Working on behalf of

highways england

AECOM

A428 Black Cat to Caxton Gibbet

Environmental Scoping Report

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1. INTRODUCTION

1.1. Purpose of the Report

1.1.1. As the Government-owned company responsible for the operation, maintenance and improvement of England's motorways and major A-roads, Highways England is proposing to undertake highway works to the A428 between Black Cat junction and Caxton Gibbet junction (the Scheme), located east of Bedford.

1.1.2. The Scheme involves upgrading the road network from west of the A421/A1 Black Cat junction through to east of the A428/A1198 Caxton Gibbet junction. The proposed works include the construction of a new 18.6km long offline dual two lane carriageway between Black Cat junction and Caxton Gibbet junction, with a grade separated interchange at Black Cat and grade separated junctions at Cambridge Road and Caxton Gibbet. In addition, the existing A428 trunk road between Wyboston interchange and Caxton Gibbet junction will be de-trunked and returned to local road status.

1.1.3. The Scheme is defined as a Nationally Significant Infrastructure Project under Section 14(1)(h) and Section 22(2) of the Planning Act 2008 (as amended) (PA2008) [REF 1-1] as:

- the highway will (when constructed) be wholly within England;
- the Secretary of State will be the highway authority for the highway; and
- the area of development will be greater than the relevant limit set out in subsection (4) (the relevant limit being 12.5 hectares, as the speed limit for any class of vehicle is expected to be 50 miles per hour or greater).

1.1.4. Highways England intends to make an application for a Development Consent Order (DCO) to the Planning Inspectorate (the Inspectorate) for the Scheme. The Inspectorate will examine the DCO application and will make a recommendation to the Secretary of State on whether development consent for the Scheme should be granted or refused.

1.1.5. The Scheme is subject to mandatory Environmental Impact Assessment (EIA) procedures, as set out within The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) [REF 1-2] (the EIA Regulations), as the Scheme comprises construction of a new road of four lanes and of 10km or more in a continuous length, as listed in paragraph 7(3) of Schedule 1.

1.1.6. The findings of the EIA will be reported in an Environmental Statement, which will form part of the DCO application.

1.1.7. Highways England has made a formal request to the Inspectorate, on behalf of the Secretary of State, under Regulation 10(1) of the EIA Regulations [REF 1-2] to provide its written opinion as to the scope and level of detail of the information to be provided in the Environmental Statement (the Scoping Opinion).

1.1.8. This Scoping Report accompanies the request for a Scoping Opinion and contains the information stipulated in Regulation 10(3) of the EIA Regulations [REF 1-2]. The purpose of the Scoping Report is to:

- provide a summary of the Scheme and the alternatives considered during its development to date;
- set out the scope of work and methodologies to be applied in carrying out the EIA; and

- set out the content of the Environmental Statement.

1.1.9. The content and structure of this Scoping Report reflects the requirements of the following documents:

- The Department for Transport's (DfT) National Policy Statement for National Networks [REF 1-3].
- Highways England's Design Manual for Roads and Bridges Volume 11: Environmental Assessment [REF 1-4].
- The Inspectorate's Advice Note Seven: EIA Process, Preliminary Environmental Information and Environmental Statements (Advice Note 7) [REF 1-5].

1.1.10. This Scoping Report is structured in the following manner:

- Chapter 1: Introduces the purpose of this Scoping Report and provides an overview of the Scheme.
- Chapter 2: Explains the need for the Scheme and its objectives, describes the environmental characteristics of the area within which the Scheme will be implemented, and summarises the main features and components of the Scheme.
- Chapter 3: Presents a summary of the options and alternatives considered during the design-development of the Scheme, leading to the selection of a preferred option.
- Chapter 4: Summarises consultation undertaken to date on the Scheme, and the types of engagement that will be carried out as part of the design-development and EIA processes.
- Chapter 5: Presents the overarching scope of the EIA and the general methodologies and criteria that will be applied, including any overarching assumptions and limitations adopted during the scoping exercise.
- Chapters 6 to 15: Present the technical scopes for environmental topics that will be assessed within the EIA.
- Chapter 16: Presents the technical scope of the cumulative effects assessment.
- Chapter 17: Summarises the scope of the EIA.
- Chapter 18: Contains a list of all technical terms, abbreviations and references used.
- Chapter 19: Contains a series of plans and figures which depict the design of the Scheme and its associated environmental designations, features and constraints.

1.1.11. This Scoping Report is also supported by a series of appendices containing further information and detail on matters relating to the scope of the EIA, and environmental data and records referenced as part of the scoping exercise.

1.2. Overview of the Scheme

1.2.1. The existing A428 connects communities between St Neots and Cambourne and links the East of England to important regional, national and international hubs such as the Felixstowe and Harwich ports. The route also connects Bedford, Milton Keynes and the M1 motorway to Cambridge and the M11 motorway, and is used by both local and long-distance traffic.

1.2.2. Between St Neots and Cambridge, the A428 is the only stretch of single carriageway along this route and motorists are subject to regular delays and congestion. There are

also a high number of incidents along the route, with delays on the A428 directly affecting journey times. There is also a risk of accidents resulting from unsegregated slow moving traffic such as agricultural vehicles travelling along the route.

1.2.3. Significant growth is planned in the local area, with new housing and transport developments likely to come forward in the near future which will exacerbate the current problems on this section of the road network.

1.2.4. The DfT announced in its Road Investment Strategy for the 2015-2020 period (RIS) [REF 1-6] that a scheme of improvements to the A428 near St Neots was required in order to link the A421 to Milton Keynes with the existing dual carriageway section of the A428 to Cambridge through the creation of an expressway standard link between the two cities, via Bedford.

1.2.5. Since the announcement, Highways England (formerly Highways Agency) has developed, consulted upon and assessed a range of different options for the Scheme, the purpose being to develop a solution that, on balance, best addresses the following problems and issues identified on the A428 corridor between Black Cat junction and Caxton Gibbet junction:

- Inadequate public transport options along the corridor, which has limited bus services and no parallel rail service provision.
- A lack of viable alternative east-west routes between Cambridge and other economic centres such as Milton Keynes, Northampton and Bedford.
- Poor non-motorised user provision along the corridor.
- Junctions along the corridor operating close to, or at capacity.
- Speeds on the single carriageway sections of the corridor are significantly lower than those on the dual carriageway sections, with peak hour speeds significantly lower than the rest of the day.
- Low resilience against accidents and incidents.
- A lack of driver information along the corridor.
- Safety and maintenance issues along the route.
- Flooding issues along the A1 between Black Cat junction and Wyboston.
- Constrained economic growth, as a result of the above problems.

1.2.6. Highways England confirmed its preferred option for the Scheme on 18 February 2019, the selection of which was informed by the outcomes of option assessments and feedback gathered from non-statutory public consultation held in March and April 2017.

1.2.7. In summary, the preferred option for the Scheme comprises the following components:

- A new offline dual two lane carriageway between Black Cat and Caxton Gibbet, designed to allow it to become an expressway in the future.
- A grade-separated interchange at Black Cat.
- Grade-separated junctions at Cambridge Road and Caxton Gibbet.
- A single-span bridge over the East Coast Main Line railway.
- An overbridge on the B1046 to cross the new dual carriageway.

- Local road diversions.
- Local junction and access modifications.
- New and improved drainage infrastructure.
- Vehicle recovery areas.

1.2.8. Land potentially required to accommodate these components and other measures including landscaping, ecological habitats and flood compensation areas has been identified.

1.2.9. Subject to the DCO being granted by the Secretary of State, construction works for the Scheme will commence in 2021/2022 and will continue for a period of four years, with the Scheme being open to traffic in 2025.

1.2.10. Upon completion of the Scheme, the existing A428 trunk road between Wyboston interchange and Caxton Gibbet junction will be downgraded and de-trunked, with the responsibility for its future operation and maintenance passing to the local highway authorities.

2. THE SCHEME

2.1. Need for the Scheme

2.1.1. England's strategic road network drives local, regional and national economic activity by enabling new housing and business developments to come forward, encouraging trade and attracting investment.

2.1.2. In 2013, the Government announced plans for the biggest ever upgrade of the strategic road network within Investing in Britain's Future [REF 2-1], which included proposals to significantly increase investment in road projects by 2020/2021.

2.1.3. In 2015, the Department for Transport identified the need for improvements to the strategic road network in the Road Investment Strategy for the 2015-2020 period (RIS) [REF 2-2]. Within the East of England area, the RIS [REF 2-2] outlines the case to dual the 'missing link' of the A428 between Black Cat and Caxton Gibbet, this being a strategic route for vehicles travelling east-west between Oxford and Cambridge via settlements including Milton Keynes and Bedford.

2.1.4. The section of the A1 and A428 between Black Cat junction and Caxton Gibbet junction comprises both single and dual carriageway sections of carriageway, with a relatively large number of low-capacity at-grade junctions. The section of the A428 between the Wyboston interchange and Caxton Gibbet junction is the only remaining single carriageway section.

2.1.5. The A428 suffers from congestion, particularly around the Black Cat junction but also at the Wyboston interchange and the Barford Road, Cambridge Road (St Neots) and Caxton Gibbet junctions, affecting journey time reliability.

2.1.6. Journey times between Black Cat junction and Caxton Gibbet junction are significantly longer in peak periods than in off-peak periods. This is a consequence of road sections and intermediate junctions reaching capacity, which results in delays along the route. There are also a high number of incidents, with major collision clusters at both junctions.

2.1.7. Significant traffic growth is predicted on the road network, with new developments planned in surrounding areas which are expected to contribute to an increase in future traffic flows on the A428. Without improvement, these developments are likely to exacerbate the current problems of safety, congestion and journey reliability on the route and could inhibit growth in homes and jobs along the St Neots – Cambridge corridor.

2.2. Scheme Objectives

2.2.1. The purpose of the Scheme is to address the issues of congestion, journey delays and accidents along the A428 corridor between Black Cat junction and Caxton Gibbet junction.

2.2.2. Based on the overarching objectives set out in the RIS [REF 2-2] the following objectives for the Scheme have been developed by Highways England to address the problems identified on this part of the strategic road network, and to take advantage of the opportunities that new and improved road infrastructure can deliver to local communities and the environment:

- **Enabling economic growth**: Connectivity enables economic growth. Improved journey times and reliability brings people and businesses closer together, creates job opportunities and long-term sustainable growth. Increasing road capacity now will also help to meet predicted demand in the future.

- **A safe and serviceable network**: The Scheme would improve safety for all road users and road workers. Tackling congestion helps to reduce the risk of accidents.
- **A more free-flowing network**: A free-flowing network with less congestion benefits local residents, daily commuters and businesses. The increased resilience would help the road network cope with incidents including collisions, breakdowns, maintenance and extreme weather, creating more reliable journey times for everyone.
- **An improved environment**: By focusing on the environment at the design stage, the Scheme would seek to improve the environmental impact on local communities in areas such as air quality and noise pollution. It would also mitigate any impacts on cultural heritage.
- **A more accessible and integrated network**: Ensuring the safety of cyclists, walkers and equestrians improves access and integration with neighbouring communities for everyone. The Scheme also aims to improve connections between communities and villages for those who travel by public transport.
- **Customer satisfaction**: Listening to what is important to our customers will deliver a better road for everyone and improve customer satisfaction.

2.3. Scheme Location

Location

2.3.1. Figure 2.1 in Chapter 19 illustrates the geographic location of the Scheme.

2.3.2. The Scheme will be implemented on land within the administrative areas of the following authorities, located in the east of England:

- Huntingdonshire District Council.
- South Cambridgeshire District Council.
- Central Bedfordshire Council.
- Bedford Borough Council.

2.3.3. Black Cat junction is located at National Grid Reference TL 159553, and Caxton Gibbet junction is located at National Grid Reference TL 296606.

2.3.4. The following sections describe the main designations, features and elements associated with the natural and built environment, as illustrated on Figure 2.2 and Figure 2.3 in Chapter 19 respectively.

Transportation

2.3.5. The A428 connects the Bedford Borough and the Central Bedfordshire unitary authorities with the districts of South Cambridgeshire and Huntingdonshire.

2.3.6. The A428 connects into the A1 Great North Road (A1) at the Wyboston interchange approximately 2km north of the Black Cat junction, and runs in a broadly east – west direction for approximately 17km before connecting into Caxton Gibbet junction, south of Papworth Everard.

2.3.7. Black Cat junction is a partially signalised at-grade roundabout that connects the A1 with the A421 and Bedford Road, south of Chawston. The junction comprises a two lane circulatory, with the eastern side of the junction having segregated lanes to separate A1 southbound traffic from A421 traffic. The existing roundabout at Black Cat junction has been subjected to recent improvement, with works completed in spring 2015.

2.3.8. The A421 continues west from Black Cat junction through to south of Renhold, bypassing the settlements of Great Barford and Roxton.

2.3.9. The A1 is a dual carriageway running in a north – south direction, the alignment of which lies broadly parallel with the River Great Ouse and the East Coast Main Line railway.

2.3.10. Between its junctions with the A1 north of Black Cat junction and the A1198 at Caxton Gibbet junction, the A428 comprises a single carriageway road. The route is principally accessed from the local road network via its junctions with Barford Road (south of Eynesbury), the B1428 Cambridge Road (east of St Neots), and the B1040 St Ives Road (north and west of Eltisley). A number of smaller local roads, unnamed roads and farm access tracks also connect directly onto the A428.

2.3.11. Caxton Gibbet junction comprises an at-grade junction that connects the A428 to the A1198 (Caxton Gibbet junction). East from this junction, the A428 continues as a dual carriageway towards Cambridge.

2.3.12. The East Coast Main Line railway forms a key route on the national railway network, and connects the larger settlements of St Neots (north of the A1/A428 junction) and Sandy (south of Black Cat junction).

2.3.13. The existing junctions at Black Cat and Caxton Gibbet, and the A428 between Wyboston and Caxton Gibbet, have limited facilities for non-motorised users (NMU). A section of the Sustrans National Cycle Network Route 12 connects the village of Great Barford to the west of Black Cat junction to St Neots, and passes close to the villages of Roxton, Chawston and Wyboston.

Landform, Topography and Soils

2.3.14. The A428 corridor is characterised by varying landform. Local topography at Black Cat junction, the A1 and the western extents of the A428 in the Wyboston locality is relatively flat and situated around 20m to 30m above Ordnance Datum (AOD), rising gradually to around 40m AOD near the settlement of Great Barford to the west.

2.3.15. East of St Neots, the profile of the land along the A428 corridor gradually rises in elevation before reaching 65m AOD surrounding Caxton Gibbet junction. West of St Neots, the local topography generally lies between 30m to 40m AOD.

2.3.16. South of A428 corridor, the topography of the wider landscape gradually rises to between 50m to 60m AOD, west of Abbotsley.

2.3.17. The majority of land along and surrounding the A428 corridor and to the north and west of Black Cat junction is mapped on Natural England's Agricultural Land Classification Map: Eastern Region [REF 2-3] as being best and most versatile land, comprising Grade 2 soils. Small pockets of Grade 1 soils are located around the Chawston, Wyboston and Roxton locality. An area of Grade 3 soil is located to the east of Black Cat junction, associated with the Little Barford locality.

Settlement and Land Use

2.3.18. Land use is marked by a contrast of urban development within St Neots, Eynesbury and Eaton Socon on the western extents of the A428 against the more open landscapes and smaller settlements and farms along and surrounding the remainder of the A428 corridor.

2.3.19. The A428 predominantly passes through an area characterised by agriculture, comprising a pattern of agricultural fields and pockets of plantation woodland framed by a network of hedgerows and farm access tracks.

2.3.20. Built form associated with the A1 corridor south of Eaton Socon comprises ribbon development within the settlements of Chawston and Wyboston north of the Black Cat junction, and the settlements of Tempsford and Church End south of the junction. The village of Roxton located south west of Black Cat junction comprises another area of settlement in proximity to the A1 corridor, with the larger village of Great Barford located further to the west along Bedford Road. Cambourne, located east of Caxton Gibbet junction, forms a substantial area of settlement adjacent to the dualled section of the A428.

2.3.21. The agricultural landscapes surrounding the A428 contain the dispersed villages of Little Barford, Abbotsley, Croxton, Eltisley and Caxton to the south, and the village of Yelling and the settlement of Papworth Everard to the north.

2.3.22. Commercial interests including hotels, plant nurseries, garages and local businesses are focused around the Black Cat junction, along the A1, and around Wyboston interchange. Further commercial interests including supermarkets and fast food outlets are located around the junction of the B1428 Great North Road at Little End, south of Eaton Socon. A number of individual business, residential properties and farms front onto the A428 to the east of St Neots.

2.3.23. Industrial land uses are characterised by a large electricity generating station situated east of the River Great Ouse (south of the B1043/A428 junction) at Little Barford, an industrial estate and depot adjacent to the electricity generating station, and an active aggregate quarry accessed from Black Cat junction.

2.3.24. Recreational and leisure facilities include parkland associated with Croxton Park and Roxton Park, Wyboston Leisure Park and Golf Course, driving ranges, and the Abbotsley Hotel, Golf and Country Club.

Hydrology

2.3.25. The River Great Ouse runs parallel to the A1 and the East Coast Main Line railway, and comprises an important habitat and landscape feature due to its extensive floodplain. Parts of the floodplain are subject to mineral extraction operations.

2.3.26. Hen Brook and Fox Brook are tributaries to the River Great Ouse and join the river within St Neots. Both tributaries have an associated floodplain.

2.3.27. Other watercourses include the Rockham Ditch which crosses the A421 and Bedford Road south of Black Cat junction, and South Brook which crosses the A1 south of Chawston.

Geology

2.3.28. The solid geology is characterised by the Oxford Clay Formation, formed of silicate mudstone with sporadic limestone beds.

2.3.29. There are superficial deposits and river terrace deposits associated with the River Great Ouse, comprising of sand and gravel, and alluvium deposits comprising of clay, silt, sand and gravel.

Environmental Designations

2.3.30. European sites comprise Eversden and Wimpole Woods Special Area of Conservation (SAC), located approximately 8.5km south of Caxton Gibbet junction (designated for bats, particularly barbastelle bat (*Barbastella barbastellus*)), and Portholme SAC, located approximately 10km north of the settlement of Croxton (designated for its lowland hay meadows).

2.3.31. Nationally important ecological sites include the following:

- Papworth Wood Site of Special Scientific Interest (SSSI) – located approximately 2km north of Caxton Gibbet junction.
- Elsworth Wood SSSI – located approximately 1.8km north east of Caxton Gibbet junction.
- St Neots Common SSSI – located approximately 3km north of Wyboston interchange.
- Little Paxton Pits SSSI – located approximately 4.8km north of Wyboston interchange.
- Little Paxton Wood SSSI – located approximately 5.2km north of Wyboston interchange.

2.3.32. Little Paxton Pits Local Nature Reserve comprises two separate areas of land to the east of Little Paxton, approximately 2.5km north of the B1428/A428 junction.

2.3.33. Stands of ancient woodland are located within or near to the settlements of Eltisley (approximately 900m south of the A428) and Papworth Everard (approximately 2.1km north of Caxton Gibbet junction). Further stands of ancient woodland are located approximately 1.7km north east of Caxton Gibbet junction, approximately 3.3km east and 2.8km west of Black Cat junction.

2.3.34. To the south west of the A428, a number of Scheduled Monuments are located within and in proximity to the settlements of Wyboston, Chawston, Tempsford, Roxton, Great Barford, Church End and Eaton Socon. Scheduled Monuments are also recorded south of the A428 near to the settlements of Croxton and Eltisley, and within Papworth Everard north of Caxton Gibbet junction. Further sites are also located to the south of Caxton Gibbet junction.

2.3.35. Conservation areas are associated with the towns, settlements and villages of St Neots, Yelling, Eltisley, Croxton, Caxton, Papworth Everard, Tempsford, Church End, Roxton and Great Barford.

2.3.36. Numerous listed buildings of predominantly Grade II listing are located in close proximity to the A428, with a particular focus of buildings within Croxton and Eltisley. Groups of Grade II listed buildings are also situated within Chawston and Wyboston, north of Black Cat junction, and within Roxton and Great Barford to the south west of the junction. A small number of Grade II* listed buildings are also located within the settlements of Roxton, Little Barford, Eaton Socon, Croxton, Eltisley and Caxton. The settlement of Croxton also contains the historic Croxton Park, a Grade II* listed Registered Park and Garden. The Grade I listed Barford Bridge and Causeway is located on the River Great Ouse, south of Great Barford.

2.3.37. Noise Important Areas (NIA) are located on: the A1 between Black Cat junction and Wyboston interchange; the A1 between Wyboston interchange and Little Paxton; in the locality of Church End on the A1 south of Black Cat junction; between Church End and the north of Sandy on the A1; on the A428 (the first approximately 1km east of the A428/B1428 Cambridge Road junction and the second approximately 0.7km east of Caxton Gibbet junction); and on Bedford Road between Great Barford and Roxton.

2.3.38. One Air Quality Management Area (AQMA) has been designated by Huntingdonshire District Council on St Neots' High Street, approximately 5.4km to the north of Black Cat junction. A second AQMA has been designated by Central Bedfordshire Council along a section of the A1 immediately west of Sandy, approximately 5km south of Black Cat junction.

Utilities

2.3.39. Underground gas mains, water mains, fuel pipelines and overhead electricity transmission infrastructure cross the landscapes between Black Cat junction and Caxton Gibbet junction. This infrastructure is particularly focused on land between Black Cat junction and the East Coast Main Line railway.

Development Land and Planning Applications

2.3.40. A number of areas of land within the jurisdictions of Huntingdonshire District Council, South Cambridgeshire District Council, and Central Bedfordshire Council have been allocated for future mixed use and greenspace development. These include parcels of land to the east of Black Cat junction and the A1, land adjacent to the A428 in St Neots, and land along the River Great Ouse valley north of the A428.

2.3.41. A number of significant planning applications of varying status within some of these development zones have been identified, which if consented will bring forward new housing, commercial and industrial development.

2.3.42. Plans are also being developed by the East-West Rail Company to deliver the East-West rail scheme (also known as the “Varsity Line”) between Oxford and Cambridge.

2.3.43. Further details of these planned developments and planning applications are presented within Chapter 11.

2.4. Scheme Description

Development Consent Order Site Boundary

2.4.1. The land potentially required temporarily and/or permanently for the construction, operation and maintenance of the Scheme, referred to as the Development Consent Order (DCO) site boundary, is illustrated on Figure 2.1 in Chapter 19.

2.4.2. For the purposes of scoping, the extents of the DCO site boundary currently capture what Highways England believes to be the reasonable worst case for the Scheme in terms of its landtake requirements.

Engineering Components

2.4.3. Figure 2.4 within Chapter 19 illustrates the general arrangement (engineering layout) of the Scheme.

2.4.4. The Scheme involves improving and upgrading an 18.6km stretch of the existing trunk road network from west of the A421/A1 Black Cat junction through to east of the A428/A1198 Caxton Gibbet junction.

2.4.5. The Scheme comprises new offline dual two lane carriageway (new dual carriageway) between Black Cat and Caxton Gibbet with a grade separated interchange at Black Cat and grade separated junctions at Cambridge Road and Caxton Gibbet.

2.4.6. The new dual carriageway will be an all-purpose trunk road, with a design that will allow it become an expressway in the future.

2.4.7. At Black Cat junction a new all movements grade separated interchange will be constructed to provide free-flow links for the A1 carriageway and the new A428 link through the junction. Additionally, an interchange link will be provided between the A421 eastbound carriageway and the A1 northbound carriageway.

2.4.8. The new interchange at Black Cat will be on three levels with the A1 carriageway at the lower level, passing under the circulatory carriageway of the junction gyratory. The junction gyratory will be constructed at existing ground level and the new A428

link will pass over the junction at the higher level. The existing Roxton Road Bridge will be demolished due to the need to lift the A421. A new structure, just to the west of the existing structure, to maintain the Roxton Road link to Bedford Road will be constructed.

2.4.9. As a result of the Scheme direct access onto the A1 from School Lane, Chawston Lane, Nagshead Lane and The Lane will be prevented, and the existing public access to Kelpie Marina and the Great North Road will be closed. The Scheme will provide a new local road, linking The Lane, Nagshead Lane and Chawston Lane to Bedford Road via the new Roxton Road Bridge to provide alternative, safe access. The Scheme will also provide an alternative access to Kelpie Marina, and a new link road connection from the south end of Great North Road to the new Black Cat interchange.

2.4.10. From the Black Cat interchange the Scheme comprises a new dual carriageway, which will run east across the River Great Ouse and its flood plain, passing under existing high voltage power lines before crossing over the East Coast Main Line railway.

2.4.11. Across the river and its flood plain, the new dual carriageway will be positioned on embankment via a multi-span viaduct. At the East Coast Main Line railway a new single-span bridge will be constructed.

2.4.12. After crossing the railway, the route of the Scheme changes to a northerly direction, passing to the west of the Abbotsley Golf Course and crossing the Potton Road and B1046 before turning east again to the south of the existing A428 single carriageway road.

2.4.13. A single overbridge will be provided on the B1046 to cross over the new dual carriageway. Potton Road will be diverted north from its junction with the Eynesbury Plant Hire Company, up to a new priority junction with the B1046 on the eastern side of the new dual carriageway.

2.4.14. The new dual carriageway will cross the existing A428 to the east of the existing junction with the B1428 Cambridge Road, before continuing in a north easterly direction towards the C182 Toseland Road.

2.4.15. A new grade separated junction will be constructed to the east of the existing Cambridge Road junction to provide for all movements and maintain a continuous link for the existing A428. A new overbridge will be constructed on the Toseland Road to maintain this link over the new dual carriageway.

2.4.16. After crossing Toseland Road the new dual carriageway will dip south east to cross the B1040 St Ives Road, before again crossing over the existing A428 carriageway to the east of Eltisley to run along the southern side of the existing road.

2.4.17. To the northeast of Eltisley the existing A428 will be diverted via two new roundabout junctions and a new overbridge to the northern side of the new dual carriageway. From here the existing A428 will continue east to tie-in to the existing road past North East Farm and Pembroke Farm before connecting into the new Caxton Gibbet Junction.

2.4.18. At the existing Caxton Gibbet junction, the new dual carriageway will pass on embankment to the north of the existing junction with the A1198. The new dual carriageway will then tie-in to the existing A428 dual carriageway just to the east of this junction.

2.4.19. A new grade separated all movement junction is proposed at Caxton Gibbet in addition to maintaining access to the existing fuel filling station and businesses on the south side and linking into the existing A428 on the north side. This grade separated

junction will incorporate the existing junction on the south side of the new dual carriageway, and a new roundabout will be constructed on the north side.

2.4.20. The existing A428 between St Neots and Caxton Gibbet will be downgraded and de-trunked. Responsibility for operating and maintaining the road will pass from Highways England to Cambridgeshire County Council and Bedford Borough Council on completion of the Scheme.

