road surfacing would be installed throughout the Scheme. In locations where noise levels are expected to increase to a threshold triggering mitigation measures, additional Environmental Barriers or home insulation would be provide as appropriate
Policy 86: Buildings of Special Architectural or Historic Interest	In considering applications for planning permission for development which affects the setting of a listed building, Council will have regard to the desirability of preserving the setting	Neutral	There are a number of Listed Buildings in this part of the study corridor. No direct impacts are anticipated but effects on setting would be mitigated

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Policy	Objectives	Impact Assessment	Comment
Policy 103: Forestry and Woodlands	Proposals which would result in the loss of significant woodland and trees will normally be resisted.	Adverse	Ancient woodlands are located adjacent to the Scheme in a number of areas. Buffer vegetation would be retained or provided to protect the woodlands and minimise secondary impacts. As the Scheme is located in an existing route corridor and works are confined to the existing highway boundary, any potential adverse impacts on the woodlands would not be significant
Policy 105: Landscape Development and Improvement	Council will seek to secure landscape improvement and enhancement throughout the Green Belt countryside	Adverse	Existing planting would be retained, enhanced or replaced where land availability permits. The setting of the green belt would be adversely affected due to introduction of continuous lighting and new gantries along the Scheme. The visual impact of works would be greatest immediately after construction due to loss of screening vegetation. The overall potential impact is lessened due to the Scheme being located within an existing transport corridor

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Policy	Objectives	Impact Assessment	Comment
St Albans District Council, May 2006 (Adopted) Joint Issues and Options Consultation			
Paragraph 4.18	States that motorways and trunk roads are a Government responsibility, whilst Hertfordshire County Council is responsible for the rest of the road network. The M1 is now being widened between Junction 6A (the M1/M25 junction) and Junction 10 at Luton. In addition, the Government has announced its intention to widen the M25. Both motorways will have four lanes in each direction. Even with the widening, there are doubts that the motorways will be able to cope with increasing traffic flows in the long term. The Government is considering whether demand management measures should be introduced, such as area-wide road user charging or motorway tolls	Beneficial	The Scheme constitutes part of the M25 widening mentioned as a policy objective in this draft policy text
Hertsmere Borough Council, May 2003, (Adopted) Hertsmere Local Plan – Through to 2011			
Policy C1: Green Belt	There is a general presumption against inappropriate development, and such development will not be permitted unless very special circumstances exist. Development proposals will be assessed against the requirements of PPG2	Neutral	The Scheme is considered to constitute <u>appropriate</u> development, for which very special circumstances are <u>not</u> required to be justified. This is due to the fact that the Scheme is not considered to significantly adversely affect any of the five specific purposes of including land in Green Belts nor any of the six objectives for the use of land in the Green Belt

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Policy	Objectives	Impact Assessment	Comment
Policy C10: Landscape Character	Proposals for development in the wider countryside, Council promotes enhancement of local landscape character. It will require conservation and enhancement of woodlands, grasslands, trees etc	Adverse	<p>Existing planting would be retained, enhanced and replaced where possible. The visual impact of works would be greatest immediately after construction due to loss of screening vegetation. The overall potential impact is lessened due to the Scheme being located within an existing transport corridor</p> <p>An area of ancient woodland is located adjacent to the Scheme in this district. Buffer vegetation would protect the woodland and minimise secondary impacts. As the Scheme is located in an existing route corridor and works are confined to the existing highway boundary, any potential adverse impacts would not be significant</p>
Policy M1: Movement Management	Council will work to implement integrated transport strategies which support, where possible, alternatives to the private car	Neutral	The Scheme does not promote alternatives to the private car. However, it is located within an established route corridor, and does not further interfere with other non-vehicular modes of transport

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Policy	Objectives	Impact Assessment	Comment
<p>Policy M2: Development and Movement</p>	<p>States that development proposals will only be permitted in locations where good access exists, or can be created, to passenger transport services, pedestrian and cycle routes, and where the highway network and the environment can accommodate the amount and type of transport movement likely to be generated. Development will not be permitted if: (i) the scheme would cause or add significantly to road congestion; (ii) the scheme would cause or add to safety problems for road users including non-motorised users; (iii) the traffic or parking generated by the development would adversely affect the quality of the surrounding environment; (iv) the site is poorly related to passenger transport services and the development has inadequate facilities for cyclists and pedestrians, or does not incorporate measures to improve such accessibility</p>	<p>Beneficial</p>	<p>Whilst the Scheme is not the most obvious target for this policy, it would seek to reduce road congestion and safety problems for road users including non-motorised users</p>
<p>Policy M5: Pedestrian Needs</p>	<p>Journeys on foot will be encouraged. This will be achieved by: providing a safe, direct and useable network of paths; ensuring that those responsible for the design of road schemes take into account the needs and safety requirements of pedestrians</p>	<p>Neutral</p>	<p>As pedestrians are prohibited from using the motorway, no provisions are required for them. All public rights of way would be maintained, although those adjacent to the motorway may suffer a slight decrease in amenity</p>

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Policy	Objectives	Impact Assessment	Comment
Policy M6: Cyclists	The use of cycles will be encouraged by: providing a safe, direct and useable network of cycle routes; ensuring that those responsible for the design of road schemes take into account the needs and safety requirements of cyclists	Neutral	As cyclists are prohibited from using the motorway, no provisions are required for them. All public rights of way would be maintained, although those adjacent to the motorway may suffer a slight decrease in amenity
Policy M8: Rights of Ways - Existing	Council will work to ensure that the existing rights of way network is retained, maintained and enhanced	Neutral	A number of existing public rights of way – footpaths, bridleways and national/recreational trails – cross the Scheme corridor. Although adjacent to the motorway, there might be a slight decline in amenity. All public rights of way would be maintained
Policy E10: Archaeology – Nationally Important Sites	Planning permission will not be granted for development that will affect Scheduled Ancient Monuments, or other nationally important archaeological sites and monuments and their settings	Neutral	A Scheduled Ancient Monument – Colney Chapel Moated Site (London Colney) is located within the study corridor in this region, between Junctions 21 and 22. No direct impacts would occur. Since the Scheme is located within an existing transport corridor impacts on the setting would be mitigated through planting
Policy E11: Archaeology – Sites of Less Than National Importance	Permission will only be granted for development which affects archaeological remains of less than national importance or their settings, if the merit of the development outweighs the importance of the remains	Neutral	There are a small number of non-statutory areas of Archaeological Notification Areas situated within the 500 metre study corridor in this region. Although, as a result of the works being located within the existing highway boundary, and earthworks limited to that required for construction, the majority of sites are likely to have been already disturbed during the construction of the current M25. Any archaeological remains would be preserved through record during a watching brief

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Policy	Objectives	Impact Assessment	Comment
Policy E16: Listed Buildings – Development Affecting the Setting of a Listed Building	Planning permission will be refused for any development which would materially affect the setting of a listed building	Neutral	A number of Listed Buildings are located within the 500 metre study corridor in this district. No direct impacts are anticipated but effects on setting would be mitigated
Policy E27: Conservation Areas – Adjacent Development	In determining applications for development adjacent to Conservation Areas, consideration will be given to the character and appearance of the Conservation Area. Permission will be refused for development that will adversely affect its setting.	Neutral	The London Colney Conservation Area is located in this part of the route corridor but no impacts on its setting are anticipated
Policy D1: Watercourses	Development will not be permitted where it would have an adverse impact on the Borough's watercourses, river corridors and floodplains	Beneficial	The M25 crosses Catharine Bourne and Mimmshall Brook watercourses in this district. The Scheme proposes attenuation ponds and bioretention to mitigate impacts
Policy D3: Control of Development Drainage and Runoff Considerations	A drainage impact study may be required where development is not in an area at risk of flooding, but where a risk might be created as a consequence of the development	Beneficial	The Scheme proposes attenuation ponds to reduce risk of flooding and to maintain flow rates
Policy D14: Noisy Development	New development involving noisy activities should be sited away from noise-sensitive land uses. In particular there is a need to ensure that residential properties, and nature conservation sites, are protected from the impact of noise levels. Where planning permission is granted appropriate conditions may be imposed to control noise levels emitted.	Beneficial	The proposed Scheme would reduce overall noise levels slightly at receptors. Low noise road surfacing would be installed throughout the Scheme. In locations where noise levels are expected to increase to a threshold triggering mitigation measures, additional Environmental Barriers or home insulation would be provide as appropriate