Earthworks

2.4.21. Earthwork slopes incorporated into the design of the Scheme vary to accommodate the profile of the new dual carriageway within the local landscape.

Landtake and Demolitions

2.4.22. Land will be required both temporarily and permanently to construct, operate and maintain the Scheme.

2.4.23. The Scheme will require the extinguishment of some existing businesses and the demolition of some existing premises. This currently includes the following:

- Extinguishment and demolition of the Travelodge – located north west of Black Cat junction.
- Extinguishment and demolition of the Shell Garage – located north west of Black Cat junction.
- Extinguishment and demolition of the A1 Keen Screens and associated businesses – located just north of Black Cat junction.
- Demolition of Brook Cottages, a Grade II listed building – located to the north of Black Cat junction and accessed off the A1 northbound carriageway.
- Extinguishment of a car wash business and demolition of a disused fuel filling garage – located to the west of Caxton Gibbet junction, on the north side of the existing A428.

Drainage and Structures

2.4.24. Appropriate locations for drainage have yet to be identified; however surface water drainage will consist of a combination of attenuation measures and kerbs and gullies to capture, direct and attenuate flows to maintain the current rates of discharge into existing watercourses.

2.4.25. As the Scheme coincides with areas at risk of flooding, areas are currently being identified for potential flood storage to compensate for the permanent loss of floodplain.

2.4.26. Structures incorporated into the Scheme include bridges and culverts, which are proposed in locations where the new dual carriageway will cross existing watercourses and the existing road network.

2.4.27. Depending on the outcomes of the Environmental Impact Assessment (EIA), barriers may be required along sections of the Scheme to reduce traffic-related noise.

Lighting, Signage and Technology

2.4.28. Lighting, signage and technology will be provided as part of the Scheme, as follows:

- Lighting will be introduced at Black Cat interchange, Cambridge Road junction and Caxton Gibbet junction.
- Existing lighting along the A1 through Black Cat interchange will be maintained.

- Variable Message Signs will be installed on the A1, A421 and new A428 approaches to Black Cat interchange.
- Closed Circuit Television Cameras will be installed to monitor Black Cat interchange, Cambridge Road junction and Caxton Gibbet junction.

2.4.29. Installation of this equipment will require improvements to be made to the communications network, for example the installation of new cabling.

Public Rights of Way, Footpaths and Crossings

2.4.30. Facilities to enable NMUs to safely cross the new road and maintain existing connectivity between public rights of way, local roads and communities are being developed for incorporation into the Scheme.

2.4.31. These facilities will comprise a combination of features such as new bridges, underpasses, footpath and bridleway diversions, crossings, and new provisions for cyclists to maintain and (where possible) enhance access along existing and proposed routes.

Environmental Measures

2.4.32. The final form and location of environmental measures to be incorporated into the Scheme will be determined through the EIA process; however, it is expected that these will likely comprise combinations of the following types of mitigation:

- Landscape – comprising elements such as woodland, trees, hedgerows, shrubs and grassland to integrate the Scheme into the local landscape, provide visual screening for sensitive receptors and compensate for features lost as a result of the Scheme.
- Ecology – comprising elements such as new and replacement habitats to mitigate impacts on protected species.
- Water – comprising sustainable drainage features to improve water quality and provide habitats for aquatic species.

Construction

2.4.33. The Scheme allows for temporary traffic management areas, temporary working and storage areas, material stockpiles, construction compounds, vehicle recovery sites, and haul roads. At this stage, several potential vehicle recovery sites have been identified; however, not all of these sites will be required as part of the Scheme.

2.4.34. At the time of preparation of this Scoping Report, there are limited details regarding the quantity of material to be excavated or material required to facilitate construction of the Scheme (referred to as the cut-fill balance); however, preliminary calculations have identified that borrow pits could be required to obtain sufficient material to improve the cut-fill balance.

2.4.35. The Scheme's contractor will require site compounds close to the Scheme for welfare facilities, materials handling and storage, and production facilities. The final compound locations have yet to be determined; however, at the current time the Scheme includes:

- a main site compound centrally between the B1046 and Cambridge Road, with access provided off the existing A428 via ether a new roundabout or left-in/left-out junction to facilitate safe vehicular access; and
- a smaller compound located north of Bedford Road near to Roxton (previously used during construction of the A421 Great Barford Bypass), which will serve

construction of the western extents of the Scheme and Black Cat interchange and will be accessed off Bedford Road.

2.4.36. The principal routes that the contractor will use to access construction working areas are expected to be the A1, A428, A1198, B1046, B1040, Bedford Road, Barford Road and Toseland Road.

2.4.37. Traffic management measures will be agreed with the relevant local authorities and employed during construction to ensure the safe movement of materials to working areas and compounds, reduce delays on other road users, and minimise interference with local traffic.

2.4.38. A continuous site traffic route will be identified within the extents of the Scheme to minimise impacts of construction traffic on local roads and at existing junctions.

2.4.39. A phased approach to construction of the Scheme will likely be adopted by the contractor.

Timescales

2.4.40. Highways England plans to formally submit the DCO application for the Scheme in early 2020, following completion of Statutory Consultation and the undertaking of design refinements and the EIA process.

2.4.41. Subject to successfully progressing through the statutory procedures associated with DCO applications, it is intended to commence construction of the Scheme in 2021/22.

2.4.42. The Scheme is planned to be open to traffic by 2025.

3. ASSESSMENT OF ALTERNATIVES

3.1. Assessment Methodologies

Background

3.1.1. The Scheme has been subjected to a staged process of option identification, assessment and selection to identify a preferred solution that best achieves the objectives presented in Chapter 2.

Initial Options Identification, Assessment and Sifting

3.1.2. In 2016, Highways England explored a number of high level opportunities to improve access along the A428 between Black Cat junction and Caxton Gibbet junction. These opportunities were categorised into the following types of intervention:

- Online options.
- Offline options.
- Combined package options.
- Public transport improvements.
- Non-motorised user options.

3.1.3. A total of 50 options were identified within these categories which were initially reviewed using a sifting spreadsheet against the criteria described below.

Assessment Against Problems

3.1.4. Each option was assessed against how it could help to resolve the identified problems and achieve the Scheme objectives.

3.1.5. The exercise was undertaken by specialists within transport planning and appraisal, highway design and environmental disciplines, and was based upon local knowledge, technical expertise, professional judgement and experience.

3.1.6. The options were scored using a spreadsheet to understand the potential benefits that could be delivered by each intervention.

Assessment Against Solutions

3.1.7. The next stage involved a scoring assessment of each option by the specialists against the following deliverability and feasibility criteria:

- Political acceptability.
- Planning.
- Implementation timescales and funding likelihood.
- Physical constraints.
- Land ownership and viability.
- Design standards.

Sifting Criteria and Sift of Options

3.1.8. The following criteria were developed to sift out those interventions that were unlikely to provide a significant contribution to the identified problems and defined objectives, or were unlikely to be deliverable or feasible:

- Overall moderate impact against identified problems.

- Overall moderate fit with route objectives.
- Likely to be deliverable.
- Likely to be feasible.

3.1.9. Based on the outcomes of the sifting, a total of 16 options from the 50 options initially identified were taken forward for further assessment; these being the interventions which met all four of the above criteria.

Early Assessment and Sifting Tool

3.1.10. The 16 options were assessed using the Department for Transport's (DfT) Early Assessment and Sifting Tool (EAST) [REF 3-1].

3.1.11. Each option was assessed using the EAST against the following:

- Strategic case – considerations within this aspect included how the options fit with wider transport objectives, their scale of impact, and uncertainties.
- Economic case – considerations within this aspect included how the options performed in relation to social and environmental factors, economic growth and wellbeing.
- Management case – considerations within this aspect included the public acceptability of the options, their practical feasibility and delivery timescales.
- Financial case – considerations within this aspect included the affordability and cost of the options.
- Commercial case – considerations within this aspect included the identification of potential funding sources for the options, and their overall flexibility.

3.1.12. The scoring outcomes of the EAST concluded that, from the 16 options evaluated, the following eight options warranted further consideration (these being the options that comprised distinct and feasible options):

- **Option C1** – A428 full offline dualling with grade separation of Black Cat junction and grade separation of Caxton Gibbet junction.
- **Option C2** – A428 full offline dualling with grade separation of Black Cat junction and signalisation of Caxton Gibbet junction.
- **Option C5** – A428 bypass to Cambridge Road junction with grade separation at Black Cat, and grade separation at Caxton Gibbet junction.
- **Option C6** – A428 bypass to Cambridge Road junction with grade separation at Black Cat junction, and signalisation at Caxton Gibbet junction.
- **Option C7** – A428 single lane carriageway bypass to Cambridge Road junction with online dualling between Cambridge Road junction and Caxton Gibbet junction, grade separation at Black Cat junction and grade separation at Caxton Gibbet junction.
- **Option C10** – Local junction widening with channelisation at existing A428 junctions, grade separation at Caxton Gibbet junction, grade separation at Black Cat junction and upgrade to existing A1 junctions.
- **Option C11** – Local junction widening with channelisation at existing A428 junctions, signalisation at Caxton Gibbet junction, grade separation at Black Cat junction and upgrade to existing A1 junctions.

- **Option C16** – A428 dual carriageway bypass to Cambridge Road junction with online dualling between Cambridge Road junction and Caxton Gibbet junction, grade separation at Black Cat junction and grade separation at Caxton Gibbet junction.

3.1.13. These eight interventions were accordingly taken forward into the next stage of option assessment.

Strategic Outline Business Case

3.1.14. The eight options were assessed qualitatively against the following five 'cases', as part of the Strategic Outline Business Case developed for the Scheme:

Case 1: Strategic fit

3.1.15. The assessment identified that all options were expected to significantly improve traffic conditions on the A428 and A1, and in particular all were likely to add capacity to congested sections of the A428 and alleviate queuing at Black Cat junction and Caxton Gibbet junction.

3.1.16. All options were also likely to aid the development goals of the region, and likely to support national, regional and local policy.

3.1.17. Option C1 was identified as having the strongest fit with policy by having the largest impact on journey times, economic growth and congestion.

Case 2: Value for money

3.1.18. All options were appraised across a range of potential monetised, qualitative and quantitative impacts, which included economic, environmental, social, and impacts on public accounts using the DfT's Transport Analysis Guidance (WebTAG) [REF 3-2].

3.1.19. The economic appraisal concluded that Option C1 would provide the greatest benefit whilst Option C10 and C11 would provide the least benefit.

3.1.20. All the options were appraised as having similar social impacts, with neutral impacts on physical activity, accidents, security, access to services, affordability, severance, and option and non-use values. The options would also have a varying degree of beneficial impact on journey quality.

3.1.21. The appraisal concluded that all options would have a mix of beneficial and adverse environmental impacts. Options C1, C2, C7 and C16 would likely have a moderate beneficial impact on noise, while Options C10 and C11 would likely have a moderate adverse impact. Options C1, C2, C5, C6, C7 and C16 were expected to have a slight beneficial impact on air quality with their offline components likely to move traffic away from sensitive receptors and residential areas, although Options C10 and C11 would not receive this benefit. All options were identified as likely to have adverse impacts on landscape, the historic environment and water environment; however, Options C10 and C11 would have a lesser impact.

Case 3: Financial case

3.1.22. Based on a budget of £1 billion, all the options fell within this budget but would have costs ranging from between £100 million to £1 billion.

Case 4: Delivery case

3.1.23. The assessment identified that Options C10 and C11 could be delivered with a single designer and contractor leading to more simple governance and risk management arrangements. It also identified that the smaller scale improvements such as Options C10 and C11 could be delivered in a shorter timescale.

Case 5: Commercial case

3.1.24. No assessment was undertaken within the commercial case due to the early stage of option development.

Summary

3.1.25. Option C1 was considered to be the best performing option for the following reasons:

- It would have the largest impact on the problems and issues affecting the operation of the route.
- It would have the best fit with government policy.
- It was estimated to have the highest level of economic benefits.
- It would have a higher level of public acceptability than other options.
- There was a robust assurance and risk management framework available.
- There was a clear and defined procurement framework available.

3.1.26. Options C1 and C2 were considered to be variants of one another, with the only difference being the level of intervention at Caxton Gibbet (grade separation compared to signalisation).

3.1.27. Options C5 and C6 were considered to be effectively the same aside from the level of intervention at Caxton Gibbet.

3.1.28. Options C7 and C16 were considered variants of one option, with the only difference being a single carriageway or dual carriageway bypass between Black Cat junction and Cambridge Road junction. These two options also provided a higher level of benefit than Options C5 and C6, although more expensive. Options C7 and C16 were expected to have a more significant beneficial impact on noise

3.1.29. Options C10 and C11 were only differentiated by the level of intervention at Caxton Gibbet junction, and were the lowest cost options.

Development and Assessment of Shortlisted Options

A428

3.1.30. As part of the next stage of development and assessment, the eight shortlisted options for the A428 were consolidated by type and renamed as Options 1 to 4 in the following manner:

- **Option 1 (C1/C2)** – Full offline dualling between Black Cat and Caxton Gibbet with a grade separated junction at Cambridge Road. Grade separation of both Black Cat and Caxton Gibbet junctions.
- **Option 2 (C10/C11)** – Minor junction improvements along the A428 at Wyboston, Cambridge Road, Croxton and Eltisley. Grade separation of both Black Cat and Caxton Gibbet junctions.
- **Option 3 (C5/C6)** – A428 bypass between Black Cat and Cambridge Road junctions. No widening between Cambridge Road and Caxton Gibbet. Grade separation of both Black Cat and Caxton Gibbet junctions.
- **Option 4 (C7/C16)** – Offline dual carriageway bypass between Black Cat and Cambridge Road and online widening between Cambridge Road and Caxton Gibbet. Grade separation of both Black Cat and Caxton Gibbet junctions.

3.1.31. Additionally, four new options (Options 5, 6, 7 and 8) were identified for development and assessment as it was identified that limited consideration had been given in the initial optioneering work to an option further south, away from the existing A428 corridor.

3.1.32. The identification of these four additional options was informed by analysis of a number of factors including, but not limited to, area of construction within flood zones, proximity to residential areas, proximity to listed buildings, the number of B- and C-classification roads crossed, safety considerations and cost.

3.1.33. The four additional options are described below, and included two offline options to the south of the A428, and two lower cost options that could be implemented separately or as part of a phased full scheme.

- **Option 5** – Full offline dualling between Black Cat and Caxton Gibbet with no connection to Cambridge Road junction. The alignment lay to the north of Abbotsley. Grade separation of Black Cat and Caxton Gibbet junctions.
- **Option 6** – Full offline dualling between Black Cat and Caxton Gibbet with no connection to Cambridge Road junction. The alignment lay to the south of Abbotsley. Grade separation of Black Cat and Caxton Gibbet junctions.
- **Option 7** – Dualling between Wyboston and the River Great Ouse crossing, and a new roundabout at Wyboston. Minor junction improvements at Barford Road and Cambridge Road. Grade separation at Black Cat junction and signalised junction at Caxton Gibbet.
- **Option 8** – Grade separation of both Black Cat and Caxton Gibbet junctions.

Black Cat Junction

3.1.34. The following options for Black Cat junction were identified and considered:

- **Option 1A** – Dumbbell roundabouts on Roxton Road with merge and diverge slips from A428 and A1 connecting to the two roundabouts.
- **Option 1B** – Dumbbell roundabouts near the existing Black Cat junction with merge and diverge slips from A428 and A1 connecting to the two roundabouts.
- **Option 1C** – Similar to Option 1B with merge and diverge on the A428 located further away from the mainline.
- **Option 1D** – Dumbbell roundabouts on Roxton Road with merge and diverge slips from A428 connecting to the two roundabouts. New roundabouts on the A1 with merge and diverge slips from A1 connecting to the new roundabout, with a side road connecting the roundabout on the A1 and southern roundabout at Roxton.
- **Option 1E** – Dumbbell roundabouts on Roxton Road and A1 with merge and diverge slips from A428 and A1 connecting to the two dumbbell roundabouts.
- **Option 2A** – Dumbbell roundabouts on Roxton Road with diverge and merge from A428 connecting to the roundabouts. Another dumbbell to the east of A1 with diverge and merge from A428 connecting to these roundabouts with southbound diverge and merge on A1 connecting to east roundabout and link roads connecting east and west roundabouts.
- **Option 2B** – One roundabout on Roxton Road with diverge and merge from A428 connecting to the roundabout. Another roundabout to the east of A1 with diverge and merge from A428 connecting to this roundabout with southbound diverge, merge on A1 and link roads connecting this roundabout.

- **Option 3A** – One roundabout at existing Black Cat junction with merge and diverge slip roads from A428 and A1 connecting the roundabout.
- **Option 3B** – Similar to Option 3A with merge and diverge on the A428 moved further away from the mainline carriageway.
- **Option 4** – Junction with slip roads and interchange links for all directions. Loop slip roads between A1 northbound and A428 eastbound as well as A1 southbound and A428 westbound.
- **Option 5** – Eastbound diverge slip and westbound link from A428 connecting to A1 northbound and southbound respectively. Southbound diverge loop from A1 connecting to A428 westbound.
- **Option 6** – Eastbound diverge link road from A428 connecting to A1 northbound and diverge slip connecting to existing Black Cat junction. Southbound diverge link road from A1 connecting to A428 westbound, and westbound merge slip on A428 connecting from the existing Black Cat junction.

Non-Statutory Consultation on Options

3.1.35. Following assessment against a number of criteria including environment, safety, constructability and accessibility, Options 1, 5 and 6 for the A428 were identified as the best performing options as they would meet the majority of the Scheme objectives, and would provide the most significant benefits with the lowest potential environmental impact. It was therefore concluded that these three options should be taken forward for further development and assessment.

3.1.36. To inform the process of assessment and non-statutory consultation, Options 1, 5 and 6 were renamed and described as follows:

- **Orange (Option 1)** – This option comprised an offline solution providing a new expressway standard link between Black Cat junction and Caxton Gibbet junction, whilst also providing a grade separated junction at Cambridge Road. The route was approximately 18.9km in length and a dual two lane all-purpose carriageway, with both Black Cat junction and Caxton Gibbet junction being grade separated. After the route crossed the East Coast Main Line, the alignment changed to a north direction for approximately 2.5km, heading towards the existing A428 and B1046/St Neots Road and on an improved two tier, grade separated Cambridge Road junction. The route then ran broadly parallel, and to the north of, the existing A428 for approximately 9km. The route crossed Toseland Road and B1040/St Neots Road, and passed through an improved Caxton Gibbet junction.
- **Purple (Option 5)** – This option comprised a wholly offline dual all-purpose carriageway running from Black Cat junction to Caxton Gibbet junction, approximately 18.4km in length. From Black Cat to Caxton Gibbet, the route was aligned east towards Abbotsley for approximately 5km. The alignment then changed to a north east direction, bypassing north Abbotsley for approximately 2km. Past Abbotsley, the route continued east for approximately 5km, passing north-west of Great Gransden. The alignment then changed to a north direction passing Eltisley to the south and joining Caxton Gibbet.
- **Pink (Option 6)** – This option comprised a wholly offline dual all-purpose carriageway running from Black Cat junction to Caxton Gibbet junction, approximately 18.4km in length. From Black Cat to Caxton Gibbet, the route was aligned directly east towards Little Gransden for approximately 7km. The alignment changed to a north east direction when it reached southern Abbotsley. The route bypassed Abbotsley to the south and continued in a north east direction for

approximately 5.5km towards the mid-point between Eltisley and Great Gransden, where it continued in a northerly direction towards Caxton Gibbet junction.

3.1.37. The horizontal alignments of the Orange, Purple and Pink route options are illustrated on Figure 3.1 in Chapter 19.

3.1.38. For Black Cat junction, the 12 options were assessed based on their constructability, safety, traffic flow and cost. The assessment accordingly concluded that the following three options should be taken forward to the non-statutory consultation:

- **Option A (Options 1A/1C)** – Forming a combination of Options 1A and 1C, this comprised a three-tiered roundabout, removing the current Black Cat junction, and involved the construction of two roundabouts to the west of the current junction. A new free-flow continuous link from the A421 eastbound towards the A1 northbound would be created along with slip roads to and from the A421, the A1 and the A428. With this option the A1 would become a free-flow continuous road going under the slip roads.
- **Option B (Option 6)** – Based on Option 6, this comprised a two-tiered roundabout, retaining the existing Black Cat junction and would create a new free-flow continuous link from the A421 eastbound towards the A1 northbound. The addition of slip roads would provide a free-flow link, bypassing the junction traffic moving southbound onto the A421 with the A1 remaining the same.
- **Option C (Option 3B)** – Based on Option 3B, this comprised a three-tiered roundabout, enlarging the existing Black Cat junction and creating a new free-flow continuous link from the A421 eastbound towards the A1 northbound. Slip roads would be built from the A421 to the A1, and the A428 and the A1 would become a continuous free-flow road under the widened Black Cat junction.

3.1.39. The three options for the A428 and Black Cat junction were assessed to identify and compare their relative advantages and disadvantages, prior to being presented to the public as part of a non-statutory consultation exercise (see Chapter 4).

3.1.40. The main outcomes of the environmental assessment of the Orange, Purple and Pink options, as presented during the non-statutory consultation, are summarised in **Table 3.1**.

Table 3.1: Summary of the Assessment of the Orange, Purple and Pink Options

Aspect	Orange Option	Purple Option	Pink Option
Length	Approximately 18.9km	Approximately 18.4km	Approximately 18.4km
Traffic	Provides a connection for St Neots which could mean a greater amount of traffic use the new route. Encourages additional traffic to travel through St Neots to access the new route. Leads to more traffic using the B645, B660 to the west of the A1, as well as Ermine Street North on the Caxton Gibbet end of the Scheme instead of the bypass.	Helps to remove traffic from local roads and near St Neots town centre. Cuts traffic on the B1042 and B1046. Leads to more traffic using Ermine Street North (towards Papworth Everard) and Ermine Street South (towards Caxton), instead of the bypass. Potential for traffic to increase during evening peak periods on some local roads to the west of the A1.	Encourages traffic to shift from other strategic routes going east or west and so would cut traffic on the B1042 and B1046. Leads to more traffic using Ermine Street North (towards Papworth Everard) and Ermine Street South (towards Caxton), instead of the bypass.
Air Quality	Removes traffic from the current single carriageway and reduces traffic through Barford Road, Great Gransden and Little Gransden. Helps shift traffic away from local roads by encouraging drivers to use the existing dual carriageway of the A421 and A428. Traffic along the existing A428 would reduce and therefore there could be air quality benefits to the communities along the A428. There is also an AQMA in the centre of St Neots.		
Cultural Heritage	Potential to impact the setting of two deserted medieval villages at Weald and Wintringham, as well as the setting of a scheduled monument near the junction with the A1198 and a Grade II listed building to the east of Cambridge Road. Reduces traffic noise and emissions around Croxton Park leading to improved noise and air quality impacts.	Potential to impact a scheduled monument near the junction with the A1198 as well as nine Grade II listed buildings. This option also passes within 500m of Abbotsley Conservation Area.	Potential to impact a scheduled monument near the junction with the A1198 as well as nine Grade II listed buildings. However the route would be further away from the Abbotsley Conservation Area than the Purple Option.
Archaeology	There is the potential for unknown archaeological remains.		
Visual Impact	Visual impact where the junction improvements are proposed at Black Cat, Cambridge Road and Caxton Gibbet. Some rural properties may be affected as well	Visual impact where the junction improvements are proposed at Black Cat and Caxton Gibbet. To the east of the River Great Ouse, visual impacts could potentially	Visual impact where the junction improvements are proposed at Black Cat and Caxton Gibbet. Potential visual impact to the east of the River Great Ouse, particularly

Aspect	Orange Option	Purple Option	Pink Option
	as public rights of way to the east of St Neots.	be experienced by rural properties on the northern edge of Abbotsley and southeast edge of Eltisley, as well as people using Abbotsley Golf Course.	for rural properties where the route is close to a number of farmsteads.
Ecology and Nature Conservation	Habitats which could be affected in the area include broadleaved woodland, lowland fen and floodplain grazing marshland.	Located within 5km of five SSSIs to the south of the route, and within 10km of the Eversden and Wimpole Woods Special Area of Conservation (SAC). Habitats which could be affected in the area include woodland and floodplain grazing pasture.	Located within 1km of Weaveley and Sand Woods SSSI. It is also within 5km of five SSSIs. This is closer than the purple option and therefore more likely to have an impact. At this distance, impacts associated with air quality change, disturbance or habitat degradation could arise. Located within 10km of Eversden and Wimpole Woods SAC. Deciduous woodland would be directly affected.
	Located next to the River Great Ouse County Wildlife Site (CWS) with the potential for impacts due to direct habitat loss, habitat degradation, changes in air/water quality, noise/light disturbance, and severance. Probable presence of protected species including bats, badgers, great crested newts and reptiles.		
Geology and Soils	Temporary and permanent loss of best and most versatile agricultural land in the area of the new routes.		
Noise and Vibration	Properties in and to the east/south east of Little Barford and north of the A428 might experience an increase in noise.	Properties on the northern side of Abbotsley are likely to experience increases in traffic noise.	Properties on the southern side of Abbotsley are likely to experience increases in traffic noise.
	Reduced noise at residential properties along the A1 and south of St Neots. Residents in Croxton and Eltisley are likely to also experience a reduction in noise.		
Rights of Way	Crosses public rights of way and requires safe crossings, diversions, or closures. There is an opportunity to improve access for pedestrians, equestrians and cyclists along the existing A428.		
Water	Requires a new crossing over the River Great Ouse. It could alter existing flood risk patterns as a result of construction within the floodplain.		
Climate Change	Designed to be more resilient to climate change, including potential for increasing capacity of drainage systems and providing surfacing more resistant to extreme weather conditions.		
Sustainable Travel	Opportunities to improve access for walkers, cyclists and equestrians along the existing A428 with the potential for a positive effect on human health.		

3.1.41. The main outcomes of the environmental assessment of the Black Cat junction options, as presented during the non-statutory consultation, are summarised in **Table 3.2**.

Table 3.2: Summary of the Assessment of the Black Cat Junction Options

Aspect	Option 1	Option 2	Option 3
Air Quality	Air quality may improve slightly in the short term as traffic reduces at Black Cat junction. Until the bypass is built, there could be increased congestion around Wyboston which could have an impact on air quality. It will also be important to consider air quality at the AQMA in St Neots.		
Cultural Heritage	Works to Tempsford Bridge could impact on the setting of the nearby scheduled monument. May affect the setting of the listed building to the north of Black Cat junction.	May result in the removal of the Grade II Listed building to the north of Black Cat junction.	
Archaeology	Potential to affect unknown buried archaeology. Affects areas of known archaeology, including cropmarks, and requires further archaeological investigation.		
Ecology and Nature Conservation	May impact habitats and species within the River Great Ouse corridor. The area is a habitat enhancement area.		
Geology and Soils	Affects two minerals sites. The Scheme would therefore need to take into account the programme for mineral extraction.	Has a large area within a minerals site. The Scheme would therefore need to take into account the programme for mineral extraction.	Has a small area within a minerals site. It is the least likely to be affected by the programme for mineral extraction.
Noise and Vibration	May improve noise levels slightly in the short term to properties around Black Cat junction as well as improve noise levels in the Noise Improvement Area to the north of Black Cat junction. Until the bypass is built, there is likely to be increased congestion at Wyboston which could temporarily impact on noise levels in this area.		
Water	Has an area within the River Great Ouse floodplain and would require floodplain mitigation.	Has the largest area within the River Great Ouse floodplain compared to Options 1 and 3 and would likely have the greatest impact on flood risk. Requires floodplain mitigation.	Has the smallest area within the River Great Ouse floodplain compared to Options 1 and 2. Requires some floodplain mitigation.

3.1.42. The outcomes from the non-statutory consultation identified that the Orange option and Option C for the Black Cat junction were preferred by the public.

3.1.43. Suggestions for alternative designs made by consultees were collated and considered as part of the next stage of option development and assessment, in order to determine their feasibility and potential environmental impacts.

Further Option Development and Assessment

A428

3.1.44. Based on the feedback from the non-statutory consultation and the environmental assessment of the options, the Orange option was refined and developed further to accommodate future traffic associated with normal growth on the network, and that associated with planned future development within the region.

Black Cat Junction

3.1.45. Further assessments undertaken on the Black Cat junction options concluded that Options A, B and C would have similar environmental effects; however, Option B was identified to be the environmentally preferred option due to its reduced landscape and visual effects.

3.1.46. Specific consideration was given during the assessment of the Black Cat junction options to Brook Cottages, a Grade II listed building located immediately adjacent to the A1 north of the existing junction. As the relationship of the junction to this asset presented a constraint to the design-development of the Black Cat junction options, Option C was re-examined to determine whether if it was feasible to improve its design and avoid the demolition or relocation of the building.

3.1.47. Accordingly, two additional options (Option C+ and the Refined Option C) were developed. On assessment, it was found that while the Refined Option C would require the demolition of Brook Cottages (likely to result in a significant environmental effect), the following effects associated with Option C+ would be avoided:

- Relocation of a high pressure gas main would not be required, resulting in cost and programme savings.
- A long and more complex diversion of the Bedford Road link would not be required, thereby removing a bridge structure and realising cost savings.
- The implementation of a more conventional junction arrangement would provide cost and programme advantages, would also reduce potential air and noise effects, and would be more easily understood by the travelling public.
- Earthwork cuttings would not be required on the A421/A1 link road, thereby avoiding a requirement for a pumped drainage system which would present cost savings.
- Potential effects on Roxton Garden Centre would be reduced, as would the overall landtake for the junction.
- Refined Option C would provide a more resilient operational junction arrangement.

3.1.48. It was concluded that the Refined Option C should be taken forward as part of the Scheme design.

Preferred Option

3.1.49. Highways England announced its preferred option for the Scheme on 18 February 2019.

3.1.50. A description of the preferred option for the Scheme, and the Development Consent Order (DCO) site boundary on which the scope of the Environmental Impact Assessment (EIA) has been based, is presented in Chapter 2.

Reference Design

3.1.51. The design of the preferred option for the Scheme will be developed further through a 'reference design' stage, and will take account of the outcomes of statutory consultation planned to be held in June 2019.

3.1.52. The reference design will form the basis of the DCO application, and will incorporate sufficient flexibility and scope to finalise the detailed design of the Scheme and the final construction methodology in due course. This could include landtake flexibility to allow minor alignment modifications to be made during construction, for example in response to any unforeseen ground conditions encountered.

3.1.53. The adoption of a reference design within the DCO application will enable the EIA to identify, and be based on, a reasonable worst case Scheme design. The reference design will incorporate a series of development parameters, the purpose of which will be to enable design flexibility to be retained in line with the principles of the 'Rochdale Envelope' (see Chapter 5).

4. CONSULTATION

4.1. Proposed Consultation

Statutory Requirements

4.1.1. The Planning Act 2008 (as amended) (PA2008) [REF 4-1] requires that certain bodies, stakeholder groups and communities must be consulted as part of the pre-application process. These requirements are set out in Sections 42, 43, 44, 46 and 47 of the PA2008 [REF 4-1]. Effective stakeholder engagement and consultation during this stage is fundamental to the success of the Scheme.

4.1.2. The PA2008 [REF 4-1] also sets out how the Scheme must be publicised, and specific documents produced, including a Statement of Community Consultation (SoCC) and a Consultation Report.

Previous Stakeholder Consultation

4.1.3. The Scheme has a wide range of stakeholders which include landowners, statutory consultees, local communities and specialist interest groups, many of whom have been involved at different stages during the identification, development and assessment of options.

4.1.4. Engagement to date has involved meetings and workshops with stakeholders to discuss design and technical matters, for example the incorporation of facilities for walkers, cyclists and equestrians, as well as liaison with organisations, parishes and elected members to understand local issues and concerns.

4.1.5. The principles of engagement have been based on early and ongoing engagement with stakeholders at key stages of the design-development process to inform and influence the design of the Scheme, and record their views and feedback (and where practicable ensure their concerns are addressed).

4.1.6. Forums have been established to engage with a range of stakeholders including both local and national groups, the aim being to bring together organisations and community representatives with shared interests in the Scheme. These have included, for example, council member's forums, environmental forums and community forums.

4.1.7. Organisations involved in the environmental forums include the Environment Agency, Historic England, Natural England and the Wildlife Trust for Bedfordshire, Cambridgeshire and Northamptonshire. Through the forums, these organisations have provided views and feedback on Highways England's options for the Scheme.

4.1.8. Engagement has also taken place between Highways England and other key stakeholders including local landowners and utility companies.

Non-statutory Consultation

4.1.9. Highways England undertook non-statutory consultation on a number of route and junction options between 6 March 2017 and 23 April 2017. The purpose of this consultation was to seek feedback from stakeholders and the local community on the three design options for the A428 between Black Cat junction and Caxton Gibbet junction, and the three design options for Black Cat junction, which were collectively identified through the options identification and selection process.

4.1.10. The responses obtained from the non-statutory consultation were taken into account in the identification of the preferred option for the Scheme.

Consultation on the Environmental Impact Assessment Scope

4.1.11. Consultation undertaken to date with a range of statutory and non-statutory bodies and the general public as part of the option identification and selection process has been used to inform the scope of the Environmental Impact Assessment (EIA) presented within this Scoping Report.

4.1.12. In requesting a Scoping Opinion from the Secretary of State, the Inspectorate will consult on this Scoping Report under the provisions of the EIA Regulations [REF 4-2] to obtain the views of statutory and non-statutory bodies on the form and nature of the environmental assessments to be undertaken within the EIA.

4.1.13. The content of the Scoping Opinion will be used by Highways England to shape and influence the technical scope of the assessments to be reported within the Environmental Statement.

4.1.14. The Environmental Statement will include a table summarising the responses contained within the Scoping Opinion, and will set out how and where the matters raised by consultees have been addressed.

Statutory Consultation

4.1.15. Highways England plans to undertake statutory consultation on the Scheme from June 2019, in accordance with the requirements of Section 42 and Section 48 of the PA2008 [REF 4-1] and associated guidance.

4.1.16. Statutory consultation will involve engaging statutory environmental bodies, relevant planning authorities, landowners and other key consultees.

4.1.17. The local community and wider public will be consulted on the Scheme via a statutory consultation period, undertaken in accordance with Section 47 of the PA2008 [REF 4-1]. This is expected to commence in June 2019 and will be carried out in accordance with the SoCC, currently being developed by Highways England, and will take into account any responses received from relevant local authorities.

4.1.18. As stakeholders have differing interests they will, accordingly, require varied levels of information about the Scheme as part of the pre-application process. Pre-application communication activities and engagement will, therefore, be focused on meeting the needs of particular individuals and groups.

4.1.19. Methods of engagement are expected to include the following:

- Exchanges of correspondence, meetings, workshops and forums with local groups and businesses.
- The publication of leaflets, reports and other information, made available locally in print and online.
- Public exhibitions, at which attendees can meet with members of Highways England's project team.

4.1.20. As part of the statutory consultation, Highways England will publish and make available environmental information relating to the Scheme and its likely effects in the form of a Preliminary Environmental Information Report.

4.1.21. Feedback received during the consultation will be taken into consideration by Highways England, as required by Section 49 of the PA2008 [REF 4-1], and summarised in a Consultation Report, which will be submitted as part of the Development Consent Order application.

4.1.22. The outcomes of the consultation will be used to inform the ongoing design-development of the Scheme, and to identify and agree any requirements for environmental mitigation and/or control measures required to address the likely significant effects of the Scheme during its construction, operation and future maintenance.

5. ENVIRONMENTAL ASSESSMENT METHODOLOGY

5.1. Surveys and Predictive Techniques and Methods

Scoping of the Assessments

5.1.1. Scoping has been undertaken to establish the form and nature of the assessments to be undertaken as part of the Environmental Impact Assessment (EIA) and the level of detail they should be progressed to.

5.1.2. The scoping exercise has been undertaken based on the Scheme design presented at Preferred Route Announcement (see Chapter 2) and has taken into account the extent of land within the Development Consent Order (DCO) site boundary considered by Highways England as being required for its construction, operation and maintenance.

5.1.3. The following documents have been used to guide and inform the scoping exercise.

National Policy Statement for National Networks

5.1.4. As the Scheme comprises a nationally significant infrastructure project (NSIP) relating to the strategic road network, the general principles of assessment contained within Section 4 of the National Policy Statement for National Networks (NPSNN) [REF 5-1] and the assessment methodologies presented within Section 5 of the NPSNN [REF 5-1] have been referenced and adopted, where appropriate, to ensure the scope of the EIA meets the assessment requirements of this policy document.

Infrastructure Planning (Environmental Impact Assessment) Regulations 2017

5.1.5. The environmental and social factors stipulated in Regulation 5(2) of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 [REF 5-2] (as amended) (the EIA Regulations) require consideration when undertaking an EIA of an NSIP and have been taken into account during the scoping exercise.

Design Manual for Roads and Bridges

5.1.6. Guidance contained within the Design Manual for Roads and Bridges (DMRB) Volume 11: Environmental Assessment [REF 5-3] has been referenced during the scoping exercise. This guidance identifies a range of environmental topic areas for consideration in the assessment of highways projects, and provides advice on the level of assessment detail appropriate to each.

5.1.7. Supplementary guidance contained within Interim Advice Note (IAN) 125/15: Environmental Assessment Update [REF 5-4], which provides further advice to the DMRB on ensuring that EIAs of road projects are both effective and efficient, has also been referenced during the scoping exercise.

Scoped In Topics

5.1.8. Following a review of relevant policy and guidance [REF 5-1, REF 5-2, REF 5-3, REF 5-4], the scoping exercise has identified that the following topics should be scoped into the EIA on the basis that construction (including demolition works), operation and maintenance of the Scheme could potentially lead to significant effects on the environment:

- **Air Quality** – covering the factors of population, human health and air.
- **Cultural Heritage** – covering the factor of cultural heritage.
- **Biodiversity** – covering the factor of biodiversity.
- **Landscape** – covering the factors of landscape and population.

- **Noise and Vibration** – covering the factors of population and human health.
- **Population and Health** – covering the factors of human health, population, land, and material assets.
- **Road Drainage and the Water Environment** – covering the factors of flood risk, human health and water.
- **Geology and Soils** – covering the factor of soil.
- **Material Assets and Waste** – covering the factors of waste and material assets.
- **Climate** – covering the factor of climate.
- **Assessment of Cumulative Effects** – covering the potential interactions between the above factors, and those associated with other plans and projects.

5.1.9. In relation to the future monitoring of significant environmental effects, the scoping exercise has identified that the requirement for such actions will be best presented within an Outline Environmental Management Plan (OEMP). The OEMP will be prepared in line with environmental management guidance contained in IAN 183/14: Environmental Management Plans [REF 5-5].

Scoped Out Topics

5.1.10. A screening exercise has been undertaken to identify whether the Scheme will be vulnerable to risks associated with major accidents and disasters, and whether these could potentially result in any change to the effects that will be identified and reported within other topics scoped into the EIA. Using professional judgement, a staged methodology has been developed to:

- identify any major accidents and disasters of relevance and categorise these in relation to the likelihood of occurrence and relationship to the Scheme;
- describe their potential to change the significance of effects recorded within each relevant assessment topic for identified major accidents and disasters;
- report the outcomes and conclusions within each assessment topic, where relevant; and
- describe any assumed mitigation measures to both support the conclusions and demonstrate that effects related to major accidents and disasters have been mitigated or can be managed to an acceptable level.

5.1.11. The screening exercise has concluded that the vulnerability of the Scheme to such events will be low, and that the Scheme will not be a contributing factor to causing or exacerbating these types of event. The outcomes of the major accidents and disasters screening exercise are presented within Appendix 5.1 of this Scoping Report, and based on the outcomes of the screening exercise, the topic of major accidents and disasters will be scoped out from further consideration in the EIA.

5.1.12. Following the undertaking of a preliminary screening exercise, the scoping exercise has concluded no significant potential for transboundary effects to occur within the above topics, these being effects that could arise on other European Economic Area (EEA) States as a result of the Scheme. This was attributed to factors such as the characteristics of the Scheme, the geographical area of which effects would be confined, and the intervening distance to the nearest EEA States. The outcomes of the transboundary screening exercise are presented in Appendix 5.2 of this Scoping Report, and this type of effect will not be considered further in the EIA.

5.1.13. The scoping exercise has concluded that heat and radiation are not relevant matters requiring consideration in the EIA, given that the form and nature of the Scheme is such that these emissions will not occur. Accordingly, these matters will be scoped out and not considered further in the EIA.

5.1.14. The scoping exercise has examined whether the decommissioning of the Scheme could result in significant effects within the above topic areas. This has concluded that it will be highly unlikely that the Scheme will be decommissioned, as the new and improved infrastructure will form an integral part of the strategic road network, with components having a lifespan of up to 120 years. Accordingly, decommissioning of the Scheme will not be considered as a scenario within the EIA.

Rochdale Envelope Parameters and Managing Design Uncertainty

5.1.15. Refinement of the Scheme design will continue from completion of EIA scoping, through the reference design stage, to completion of the detail design.

5.1.16. Design uncertainty will be addressed within the EIA by adopting a precautionary approach to identifying significant environmental effects, through the establishment of a series of maximum development extents known as a 'Rochdale Envelope'.

5.1.17. The Rochdale Envelope is named after a UK planning law case [REF 5-6]. It is an established principle that allows a project description to be broadly defined within a number of parameters. Its adoption allows meaningful EIA to be undertaken by defining a reasonable worst case scenario that decision-makers can consider when determining the acceptability or otherwise of the environmental effects of a development project.

5.1.18. The principle is founded on the assumption that as long as the technical and engineering parameters of a project fall within the limits of the envelope, and the EIA has considered the likely significant effects of that envelope, then flexibility within those parameters is deemed to be permissible within the terms of any consent granted for the project.

5.1.19. The realistic worst case scenario assumes that one or other of the parameters will have a more significant adverse effect than the alternative, and where a range of parameters is provided, the most environmentally detrimental parameter is assessed in the EIA (which can differ depending on the environmental resource or receptor being assessed).

5.1.20. Advice published by the Inspectorate [REF 5-7] fully endorses the approach of assessing design uncertainty, whilst still meeting the requirements of the EIA Regulations [REF 5-2].

5.1.21. In line with this approach, a series of parameters will be established across a number of aspects relating to the design and construction of the Scheme to manage design uncertainty and provide flexibility for deviation where needed. For example, flexibility may be needed to enable minor design refinements to be made during construction by the contractor within the overall parameters of any consent granted, or to provide statutory undertakers with flexibility within which they can develop the final design solutions for the diversion of existing underground and overhead utilities.

5.1.22. These parameters will form part of the project description within the Environmental Statement, and will include matters such as defining the maximum extent of land required to mitigate environmental effects, and the identification of horizontal and vertical limits of deviation within which the design of the Scheme can be adjusted if necessary.

5.1.23. This approach to managing uncertainty within defined parameters and limits will ensure that any design changes that may arise post submission of the DCO application will not be of an order that renders the content of the Environmental Statement inadequate or invalid.

EIA Guidance

5.1.24. The principal documents used to undertake and report the assessments presented within the Environmental Statement will be DMRB Volume 11: Environmental Assessment [REF 5-3] and IAN 125/15 [REF 5-4].

5.1.25. In undertaking the EIA, the key principles, topics, approaches and criteria set out in these documents will be applied; however, where appropriate these will be supplemented using guidance contained in the following policy documents, advice notes and best practice guidelines:

- NPSNN [REF 5-1] – this sets out the need for and Government policies for road network NSIPs in England.
- National Policy Planning Framework [REF 5-8] – this sets out the Government's planning policies for England and how these should be applied including policy guidance on the treatment of environmental impacts and the achievement of good design.
- The Inspectorate's Advice Notes [REF 5-7; REF 5-9; REF 5-10; REF 5-11; REF 5-12] – these provide guidance on EIA technical and procedural matters for NSIPs.
- IEMA Guidelines for Environmental Impact Assessment [REF 5-13] – this provides best practice guidance for undertaking EIA.
- IEMA Environmental Impact Assessment: Guide to Shaping Quality Development [REF 5-14] – this sets out principles and the framework for maximising the interaction between environmental thinking and project design within the decision-making process.

5.1.26. Individual assessments within the EIA will additionally reference other topic-specific guidance published by public authorities and/or professional bodies, the details of which are presented within Chapters 6 to 15 where applicable.

Establishment of the Baseline Environment

5.1.27. The EIA will commence with the identification of the existing (baseline) environmental conditions that may be affected by the Scheme through a review of information relating to known, or the likely presence of, environmental resources and receptors within defined study areas to determine their relative value, importance or sensitivity towards change.

5.1.28. Resources comprise environmental aspects which support and are essential to natural or human systems. These include areas or elements of population, ecosystems, watercourses, air and climatic factors, landscape, and material assets.

5.1.29. Receptors comprise people (for example occupiers of dwellings and users of recreational areas, places of employment and community facilities) and elements within the environment (for example flora and fauna) that rely on environmental resources.

5.1.30. Environmental data, information and records will be obtained using a combination of the following sources and techniques:

- Desk based sources – these include: previously published studies and assessments undertaken as part of the Scheme; published literature; databases,

records and schedules relating to environmental designations; national and local planning policy documents; historic and current mapping; and aerial photography.

- Site based surveys – these will be undertaken to verify and consolidate information gathered during the desk-based review, and to evaluate the relationships between specific environmental interests and their wider environmental value.
- Consultation – engagement with statutory and non-statutory organisations will be undertaken to obtain factual information and records.

5.1.31. The establishment of the environmental baseline will involve identifying the current state of the environment, and its likely evolution without implementation of the Scheme (referred to as the future baseline). A combination of predictive modelling and professional judgement will be used in the EIA to identify and take account of the following variables that have a likelihood of occurring in the absence of the Scheme:

- Changes from natural events or trends (including human activities) – for example where ecological species move from their current location over time and populate different areas.
- Changes in environmental and societal values – for example where the status of the environment alters due to protection through planning designation.
- Changes to the problems being addressed by the Scheme – for example where existing traffic issues on the network alter as a consequence of other development projects or interventions being implemented, for example highway schemes.

Spatial and Temporal Scope

5.1.32. The spatial extent of assessment study areas varies in accordance with the environmental topic area being considered.

5.1.33. The study area(s) for each environmental topic is outlined within each of the topic chapters (see Chapters 6 – 15); these reflect the geographical area over which environmental effects may potentially arise and take account of DMRB Volume 11: Environmental Assessment [REF 5-3] guidance.

5.1.34. All topic study areas incorporate the land and features contained within the DCO site boundary as a minimum.

5.1.35. For some topics, study areas have been defined as being relatively localised to the DCO site boundary, whilst for others they extend outwards beyond this boundary to capture the surrounding road network, distant communities, and environmentally sensitive areas.

5.1.36. It is accepted practice to assess the potential effects of a development project temporally at defined points in its lifecycle, in order to establish how environmental conditions and effects may alter over time. These conditions can change in response to influences such as:

- the progression of other development projects, which may alter existing land use relationships and the movement, volume and distribution of traffic;
- new or amended planning policy, which may alter the status and protection of existing environmental areas, components and features;
- the effect of climate change, which may result in an increased risk of flooding and increases in greenhouse gas emissions that could directly and indirectly alter the current condition of the environment; and

- the natural evolution of the environment, which may change the current balance and relationships of its components and features.

5.1.37. Accordingly, the EIA will assess the Scheme at key stages relating to its construction, operation and future maintenance periods, against both the current and future baseline conditions where appropriate, using a combination of available information, scientific knowledge and professional judgement.

5.1.38. The following assessment years and scenarios have been defined and will be adopted within the EIA, where relevant to the topic under consideration:

- Current baseline (2019) – reflective of the conditions which exist at the time of gathering baseline environmental data and undertaking the EIA.
- Future baseline (2021) – reflective of the conditions that will be experienced in the future, immediately prior to construction of the Scheme.
- Construction (2021–2025) – reflective of the conditions that will be experienced during the period over which construction of the Scheme is planned to take place.
- Operation (2025) – reflective of the conditions that will be experienced when the Scheme will become operational and open to traffic (this is referred to as the Opening Year or the Year of Opening).
- Future conditions (2040) – reflective of the conditions that will be experienced at a point 15 years after the year of opening of the Scheme (this is referred to as the Design Year or Year 15).

5.1.39. For some assessments such as air quality and noise and vibration, DMRB Volume 11: Environmental Assessment [REF 5-3] refers to the future baseline and future conditions as the “Do Minimum” and “Do Something” scenarios respectively:

- Do Minimum represents the conditions that will exist at a given point in the future without the Scheme in place, but accounting for ongoing maintenance on the road network, the natural evolution of the environment, and the influence that other development projects will have on this.
- Do Something represents the above conditions, but with the Scheme in place.

5.1.40. Both sets of terminology will be used, where appropriate, to reflect the conventions set out in established guidance for the relevant assessment topics.

Construction Traffic

5.1.41. In order to estimate the total number of vehicle movements associated with construction of the Scheme, calculations will be undertaken to establish the likely number of Heavy Goods Vehicles (HGVs) and private vehicles that will be added to the road network during this phase of the Scheme.

5.1.42. Movements on the road network will be calculated using construction information relating to a number of factors, for example the phasing of the works, plant and equipment requirements, material quantities, construction compound details, worker numbers, and shift times.

5.1.43. Construction vehicle movements will be calculated based on a number of assumptions about how the Scheme will be built. This includes vehicle occupancy rates, the periods over which HGV movements will be distributed, and when the peak construction period will occur.

5.1.44. The calculated totals will be used to inform the assessment of construction-related effects in the topics relating to noise and vibration, and air quality.

Operational Traffic

5.1.45. A traffic model covering the locality associated with the strategic and local road network has been developed to forecast future traffic flows, both with and without the Scheme. To date, information generated from this model has principally been used to inform the development and assessment of route options for the Scheme, and to inform the selection of the preferred option.

5.1.46. Information contained within the operational traffic model will be refined to reflect the reference design for the Scheme, on which the EIA will be based. The operational traffic model will also be used to:

- establish the minimum engineering requirements of the Scheme;
- inform the assessment of accidents;
- inform the economic appraisal of the Scheme; and
- produce data in a variety of formats to inform the assessments of effects within with the topics of air quality, noise and vibration, road drainage and the water environment, and population and health.

5.1.47. Other development projects in the area that could influence future traffic flows on the network will form an intrinsic part of the traffic model. Information relating to the form and status of other development projects will be obtained from the planning authorities within the geographical extents of the traffic model, and from other sources including the Road Investment Strategy for the 2015-2020 period [REF 5-15]. These will be categorised to determine their status and the level of confidence attached to their delivery.

5.1.48. The traffic model will also be used to inform the calculation of speed categories (referred to as speed banding), to provide additional data for inclusion within the air quality and noise and vibration assessments.

Other Modelling

5.1.49. Other forms of computer modelling will be undertaken within the topics of air quality, noise and vibration, and road drainage and the water environment. These will use a combination of traffic data, monitoring data and environmental factors (for example those relating to climate change) to model the conditions that will occur within the different assessment scenarios and years adopted.

Impact Identification and Assessment

5.1.50. Impacts comprise the following identifiable changes to the baseline conditions:

- Direct impact – for example the loss of ecological habitat to accommodate a project.
- Indirect impact – for example pollution downstream arising from silt deposition during earthworks.
- Secondary impact – for example changes to ecological species as a result of water pollution.
- Short-term (or temporary) impact – for example dust generated as a result of construction activities.
- Medium-term impact – for example the cutting back of planting which is allowed to regenerate.

- Long-term (or permanent) impact – for example the introduction of new built form into an established view.

5.1.51. These types of impact will be classified as being either

- beneficial (positive) – for example the introduction of planting to screen visually detracting elements; or
- adverse (negative) – for example loss of a valuable environmental feature.

5.1.52. Impacts will be defined in accordance with accepted terminology and standardised methodologies to predict the magnitude of impact (or change) resulting from the Scheme, in accordance with DMRB Volume 11: Environmental Assessment [REF 5-3] and IAN 125/15 [REF 5-4] guidance.

5.1.53. The impact assessments undertaken will be both quantitative and qualitative in nature, depending on the nature of the topic under consideration and the techniques used to identify and predict the magnitude of impacts (or change). For example, the assessment of noise and vibration will use computer modelling to calculate changes in noise levels resulting from the Scheme, whereas the assessment of visual effects will rely upon the experience, perception and opinion of the individual undertaking the assessment using available information and professional judgement.

5.1.54. The impact assessments will be based on the reference design for the Scheme, and will take account of any works required to the underground and/or overhead equipment belonging to statutory undertakers.

5.1.55. An acknowledgement will be made within the impact assessments of any uncertainty or assumptions attached to the prediction of impacts, such as those arising from the validity of baseline data decreasing with the passage of time or where assessments have taken their findings from incomplete or inconclusive data.

5.1.56. In instances where high levels of uncertainty exist, such as when information is unable to be gathered due to land access restrictions, a precautionary approach which assumes a worst case impact will be adopted.

Environmental Mitigation

5.1.57. Mitigation is the term to describe measures including any process, activity or design to avoid or reduce the adverse environmental impacts or effects of a development project.

5.1.58. The iterative optioneering and design-development processes have sought, and will continue to seek, to mitigate environmental impacts during the early stages of the EIA by:

- designing-out potential issues and conflicts between the Scheme and environmental resources and receptors;
- embedding features such as landscaping and drainage infrastructure into the overall design of the Scheme; and
- identifying standard ‘good practice’ working methods and techniques to be employed by the contractor during construction of the Scheme.