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Policy	Objectives	Impact Assessment	Comment
Policy D17: Pollution Control	Planning permission will be refused for developments in locations where: it could give rise to unacceptable levels of pollution which would adversely affect the use of other land, natural resources or the environment	Adverse	<p>- Air: One Air Quality Management Area is declared along the M25 in Hertsmere. The Scheme is proposed to improve journey time reliability, but it would result in increased traffic flows</p> <p>- Water: Increases in the permeable surface and traffic may increase the amount of pollutants reaching ground and surface waters. The existing situation provides minimal treatment. The Scheme would include improved treatment facilities to maintain the overall quality of drainage entering receiving waters</p> <p>- Ground: There are operating and (former) landfill sites and potentially contaminated sites, consisting of backfilled quarries, in the vicinity of the Scheme. If best practice is followed, these are not expected to have an impact.</p>
Policy D19: Light Pollution	In order to minimise light pollution, external lighting scheme proposals will only be approved where it can be demonstrated that: it minimises potential pollution from glare and light spillage; there would be no adverse impact on residential amenity	Adverse	The section of the M25 in this district is currently unlit in part of the link between Junctions 21A and 22, and the link between Junctions 22 and 23. These unlit sections would be lit with more efficient lanterns with less spill. Overall visual impacts on receptors are considered to be moderately adverse, and there would be a slight adverse impact on the local ecology, including protected species. However, the safety and economic benefits of lighting the currently unlit section is considered to outweigh the environmental disbenefits
Hertsmere Borough Council, February 2006, (Adopted) Issue and Options Paper			
Future Option for Hertsmere 13(b)	To reflect the high levels of car ownership in the Borough by maximising and accommodating use	Beneficial	The Scheme would help to maximise and accommodate (car) use

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Policy	Objectives	Impact Assessment	Comment
Future Option for Hertsmere 13(c)	To encourage the use of alternative modes where appropriate, acknowledging the need for car elsewhere	Adverse	The Scheme would not help to encourage the use of alternative modes
Hertsmere Borough Council, December 2006, (Adopted) Hertsmere Local Plan - Planning and Design Guide Supplementary Planning Document			
Section 5.4	Transport route should reflect urban design objectives and not just traffic consideration	Beneficial	The Scheme design has taken account of this policy
Local "Other" Policy			
Shadow Chilterns Conservation Board (SCCB), undated, The Chilterns Area of Outstanding Natural Beauty Management Strategy - The Framework for Action 2002-2007			
Policy TR19	Promote full consideration of the potential environmental impact of highways and traffic management proposals in and adjacent to the AONB so that damaging developments may be firmly resisted.	Adverse	The Scheme passes through an extremely small portion of the extreme eastern edge of the Chilterns AONB between Junctions 18 and 19. The section of the M25 passing through the AONB is located in a cutting and some widening has already occurred and new planting is proposed. However, earthworks are required in order to construct a retaining wall, new gantries would be introduced, and the visual impact would be greatest immediately after construction due to temporary loss of screening vegetation.
Policy TR23	Promote the use of low noise road traffic surfaces on motorways	Beneficial	Low noise road surfacing is proposed as part of the Scheme.