<u>Embedded Mitigation Measures</u>

5.1.59. A range of measures will be embedded into the design of the Scheme for implementation and delivery, the effectiveness of which has been proven on other road schemes developed on the strategic road network.

5.1.60. Embedded measures may include, for example, earthwork cuttings to reduce traffic-related noise, landscaping to visually screen and contain new or improved road components, and reducing habitat loss by minimising landtake.

5.1.61. Consideration will be given to embedded measures which may address one type of impact, but result in another. For example, wooden barriers erected along the sides of a new road can attenuate vehicle noise, but can themselves form an intrusive component in an existing view.

5.1.62. Chapter 3 summarises how the design of the Scheme has evolved through the option identification and selection process, and how environmental assessments have influenced the form of the preferred option.

5.1.63. Embedded mitigation measures forming an intrinsic part of the Scheme design will be described within the Environmental Statement, and will be illustrated on an Environmental Masterplan and recorded within a Register of Environmental Actions and Commitments.

Standard Mitigation Measures

5.1.64. Standard mitigation measures, comprising management activities and techniques, will be implemented during construction of the Scheme to limit impacts through adherence to good site practices and achieving legal compliance.

5.1.65. These measures may include, for example, applying construction site dust suppression techniques within working areas, which the contractor will be required to implement as part of their working practices under the terms of their contract.

5.1.66. Standard mitigation measures to address construction-related impacts will be described within the Environmental Statement and detailed in the OEMP, and will be secured through requirements contained in the DCO.

Additional Mitigation Measures

5.1.67. Additional mitigation comprises measures over and above any embedded and standard mitigation measures, for which the EIA has identified a requirement to further reduce significant environmental effects.

5.1.68. Additional mitigation measures will be described within the Environmental Statement, and will be secured through the requirements of the DCO or through other statutory agreements.

Environmental Compensation

5.1.69. Environmental compensation will be considered where mitigation at an affected location is not possible to avoid or reduce a significant effect.

5.1.70. Where identified, compensation measures forming part of the Scheme design will be described within the Environmental Statement and illustrated on an Environmental Masterplan.

Environmental Enhancement

5.1.71. Where possible and practicable, environmental enhancements will be incorporated into the design of the Scheme. These are measures which are over and above any mitigation and compensation measures required to mitigate the adverse effects of the Scheme and/or maximise the opportunity for beneficial effects from the Scheme.

5.1.72. The commitment to delivering environmental enhancements is reflected in Highways England's company licence [REF 5-16], which requires Highways England when exercising its functions, obligations and legal duties, to "*minimise the environmental*

impacts of operating, maintaining and improving its network and seek to protect and enhance the quality of the surrounding environment".

5.1.73. Enhancements will seek to meet, where possible, the requirements of the NPSNN [REF 5-1] and Highways England's company licence [REF 5-16]. Such measures could include, for example, the introduction of bat boxes on retained areas of woodland within the DCO site boundary.

5.1.74. Unlike mitigation and compensation measures, enhancements will not be factored into the determination of significant effects in the EIA; however, the potential benefits of these measures will be identified within the Environmental Statement in accordance with the NPSNN [REF 5-1].

5.1.75. Where identified, environmental enhancement measures will be illustrated on an Environmental Masterplan.

Biodiversity Offsetting

5.1.76. Highways England has committed to reducing the net loss of biodiversity across the strategic road network, the objective being to deliver no net loss by 2020 and a net gain in biodiversity by 2040.

5.1.77. In pursuit of achieving no net loss of biodiversity across the Scheme, Highways England's biodiversity offsetting metric will be applied to calculate the extent to which mitigation, compensation and enhancement measures incorporated into the design of the Scheme will offset the loss of ecological habitats and features.

5.1.78. Where required, biodiversity offsetting measures may include improving existing areas of grassland to increase their habitat value by bringing them into more favourable management. Such areas will be described within the Environmental Statement and illustrated on an Environmental Masterplan as areas of potential ecological improvement.

5.1.79. Delivery of these potential improvements will be sought through the provisions of the DCO where possible and/or via third party agreements with landowners.

5.1.80. Subject to their delivery, the identification of these potential improvements will allow effective and valuable environmental benefits to be identified, and will assist in meeting the aspirations of stakeholders with an interest in achieving wider environmental benefits on development projects.

Environmental Effects

5.1.81. Environmental effects are the consequence of impacts. By way of example, an impact arising from a new highway project could be represented by the loss of mature woodland to accommodate a new section of carriageway, the effect (or consequence) of which could be the opening of new views in which this infrastructure becomes a point of focus.

5.1.82. For an effect to occur there has to be a pathway between the impact and the resource or receptor.

5.1.83. In the EIA, effects will be formulated as a function of the importance, value or sensitivity of an environmental resource or receptor, and the magnitude of impact (or change) predicted. A combination of professional judgement, defined thresholds, established criteria and standards will be used in their definition.

5.1.84. The significance criteria presented in Section 5.3 will be used to report the significance of effects, the assignment of which will rely on reasoned argument,

professional judgement, established thresholds and guidelines, and the views of relevant organisations.

5.1.85. Account will be taken of the role of embedded and standard environmental mitigation, and compensation measures, in reducing the significance of adverse effects. When such measures form an integral part of the Scheme design and/or the approach to its construction, the assessment of likely significant effects will only report the post-mitigation effects within the Environmental Statement.

5.1.86. Where additional mitigation measures are identified, the Environmental Statement will report both pre- and post-mitigation effects in order to demonstrate their efficacy in further reducing the significance of effects.

Cumulative Environmental Effects

5.1.87. The effects of a development project may not be significant on their own; however, when combined with other effects these could become significant.

5.1.88. The EIA will identify cumulative effects resulting from the combination of different activities within the Scheme, and from activities associated with other development plans and projects in the surrounding area.

5.1.89. Details of the methodology for the cumulative effects assessment are presented in Chapter 16.

Monitoring

5.1.90. The Environmental Statement will set out any requirements for the monitoring of identified significant adverse effects, post-construction of the Scheme.

Related Assessments

5.1.91. Information gathered and assessed as part of the EIA process will be used to inform the following related assessments, as required by the NPSNN [REF 5-1]:

- **Habitats Regulations Assessment** – this assessment will reference the information gathered as part of the biodiversity assessment.
- **Flood Risk Assessment** – the modelling and assessment of flood risk will reference the information gathered as part of the road drainage and the water environment assessment.
- **Water Framework Directive Assessment** – this assessment will reference the information gathered as part of the road drainage and the water environment assessment.

5.2. General Assessment Assumptions and Limitations

Limitations

5.2.1. A number of general limitations have been encountered during the scoping exercise.

5.2.2. The detailed construction methodology for the Scheme has yet to be defined. This will be subject to further development during the process of iterative design and environmental assessment of the Scheme; however, the DCO site boundary incorporates the currently anticipated requisite areas for construction activities.

5.2.3. The status of other planned developments with which the Scheme could potentially interact cumulatively is correct at the time of undertaking the scoping exercise. Verification of these developments will be undertaken during the EIA process to establish any change in their status, and to identify whether additional development proposals have come forward that warrant consideration in the EIA.

5.2.4. Traffic modelling undertaken to inform the design-development of the Scheme currently takes account of planned development that is likely to influence traffic on both the strategic and local road network. Verification will be undertaken to identify any change in the status of the developments included in the model, the outputs of which will be used to generate traffic forecasts for the EIA. Updates to the traffic model will also be undertaken, where necessary, to reflect Scheme design changes, for example modifications arising from statutory consultation feedback.

5.2.5. The scoping exercise has been prepared based on the environmental baseline information available at the time of writing, the design of the Scheme (as described in Chapter 2) and the extents of landtake defined by the DCO site boundary. Due to the scoping exercise being undertaken part way into the design-development and EIA processes, not all environmental desk-based and site-based surveys have commenced or have been completed within and surrounding the DCO site boundary. A full programme of data gathering and surveys has been developed and these will be carried out during the EIA process; however, where baseline information is currently absent, any related limitations encountered during the scoping exercise are described within the topic-specific assessment scopes presented in Chapters 6 to 15.

Assumptions

5.2.6. To inform the scoping exercise, a number of assumptions have been made regarding the Scheme and its potential environmental effects, based on current available information.

5.2.7. Scoping has assumed the extents of the DCO site boundary represent the maximum area within which physical disturbance may occur to environmental resources and receptors.

5.2.8. In relation to Scheme construction:

- scoping has assumed that the Scheme will require one main construction compound and a number of satellite compounds, all of which will be located within the DCO site boundary;
- conventional methodologies and techniques have been assumed to be employed during construction of the Scheme, with best practice site-based measures implemented to protect sensitive environmental features during the works;
- it has been assumed that works at Black Cat, Cambridge Road and Caxton Gibbet junctions will require lane closures and traffic management phasing, which are likely to be completed during the night-time period to minimise disruption and environmental impact;
- although opportunities to reuse material will be sought and implemented, it is expected that additional material will need to be imported to site, potentially from borrow pits; and
- the advanced diversion of some existing utilities will likely be required to enable the Scheme to proceed, and information obtained regarding the form and location of such infrastructure has been assumed to be accurate for the purposes of scoping.

5.2.9. Scoping has acknowledged that the design of the Scheme will be subject to further refinement and adjustment in response to the outcomes of Statutory Consultation and future stakeholder engagement, ongoing design-development and the EIA process.

5.2.10. As the Scheme will become an integral part of England's strategic road network, it has been assumed that the Scheme will not be decommissioned.

5.3. Significance Criteria

5.3.1. Generic criteria contained in DMRB Volume 11: Environmental Assessment [REF 5-3] for sensitivity (or importance/value), magnitude of impact (or change) and significance of effect will be applied across the assessed topics to ensure the identified environmental effects are assessed and evaluated in a comparable manner, except where other prevailing standards, thresholds and/or established criteria have been followed or applied. In such instances, the deviation from the generic criteria will be explained within the individual assessment methodologies presented within the Environmental Statement.

5.3.2. **Table 5.1** presents the generic sensitivity (or importance/value) criteria that will be applied in the EIA, reproduced from DMRB Volume 11: Environmental Assessment [REF 5-3].

Table 5.1: Criteria for Determining the Sensitivity (or importance/value) of Environmental Resources and Receptors

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

5.3.3. **Table 5.2** presents the generic magnitude of impact (or change) criteria that will be applied in the EIA, reproduced from DMRB Volume 11: Environmental Assessment [REF 5-3].

Table 5.2: Criteria for Determining the Magnitude of Impact (or change) on Environmental Resources and Receptors

Magnitude of impact (or change)	Typical descriptors
Major (adverse)	Loss of resource and/or quality and integrity of resource; severe damage to key characteristics, features or elements.
Major (beneficial)	Large scale or major improvement of resource quality; extensive restoration or enhancement; major improvement of attribute quality.
Moderate (adverse)	Loss of resource, but not adversely affecting the integrity; partial loss of/damage to key characteristics, features or elements.
Moderate (beneficial)	Benefit to, or addition of, key characteristics, features or elements; improvement of attribute quality.
Minor (adverse)	Some measurable change in attributes, quality or vulnerability; minor loss of, or alteration to, one (maybe more) key characteristics, features or elements.
Minor (beneficial)	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.
Negligible (adverse)	Very minor loss or detrimental alteration to one or more characteristics, features or elements.

Magnitude of impact (or change)	Typical descriptors
Negligible (beneficial)	Very minor benefit to or positive addition of one or more characteristics, features or elements.
No change	No loss or alteration of characteristics, features or elements; no observable impact in either direction.

5.3.4. **Table 5.3** presents the generic significance of effect criteria that will be applied in the EIA, adapted from DMRB Volume 11: Environmental Assessment [REF 5-3].

Table 5.3: Criteria for Determining the Significance of Effect on Environmental Resources and Receptors

Significance of effect	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 major change in a site or feature of local importance may also enter this category.
Large	These beneficial or adverse effects are considered to be very important considerations and are likely to be material in the decision-making process
Moderate	These beneficial or adverse effects are considered to be important in informing the decision-making process. The cumulative effects of such factors may influence decision-making if they lead to an increase in the overall adverse effect on a particular resource or receptor.
Slight	These beneficial or adverse effects may be raised as local factors. They are unlikely to be critical in the decision-making process, but are important in enhancing the subsequent design of the project.
Neutral	No effects or those that are beneath levels of perception, within normal bounds of variation or within the margin of forecasting error.

5.3.5. The significance of cumulative effects will be ascribed using the ratings and definitions presented within **Table 16.1** in Chapter 16.

5.3.6. DMRB Volume 11: Environmental Assessment [REF 5-3] does not explicitly define what a significant effect is, and does not prescribe the level at which an effect within the scales of significance could be deemed significant.

5.3.7. Based on professional judgement, individual and cumulative effects of very large, large or moderate significance will be considered to represent a significant effect in the context of the EIA Regulations [REF 5-2], except where different criteria or guidance adopted within the topic-specific assessment methodologies present a different threshold or approach to the determination of a significant effect.

6. AIR QUALITY

6.1. Study Area

6.1.1. This chapter presents the approach to the assessment of the Scheme's effects on air quality.

6.1.2. Based on the advice provided in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1: Air Quality [REF 6-1], and using professional judgement, a preliminary review of the roads contained within the traffic model prepared for the Scheme was undertaken to identify those which could potentially be affected by changes in traffic flows as a result of the Scheme[1].

6.1.3. The roads identified from this review formed the basis of the scoping study area, the majority of which extend beyond the Development Consent Order (DCO) site boundary.

6.2. Baseline Conditions

6.2.1. To inform the scoping exercise, the following data and information relevant to the assessment of air quality was obtained:

- Air Quality Management Areas (AQMA) [REF 6-2].
- Local authority air quality monitoring data [REF 6-3; REF 6-4; REF 6-5; REF 6-6; REF 6-7].
- Highways England air quality monitoring data [REF 6-8].
- Defra air pollution background concentration maps [REF 6-9].
- Defra Pollution Climate Mapping (PCM) Model GIS data [REF 6-10],
- Locations of human health receptors (comprising residential properties, schools, hospitals and elderly care homes) from Ordnance Survey (OS) MasterMap and AddressBase data [REF 6-11].
- Statutorily designated ecological sites [REF 6-12].

6.2.2. Figure 6.1 in Chapter 19 illustrates the locations as AQMAs and air quality monitoring sites within and surrounding the DCO site boundary.

Air Quality Management Areas

6.2.3. AQMAs within the scoping study area declared for exceedances of the nitrogen dioxide (NO_2) annual mean air quality objective are:

- Sandy AQMA – located approximately 5km south of Black Cat junction (declared by Central Bedfordshire Council); and
- St Neots High Street AQMA – located approximately 5.4km north of Black Cat junction (declared by Huntingdonshire District Council).

Defra Mapping and Modelling

6.2.4. A review of the Defra air pollution background concentration maps [REF 6-9] covering the scoping study area identified that background annual mean NO_2, Particulate Matter (PM_{10}) and Fine Particulate Matter ($PM_{2.5}$) for 2017 were below the relevant air quality objective values.

[1] The affected road network applies to those roads within the "traffic reliability area" (comprising the area within which traffic data is considered to be suitable for use in environmental assessments by the traffic team) and which meet any of the DMRB [REF 6-1] screening criteria.

6.2.5. In relation to road contribute concentrations of pollutants, information on areas exceeding EU limit value thresholds available from Defra's PCM Model (based on modelled 2017 roadside NO_2 concentrations) confirms that no road links exceeding 40µg/m^3 are present within 10km of the DCO site boundary [REF 6-10].

Local Authority Monitoring

6.2.6. Air quality monitoring has been carried out at a range of locations within the scoping study area by the relevant local authorities. A summary of the monitoring data recorded for the five year period between 2013 to 2017 inclusive is presented by authority in **Table 6.1**.

Table 6.1: Nitrogen Dioxide Concentrations at Local Authority Monitoring Locations

				Annual Mean NO_2 concentrations micrograms (1-millionth of a gram) per cubic meter air (µg/m^3)				
Site ID	**Site Name**	**Site Type**	**Distance to the DCO Site Boundary (km)**	**2013**	**2014**	**2015**	**2016**	**2017**
Bedford Borough Council								
DT12	The Lane, Wyboston	Roadside	0.0012	23	23	21	23	20
DT13	20 Great North Rd (A1 South)	Background	0.014	34	26	27	26	27
DT21	Great North Rd (A1 North)	Kerbside	0.0069	**45**	**45**	37	**43**	40
Huntingdonshire District Council								
St Neots 2	18 Cromwell Gardens	Roadside	1.106	N/A	N/A	N/A	N/A	20.3
St Neots 8	122 Lindisfarne Close	Suburban	0.0148	N/A	N/A	N/A	N/A	20.1
St Neots 9	5 Duchess Close	Suburban	1.6697	24.5	23.5	24.5	28.4	28.1
Buckden 1	6 Perry Road	Roadside	6.234	27.6	26.8	21.2	24.9	20.8
Buckden 2	4 High Street (Roundabout)	Roadside	6.325	23.8	25.3	25.6	25.8	25.6
Buckden 3	34 High Street (shop)	Roadside	6.531	32.2	32.2	28.9	29.6	27.7
Buckden 4	11 Taylors Lane	Roadside	6.857	19.5	19.5	19.4	22.3	18.7
South Cambridgeshire District Council								
IMP	Impington (A14)	Roadside	12	27	23	22	23	23
DT3	Hill Farm Cottages	Roadside	6.8	27.5	31.8	29.8	27.6	26.5
DT5	Rhadegund Farm	Roadside	7.63	26.0	21.7	19.0	20.6	16.2

				Annual Mean NO_2 concentrations micrograms (1-millionth of a gram) per cubic meter air ($\mu g/m^3$)				
Site ID	**Site Name**	**Site Type**	**Distance to the DCO Site Boundary (km)**	**2013**	**2014**	**2015**	**2016**	**2017**
DT7	High Street, Tadlow	Roadside	11.6	14.1	11.9	10.4	11.8	12.1
DT10	Weavers Field, Girton	Urban Background	10.8	26.8	30.5	26	26.2	26.3
DT16	Hackers Fruit Farm	Roadside	8.4	**42.9**	38.0	32.8	37.1	28.6
DT18	Catchall Farm Cottages	Roadside	8.9	26.4	25.4	21.7	24.1	25.8
DT19	Crafts Way, Bar Hill	Roadside	7.4	23.7	22.9	19.8	24.5	20.3
Central Bedfordshire Council								
MD3	Sandy (Roadside)	Roadside	2.3	31.0	27.9	30.6	33.0	34.0
N1	A1 Sandy	Kerbside	2.7	39.3	39.1	43.2	43.0	44.0
N4	A1 Beeston	Kerbside	3.8	36.6	33.5	37.2	37.2	33.9
N6	Bedford Road Sandy	Kerbside	2.85	35.5	33.4	36.6	34.3	33.5
N16	Bedford Rd Sandy	Kerbside	2.863	35.5	34.4	**43.2**	**40.6**	**40.8**
N17	Bedford Rd Sandy	Kerbside	2.869	**49.1**	**42.1**	**50.2**	**48.3**	**54.0**
N18	Eddie's Cottage Sandy	Kerbside	2.874	28.6	28.3	30.5	29.9	30.2
N20	A1 Carter Street Sandy	Kerbside	1.973	**80.3**	**70.1**	**74.0**	**69.8**	**66.3**
N25	The Akbar A1 Sandy	Kerbside	1.781	N/A	N/A	37.6	38.1	36.8
N28	Carter St Sandy	Kerbside	1.982	N/A	N/A	21.8	24.6	25.1
N31	Bedford Rd Sandy	Kerbside	2.852	N/A	N/A	N/A	27.9	27.4

N/A = not available.
Concentrations in bold represent exceedances of the annual mean air quality objective.
Data is reported as presented in the local authority Local Air Quality Management documents.

6.2.7. NO_2 diffusion tube sites DT12, DT13 and DT21 are located adjacent to the A1 to the north of Black Cat junction. The highest NO_2 concentrations have been measured at DT21, which is a kerbside site. In the years 2012 to 2014 (inclusive) and in 2016 annual mean NO_2 concentrations exceeded the air quality objective. The results for 2015 and 2017 indicated that the annual mean NO_2 air quality objective was achieved. NO_2 concentrations at sites DT12 and DT13, located approximately 30m and 20m from the A1, respectively, were well below the objective in all years between 2013 and 2017.

6.2.8. There are seven diffusion tube monitoring locations to the north of the scoping study area (St Neots 2, 8, 9 and Buckden 1, 2, 3, 4). Monitored NO_2 concentrations at these sites have been well below the annual mean NO_2 objective in recent years. The highest monitored NO_2 concentrations at these locations in all years between 2013 and 2017 have been measured at site Buckden 3, ranging between 32.2 µg/m^3 in 2013 and 2014 and 27.7 µg/m^3 in 2017.

6.2.9. The nearest continuous monitoring station measuring NO_2, PM_{10} and $PM_{2.5}$ is within the Sandy AQMA. This site is part of Defra's Automatic Urban and Rural Network, and measured pollutant concentrations at this roadside site have been below the relevant objective values in recent years. The monitored NO_2 annual mean concentration in 2017 was 34 µg/m^3.

6.2.10. During recent years, PM_{10} concentrations at all nearby continuous monitoring sites have been well below the annual mean and daily mean objectives.

6.2.11. The nearest local authority monitoring sites to the east of the DCO site boundary are located approximately 7km away within Bar Hill. The nearest roadside diffusion tube, site DT3 at Hill Farm Cottages, recorded a concentration of 32 µg/m^3 in 2014.

Highways England Monitoring

6.2.12. Diffusion tube monitoring undertaken as part of Highways England's monitoring network was carried out for six months in 2016 within and around the scoping study area at 25 locations. Two locations, near to the northbound carriageway of the A1 north of Black Cat junction recorded NO_2 concentrations exceeding the annual mean air quality objective.

Additional Monitoring

6.2.13. Further diffusion tube monitoring was carried out for a six month period, from late-February to late-August 2018 at 35 locations, which included areas not covered by local authority or Highways England monitoring.

6.2.14. The objectives were to record information on current levels of NO_2 and, where possible, provide a representation of residential exposure. The results of the additional monitoring survey are shown in **Table 6.2**.

Table 6.2: Nitrogen Dioxide Concentrations at Additional Baseline Monitoring Locations

Site ID	Raw Diffusion Tube Monitoring Data - NO_2 concentrations micrograms (1-millionth of a gram) per cubic meter air (µg/m^3)						Raw Mean (µg/m^3)	Bias-adjusted Annualised Mean (µg/m^3)
	March	April	May	June	July	August		
BC-1	32.6	N/A	27.4	16.4	21.1	31.7	25.8	30.2
BC-2	24.6	23.0	22.8	15.9	17.8	17.7	20.3	22.8
BC-3	20.1	17.2	14.9	12.1	13.3	13.3	15.2	17.0
BC-4	15.5	13.4	11.5	8.8	10.4	11.3	11.8	13.3
BC-5	19.6	16.1	14.9	9.0	11.3	12.6	13.9	15.6
BC-6	18.0	15.3	12.3	8.0	11.2	12.8	12.9	14.5
BC-7	28.6	25.8	25.0	21.2	24.4	20.6	24.3	27.3
BC-8	18.4	16.2	14.3	9.9	11.4	12.9	13.9	15.6
BC-9	36.4	31.7	27.4	24.2	30.4	31.4	30.3	34.0
BC-10	36.7	55.8	52.6	49.9	51.2	60.8	51.2	**57.5**

Site ID	Raw Diffusion Tube Monitoring Data - NO_2 concentrations micrograms (1-millionth of a gram) per cubic meter air ($\mu g/m^3$)						Raw Mean ($\mu g/m^3$)	Bias-adjusted Annualised Mean ($\mu g/m^3$)
	March	April	May	June	July	August		
BC-11	25.6	24.9	18.1	12.7	14.9	17.0	18.9	21.2
BC-12	53.0	55.8	53.0	52.3	63.0	58.0	55.9	**62.8**
BC-13	35.0	45.9	56.1	49.1	63.5	63.5	52.2	**58.7**
BC-14	31.0	42.6	50.4	44.7	48.4	46.0	43.9	**49.3**
BC-15	22.9	19.6	16.6	11.9	13.5	13.5	16.3	18.4
BC-16	22.3	21.1	18.0	15.5	16.9	14.7	18.1	20.3
BC-17	29.0	30.9	26.3	23.3	23.8	17.8	25.2	28.3
BC-18	26.9	21.8	26.1	19.9	21.6	18.9	22.5	25.3
BC-19	55.5	53.0	57.1	33.6	56.4	45.3	50.2	**56.4**
BC-20	20.4	18.9	16.3	10.5	14.9	16.5	16.3	18.3
BC-21	43.2	39.0	33.6	38.1	40.4	19.3	35.6	40.0
BC-22	21.2	27.6	26.3	18.6	22.3	29.0	24.2	27.2
BC-23	22.8	25.3	22.8	18.1	18.3	23.4	21.8	24.5
BC-24	35.4	39.4	48.8	44.2	45.0	48.3	43.5	**48.9**
BC-25	13.6	12.8	11.7	7.5	9.5	11.5	11.1	12.5
BC-26	18.1	15.9	17.1	12.9	14.7	15.7	15.7	17.7
BC-27	35.4	23.5	20.3	22.8	17.3	19.9	23.2	26.1
BC-28	17.1	14.6	11.5	9.7	9.1	9.3	11.9	13.4
BC-29	N/A	28.5	14.8	11.5	11.7	14.3	16.2	19.3
BC-30	21.9	21.6	20.4	N/A	11.0	10.7	17.1	17.8
BC-31	30.3	33.9	33.6	22.0	31.1	37.7	31.4	35.3
BC-32	17.6	20.6	20.6	11.7	14.9	20.4	17.6	19.8
BC-33	41.3	40.9	43.0	23.6	36.6	49.6	39.2	**44.0**
BC-34	19.0	18.9	15.3	12.0	12.2	12.8	15.0	16.9
BC-35	28.4	35.5	29.7	25.7	28.6	33.2	30.2	33.9

N/A = no result available.

Raw mean concentrations have been adjusted for bias using Defra's National Database of Bias Adjustment Factors. Bias adjustment factor = 0.88 (Staffordshire Scientific Services, 2017, 20% TEA in water).

Data annualised in accordance with Defra Technical Guidance TG.16 Box 7.9 [REF 6-13].

6.2.15. Seven of the additional monitoring locations recorded NO_2 concentrations exceeding the annual mean air quality objective, six of which were recorded along the A1 at locations to the north and south of Black Cat junction. The remaining exceedance was measured at a location alongside the existing A428 near Croxton.

Sensitive Receptors

6.2.16. Receptors that are potentially sensitive to changes in air quality include residential properties, schools, hospitals and species and/or habitats within designated ecological sites.

6.2.17. There are numerous residential properties either side of the A1 north and south of Black Cat junction, as well as those located within the villages of Roxton, Chawston, Tempsford and Wyboston.

6.2.18. There are also a number of settlements and properties adjacent to the A428 and within the more open landscapes to the south of the A428, which include the settlements of Abbotsley, Eltisley, Croxton and various farms and individual properties.

6.2.19. There are several schools within the scoping study area, including St Neots Middlefield Community Primary School, Newton Community Primary School in Eltisley, Roxton Lower School located between the A1 and A421, and Cambourne Primary School.

6.2.20. A number of statutorily designated sites have been identified as having features that may be susceptible to changes in air quality. Those in proximity to the DCO site boundary are illustrated on Figure 6.1 in Chapter 19. These sites include, but are not limited to, the following:

- Elsworth Wood Site of Special Scientific Interest (SSSI) – located 850m from the DCO site boundary, to the north east of Caxton Gibbet junction.
- St Neots Common SSSI – located 900m from the DCO site boundary, to the north of Wyboston interchange.
- Weaveley and Sand Woods SSSI – located 2.5km from the DCO site boundary, to the south east of Black Cat junction.
- Eversden and Wimpole Woods Special Area of Conservation (SAC) and SSSI – located 7.3km from the DCO site boundary, to the south-east of Caxton Gibbet junction.

6.3. Potential Impacts

Construction

6.3.1. Potential temporary impacts during construction of the Scheme may include:

- Increases in dust emissions and the associated impact at sensitive receptors from dust generating activities on site, for example demolition works.
- Emissions associated with machinery undertaking construction works, for example the use of mobile plant.
- Changes in traffic flows as a result of temporary traffic management measures and/or additional vehicles travelling to and from the construction site, for example those transporting materials, plant and labour.

Operation

6.3.2. Operation of the Scheme has the potential to impact local air quality at human health receptors and ecological receptors, and regional air quality, due to the following:

- Inclusions and changes to the existing road layout, which may introduce new emissions sources in locations where emissions have not been present previously, for example from traffic travelling on a new section of road that is in proximity to receptors.
- Bringing emission sources closer to existing receptors, for example through the alteration of the alignment of an existing road.
- Changes in the flow, speed and composition of traffic on the road network, which could affect local and regional air quality, for example a reduction in vehicles on a road that currently carries high volumes of traffic could lead to improved air quality.

Future Maintenance

6.3.3. Consideration was given to the activities associated with the future maintenance and management of the Scheme, and whether these have the potential to result in impacts on air quality.

6.3.4. Following a review of the typical activities associated with this phase of the Scheme (for example the routine inspection and maintenance of drains, periodic carriageway resurfacing and emergency repair works), the scoping exercise concluded that there would be limited potential of such impacts to occur, and that these activities are comparable with standard maintenance operations already being undertaken elsewhere on the strategic and local road networks.

6.3.5. Accordingly, the potential impacts on air quality associated with this phase of the Scheme will be scoped out of the assessment.

6.4. Design, Mitigation and Enhancement Measures

6.4.1. Potential air quality impacts are being taken into account as part of the design-development of the Scheme in order to reduce and/or avoid adverse effects through careful design. Considerations include:

- the alignment of new sections of highway to reduce the proximity of new operational traffic flows on sensitive receptors; and
- the siting of construction compounds to reduce the potential impact of construction activities on sensitive receptors.

6.4.2. The scoping exercise has identified a likely requirement for mitigation during the construction phase of the Scheme. The following example standard measures will be developed further as part of the Outline Environmental Management Plan (OEMP) for the Scheme, and will form the basis of the measures and requirements to be embodied within the contractor's Construction Environmental Management Plan:

- Employment of dust suppression techniques, for example the sheeting of certain stockpiled materials to reduce fugitive emissions.
- Reducing emissions from construction vehicles and equipment, for example by not having engines idling unnecessarily.
- Imposing speed restrictions within working areas, for example through signposting speed limits on haul roads.
- Adoption of working methods that reduce the potential for dust emissions, for example using manual techniques.
- Monitoring of construction operations and weather conditions, for example to limit the exposure of dry materials during high winds.

6.4.3. Construction mitigation measures will be developed using guidance contained in the Institute of Air Quality Management (IAQM) publication: Guidance on the Assessment of Dust from Demolition and Construction [REF 6-14].

6.5. Description of the Likely Significant Effects

6.5.1. The scoping exercise has identified that both adverse and beneficial effects on local and regional air quality would likely result from the construction and operation of the Scheme.

Construction

6.5.2. Due to the nature, duration and geographic extents of construction works associated with the Scheme, effects may occur on sensitive receptors as a result of on-site dust emissions from construction activities, vehicle movements and plant emissions within 200m of the DCO site boundary.

6.5.3. As there are no nationally designated ecological sites within 200m of the DCO site boundary, construction-related effects on such sites will be scoped out of the assessment.

Operation

6.5.4. Annual average NO_2 concentrations are present at levels which could result in potentially significant effects as a result of operation of the Scheme.

6.5.5. Direct changes to ambient concentrations of NO_2 are likely to arise, which may affect the exposure of sensitive receptors to these pollutants. These are likely to derive from changes in the flow, speed and composition of traffic on both existing and new roads. Such changes are expected to provide an improvement in terms of alleviating traffic congestion at receptors in proximity to the A428 through the redistribution of traffic onto the new dual carriageway. Pollutant concentrations at sensitive receptors in proximity to the new dual carriageway are expected to increase due to the absence of air pollution sources, with increases also likely at receptors close to Black Cat junction.

6.5.6. For PM_{10}, local authority monitoring within the scoping study area has not identified any risk of exceedances of the relevant UK Air Quality Standard (AQS) objectives. It is therefore considered unlikely that the operational Scheme would result in significant effects on sensitive receptors with respect to PM_{10}; however, consideration will be given to this pollutant within the assessment.

6.5.7. As the Scheme may also affect the flow, speed and composition of traffic beyond the physical extents of the Scheme, operation of the Scheme may potentially affect regional air quality in relation to NO_2, PM_{10} and Carbon Dioxide (CO_2).

6.5.8. In relation to operational effects on ecological sites, no significant effects are predicted due to their distance from the affected road network.

6.5.9. As national assessments have demonstrated that there is no risk of carbon monoxide, 1,3-butadiene, benzene, lead and sulphur dioxide concentrations exceeding the relevant UK AQS objectives due to emissions from traffic anywhere in the UK, consideration of these pollutants will be scoped out of the assessment.

6.6. Assessment Methodology

Assessment Guidance

6.6.1. As the scoping exercise has recorded a likelihood of significant effects on air quality, a detailed assessment will be undertaken in accordance with the guidance and methodologies contained in DMRB [REF 6-1].

6.6.2. The assessment will also reference guidance contained within the following documents:

- Interim Advice Note (IAN) 170/12 v3: Updated air quality advice on the assessment of future NO_x and NO_2 projections for users of DMRB Volume 11, Section 3, Part 1 Air Quality [REF 6-15].
- IAN 174/13: Updated advice for evaluating significant local air quality effects for users of DMRB Volume 11, Section 3, Part 1 Air Quality [REF 6-16].

- IAN 175/13: Updated advice on risk assessment related to compliance with the EU Directive on ambient air quality and on the production of Scheme Air Quality Action Plans for users of DMRB Volume 11, Section 3, Part 1 Air Quality [REF 6-17].
- IAN 185/15: Updated traffic, air quality and noise advice on the assessment of link speeds and generation of vehicle data into 'speed-bands' for users of DMRB Volume 11, Section 3, Part 1 'Air Quality' [REF 6-18].
- Defra's Local Air Quality Management Technical Guidance (LAQM.TG(16)), where appropriate [REF 6-13].

6.6.3. The assessment will determine the effects that the Scheme will have on local and regional air quality for human health and ecological receptors, and will estimate the local pollutant concentrations and regional pollutant emissions to air (including those for carbon).

Construction Assessment

6.6.4. For the assessment of construction phase activities, the locations of any sensitive receptors within 200m of construction sites will be identified such that appropriate mitigation measures to reduce dust emissions can be developed. As demolition and construction plant emissions are considered to be a small emission source relative to ambient local conditions, the effects of these emissions will be assessed in a qualitative manner.

6.6.5. Assessment of construction phase heavy goods vehicle (HGV) emissions will be determined by applying the DMRB [REF 6-1] guidance and criteria i.e. if the traffic data for the Scheme indicates that the additional HGV movements generated during the construction phase are likely to be more than 200 HGVs per day, then detailed dispersion modelling will be carried out. If this threshold is not met, then the effects of construction phase HGVs will be scoped out of the assessment.

6.6.6. As there are no DMRB [REF 6-1] criteria to define the significance of effects with respect to construction dust, the assessment will inform the identification of measures to be incorporated into the OEMP with the specific purpose of avoiding significant dust effects.

Operational Assessment (Local)

6.6.7. The local air quality impact operational assessment will focus on emissions of the key pollutants NO_2 and PM_{10}. The following screening criteria set out in DMRB [REF 6-1] will be applied to define the affected road network in the operational assessment, based on the difference (change) in the traffic data for the opening year of the Scheme, between the Do-Minimum (without Scheme) and Do-Something (with Scheme) scenarios:

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

6.6.8. The local air quality study area will be defined based on the above criteria, for those road links within the affected road network which have relevant receptors within 200m of either side of road carriageways, as specified in DMRB [REF 6-1].

6.6.9. Representative sensitive receptors will be selected in the assessment of operational effects, and will include those sensitive receptors located closest to the affected road network (comprising residential premises, community facilities, and ecological sites protected by international or national statutory designation that contain features sensitive to air pollution).

6.6.10. The local air quality operational assessment will use the most up to date version of Atmospheric Dispersion Modelling System (ADMS) Roads dispersion model to predict road pollutant annual mean concentrations of NO_2 and PM_{10} at the representative sensitive receptors, and annual mean NO_x concentrations and total annual nitrogen deposition at designated ecological sites.

6.6.11. Base year modelled concentrations will be verified by comparison against available ratified monitoring data, wherever possible, and with reference to Defra's Technical Guidance LAQM.TG(16) [REF 6-13]. Where systematic bias is identified in the model verification process, adjustment factors will be applied to improve the performance of the model and the agreement between modelled and measured pollutant concentrations.

6.6.12. Predictions of the changes in NO_2 and PM_{10} concentrations will be modelled for the Do-Minimum and Do-Something scenarios for the opening year.

6.6.13. LAQM guidance [REF 6-13] and other tools, for example Defra's NO_X to NO_2 conversion tool and background pollution maps, will be used in the assessment, as required. Hourly sequential meteorological data for 2017 will be taken from Luton Airport for use in the dispersion modelling (subject to data quality being satisfactory), as data from this station is considered representative of local meteorological conditions.

6.6.14. A key element of the local air quality impact assessment is the rate of improvement in air quality over time as cleaner vehicles enter the national vehicle fleet. The methodology outlined within IAN 170/12 [REF 6-15] on the assessment of future NO_x and NO_2 projections will be used. The speed data used in the air quality impact assessment will be derived following the methodology set out in IAN 185/15 [REF 6-18] by which the speed of a given section of road is assigned to 1 of 3 or 4 speed "bands", which have an average pollutant emission rate assigned to them.

6.6.15. Evaluation of the significance of the local air quality assessment findings at sensitive receptors for health and designated ecological sites will be undertaken in accordance with IAN 174/13 [REF 6-16]. This evaluates the significance of air quality effects using the total estimated pollutant concentrations at sensitive receptors and the magnitude of change predicted to occur as a result of the Scheme. The following key criteria for air quality will be considered when determining significance of effects:

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

6.6.16. Following the collation of information to address these questions, an informed professional judgement on the significance of local air quality effects for public exposure and designated ecological sites will be established.

6.6.17. For sensitive designated ecological sites, the effect of the Scheme on annual mean NO_x concentrations and total annual nitrogen deposition will be considered in accordance with DMRB [REF 6-1]. A comparison of results will be made with the Critical Levels for NO_x and the Critical Loads for nitrogen deposition (the latter varies according to designation), with any impacts and effects on designated sites reported as part of the biodiversity assessment (see Chapter 8).

6.6.18. The significance of the effects on European and nationally designated habitat sites, including the magnitude of change in NOx and/or nitrogen deposition, will also be considered as part of the biodiversity assessment (see Chapter 8).

Operational Assessment (Compliance)

6.6.19. Air quality will be evaluated for compliance with the Council of European Communities Directive 2008/50/EC on Ambient Air Quality and Cleaner Air for Europe 2008/50/EC [REF 6-19], in accordance with IAN 175/13 [REF 6-17]. This assessment will use the results of the local air quality modelling overlaid on the Defra compliance network to establish whether one or more of the following conditions as a result of the Scheme is met:

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

6.6.20. The compliance risk assessment will be presented as part of the air quality assessment. This assessment enables the Scheme to be reviewed in terms of non-compliance with the EU Directive. The evaluation of significance will also include information on compliance risks in relation to the Directive.

Operational Assessment (Regional)

6.6.21. An assessment of regional emissions of NO_X, PM_{10} and CO_2 associated with the operational Scheme will be undertaken in accordance with DMRB [REF 6-1] using Defra's Emissions Factors Toolkit [REF 6-20]. The regional screening criteria set out in the DMRB [REF 6-1] will be applied to traffic data for the opening year and design year of the Scheme to define the regional affected road network (different to that for local air quality). Roads that meet the following criteria will be included within the regional affected road network:

- Daily traffic flows will change by 10% annual average daily traffic or more.
- Heavy duty vehicle flows will change by 10% annual average daily traffic or more.
- Daily average speed will change by 20km/hr or more.

6.6.22. Total pollutant emissions will be calculated for the existing base case (the traffic model base case); future Do-Minimum and Do-Something in the opening year; and Do-Minimum and Do Something scenarios in the design year. As the regional assessment outcomes do not have defined significance criteria, these will be presented and described to inform the assessment of overall change.

Transport Analysis Guidance Assessment

6.6.23. Transport Analysis Guidance (TAG) [REF 6-21] assessments for local air quality (known as plan level), regional air quality, the economics of air quality effects, social and distributional effects and greenhouse gases (GHG) sub objectives will be reported separately. Only the local plan level air quality appraisal from TAG [REF 6-21] will be reported, as required by DMRB [REF 6-1], which will quantify the change in exposure at receptors in the opening year as a result of the Scheme through the quantification of exposure for all roads affected. An overall positive score indicates an overall worsening in air quality, and an overall negative score indicates an overall improvement in air quality.

Policy Requirements

6.6.24. The National Planning Statement for National Networks (NPSNN) [REF 6-22] includes statements relating to air quality and the weight that should be given to air quality considerations in the decision making process and when refusal, after taking mitigation into account, should be determined. The NPSNN [REF 6-22] also includes a separate reference to any potential increases in carbon emissions as a result of the Scheme.

6.6.25. The application of the methodologies for the assessment of local and regional air quality effects will ensure the assessment is compliant with the requirements of the NPSNN [REF 6-22].

Study Area

6.6.26. For the construction assessment, the study area will be defined as the area within 200m of the DCO site boundary.

6.6.27. The local air quality assessment study area will be defined by those road links within the affected road network which have relevant receptors within 200m of either side of the road carriageway, this being the distance beyond which pollutant contributions from roads are indistinguishable from background concentrations.

6.6.28. The study area for the assessment of regional emissions will be defined using the regional air quality study area set out in DMRB [REF 6-1].

Information Sources

6.6.29. The information sources referenced as part of the scoping exercise will continue to be evaluated in order to obtain, where available, updated monitoring data.

6.6.30. Ordnance Survey AddressBase data will be used to identify non-ecological sensitive receptors within the assessment study areas.

6.6.31. The construction assessment will rely on information prepared in respect of the planned approach, timing and locations of the works, for example construction compounds and haul roads.

6.6.32. Annual Average Daily Traffic flow data and speed banded data generated from the traffic model prepared for the Scheme will be used in the assessment.

Consultation

6.6.33. No consultation is planned as part of the air quality assessment.

6.7. Assessment Assumptions and Limitations

6.7.1. Scoping has been undertaken using monitoring data collected up to the year 2018, which for the purposes of the assessment is assumed to reflect existing conditions.

6.7.2. No modelling has been undertaken to establish the likely extents of the affected road network, and individual receptors within 200m of the affected road network have not been identified as part of the scoping exercise.

7. CULTURAL HERITAGE

7.1. Study Area

7.1.1. This chapter presents the approach to the assessment of the Scheme's effects on cultural heritage (comprising archaeological remains, historic buildings and historic landscapes).

7.1.2. Based on the guidance provided in Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3 Part 2: Cultural Heritage [REF 7-1], and following consultation with Cambridgeshire County Council, Central Bedfordshire Council and Bedford Borough Council, a 1km scoping study area has been adopted around the Development Consent Order (DCO) site boundary within which the potential impacts and effects of the Scheme on designated sites and features of archaeological and heritage importance have been considered (designated sites and features comprise scheduled monuments, listed buildings and conservation areas).

7.1.3. In relation to non-designated sites and features (comprising archaeological remains and historic buildings that are not afforded statutory protection), a 1km area of search around the new dual carriageway[2] was adopted, within which information was sourced and obtained from relevant organisations through a process of desk study.

7.1.4. The locations of all assets identified within the 1km scoping study area and the 1km area of search are illustrated on Figure 7.1 in Chapter 19.

7.2. Baseline Conditions

7.2.1. To inform the scoping exercise, data, information and records relating to archaeological remains, historic buildings and historic landscapes was obtained from the following sources:

- Cambridgeshire Historic Environment Record (HER) [REF 7-2].
- Bedford Borough HER [REF 7-3].
- Central Bedfordshire HER [REF 7-4].
- The National Heritage List for England [REF 7-5].

7.2.2. Identified cultural heritage assets are numbered with their Historic England National Heritage List for England (NHLE) numbers or their HER numbers, issued by Bedford Borough Council, Central Bedfordshire Council and Cambridgeshire County Council respectively. These refer to the assets illustrated on Figure 7.1 in Chapter 19, and the list of all identified sites listed in Appendix 7.1 of this Scoping Report.

7.2.3. In relation to designated sites and features within the 1km scoping study area, these include: 14 scheduled monuments; one Grade II* entry of the Register of Parks and Gardens (12280); six Grade II* listed buildings (five churches or chapels and one house); 113 Grade II listed buildings (including two of the scheduled monuments); and seven conservation areas.

7.2.4. Further details of the identified cultural heritage assets are described by type in the following sections.

[2] Data focused on a distance of 1km around the new dual carriageway (referred to as the 1km area of search) was obtained prior to development and refinement of the DCO site boundary. Although this distance covers the majority of the extents covered by the DCO site boundary, it does not extend to more remote areas within the DCO site boundary (specifically isolated parcels of land located to the north of St Neots, along the existing A428 to the south of St Neots, and south and west of Black Cat junction on the A1 and the A421) which were incorporated into the DCO site boundary late into the scoping process.

Archaeological Remains

7.2.5. Designated archaeological remains include 14 scheduled monuments within the 1km scoping study area, comprising a Bronze Age bowl barrow (NHLE 1013521), eight medieval moated sites (NHLE 1019176; 1019638 1019177; 1010114; 1012076; 1013419; 1010864; 1010948), three deserted medieval villages (NHLE 1006849; 1006815; 1006783), a 17th-18th century bridge (NHLE 1004504) and a 19th century bridge (NHLE 1005393).

7.2.6. In relation to the non-designated archaeological remains within the 1km area of search, the earliest remains date to the Palaeolithic (to *c.* 10,000 BC), Mesolithic (*c.* 10,000 to 4000 BC) and Neolithic (*c.* 4000 to 2500 BC), consisting of find spots of flint artefacts. Remains of Bronze Age date (2500 to 800 BC) include flint scatters, cropmarks of a ring ditch and possible enclosure and agricultural activity, as well as the scheduled barrow. Another possible non-designated barrow is also recorded.

7.2.7. Remains of Iron Age date (800 BC to AD 43) are comparatively limited, although there are a number of cropmark sites which may be Iron Age or Roman (AD 43 to 410) in date, comprising enclosures and ditches. Other assets of Roman date include Ermine Street, which follows the line of the A1198, the Sandy to Godmanchester Roman road, numerous find spots of pottery, coins and metalwork, and other occupation activity.

7.2.8. There is evidence of early medieval occupation, including the site of Eltisley Abbey, remains of Saxon date, and finds of early medieval date. There is extensive evidence of medieval date, including eight scheduled moated sites and three scheduled deserted medieval villages. 13 non-designated moated sites are also recorded. A number of the villages in the area have origins in the medieval period, and there is widespread evidence of ridge and furrow.

7.2.9. Archaeological evidence of post-medieval date comprises the sites of buildings and industrial activity including gravel pits, kilns, and a blacksmith. The route of turnpike roads and the railway are also recorded. Evidence of modern date is largely limited to evidence of the World War II defences in the area.

Historic Buildings

7.2.10. 119 listed buildings are recorded in the 1km scoping study area, largely consisting of post-medieval houses, cottages and farm buildings.

7.2.11. Four churches, Saint Pandionia, Saint Peter, Saint Nicholas and Saint John the Baptist, are Grade II* listed and have medieval origins.

7.2.12. Tempsford Bridge and Blunham Bridge are both Grade II listed and scheduled monuments.

7.2.13. Non-designated historic buildings within the 1km area of search include residential properties and farm buildings, with other amenity buildings such as pubs, schools and religious buildings also recorded.

Historic Landscapes

7.2.14. Croxton Park is a Grade II* registered park and garden located within the 1km scoping study area. Its origins are as a 16th century deer park, with gardens set around an 18th century house. The deserted medieval village of Croxton is also located within the park.

7.2.15. There are seven conservation areas within the 1km scoping study area located in: Blunham; Tempsford; Great Barford and Green End; Great Barford Hill; St Neots; Croxton; and Eltisley.

7.2.16. Three non-designated parks are recorded in the 1km area of search at Wintringham Hall, Tempsford Hall and Roxton Park.

7.2.17. RAF Caxton Gibbet, a World War II military airfield, is also recorded within the 1km area of search.

7.3. Potential Impacts

Construction

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

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

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

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

Operation

7.3.3. Operational impacts of the Scheme potentially include the following:

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

Future Maintenance

7.3.4. Consideration was given to the activities associated with the future maintenance and management of the Scheme, and whether these have the potential to result in impacts on cultural heritage.

7.3.5. Following a review of the typical activities associated with this phase of the Scheme (for example the routine inspection and maintenance of drains, periodic carriageway resurfacing and emergency repair works), the scoping exercise concluded that there

would be limited potential of such impacts to occur, and that these activities are comparable with standard maintenance operations already being undertaken elsewhere on the strategic and local road networks.

7.3.6. Accordingly, the potential impacts on cultural heritage associated with this phase of the Scheme will be scoped out of the assessment.

7.4. Design, Mitigation and Enhancement Measures

7.4.1. The scoping exercise has identified a potential requirement for the following types of mitigation:

- Designing the Scheme to avoid or reduce impacts on heritage assets, for example through the use of landscaping to visually contain new road infrastructure.
- Historic building recording and historic landscape recording in advance of Scheme construction, to provide a permanent documentary record of assets in their current form and condition.
- Archaeological investigations in advance of, or during, Scheme construction.
- Installation of physical protection or screening measures, or the temporary removal of assets and reinstatement following the completion of construction works.
- Dissemination of the results of all surveys in an appropriate format and supporting archive.

7.4.2. It is predicted that it will be possible to mitigate the Scheme's impacts upon the buried archaeological resource through a staged programme of archaeological investigation and recording, the purpose of which is to ensure that surviving remains are recorded prior to their destruction by construction activities. This will include geophysical survey and evaluation excavation (trial trenching) to identify the extent and survival of recorded remains, followed, where required, by excavation to ensure they are fully understood and recorded.

7.4.3. Archaeological monitoring during construction is also likely to be required to mitigate any effects on unrecorded remains.

7.4.4. The development of mitigation will follow guidance from the Chartered Institute for Archaeologists [REF 7-6], with measures refined during the EIA process and agreed with stakeholders including Historic England, Cambridgeshire County Council, Bedford Borough Council and Central Bedfordshire Council's Historic Environment Teams, and the relevant Conservation Officers.

7.4.5. The findings of the cultural heritage assessment are expected to form a key consideration in the development of the landscaping strategy for the Scheme, which will take into account key heritage assets in proximity to the Scheme, for example Croxton Park, scheduled monuments and listed buildings (see Chapter 9).

7.5. Description of the Likely Significant Effects

7.5.1. The scoping exercise has identified that both adverse and beneficial effects on cultural heritage would likely result from the construction and operation of the Scheme.

7.5.2. It is predicted that the Scheme will result in the total loss of the following previously recorded heritage assets, the effects of which are likely to be significant:

- The Grade II listed Brook Cottages (NHLE 1311862; HER 12458).
- A Grade II listed milestone (NHLE 1162760).

- Enclosures identified from cropmarks (MCB24586; MCB21136; MCB18829/09972; MCB24588).
- Ditches with may be part of an enclosure which were identified on aerial photographs (MCB19041).
- The site of a post-medieval windmill (02463; 02541).

7.5.3. One additional asset, Wyboston Green (a former medieval green), is likely to be partially affected by the Scheme. The scoping exercise has concluded that this may still result in a significant effect on the feature.

7.5.4. There may be physical impacts to one scheduled monument, the moated site at Pastures Farm (1019177), which coincides with the DCO site boundary; however, the scoping exercise has identified that any effect on this site is unlikely to be significant.

7.5.5. A further 45 assets will be partially affected by the Scheme. These include cropmarks of enclosures, ditches and ridge and furrow. Three historic road alignments, including Ermine Street Roman road, Sandy to Godmanchester Roman road, and a turnpike road, will be crossed by the Scheme, as well as the line of the Great Northern Railway. Other assets include medieval features identified through watching brief. The Scheme may also physically affect part of extant buildings, the Whitehall complex and the Croxton old rectory, as well as the site of several former buildings, including the site of 19th century school, pillbox, former milepost, and a demolished farmhouse.

7.5.6. Other assets which may be affected include the site of Caxton Gibbet, a possible tanning vat, and the site of Second World War anti-tank traps. The northern edge of the moated site at Wintringham runs along the southern side of the DCO site boundary, which may be physically affected.

7.5.7. The remaining affected assets include a number of flints artefacts recovered during excavations and prehistoric and Roman find spots. The scoping exercise has concluded that these effects are not predicted to be significant.

7.5.8. There will be adverse effects on seven scheduled monuments, caused by changes to their setting. These consist of a Bronze Age bowl barrow (NHLE 1013521), two medieval moated sites (NHLE 1012076 & NHLE 1019177), Tempsford Bridge (1005393) and two deserted medieval villages at Wintringham and Weald (NHLE 1006815 & NHLE 1006849).

7.5.9. The scoping exercise has identified that the setting of a number of listed buildings and non-designated historic buildings will likely be adversely affected. These include those located along the A1 north of Black Cat junction, buildings near the Cambridge Road junction at Wintringham, those located to the north of Eltisley, at Top Farm, and the dovecote at Pastures Farm.

7.5.10. There is the potential for adverse effects on previously unrecorded archaeological remains within the DCO site boundary, which may be encountered during construction of the Scheme.

7.5.11. Assets at Croxton, including the scheduled Croxton deserted medieval village (NHLE 1006783), the Grade II* registered Croxton Park, and a number of listed buildings along Abbotsley Road, are expected to experience a beneficial effect once the Scheme is operational. This would be associated with the reassignment of traffic from the existing A428 onto the new dual carriageway. Similarly, the Scheme is also expected to have a beneficial effect on designated assets in Eltisley.

7.6. Assessment Methodology

Assessment Guidance

7.6.1. As the scoping exercise has recorded a likelihood of significant effects on cultural heritage, a detailed assessment will be undertaken in accordance with the guidance and methodologies contained within DMRB Volume 11, Section 3, Part 2: Cultural Heritage (HA 208/07) [REF 7-1].

7.6.2. The assessment will adopt the criteria contained within this guidance [REF 7-1] to identify and assess the value of, and the magnitude of impacts and significance of effects on, known cultural heritage assets, as presented in **Table 7.1**, **Table 7.2** and **Table 7.3**.

Table 7.1: Value Criteria for Archaeological Assets, Built Heritage and Historic Landscapes

Value	Archaeological Assets	Built Heritage	Historic Landscapes
Very High	World Heritage Sites (including nominated sites). Assets of acknowledged international importance. Assets that can contribute significantly to acknowledged international research objectives.	Structures inscribed as of universal importance as World Heritage Sites. Other buildings of recognised international importance.	World Heritage Sites inscribed for their historic landscape qualities. Historic landscapes of international value, whether designated or not. Extremely well preserved historic landscapes with exceptional coherence, time-depth, or other critical factor(s).
High	Scheduled Monuments (including proposed sites). Undesignated assets of schedulable quality and importance. Assets that can contribute significantly to acknowledged national research objectives.	Scheduled Monuments with standing remains. Grade I and Grade II* Listed Buildings. Other listed buildings that can be shown to have exceptional qualities in their fabric or historical associations not adequately reflected in the listing 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 value. Well preserved historic landscapes, exhibiting considerable coherence, time-depth or other critical factor(s).

Value	Archaeological Assets	Built Heritage	Historic Landscapes
Medium	Designated or undesignated assets that contribute to regional research objectives.	Grade II Listed Buildings. Historic (unlisted) buildings that can be shown to have exceptional qualities in their fabric or historical associations. Conservation areas containing buildings that contribute significantly to its historic character. Historic Townscape or built-up areas with important historic integrity in their buildings, or built settings (e.g. including street furniture etc.).	Designated special historic landscapes. Undesignated historic landscapes that would justify special historic landscape designation, landscapes of regional value. Averagely well-preserved historic landscapes with reasonable coherence, time-depth or other critical factor(s).
Low	Designated and 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 etc.).	Robust undesignated historic landscapes. Historic landscapes with importance to local interest groups. Historic landscapes whose value is limited by poor preservation and/or poor survival of contextual associations.
Negligible	Assets with very little or no surviving archaeological interest.	Buildings of no architectural or historical note; buildings of an intrusive character.	Landscapes with little or no significant historical interest.
Unknown	The importance of the resource has not been ascertained.	Buildings with some hidden (i.e. inaccessible) potential for historic significance.	n/a

Table 7.2: Magnitude of Impact Criteria for Archaeological Assets, Built Heritage and Historic Landscapes

Impact Magnitude	Description		
	Archaeological Assets	**Built Heritage**	**Historic Landscapes**
Major	Change to most or all key archaeological materials, such that the resource is totally altered. Comprehensive changes to setting.	Change to key historic building elements, such that the resource is totally altered. Comprehensive changes to the setting.	Change to most or all key historic landscape elements, parcels or components; extreme visual effects; gross change of noise or change to sound quality; fundamental changes to use or access; resulting in total change to historic landscape character unit.
Moderate	Changes to many key archaeological materials, such that the resource is clearly modified. Considerable changes to setting that affect the character of the asset.	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 materials, such that the asset is slightly altered. Slight changes to setting.	Change to key historic building elements, such that the asset is slightly different. Change to setting of an historic building, such that it is noticeably changed.	Changes to few key historic landscape 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 archaeological materials, or setting.	Slight changes to historic buildings 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 or access; resulting in a very small change to historic landscape character.
No Change	No change.	No change to fabric or setting.	No change to elements, parcels or components; no visual or audible changes; no changes arising from in amenity or community factors.

Table 7.3: Significance of Effect Matrix

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

7.6.3. Guidance on undertaking desk-based assessment from the Chartered Institute for Archaeologists [REF 7-7] and guidance contained within Historic England's Good Practice Advice in Planning Note 3 [REF 7-8] will also be used to inform the cultural heritage assessment.

Policy Requirements

7.6.4. The National Policy Statement for National Networks (NPSNN) [REF 7-9] acknowledges that the construction and operation of road infrastructure has the potential to affect the historic environment, and provides guidance on the identification, assessment and mitigation of effects on cultural heritage assets.

7.6.5. The NPSNN [REF 7-9] also sets out the matters that the Secretary of State should give due regard to when determining DCO applications for developments that are likely to affect the significance of cultural heritage assets, their settings or their conservation.

7.6.6. The requirements of the NPSNN [REF 7-9] in relation to identifying the significance of cultural heritage assets, and assessing and mitigating the effects of the Scheme on such assets, will be taken into account within the cultural heritage assessment.

7.6.7. The cultural heritage assessment will include an assessment of the heritage significance of potentially affected assets, in line with the National Planning Policy Framework (NPPF) [REF 7-10]. This will also assess any change to heritage significance resulting from changes to the setting of heritage assets.

7.6.8. The NPPF defines value of heritage assets as "*the value of a heritage asset to this and future generations because of its heritage interest*". [REF 7-10], and sets out criteria which should be considered when assessing the significance of cultural heritage assets, which include archaeological, architectural, artistic and historic interest. These criteria will be used in the assessment of significance for each affected asset and this information, in conjunction with professional judgement, will be used to assess the value of heritage assets.

7.6.9. Within the NPPF [REF 7-10], impacts affecting the value of heritage assets are considered in terms of harm. There is a requirement to determine whether the level of harm amounts to 'substantial harm' or 'less than substantial harm'. Although there is no direct correlation between the significance of effects identified through the EIA process and the level of harm caused to heritage significance, the assessment of harm arising from the impact of the Scheme will be reported within the Environmental Statement and determined using professional judgement, and with regard to the following considerations:

- A large (significant) effect on a heritage asset would more often be the basis by which to determine that the level of harm to the significance of the asset would be substantial.
- A moderate (significant) effect is unlikely to meet the test of substantial harm, and would therefore more often be the basis by which to determine that the level of harm to the significance of the asset would be less than substantial.
- A slight (not significant) effect would still amount to less than substantial harm, which triggers the statutory presumptions against development within s.66 of the Planning (Listed Buildings and Conservation Areas) Act 1990 [REF 7-11].
- A neutral effect would be classified as having no harm.

7.6.10. Each asset will be assessed on an individual basis. For example, some moderate effects may cross the threshold into substantial harm.

Study Area

7.6.11. A study area capturing all land within and surrounding the DCO site boundary (outward to 1km) will be adopted within the cultural heritage assessment within which information and records will be obtained to identify all archaeological remains, historic buildings and historic landscapes within this distance.

7.6.12. A flexible approach will be adopted when identifying high-value assets on which there may be impacts upon their setting. This will be guided by professional judgement and the extents of the Scheme's Zone of Theoretical Visibility (ZTV) prepared as part of the landscape and visual impact assessment (see Chapter 9). This will also consider any physical and historical connectivity, and relationships with other monuments and the wider landscape.

Information Sources

7.6.13. The following desk-based information sources will be used within the cultural heritage assessment to establish the baseline conditions:

- The National Heritage List for England (NHLE).
- Updated HER data from Cambridgeshire County Council, Bedford Borough Council and Central Bedfordshire Council.
- Analysis of aerial photography (historic and current).
- Historic mapping and other archival sources, including the Cambridgeshire Record Office and the Bedfordshire Archives and Record Service.
- Available geotechnical information (see Chapter 13).
- Available reports of previous archaeological fieldwork undertaken in the DCO site boundary.
- Other sources identified as research progresses.

7.6.14. The desk-based information will be supplemented by a full heritage walkover survey, which will include an assessment of sites for impacts caused by changes to setting.

7.6.15. A geophysical survey will be undertaken within areas of the DCO site boundary where land access can be obtained by way of landowner agreement.

7.6.16. Further archaeological fieldwork comprising archaeological evaluation and detailed setting assessments will be undertaken as part of the assessment process, the scope

of which will be informed by the desk-based analysis of information, the outcomes of the geophysical survey, and through consultation with relevant bodies.

Consultation

7.6.17. Consultation will be undertaken with the following bodies as part of the assessment process:

- The County Archaeologists for Cambridgeshire, Bedford and Central Bedford.
- Relevant Conservation Officers.
- Historic England.

7.6.18. Consultation will also be undertaken regarding the demolition of the Grade II listed Brook Cottages (NHLE 1311862; HER 12458) and the Grade II listed milestone (NHLE 1162760). This will include the development and agreement of measures to ensure they are appropriately recorded prior to Scheme construction, as well as measures to protect or reinstate the milestone.

7.7. Assessment Assumptions and Limitations

7.7.1. Scoping has been undertaken using data received from databases held and maintained by third parties, which for the purposes of the scoping exercise are assumed to be up to date and appropriate for use.

7.7.2. As noted in Section 7.1, the 1km area of search adopted within the scoping exercise for non-designated sites and features does not extend around all areas of the DCO site boundary. The cultural heritage assessment will take full account of these areas of the DCO site boundary.

7.7.3. As the HERs only list known archaeological sites or significant historic landscape features, potential exists for previously unrecorded archaeological remains to be discovered. Such potential has not been considered as part of the scoping exercise, but will be accounted for in the cultural heritage assessment.

7.7.4. Due to the inherent limited design information currently available for the Scheme, it is not possible to accurately determine the impacts on both recorded and previously unrecorded archaeological remains. The Scheme may impact on buried and previously unrecorded archaeological remains, or other heritage assets that have not yet been identified or recorded in heritage datasets.

7.7.5. Historic Landscape Characterisation data was not available at the time of undertaking scoping and was therefore not considered as part of the scoping exercise. This information will, however, be obtained and evaluated as part of the cultural heritage assessment.

7.7.6. The DCO site boundary has not been subject to any site walkover or archaeological investigation to inform the scoping process. Fieldwork will be undertaken as part of the cultural heritage assessment, but may be limited in its scope and coverage by landowner agreement to access parcels of land to carry out both intrusive and non-intrusive investigations.

8. BIODIVERSITY

8.1. Study Area

8.1.1. This chapter presents the approach to the assessment of the Scheme's effects on biodiversity.

8.1.2. The study areas adopted as part of the scoping exercise vary according to the spatial characteristics of the site, habitat or species under consideration. A combination of best practice guidance and professional judgement has been used to determine the geographical extents over which effects could occur on biodiversity features as a result of the Scheme.

8.1.3. The following study areas for international statutory (for example Special Areas of Conservation (SAC)) and national statutory (for example Sites of Special Scientific Interest (SSSI)) and non-statutory (for example County Wildlife Sites (CWS)) have been adopted in the scoping exercise, with information sourced through desk study:

- International statutorily designated sites: within 5km of the Development Consent Order (DCO) site boundary.
- National statutorily designated sites: within 1km of the DCO site boundary.
- Non-statutory designations: within 1km of the DCO site boundary.

8.1.4. For international statutorily designated sites, where bats are a primary reason for designation and/or there are potential pathways present (for example in respect to flight paths or feeding areas of birds outside a Special Protection Area (SPA)), a wider scoping study area of 30km beyond the DCO site boundary has been applied, in accordance with the guidance contained in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 4, Part 1: Assessment of Implications on European Sites [REF 8-1].

8.1.5. A 1km area of search (extending to 2km for bats) around the main engineering components of the Scheme[3] was adopted for the following types of biodiversity feature, within which information and records were sourced through desk study:

- Legally protected and notable species, including invasive non-native species (within the last ten years).
- Habitats and habitat connections relevant to the interpretation of planning policy and assessment of potential protected and notable species constraints.
- Designated green corridors, wildlife networks and other ecological features.
- Local Biodiversity Action Plan (LBAP) Priority Habitats and Species, and Species of Principal Importance.

8.2. Baseline Conditions

8.2.1. To inform the scoping exercise, data, information and records relating to biodiversity features was obtained from the following sources within the adopted scoping study areas:

[3] Data focused on 1km around the main engineering components of the Scheme was obtained prior to development and refinement of the DCO site boundary. Although this distance covers the majority of the extents covered by the DCO site boundary, it does not extend to more remote areas within the DCO site boundary (specifically isolated parcels of land located to the north of St Neots, along the existing A428 to the south of St Neots, and south and west of Black Cat junction on the A1 and the A421) which were incorporated into the DCO site boundary late into the scoping process.

- Natural England – to obtain information on statutorily designated sites, national character areas, and the grades of agricultural land.
- Environmental records centres and local groups – to obtain information and records on notable plant and animal species.
- Published Biodiversity Action Plans (BAPs).
- Various published texts concerning habitats and species recorded within Cambridgeshire and Bedfordshire.
- Aerial photography.

8.2.2. Additionally, data gathered from site-based surveys, fieldwork and appraisals undertaken during the optioneering stages of the Scheme between 2016 and 2018 informed the scoping exercise.

Statutorily Designated Sites

8.2.3. Figure 8.1 in Chapter 19 illustrates the locations of international and other statutorily sites designated for their nature conservation value and their relationship to the DCO site boundary.

8.2.4. Within the 30km scoping study area (for European sites), Eversden and Wimpole Woods SAC is located 7.3km from the DCO site boundary, to the south-east of Caxton Gibbet junction. This site is designated primarily for its barbastelle (*Barbastella barbastellus*) bat species interest, and is also designated as a SSSI.

8.2.5. No internationally designated sites are located within the 5km scoping study area.

8.2.6. Two statutorily designated sites are located within the 1km scoping study area. These are:

- Elsworth Wood SSSI – located 850m from the DCO site boundary, to the north east of Caxton Gibbet junction; and
- St Neots Common SSSI – located 900m from the DCO site boundary, to the north of Wyboston interchange.

8.2.7. No designated National or Local Nature Reserves are located within the 1km scoping study area.

Non-Statutorily Designated Sites

8.2.8. Figure 8.1 in Chapter 19 illustrates the locations of non-statutorily designated sites of nature conservation value within the 1km scoping study area. These sites are summarised in **Table 8.1** along with their geographical relationship to the DCO site boundary.

Table 8.1: Non-statutorily Designated Sites within 1km of the DCO Site Boundary

Non-statutorily designated site	Location with respect to DCO site boundary	Designation
Birchfield Farm Meadows	615m from the DCO site boundary.	County Wildlife Site
Croxton Park	Located immediately adjacent to the DCO site boundary.	County Wildlife Site
Great Barford House Grassland	750m from the DCO site boundary.	County Wildlife Site
Latch Pool and Ditch	570m from the DCO site boundary.	County Wildlife Site
Little Barford	645m from the DCO site boundary.	County Wildlife Site
River Great Ouse	Crossed by the DCO site boundary.	County Wildlife Site
Willow Pollards West of Sharp's Barn	705m from the DCO site boundary.	County Wildlife Site
Wyboston Pits	Crossed by the DCO site boundary	County Wildlife Site
Zwetsloots Pits	205m from the DCO site boundary.	County Wildlife Site
Eltisley Wood	900m from the DCO site boundary.	County Wildlife Site Ancient Woodland
Palaceyard Wood	630m from the DCO site boundary.	County Wildlife Site Ancient Woodland
Sir John's Wood	200m from the DCO site boundary.	County Wildlife Site Ancient Woodland
Begwary Brook (Pits) Nature Reserve	300m from the DCO site boundary.	County Wildlife Site Wildlife Trust Nature Reserve
Cambourne Nature Reserve	650m from the DCO site boundary.	Wildlife Trust Nature Reserve
Elsworth Wood	850m from the DCO site boundary.	Ancient Woodland
Elsworth (A428 to Common Farm)	Crossed by the DCO site boundary.	Protected Road Verge

National Character Areas and Biodiversity Interest

8.2.9. The DCO Site boundary is located within National Character Area 88: Bedfordshire and Cambridgeshire Claylands (NCA) [REF 8-2].

8.2.10. Although only a small proportion of NCA 88 [REF 8-2] is designated for its biodiversity interest, the area contains a diverse range of habitats of importance including: floodplain grazing marsh; lowland mixed deciduous woodland; fen; lowland meadow; reedbed; traditional orchards; wood pasture; and parkland with ancient and veteran trees.

8.2.11. These habitats support a range of species, some rare and scarce, many of which are associated with the remnant ancient woodland including butterflies such as the white admiral (*Limenitis camilla*), purple hairstreak (*Favonius quercus*) and black hairstreak (*Satyrium pruni*), [hazel] dormouse (*Muscardinus avellanarius*), barbastelle bat and specialist invertebrates. Riparian and wetland habitats provide valuable habitat connectivity within the landscape and support populations of breeding and overwintering birds, water vole (*Arvicola amphibius*), otter (*Lutra lutra*), great crested newt (*Triturus cristatus*) and species of stonewort (submerged aquatic plants). The

farmscape supports farmland birds such as skylark (*Alauda arvensis*) and grey partridge (*Perdix perdix*), and brown hare (*Lepus europaeus*).

8.2.12. The biodiversity of NCA 88 [REF 8-2] is under pressure from land use change, development and infrastructure improvements, and demand for resources (especially water); however, opportunities exist to benefit biodiversity and recreation by creating new green infrastructure. The management and extension of semi-natural habitats within NCA 88 [REF 8-2] will bring benefits for biodiversity, soil and water quality, climate regulation and recreation.

Habitats

Desk Study

8.2.13. The DCO site boundary is located in parts of Cambridgeshire and Bedfordshire that are predominantly managed under intensive arable cultivation.

8.2.14. A large part of the DCO site boundary is classified within the Agricultural Land Classification (ALC) [REF 8-3] as being Grade 2 Very Good land (see Chapter 11). Apart from the River Great Ouse corridor, soils are of a single type: lime-rich loamy and clayey with impeded drainage. The soil along the river corridor is freely draining, slightly acid and sandy [REF 8-4].

8.2.15. To the south and west of the DCO site boundary is a chalky clay boulder clay plateau known as the West Cambridgeshire Hundreds, where woodland has likely not comprised more than 5% of the total land surface since Anglo-Saxon times [REF 8-5] (the British average woodland cover being 11%). Although relatively sparse and privately managed, most of the larger woodlands have a high biodiversity value, are ancient woodland, and designated either as SSSIs or CWSs.

8.2.16. The River Great Ouse passes through the DCO site boundary, and is designated as a CWS and identified as a botanical hotspot in Bedfordshire [REF 8-6]. Downstream, there are a number of CWSs (including one designated as a SSSI), all of which are closely linked to the river, as illustrated on Figure 8.1 in Chapter 19.

8.2.17. Tributaries of the River Great Ouse that coincide with the DCO site boundary are Hen Brook (known as Abbotsley Brook in its upstream), Fox Brook and Gallows Brook, none of which is designated for their biodiversity value.

8.2.18. Croxton Park is a landscape scale CWS located adjacent to the DCO site boundary, comprising parkland habitat with meadows showing evidence of ridge and furrow, woodland and veteran trees. A variety of other habitats are noted: arable land; brooks; ponds; woods; veteran trees; meadows; roads; the village and small brownfield sites. A botanical survey of the parish, of which the park is a substantial part, recorded over 400 plant species, most of which were relatively common [REF 8-7]. In 1966, oxlip (*Primula elatior*) was found in Turtlow Plantation at Croxton Park, the most westerly location for oxlip in Cambridgeshire [REF 8-8] (a nationally scarce species).

8.2.19. A number of Cambridgeshire BAP [REF 8-9] Priority Habitats and Bedfordshire BAP Priority Habitats [REF 8-10] may occur within or in proximity to the DCO site boundary, including: farmland (arable); deciduous woodland; wet woodland; grazing marsh; wood pasture and parkland; traditional orchards; lowland dry acid grassland; lowland calcareous grassland; lowland heathland; lowland meadows; hedgerows; ponds; reedbeds; and rivers and streams.

Field Survey

8.2.20. An extended Phase 1 Habitat survey was undertaken in 2016 as part of the assessment of Scheme options. In conjunction with analysis of recent aerial photography and field surveys, a range of habitats have been identified within 500m of the DCO site boundary.

8.2.21. The majority of habitat coverage comprises arable fields with small and localised blocks of semi-natural and plantation woodland. Most field boundaries support hedgerows, some of which include mature trees including in one case a veteran tree. There are also streams, ditches and over 70 ponds and other waterbodies recorded within 500m of the DCO site boundary.

8.2.22. Some of the habitats present within 500m of the DCO site boundary are listed as priority habitats under the UK Post-2010 Biodiversity Framework [REF 8-11].

8.2.23. The extended Phase 1 Habitat survey has been added to through focussed habitat surveys including surveys of arable field boundaries, hedgerows and streams, as well as observations made when other surveys were undertaken, such as riparian mammals and Great Crested Newt (GCN) surveys.

Species

Desk Study

8.2.24. Data relating to the presence of several notable animal and plant species was obtained from Cambridgeshire and Peterborough Environmental Records Centre [REF 8-12a]. Within the 1km area of search, this identified:

- 57 species listed on Section 41 of the Natural Environment and Rural Communities Act 2006 (NERC Act 2006) [REF 8-13];
- 33 species listed under the Wildlife and Countryside Act 1981 [REF 8-14] (as amended), including four species listed on the Conservation of Habitats and Species Regulations 2017 [REF 8-15];
- 57 species listed under the UK Biodiversity Action Plan [REF 8-16];
- nine local species; and
- seven birds listed under Annex 1 of the Birds Directive [REF 8-17].

8.2.25. In addition, two European protected species mitigation licences have been granted for GCN within the 1km area of search, as identified within NCA 88 [REF 8-2].

8.2.26. Bedfordshire and Luton Biodiversity Recording and Monitoring Centre [REF 8-12b] and Bedfordshire Bat Group [REF 8-12c] provided data relating to the presence of several notable animal and plant species within the 1km area of search (extending to 2km for bats). This identified:

- 44 species listed on Section 41 of the NERC Act 2006 [REF 8-13];
- 52 species listed under the Wildlife and Countryside Act 1981 [REF 8-14] (as amended), including 11 species listed on the Conservation of Habitats and Species Regulations 2017 [REF 8-15];
- 43 species listed under the UK Biodiversity Action Plan [REF 8-16];
- three local species; and
- 27 birds listed under Annex 1 of the Birds Directive [REF 8-17].

8.2.27. A review is currently being undertaken of the published accounts of the habitats, flora and fauna within the counties of Cambridgeshire, Bedfordshire and (up to 1973) Huntingdonshire. Key texts that have been consulted to date include the following:

- Cambridgeshire's Red Data Book [REF 8-18].
- Cambridgeshire Mammal Atlas [REF 8-19].
- Cambridgeshire Bird Atlas [REF 8-20].
- Bedfordshire Wildlife [REF 8-21].
- Nature in Cambridgeshire [REF 8-22].
- Bedfordshire Naturalist [REF 8-23].
- Reports of the Huntingdonshire Fauna & Flora Society [REF 8-24].

Field Survey

8.2.28. The 2016 extended Phase 1 Habitat survey confirmed that the scoping study area supports habitats that are suitable for a range of protected and notable species and species groups including invasive non-native species of plants and animals.

8.2.29. **Table 8.2** summarises the animal species and species groups that are known to occur in Cambridgeshire and Bedfordshire, supplemented by relevant legislation and their current progress and status.

Table 8.2: Summary of Species, Species Groups and Survey Status

Species or Group of Species	Basis for Undertaking Surveys	Survey Status
Bats	All species including roosting, foraging and commuting; legally protected are those listed under Schedules 1, 5 and 8 of the Wildlife and Countryside Act 1981 (as amended) [REF 8-14] and Schedules 2 and 4 of The Conservation of Habitat and Species Regulations 2017 [REF 8-15], Species of Principal Importance and the 2015 Highways England BAP [REF 8-25]	2018: Appraisal of bat roost potential for most of the Scheme. 2019: Surveys focussed on buildings and trees with bat roost potential and on the home range and bat roost of barbastelle located in 2018. The combination of 2018 and 2019 survey data covers a 100m distance around the Scheme.
Badger (*Meles meles*)	Legally protected. See also the 2015 Highways England BAP [REF 8-25]	2017-18: Survey of activity and sett locations for most of the Scheme. 2019: Bait marking surveys and filling any survey gaps. The combination of 2018 and 2019 survey data covers a 500m distance around the Scheme.

Species or Group of Species	Basis for Undertaking Surveys	Survey Status
Riparian mammals (Water Vole (*Arvicola amphibius*), Otter (*Lutra lutra*), American Mink (*Mustela vison*)	Both Water Vole and Otter are legally protected, Species of Principal Importance – NERC Act 2006 [REF 8-13]. Otter is a European Protected species. See also LBAPs [REF 8-9; REF 8-10], and the 2015 Highways England BAP [REF 8-25]. American Mink: see Schedule 9 Wildlife and Countryside Act 1981 (as amended) [REF 8-14] Schedule 14.	2018: Survey of activity and signs of the species for most of the Scheme. 2019: Continuation of 2018 survey, last visit scheduled for April. The combination of 2018 and 2019 survey data covers a 500m distance around the Scheme.
Other mammals (Hazel Dormouse (*Muscardinus avellanarius*)	Conservation of Habitats and Species Regulations 2017 [REF 8-15] and the Wildlife and Countryside Act 1981 (as amended) [REF 8-14], the 2015 Highways England BAP [REF 8-25], and European Protected Species.	Scoped out of the biodiversity surveys based on restricted distribution in Bedfordshire and Cambridgeshire.
Brown Hare (*Lepus europaeus*), Hedgehog (*Erinaceus europaeus*), Harvest Mouse (*Micromys minutus*), Polecat (*Mustela putorius*))	Conservation of Habitats and Species Regulations 2017 [REF 8-15] and the Wildlife and Countryside Act 1981 (as amended) [REF 8-14] and the 2015 Highways England BAP [REF 8-25].	Assumed to be present in the DCO site boundary. No surveys to be undertaken.
Reeve's Muntjac (*Muntiacus reevesii*) and other deer species	Schedule 9 Wildlife and Countryside Act 1981 (as amended) [REF 8-14] Schedule 14.	Assumed to be present in the DCO site boundary. No surveys to be undertaken.
Birds including wintering and breeding birds, Barn Owl (*Tyto alba*), Red Kite (*Milvus milvus*), Skylark (*Alauda arvensis*) and Grey Partridge (*Perdix perdix)*	Breeding and wintering birds, all birds are legally protected and Species of Principal Importance are protected by the NERC Act 2006 [REF 8-13]. See also LBAPs [REF 8-9; REF 8-10], the 2015 Highways England BAP [REF 8-25] and NCA 88 [REF 8-2] profile.	2017-18: Wintering bird survey 2018: Breeding bird survey 2017-18: Barn Owl, Red Kite and other Schedule 1 species 2019: Filling survey gaps.
Reptiles	Protected under Schedule 52 (Sections 9(1) and 9(5)) of the Wildlife and Countryside Act 1981 (as amended) [REF 8-14].	2018: Survey of the Scheme. 2019: Filling any survey gaps. The combination of 2018 and 2019 survey data covers a 100m distance around the Scheme.
Great Crested Newt (*Triturus cristatus*) and Common Toad (*Bufo bufo)*	Protected as a Species of Principal Importance – NERC Act 2006 [REF 8-13], LBAPs [REF 8-9; REF 8-10] and the 2015 Highways England BAP [REF 8-25] species.	2018: Survey of the Scheme and a 500m survey area. 2019: Filling any survey gaps. The combination of 2018 and 2019 survey data covers a 500m distance around the Scheme.

Species or Group of Species	Basis for Undertaking Surveys	Survey Status
Fish	Wildlife and Countryside Act 1981 (as amended) [REF 8-14], the NERC Act 2006 [REF 8-13] and the Water Framework Directive, 2000 [REF 8-26].	2018: Survey of the River Great Ouse where crossed by the Scheme.
Insects and other invertebrates (terrestrial and aquatic) (protected and invasive non-native species)	Species of Principal Importance – NERC Act 2006 [REF 8-13]. See also LBAPs [REF 8-9; REF 8-10], the 2015 Highways England BAP [REF 8-25] and notable Nationally Rare, Scarce or Red Data List).	Terrestrial species: 2018: Survey of the Scheme. 2019: Filling any survey gaps. The combination of 2018 and 2019 survey data covers a 100m distance around the Scheme. Aquatic species: 2018: Survey of the Scheme. 2019: Filling any survey gaps. The combination of 2018 and 2019 survey data covers a 100m distance around the Scheme.
Plants (protected and invasive non-native species)	Wildlife and Countryside Act 1981 (as amended) [REF 8-14]. EU Invasive Alien Species Regulation 2014 [REF 8-27]	2018: Survey of the Scheme. 2019: Filling any survey gaps along with opportunist observations. The combination of 2018 and 2019 survey data covers a 500m distance around the Scheme.

8.2.30. Information regarding Brown Hare and Hedgehog indicates that they are common in both counties. Harvest Mouse is found in scattered locations in both counties and Polecat records have increased recent years, but probably from unauthorised releases of captive-bred specimens rather than natural spread from the west. On the basis of this information it is assumed that these four species are present within the DCO site boundary and its environs.

8.2.31. Despite significant effort in surveying for Hazel Dormouse in both Cambridgeshire and Bedfordshire for many years, this species is known at only one location in Cambridgeshire (Brampton Wood, located approximately 7.5km north of the DCO site boundary) and at a cluster of three or four sites in south Bedfordshire, a situation which has pertained for many years. On this basis, and given the relatively poor quality of habitat for this species within and surrounding the DCO site boundary, it is concluded that this species is not present.

8.2.32. The invasive non-native mammal species American Mink (*Mustela vison*) was included in the surveys for Otter and Water Vole and Reeve's Muntjac is assumed (along with other species of deer) to be present within and surrounding the DCO site boundary. Other non-native species might be encountered as illustrated by the report of three species of exotica found in Bedfordshire: Wild Boar (*Sus scrofa*) and Patagonian Mara, (*Dolichotis patagonia*) in 1997, and chipmunks (*Eutamias* species) in 1996 [REF 8-28].

8.2.33. The description of NCA 88 [REF 8-2] draws attention to the butterflies of ancient woodland including White Admiral (*Limenitis camilla*), Purple Hairstreak (*Favonius quercus*) and Black Hairstreak (*Satyrium pruni*). These insects along with other species listed under the NERC Act 2006 [REF 8-13] have been included in the terrestrial and aquatic surveys.

8.2.34. Surveys for invertebrates have included invasive non-native species. One species has been found within the DCO site boundary, Zig-zag Elm Sawfly (*Aproceros leucopoda*), the larvae of which feeds on elm trees. Surveys to establish the extent of this species are being/have been undertaken by the Highways England Area Maintenance Team.

8.2.35. Plant species of biodiversity significance that will form a focus for habitat surveys are arable weeds and those species associated with ancient woodland that might be found in relict ancient woodland habitat, for example old hedgerows. Although stoneworts (charophytes) are specifically mentioned in the description of NCA 88 [REF 8-2], this refers to that part of Bedfordshire where there are many water-filled brick pits which have been colonised by a variety of the stonewort species.

8.2.36. Eleven species of invasive non-native plants have been found within or in close proximity to the DCO site boundary; these comprise five terrestrial species and six aquatic species.

8.3. Potential Impacts

Construction

8.3.1. Impacts on ecological features during construction of the Scheme are likely to include the following:

- Habitat loss or gain – direct impacts associated with changes in land use resulting from the Scheme, for example temporary works associated with site clearance, and permanent landtake associated with the installation of drainage infrastructure and earthworks.
- Fragmentation of populations or habitats – indirect impacts due to the Scheme dividing a habitat, group of related habitats, site or biodiversity network, or the creation of partial or complete barriers to the movement of species, with a consequent impairment of function.
- Disturbance – indirect impacts resulting from a change in normal conditions (light, noise, vibration, human activity) that result in individuals or populations of species changing behaviour or range.
- Habitat degradation – direct or indirect impacts resulting in the reduction in the condition of a habitat and its suitability for some or all of the species it supports, for example changes in chemical water quality or changes in surface flow or groundwater.
- Species mortality – direct impacts on species populations associated with mortalities due to construction activities, for example site clearance.

Operation

8.3.2. Impacts on biodiversity features during the operational phase of the Scheme are likely to include the following:

- Species mortality – direct impacts on species populations associated with mortalities from collisions with vehicles, and potentially from pollution incidents or management practices.

- Habitat degradation – indirect impacts associated with the operation of new road lighting and vehicles using new and/or improved sections of road, for example increased light, noise and emissions leading to a reduction of habitat quality on identified biodiversity features.
- Disturbance – indirect impacts arising from changes in human activity, including use of public rights of way that could lead to changes in animal behaviour, for example changes in roosting behaviour or nesting success.

Future Maintenance

8.3.3. Consideration was given to the activities associated with the future management of the Scheme, and whether these have the potential to result in impacts on biodiversity.

8.3.4. Following a review of the typical activities associated with this phase of the Scheme (for example the routine inspection and maintenance of drains, periodic carriageway resurfacing and emergency repair works), the scoping exercise concluded that there would be limited potential of such impacts to occur, and that these activities are comparable with standard maintenance operations already being undertaken elsewhere on the strategic and local road networks.

8.3.5. Accordingly, the potential impacts on biodiversity associated with this phase of the Scheme will be scoped out of the assessment.

8.4. Design, Mitigation and Enhancement Measures

Construction

8.4.1. A biodiversity mitigation strategy will be prepared to identify the measures required to manage and mitigate biodiversity effects associated with construction of the Scheme.

8.4.2. Best practice measures to be employed during construction will be implemented by the contractor through the framework of a Construction Environmental Management Plan, which will draw on the information contained in the Outline Environmental Management Plan for the Scheme. Such measures are likely to include supervision of works by an ecological clerk of works, toolbox talks, and the sensitive timing of works.

8.4.3. European protected species licences granted from Natural England may be required for certain species. Licences will contain appropriate method statements providing details of the measures and techniques required to ensure no long-term effects on such species.

8.4.4. Should construction works on the Scheme need to be undertaken during night-time periods, any lighting required within and surrounding works area will be managed to avoid unwanted light spill onto biodiversity features.

Operation

8.4.5. Based on available survey data and records, a number of measures are being incorporated into the design of the Scheme to minimise effects on biodiversity features. Measures are also being developed with the aim of achieving no net loss of biodiversity across the Scheme.

8.4.6. Measures currently being developed include the following:

- Habitat recreation.
- Development of an appropriate ecological design (in conjunction with wider landscaping and drainage measures).
- Avoidance of important biodiversity features through the design-development process.

- Compensation for irreplaceable features lost to the Scheme.

8.4.7. In addition, a number of potential biodiversity enhancement measures are being developed which will form part of the Scheme design.

8.4.8. The DCO site boundary currently includes areas of land identified to deliver biodiversity mitigation, compensation and enhancement measures.

8.5. Description of Likely Significant Effects

Designated Sites

8.5.1. The scoping exercise has concluded that construction of the Scheme may potentially result in indirect effects on the following non-statutorily designated sites located within the DCO site boundary:

- Croxton Park CWS.
- River Great Ouse CWS.
- Elsworth (A428 to Common Farm) Protected Road Verge.

8.5.2. Operation of the Scheme may also result in adverse effects on non-statutorily designated sites in proximity to areas of permanent works, for example through changes in traffic noise.

Habitats

8.5.3. The scoping exercise has concluded that construction of the Scheme would likely result in the following direct effects on habitats recorded within the DCO site boundary:

- Loss of habitats associated with arable land that is uniformly and intensely managed (emphasised by its Very Good classification within the ALC [REF 8-3] and single soil type).
- Loss of hedgerows within arable land (some of which support mature and veteran trees).
- Loss of lowland meadow and possibly a small reedbed.
- Loss of a small number of field ponds.
- Potential adverse effects on the River Great Ouse CWS and five streams that would be crossed by the Scheme.

8.5.4. Of the Local BAP habitats identified in the desk study, those habitats that are likely to experience adverse effects from Scheme construction are: farmland (arable), deciduous woodland, lowland meadows, hedgerows, ponds, reedbed, and rivers and streams.

8.5.5. Once operational, the Scheme may result in adverse effects on habitats located in proximity to areas of permanent works in different ways, for example as a consequence of pollution from surface runoff and vehicle emissions, and alterations to the hydrology of watercourses and sediment movement.

Species

8.5.6. The scoping exercise has concluded that construction of the Scheme may potentially result in direct and indirect effects on the different species and species groups listed in **Table 8.2**, associated with the following:

- Direct loss of habitat through landtake.

- Disturbance of habitats and species.
- Severance of wildlife corridors and the disruption of watercourses.
- Direct injury and death.
- Damage to habitats such as rivers and streams.
- Spread of invasive species.

8.5.7. Once operational, the Scheme has the potential to result in adverse effects on species as a consequence of the following:

- Direct mortality from collision.
- Displacement and isolation.
- Pollution from surface runoff and vehicle emissions.
- Road lighting.
- Noise and visual disturbance.

8.6. Assessment Methodology

Assessment Guidance

8.6.1. As the scoping exercise has recorded a likelihood of significant effects on biodiversity, a detailed assessment will be undertaken in accordance with the guidance and methodologies contained within DMRB Volume 11, Section 3, Part 4: Ecology and Nature Conservation [REF 8-29].

8.6.2. The assessment will also reference advice, guidance and methodologies contained within the following documents:

- DMRB Volume 11, Section 2, Part 1: General Principles and Guidance of Environmental Impact Assessment [REF 8-30].
- DMRB Volume 11, Section 2, Part 5: Assessment and Management of Environmental Effects [REF 8-31].
- Interim Advice Note (IAN) 125/15: Supplementary guidance for users of DMRB Volume 11 [REF 8–32].
- IAN 130/10: Ecology and Nature Conservation – Criteria for Impact Assessment [REF 8-33].
- Guidelines for Ecological Impact Assessment in the UK and Ireland: Terrestrial, Freshwater, Coastal and Marine (Second Edition) (the CIEEM guidelines) [REF 8-34].

8.6.3. A hierarchical geographical approach will be used to assign value to biodiversity features (referred to as ecological importance) based upon IAN 130/10 [REF 8-33] and the CIEEM guidelines [REF 8-34], aided by professional judgement. The following frames of reference will be assigned for biodiversity importance:

- International or European.
- UK or national.
- Regional.
- County or unitary authority.
- Local.

- Site level.

8.6.4. Impacts on ecological features resulting from the Scheme will be characterised by taking into consideration the following aspects, where applicable:

- Positive (beneficial) or negative (adverse) impact.
- Probability of occurring (certain, probable or unlikely).
- Extent (area measures or percentage of total, such as area of habitat/territory lost).
- Size or magnitude (description of severity of influence, for example a reduction of quality of habitat or complete loss).
- Reversibility (reversible or not reversible).
- Duration (permanent or temporary in ecological terms).
- Timing and frequency (important seasonal or life-cycle constraints and any relationship with frequency considered).
- Complexity (direct, indirect, in-combination or cumulative).

8.6.5. In relation to the complexity of impacts resulting from the Scheme, these will be categorised in relation to whether they are direct, indirect, secondary, transboundary, short-term, medium-term and long-term, permanent or temporary.

8.6.6. The effects of the Scheme will be determined through consideration of the importance of biodiversity features and the magnitude of impact predicted to occur as a consequence of construction and operation of the Scheme, using the significance levels presented in **Table 8.3** (based on guidance contained within IAN 130/10 [REF 8-33]).

Table 8.3: Significance of Effect

Significance	Rating
Significant (Beneficial)	Major Beneficial
	Moderate Beneficial
Non-significant	Minor Beneficial
	Negligible
	Minor Adverse
Significant (Adverse)	Moderate Adverse
	Major Adverse

Policy Requirements

8.6.7. The requirements of the National Policy Statement for National Networks (NPSNN) [REF 8-35] in relation to identifying whether the Scheme will have a significant effect on the objectives of European Sites (specifically the Eversden and Wimpole Woods SAC) will be addressed through a process of Habitats Regulations Assessment (HRA) screening. The HRA screening exercise will be informed by data obtained from the desk study in relation to barbastelle, a species of bat, which is the primary reason for the designation of this SAC. As the HRA process is a separate activity and not related to the EIA process, the outcomes of the screening exercise will be reported separately (with information shared between the two processes).

8.6.8. The requirements of the NPSNN [REF 8-35] in relation to the identification and assessment of the likely significant effects of the Scheme on sites of international,

national and local importance, the conservation of biodiversity, and protected species and habitats, will be addressed through the biodiversity assessment.

8.6.9. All species afforded legal protection that could be affected by the Scheme will be assessed within the biodiversity assessment, in order that appropriate measures can be identified to ensure adherence to the requirements of relevant protective legislation (for example protected species licencing).

Study Area

8.6.10. The study areas adopted as part of the scoping exercise around the DCO site boundary will be applied in the biodiversity assessment. These may be subject to refinement as a consequence of consultation with relevant bodies and organisations, and as a result on ongoing design-development.

Information Sources

8.6.11. Further desk studies and surveys are planned to be undertaken to augment the baseline data gathered to date.

8.6.12. The results of the extended Phase 1 Habitat survey, in conjunction with consultation with relevant bodies and organisations, will be used to inform the need and scope of any further survey work, and will also be used to influence:

- the ongoing design-development of the Scheme;
- the identification of biodiversity mitigation, compensation and enhancement measures; and
- the identification of opportunities where it may be feasible to deliver measures in pursuit of achieving biodiversity net gain on the Scheme.

8.6.13. Information contained within the Highways England BAP [REF 8-25] will be used to inform the development of biodiversity mitigation, compensation and enhancement measures.

8.6.14. The outputs from the air quality modelling (see Chapter 6) will be used to identify impacts and effects on designated sites in relation to changes in NOx and/or nitrogen deposition.

Consultation

8.6.15. Consultation will be undertaken with the following bodies:

- Natural England.
- Environment Agency.
- Forestry Commission.
- Cambridgeshire County Council.
- Bedfordshire County Council.
- South Cambridgeshire District Council.
- Huntingdonshire District Council.
- Bedford Borough Council.
- Wildlife Trust for Bedfordshire, Cambridgeshire & Northamptonshire.
- Woodland Trust.
- Bedfordshire Natural History Society.

- Huntingdonshire Fauna & Flora Society.
- Cambridge Natural History Society.
- Royal Society for the Protection of Birds (RSPB).
- Cambridgeshire Mammal Group.
- Cambridgeshire Bat Group.
- Hen and Abbotsley Brook Catchment Facilitated Group.
- Croxton Park Partnership.
- St Neots & District Fish Preservation & Angling Society.

8.7. Assessment Assumptions and Limitations

8.7.1. The scoping exercise has been based on readily available published and web-based data, some of which have not been independently verified, but is deemed to be up to date.

8.7.2. Both the desk study and habitat and species surveys are ongoing. Further information on biodiversity features may emerge through ongoing assessment and consultation, requiring consideration and evaluation in the biodiversity assessment.

8.7.3. Habitat and species data referenced in the scoping exercise have been collected from surveys undertaken in 2016, 2017 and 2018. Although not all areas of land within the DCO site boundary have been surveyed to date due to restrictions on land access, the survey coverage is considered to be comprehensive for the purposes of scoping.

8.7.4. As noted in Section 8.1, the 1km area of search (2km for bats) adopted within the scoping exercise does not extend around all areas of the DCO site boundary due to limitations on information availability. The biodiversity assessment will take full account of these areas of the DCO site boundary.

8.7.5. Further surveys are planned for 2019 to fully update the baseline conditions.

9. LANDSCAPE

9.1. Study Area

9.1.1. This chapter presents the approach to the assessment of the Scheme's effects on landscape (comprising landscape character and visual amenity).

9.1.2. Based on the guidance contained in Guidelines for Landscape and Visual Impact Assessment 3rd Edition (GLVIA3) 3rd Edition [REF 9-1], a preliminary computer-generated Zone of Theoretical Visibility (ZTV) of the operational elements of the Scheme was prepared, the purpose of which was to initially identify the areas from within which the operational Scheme may theoretically be visible. The extents of the preliminary ZTV are illustrated in Figure 9.1 in Chapter 19.

9.1.3. Study area definition took account the following, which were established through desk-based review of existing information, initial fieldwork observations, and the extents of the preliminary ZTV:

- The scale and massing of the infrastructure proposed as part of the Scheme.
- The operational elements of the Scheme, for example the movement of traffic.
- Existing landform.
- Existing vegetation.
- The influence of settlements, including: Cambourne; Papworth Everard; Eltisley; Croxton; Yelling; Toseland; Little Barford; St Neots; Wyboston; Chawston; Roxton; and Tempsford.

9.1.4. A review of the above factors indicated that the visibility of the Scheme could extend outward to 5km beyond the Development Consent Order (DCO) site boundary in more isolated, elevated locations (for example Greensand Ridge to the south east of Black Cat junction), but that the visibility and perception of the Scheme would generally be confined to a distance of 2km.

9.1.5. Accordingly, a 2km detailed study area and a 5km wider study area were defined as part of the scoping exercise.

9.2. Baseline Conditions

9.2.1. To inform the scoping exercise, information relating to landscape character, designated landscapes and visual receptors within the 2km detailed study area was obtained from the following sources:

- National Character Area (NCA) information published by Natural England, specifically NCA 88: Bedfordshire and Cambridgeshire Claylands [REF 9-2].
- The MAGIC Map [REF 9-3].
- Published landscape character assessments at the regional and local level [REF 9-4; REF 9-5; REF 9-6; REF 9-7; REF 9-8].
- Google Streetview roadside imagery [REF 9-9].
- Campaign to Protect Rural England's (CPRE) "NightBlight" online mapping of England's light pollution and dark skies [REF 9-10].
- Ordnance Survey mapping.
- Aerial photography.

9.2.2. Information and observations relating to existing landscape character and the visual environment obtained through fieldwork were also used to inform the scoping exercise. Fieldwork focused on the verification of the extents of the preliminary ZTV to establish the likely visibility of the Scheme, and the identification of representative viewpoints for assessment.

Landscape Designations

9.2.3. The scoping exercise has identified one Registered Historic Park and Garden (RPG) within the 2km detailed study area, located to the south of the existing A428 at Croxton Park. The location of this designation is illustrated on Figure 9.2 in Chapter 19.

9.2.4. The landscape of the 2km detailed study area also contains a number of historic features, the full details of which are presented in the cultural heritage assessment within Chapter 7. These include numerous listed buildings and Scheduled Monuments, for example the deserted villages at Weald, Wintringham and Croxton, and conservation areas within settlements at St Neots, Yelling, Eltisley, Croxton, Caxton, Papworth Everard, Tempsford and Church End. Where such features contribute to the character of the landscape and views, these are described as part of the review of landscape character.

9.2.5. There are a number of important tree groups and individual trees throughout the 2km detailed study area that are subject to protection through Tree Preservation Order (TPO), with some stands of ancient woodland and veteran trees recorded which are considered to be visually prominent and/or have amenity value.

National Landscape Character

9.2.6. The 2km detailed study area lies within the southern part of NCA 88: Bedfordshire and Cambridgeshire Claylands [REF 9-2]. This is summarised as:

"A broad, gently undulating, lowland plateau dissected by shallow river valleys that gradually widen as they approach The Fens NCA in the east. Within it, but distinct from it, is the Bedfordshire Greensand Ridge, a contrasting narrow and elevated outcrop of Greensand, with its associated habitats on acidic soils such as grassland, heathland and woodland".

9.2.7. The NCA 88 [REF 9-2] profile details landscape change in the area covered by the 2km detailed study area, and notes that major transport routes crossing the NCA include the A428, the A1, M1 and A421. Such routes have an impact on local landscape character.

Regional Landscape Character

9.2.8. At a regional level the East of England Landscape Framework [REF 9-11] classifies the landscape into regional landscape typologies.

9.2.9. Three landscape typologies are associated with the 2km detailed study area. These comprise the Valley Meadowlands, Lowland Village Farmlands and Wooded Village Farmlands landscape character types.

Local Landscape Character

9.2.10. Published landscape character assessments which define local Landscape Character Areas (LCAs) at the district scale are presented in **Table 9.1**. For consistency, the LCA references have been retained from the publications from which they are derived, and are described in order from west to east across the 2km detailed study area.

Table 9.1: Local Landscape Character Areas

LCA Reference	LCA name	Local Authority Publication
LCA1C	Alington Hill Clay Farmland	Bedford Borough Landscape Character Assessment (2007) [REF 9-4] and its 2014 update [REF 9-5].
LCA1E	Thurleigh Clay Farmland	
LCA1F	Renhold Clay Farmland	
LCA3	Western Claylands	Cambridgeshire Landscape Guidelines, Cambridgeshire County Council (1991) [REF 9-6].
LCA4	Ouse Valley	Huntingdonshire Landscape and Townscape Assessment (2007) [REF 9-7].
LCA4A	Great Ouse Clay Valley	Central Bedfordshire Landscape Character Assessment (2016) [REF 9-8].
LCA5F	Biggins Wood Clay Vale	
LCA5	South East Claylands	Huntingdonshire Landscape and Townscape Assessment (2007) [REF 9-7].
LCA8	Southern Wolds	

9.2.11. The local landscape character areas are illustrated on Figure 9.2 in Chapter 19.

9.2.12. Overall, the landscape character of the 2km detailed study area is distinguished by three principal features:

- Broad, meandering course of the River Great Ouse within the low-lying floodplain with a mixed pattern of land use.
- Gently undulating landform, heavy clay soils supporting intensive arable farming and a pattern of large fields, areas of extensive woodland cover and tall hedgerows with frequent mature hedgerow trees.
- Scattered historic landscape features set within the pattern of large scale arable fields. The historic parkland landscape of Croxton Park with extensive woodland blocks occupies a large area south of the existing A428.

9.2.13. A preliminary review of the published landscape character assessments has been carried out to inform the classification of the existing landscape into distinct LCAs, including a review of their key characteristics and information relating to their current condition and value.

9.2.14. Based on the criteria presented in Section 9.6, an initial assessment of landscape character has been undertaken. This has identified that most of the landscape in the 2km detailed study area to south of the A428 is of medium value characterised by an undulating landform, frequent vegetation, small villages and hamlets.

9.2.15. Pockets of higher value landscape include the Croxton Park RPG, ancient woodland at Sir John's Wood, the River Great Ouse (and adjacent areas that are designated as a County Wildlife Site), and several larger areas of broad-leaved and mixed woodland close to the A428 (these include Boys Wood near Alington Hill, North Lodge Plantation north of Croxton and recent planting at Northeast Farm and Pembroke Farm, near Caxton Gibbet).

9.2.16. The area to the south of the A428 and east of Potton Road is a quiet rural landscape of good quality, with a coherent, unspoiled, homogenous character. Key features include numerous woodlands, mature hedgerows and small-scale stream valleys with attractive open views. This area includes frequent historic landscape features (including a Roman road, moated farmhouses and small-scale pastures) and is particularly susceptible to large scale development and changes to the landform.

9.2.17. Many of the settlements both north and south of the A428 incorporate conservation areas and listed buildings, which contribute to localised areas of high landscape value.

9.2.18. Overall, considering the value of the landscape alongside its susceptibility to change, landscape sensitivity is considered to be generally medium, but with areas and features of high sensitivity within the river valleys and around the edges of some of the villages and Croxton Park RPG.

9.2.19. Landscape sensitivity is considered to be low in close proximity to the existing A1 and A428.

Tranquillity

9.2.20. Tranquillity is a perceptual aspect of landscape. Interim Advice Note (IAN) 135/10: Landscape and Visual Effects Assessment [REF 9-12] defines tranquillity as *"the remoteness and sense of isolation, or lack of it, within the landscape, which is often determined by the presence or absence of built development and traffic"*.

9.2.21. Existing road infrastructure is noted as one of the elements adversely affecting tranquillity within NCA 88 [REF 9-2].

Visual Environment

9.2.22. The extent of visibility of the Scheme is informed by the preliminary ZTV illustrated in Figure 9.1 in Chapter 19. The visibility of the Scheme could extend outward to 5km beyond the DCO site boundary at isolated, elevated locations such as the Greensand Ridge to the south east of Black Cat junction. However, beyond these isolated points the visibility and perception of the Scheme would generally be confined to a distance of 2km given the pattern of intervening landform, landcover and settlement.

9.2.23. The preliminary ZTV, coupled with information and observations gained through the desk-based review and fieldwork have identified the following groups of visual receptors within the 2km detailed study area:

- Residents within surrounding residential properties on the peripheries of settlements including Eltisley, Croxton, Papworth Everard, Yelling, Toseland, Little Barford, St Neots, Wyboston, Chawston, Roxton, Tempsford, and Cambourne.
- Residents within properties scattered throughout the open countryside and possibly residents of hotels and holiday/caravan parks.
- Users of public rights of way (PRoW) that cross the landscape, including promoted routes such as the Ouse Valley Way (a regional trail that follows a meandering along the Ouse Valley) and the Sustrans National Cycle Network (NCN) Route 12.
- People travelling through the landscape in vehicles, including those travelling on the A428, the A1 and A421 and on surrounding roads.
- Users of public open spaces, for example golf courses or country parks.
- People occupying workplaces and educational establishments.

9.2.24. A series of viewpoints representing the visual outlook available from a number of these receptors have been identified within both the 2km detailed study area and the 5km wider study area, the locations of which are illustrated on Figure 9.1 in Chapter 19. The locations of these representative viewpoints have been agreed with the relevant local authorities.

9.2.25. These representative viewpoints have been selected on the basis that they cover a range of viewing distances, elevations and orientations from locations afforded different viewing experiences.

Lighting and Night Time Visibility

9.2.26. Mapping prepared by CPRE [REF 9-10] identifies the A428 as a light source, which contrasts to the surrounding arable fields. Other road infrastructure and urban development, principally from St Neots and the A1 corridor including Black Cat roundabout, Everton to the south, the A1198 between Papworth Everard and Royston and Cambourne, are also noted for their sky glow.

9.2.27. Between these corridors and away from settlement areas, the 2km detailed study area is generally quite dark, except for the influence of vehicle headlights and reflective signs and lighting columns.

9.3. Potential Impacts

Construction

9.3.1. Clearance of vegetation during construction has the potential to directly alter the baseline conditions. For example, the removal of existing vegetation may lead to the opening up of views from visual receptors towards construction works, and the presence of construction plant and equipment in the landscape may temporarily alter local landscape character.

9.3.2. Potential landscape and visual impacts during construction of the Scheme may be associated with the following:

- Vegetation removal and soil stripping.
- Movement of construction plant.
- Use of cranes and other machinery during demolition and construction of bridges and other structures.
- Contractors' compounds, particularly when lit.
- Vehicle haul routes.
- Any temporary lighting needed for the works.
- Stockpiled soil and other materials.
- Areas of mineral and fill extraction to provide construction materials.
- Excavation of flood compensation areas and other drainage features.
- Demolition and removal of buildings and structures.
- Temporary facilities including vehicle recovery areas.

Operation

9.3.3. Potential landscape and visual impacts during operation of the Scheme may be associated with the following:

<u>Landscape</u>

- Vegetation removal, changes in landform and soil stripping.
- Intensification of highway infrastructure with increased width of traffic on sections of the Scheme adjacent to existing highways and the introduction of major highway

infrastructure along remote sections of the Scheme, as well as major junctions and bridge structures.

- Increased dominance of highway infrastructure, with introduction of new sign gantries, Variable Message Signs (VMS), Closed Circuit Television (CCTV) cameras and masts, and lighting columns.
- Increased light spill and impacts on character of landscape during darkness in localised areas around junctions.
- Changes to landscape character, land use and landscape features throughout the scheme, with increased influence and dominance of highway infrastructure and reduced tranquillity.

Visual

- Views of major highway infrastructure including junctions and bridges, new sign gantries, VMS, CCTV cameras/masts and lighting columns.
- Views of other scheme elements including environmental bunds, noise barriers, drainage lagoons, lakes in borrow pits and ecological mitigation areas and ponds.
- Views of lighting columns/light spill in localised areas around junctions.
- Views of traffic movement.

Future Maintenance

9.3.4. Consideration has been given to the activities associated with the future maintenance and management of the Scheme, and whether these have the potential to result in impacts on landscape and visual receptors.

9.3.5. Following a review of the typical activities associated with this phase of the Scheme (for example the routine inspection and maintenance of drains, periodic carriageway re-surfacing and emergency repair works), the scoping exercise concluded that there would be limited potential of such impacts to occur, and that these activities are comparable with standard maintenance operations already being undertaken elsewhere on the strategic and local road networks.

9.3.6. Accordingly, the potential impacts on landscape and visual receptors associated with this phase of the Scheme will be scoped out of the assessment.

9.4. Design, Mitigation and Enhancement Measures

9.4.1. As part of the design-development process, the choice of highway alignment and the form and location of junctions and bridge arrangements have been carefully developed to avoid and minimise impacts on landscape and visual receptors where possible. For example, the alignment of the new dual carriageway to the north of Croxton Park RPG has been selected to avoid changes to this designated site and improve the setting of the historic landscape.

Construction

9.4.2. The scoping exercise has identified a potential requirement for the following types of mitigation during construction of the Scheme:

- Keeping construction sites and compounds tidy and in good order, for example keeping stockpiled material to a minimum and arranging goods deliveries on an ‘as and when’ basis.
- Keeping night-time works to a minimum.

- Ensuring low level and directional lighting is used to illuminate construction compounds and working areas, where possible.
- Protection of retained trees and vegetation during the construction period.
- Formation of earthworks bunds early in the construction programme, where possible, to visually screen and contain construction works.
- The reinstatement and return of land used temporarily for construction to its previous condition and use.

Operation

9.4.3. To mitigate operational impacts, the design of the Scheme will incorporate a planting strategy reflective of the character of the surrounding landscape and its constituent elements.

9.4.4. In summary, the planting strategy will seek to:

- replace vegetation lost as a consequence of Scheme construction;
- filter, screen and contain more prominent components in existing views from visual receptors;
- assist the integration of components of the Scheme into the receiving landscape pattern; and
- provide visual interest to people travelling on new and modified sections of highway and the PRoW network.

9.4.5. The development of the planting strategy for the Scheme will take account of the following design principles which have been developed to address the potential operational landscape and visual impacts of the Scheme:

- A strategic, green infrastructure approach to design which considers the multiple benefits that the Scheme can deliver both within the footprint and through connections to the wider landscape.
- Sensitive design of earthworks, balancing ponds and other drainage features to fit with surrounding landform and landcover patterns.
- Sensitive location of signage, lighting and gantries to limit visual intrusion.
- Recommendations contained within relevant landscape guidelines.
- Use of a range of species, including locally indigenous native plants, to reflect the distinctive local character and to protect against the effects of climate change and reinforce biosecurity.
- Areas of species rich grassland at locations where conditions are suitable for their establishment, to provide seasonal interest and increase local biodiversity.
- The use of different types of native tree and shrub planting on and adjacent to highway earthworks to create woodlands, copses and shelterbelts in order to fit with the surrounding landscape character patterns and its constituent elements. This will also help to break up the scale of the road, screen structures, traffic and lighting and help integrate the Scheme into the existing landscape pattern.
- Retention of views to local landmarks through breaks in the planting to help create a sense of place and interest for vehicle travellers, where possible.
- Rounding of crests and toes of embankments to achieve better integration with the surrounding landform, where space and materials are available.

- Use of false cuttings to limit views of traffic and headlights.
- Use of hedgerows on the highway boundary, where appropriate, to link into existing field boundaries, provide screening and integration into the local pattern, and to connect and extend existing wildlife corridors.
- Sensitive lighting design, such as the use of horizontally mounted flat glass lanterns.

9.4.6. Off-site planting (by agreement with landowners) outside the highway boundary may be considered where the need for additional mitigation is identified, for example to further screen the Scheme in a particular view.

9.4.7. Other forms of mitigation beyond the planting strategy will include the careful siting and design of lighting, signage, earthworks and structures forming part of the Scheme to reduce impacts on landscape and visual receptors.

9.4.8. Opportunities to provide enhancement of the local landscape will be sought as part of the design-development process, where possible.

9.5. Description of the Likely Significant Effects

9.5.1. The scoping exercise has identified that both adverse and beneficial effects on landscape and visual receptors would likely result from the construction and operation of the Scheme.

Construction

9.5.2. There are likely to be temporary, adverse effects on landscape character during construction, which will be extensive and significant in places, for example in areas of higher sensitivity such as the Ouse Valley and within the setting of historic landscape features.

9.5.3. Some visual receptors will likely experience temporary, adverse visual effects during construction. Many of these effects are likely to be significant from the residential peripheries of some settlements and isolated properties in the open countryside, particularly those in close proximity to the Scheme and from PRoW that run close to, or will be crossed by, the Scheme.

Operation

9.5.4. Landscape and visual effects during operation would likely result from the introduction of new highway infrastructure, for example the proposed grade-separated junctions at Black Cat, Cambridge Road and Caxton Gibbet, bridges and underpasses for road crossings, junction improvements, lighting, gantries and signage.

9.5.5. In relation to operational effects on landscape character, the Scheme his likely to result in direct effects at the local scale on the following LCAs: Ouse Valley (LCA4); Biggin Wood Clay Vale (LCA5F); Alington Hill Clay Farmland (LCA1C); South East Claylands (LCA5); and Western Claylands (LCA3). Such effects are likely to derive from an increase in the scale of infrastructure, creating severance and reducing the sense of openness in the landscape, particularly with sections that run through open farmland away from existing road infrastructure. Accordingly, adverse effects on landscape features, character and quality (including a loss of perceived openness and tranquillity) are predicted.

9.5.6. In relation to designated landscapes, the operational Scheme is likely to introduce a degree of benefit and enhancement to the landscape setting of Croxton Park RPG, as a consequence of reducing traffic on the existing A428.

9.5.7. In relation to landscape features, the operational Scheme is likely to result in adverse effects on some TPOs north of the existing A428 at Weald, and north of Croxton Park. Adverse effects may be likely on other notable trees, for example Category A trees and a veteran tree to the north of Hen Brook. Other likely effects on landscape features include:

- permanent, adverse physical effects on the River Great Ouse floodplain as a result of the proposed improvements to Black Cat junction and taking the new dual carriageway across the valley on a viaduct;
- effects on the component landscape features of farmland east of the River Great Ouse, including severance and loss of some woodland blocks;
- changes to landform in the section east of the Ouse Valley to Potton Road (through Biggin Wood Clay Vale and Alington Clay Farmland LCAs), which are likely to result in significant adverse effects on landscape features and local landscape character;
- the loss of built form, for example roadside facilities and commercial premises to the north of Black Cat junction as a consequence of the proposed junction improvements at this location;
- visual prominence of the new dual carriageway on embankment across the valley of Hen Brook; and
- the introduction of earthworks and structures at the Cambridge Road junction, which will contrast markedly with local topography and may result in the loss of landscape features and the setting of the deserted Wintringham medieval village.

9.5.8. Effects on visual amenity resulting from the operational Scheme are likely on residents on the fringes of settlements and scattered rural properties in the open countryside, and on people using PRoW in proximity to the Scheme. Significant adverse visual effects are likely in receptors close proximity to the Black Cat, Cambridge Road and Caxton Gibbet junctions due to the scale and height of the proposed structures and traffic moving on them. Other adverse effects on visual amenity are likely to be associated with the following:

- Lighting of the Scheme, for example the illumination of junctions and roundabouts which could result in a concentration of light spill in existing views.
- The loss of existing elements and features that currently provide visual screening, for example the loss of existing vegetation.
- The introduction of new road infrastructure where none currently exists, for example where components of the Scheme will become visible in available views, or where new road infrastructure is brought closer to visual receptors.

9.5.9. Operation of the Scheme may result in some beneficial effects on landscape character and visual amenity as a result of the following:

- Potential reductions in traffic on existing roads, which may reduce the extent to which vehicle movements form a visually detracting element in available views.
- The establishment of landscaping forming part of the planting strategy for the Scheme, which may improve landscape character and the balance of components within views from visual receptors.
- The incorporation of new and improved recreational routes, which may provide greater connectivity and accessibility through the landscape.

9.6. Assessment Methodology

Assessment Guidance

9.6.1. As the scoping exercise has recorded a likelihood of significant effects on landscape and visual receptors, a detailed assessment will be undertaken.

9.6.2. The methodology for the landscape and visual assessment has been developed in accordance with IAN 135/10 [REF 9-12] but set in the context of more recent guidance and methods outlined in GLVIA3 [REF 9-1], given that both documents form the standard reference for undertaking landscape and visual assessments for major highway schemes in the UK.

9.6.3. As the guidance contained in IAN 135/10 [REF 9-12] and GLVIA3 [REF 9-1] is not prescriptive, a tailored approach will be adopted where required, acknowledging the role and importance of professional judgement in the assessment.

Landscape Value and Sensitivity

9.6.4. The value of landscape receptors will be defined within the assessment as part of the establishment of the baseline conditions. The value attached to the landscape receptor and its susceptibility to change will be considered separately, and then combined to determine sensitivity.

9.6.5. Judgements on landscape value, susceptibility and sensitivity will be made with reference to the guidance contained in the GLVIA3 [REF 9-1], which sets out a range of factors that can assist in the identification of landscape value, and criteria contained in IAN 135/10 [REF 9-12].

9.6.6. Both GLVIA3 [REF 9-1] and IAN 135/10 [REF 9-12] acknowledge that a landscape does not need to be designated to have a value. Accordingly, landscape value will be judged with reference to the geographic scale of the landscape presented in **Table 9.2**.

Table 9.2: Geographic Landscape Value Criteria

Classification	Value of LCA
National	Landscape with elements of national importance, e.g. protected by legislation
Regional	Landscape with elements of regional importance designated regional leisure routes and conservation areas.
Local	Landscape with elements which are protected or valued through local or neighbourhood planning policies, such as protected open space or groups of listed buildings or buildings of townscape merit
Community	Landscape with relatively common elements which are likely to be valued by the community which lives and works in the area
Limited	Landscape with weak or discordant elements and characteristics which detract from the quality of the area.

9.6.7. The assessment of landscape value will be undertaken using the classifications and criteria set out in **Table 9.3**

Table 9.3: Landscape Value Criteria

Classification	Value of LCA
High	The landscape is likely to be valued for one or more of its attributes at a national or regional level, and may be protected by a statutory landscape designation, e.g. National Park or Area of Outstanding Natural Beauty (AONB). The landscape may contain elements/features which are rare or perceived as very representative of the national or regional attributes and cultural associations. The landscape may provide a high scenic and landscape quality as well as many recreational opportunities.
Medium	The landscape is likely to be valued for one or more of its attributes at a community or local level and may be designated by a landscape policy designation, e.g. Special Landscape Area. The landscape may contain elements/features which are representative of the community or local level attributes and cultural associations. The landscape may provide some scenic and landscape quality and some recreational opportunities.
Low	The landscape is likely to be valued at a limited level only and not covered by any landscape designations. The landscape may contain features which are common and therefore do not specifically contribute to the wider landscape or cultural association. The landscape may provide a limited scenic and landscape quality and few recreational opportunities.

9.6.8. Susceptibility to change is defined in GLVIA3 [REF 9-1] as *"the ability of the landscape receptor (whether it be overall character or condition of a particular landscape type or area, or an individual element and/or features, or a particular aesthetic and perceptual aspect) to accommodate the Scheme without undue consequences for the maintenance of the baseline situation"*.

9.6.9. Judgements regarding the susceptibility of landscape receptors to change will be informed by the criteria set out in **Table 9.4.**

Table 9.4: Susceptibility to Change of Landscape Receptors

Classification	Susceptibility to Change
High	Undue consequences are likely to arise from the Scheme.
Medium	Undue consequences may arise from the Scheme.
Low	Undue consequences are unlikely to arise from the Scheme.

9.6.10. IAN 135/10 [REF 9-12] notes that the outputs from landscape character assessments (i.e. landscape characteristics, their condition and value) should be considered to assess their sensitivity to changes arising from a development project. The identification of sensitivity will therefore consider the value of the landscape alongside the nature of the change i.e. the type and scale of the development proposed within a particular area or type of landscape, and the association and tolerance of the identified landscape or individual contributing elements thereof, to that change.

9.6.11. The criteria presented in **Table 9.5** have been developed from those in IAN135/10 [REF 9-12] and the guidance contained in GLVIA3 [REF 9-1].

Table 9.5: Landscape Sensitivity

Sensitivity	Description
High	Landscape of national or regional value with distinctive elements and characteristics, highly susceptible to small changes of the type of development proposed without undue consequences for the maintenance of the baseline situation. Typically these would be; • Of high quality with distinctive elements and features making a positive contribution to character and sense of place. • Likely to be designated, but the aspects which underpin such value may also be present outside designated areas, especially at the local scale. • Areas of special recognised value through use, perception or historic and cultural associations. • Likely to contain features and elements that are rare and could not be replaced.
Medium	Landscape of local or community value, with mostly common elements and characteristics, which by nature of their character would be able to partly accommodate change of the type proposed without undue consequences for the maintenance of the baseline situation. Typically these would be; • Comprised of mostly commonplace elements and features creating generally unremarkable character but may include some rarer elements and with some sense of place. • Locally designated, or value may be expressed through non-statutory local publications. • Containing some features of value through use, perception or historic and cultural associations. • Likely to contain some features and elements that could not be replaced.
Low	Landscape of community or limited value and relatively inconsequential elements and characteristics, the nature of which is potentially tolerant of substantial change of the type proposed. Typically these would be; • Comprised of some features and elements that are discordant, derelict or in decline, resulting in indistinct character with little or no sense of place. • Not designated. • Containing few, if any, features of value through use, perception or historic and cultural associations. • Likely to contain few, if any, features and elements that could not be replaced.
Limited	Despoiled or degraded landscape with little or no evidence of being valued by the community.

Visual Receptor Value and Sensitivity

9.6.12. IAN 135/10 [REF 9-12] defines visual amenity as *"the value of a particular area or view in terms of what is seen"*. GLVIA3 [REF 9-1] emphasises the importance of considering the value and provides a list of indicators of the value of views, for example in relation to: heritage assets; through planning designations or appearance in guidebooks our tourist maps; provision of facilities; and any references in art or literature.

9.6.13. The classification of the value of views will be informed by the location of the viewing place and the quality or designation of the existing elements in the view, as presented in **Table 9.6**.

Table 9.6: Value of Views

Classification	Value of view
National	Recognised or iconic views within nationally/internationally designated landscapes, such as National Parks, AONB and/or national/international landmarks with views recognised in planning policy and/or management plans
Regional	Views or viewing places identified in the East of England landscape framework or regional strategies
Local	Views across high quality landscape which might include features of interest, such as landmarks, which may be identified in the Local Plan
Community	Views of relatively common landscape elements, likely to be valued by the communities which experience the view
Limited	Views across poor quality landscape with a high degree of detracting or common elements

9.6.14. Visual sensitivity is dependent upon the susceptibility of different receptors to change in views and the visual amenity they experience at particular locations. Sensitivity includes a combination of parameters, for example the activity/occupation/pastime of the receptors at particular locations, the extent to which their attention or interest may therefore be focused on the views, and the visual amenity they experience at particular locations.

9.6.15. The assessment of sensitivity will therefore comprise: the location, relative focus and orientation of particular views; the quality or importance of the existing view and its attractiveness/or scenic quality; the principal or secondary interest in that particular view; the static or sequential nature of views; the ability of the view to accommodate the type of development; and the frequency and duration of the view.

9.6.16. Both GLVIA3 [REF 9-1] and IAN135/10 [REF 9-12] note that residential properties and recreational facilities are of higher sensitivity, where the purpose of that recreation is for the enjoyment of the countryside. GLVIA3 [REF 9-1] goes on to note that the divisions between categories are not always clear cut and in reality there will be a graduation in the susceptibility to change.

9.6.17. For the purposes of the assessment, the susceptibility of visual receptors to change will reference the criteria set out in **Table 9.7**.

Table 9.7: Susceptibility to Change of Views

Visual Receptor	Susceptibility to change		
	High	**Medium**	**Low**
Occupation or activity	People living in the area or visiting areas because of their high landscape value	People passing through the area on designated routes	People working inside or passing through the area on public roads or railway lines
Degree of attention on the view	Views are an important part of the experience of the landscape	Views are relevant to the experience or activity but not central to it	Views are likely to be focused on the activity of the receptor, rather than the view
Degree of exposure to the view	Views are likely to be open	Views may be framed, partially screened or filtered	Views are likely to be limited to glimpses or are heavily screened
Length of exposure to the view	Views are likely to be experienced daily or for long periods of time	Views may be fleeting or experienced as a sequence of views moving through the area	Views are likely to be short

9.6.18. The approach set out in GLVIA3 [REF 9-1] will be followed to establish the sensitivity of visual receptors, and will reference the criteria set out in IAN 135/10 [REF 9-12], as presented in **Table 9.8**.

Table 9.8: Sensitivity of Visual Receptors

Classification	Sensitivity of visual receptors
High	Activity resulting in a particular interest or appreciation of the view (e.g. residents or people engaged in outdoor recreation whose attention is focused on the landscape and where people might visit purely to experience the view, such as promoted viewpoints) and/or a view of national value (e.g. within/towards a designated landscape).
Medium	Activity resulting in a general interest or appreciation of the view (e.g. outdoor workers, people in schools or other institutional buildings and hotels and people passing through the landscape) and/or a view of local or limited value (e.g. agricultural land or urban areas).
Low	Activity where interest, appreciation or period of exposure to the view is limited (e.g. people at work, motorists travelling through the area or people engaged in outdoor recreation that does not focus on an appreciation of the landscape) and/or a view of limited value (e.g. industrial areas or derelict land).

9.6.19. The assessment will also consider the future baseline scenario in relation to potential receptors connected with other developments that have not yet been constructed but have received planning consent (specifically developments that would be completed prior to Scheme construction).

Magnitude of Landscape and Visual Impacts

9.6.20. The magnitude of landscape impact will be determined by considering the size, scale, duration and intensity of the proposed change, the geographical extent of the area influenced the type of development, the level of integration of new features with existing elements, and its duration and reversibility. Impacts will be classified using criteria contained in IAN 135/10 [REF 9-12], as presented in **Table 9.9** below.

Table 9.9: Magnitude of Landscape Impact

Magnitude of Impact	Typical Criteria Descriptors
Major	Adverse: Total loss or large scale damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic conspicuous features and elements. Beneficial: Large scale improvement of character by the restoration of features and elements, and/or the removal of uncharacteristic and conspicuous features and elements, or by the addition of new distinctive features.
Moderate	Adverse: Partial loss or noticeable damage to existing character or distinctive features and elements, and/or the addition of new but uncharacteristic noticeable features and elements. Beneficial: Partial or noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic and noticeable features and elements, or by the addition of new characteristic features.
Minor	Adverse: Slight loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements. Beneficial: Slight improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements.
Negligible	Adverse: Barely noticeable loss or damage to existing character or features and elements, and/or the addition of new but uncharacteristic features and elements. Beneficial: Barely noticeable improvement of character by the restoration of existing features and elements, and/or the removal of uncharacteristic features and elements, or by the addition of new characteristic elements.
No Change	No noticeable loss, damage or alteration to character or features or elements.

9.6.21. The magnitude and type of visual impact will relate to the scale, duration and reversibility of change which the Scheme will potentially bring to existing views and visual receptors. Impacts will be classified using criteria contained in IAN 135/10 [REF 9-12], as presented in **Table 9.10** below.

Table 9.10: Magnitude of Visual Impact

Magnitude of Impact	Typical Criteria Descriptors
Major (adverse or beneficial)	The project, or a part of it, would become the dominant feature or focal point of the view.
Moderate (adverse or beneficial)	The project, or a part of it, would form a noticeable feature or element of the view which is readily apparent to the receptor
Minor (adverse or beneficial)	The project, or a part of it, would be perceptible but not alter the overall balance of features and elements that comprise the existing view
Negligible (adverse or beneficial)	Only a very small part of the project would be discernible, or it is at such a distance that it would form a barely noticeable feature or element of the view.
No Change	No part of the project, or work or activity associated with it, is discernible.

9.6.22. The assessment will consider the magnitude of landscape and visual impacts that are predicted to occur during the following stages of the Scheme:

- During construction.
- In the winter of the year of opening (to represent a worst-case scenario of operation, prior to the establishment of mitigation), taking account of the completed Scheme and the traffic using it.
- In the summer of the fifteenth year after project opening, by which time mitigation measures will have established and can be expected to be reasonably effective, taking account of the completed Scheme and the traffic using it.

9.6.23. A qualitative assessment will be undertaken of these three scenarios to consider both day and night time impacts against the situation that will exist if the Scheme were not to proceed, in line with guidance contained in GLVIA3 [REF 9-1] and IAN 135/10 [REF 9-12].

Significance of Landscape and Visual Effect

9.6.24. The criteria, descriptors and matrices contained within IAN 135/10 [REF 9-12] will be used to guide judgements on the significance of landscape and visual effects, based on the correlation of the sensitivity of the receptor and the magnitude of impact.

9.6.25. In line with GLVIA3 [REF 9-1], the conclusions on the significance of effect on landscape receptors will be supported by a narrative which justifies the reason for the level given (this will consider changes in landscape character and specific features and elements, for example loss of woodland or buildings).

9.6.26. For the conclusions on the significance of effect on visual receptors, each visual receptor group will be supported by a narrative that justifies the reason for the significance level given (schedules will support these summaries and will be illustrated on a series of visual effect drawings in line with IAN 135/10 [REF 9-12].

Policy Requirements

9.6.27. The National Policy Statement for National Networks (NPSNN) [REF 9-13] acknowledges that the construction and operation of road infrastructure has the potential to result in effects on landscape and visual amenity, and provides guidance on their identification, assessment and mitigation.

9.6.28. The NPSNN [REF 9-13] sets out the matters that the Secretary of State for Transport should give due regard to when determining DCO applications that would affect areas of defined landscape character and/or would result in visual impacts on receptors.

9.6.29. The requirements of the NPSNN [REF 9-13] in relation to identifying the characteristics, value and importance of designated and undesignated landscapes, and assessing and mitigating the effects of the Scheme on areas of defined (and where relevant historic) landscape character and visually sensitive receptors, will be taken account of in the assessment. Regard will also be given to the findings of the noise and vibration assessment (see Chapter 10) which can influence the appreciation, experience and tranquillity of the landscape and the overall amenity of its users.

Study Area

9.6.30. The assessment of effects on landscape and visual receptors will be undertaken within a detailed 2km study area beyond the DCO site boundary, as adopted in the scoping exercise. The only exception to this will be for the assessment of effects on

visual receptors at an isolated point up to 5km from the DCO site boundary, south east of Black Cat junction.

Information Sources

9.6.31. The information sources referenced as part of the scoping exercise will continue to be reviewed as part of the landscape and visual impact assessment.

Landscape

9.6.32. To inform the identification and assessment of baseline conditions, landscape designations relevant to the assessment study area will be identified and appraised using published information relating to their form, location and status.

9.6.33. The existing boundaries of published LCAs within the assessment study area will be verified by way of fieldwork and updated, where appropriate, to establish their key elements, features and characteristics that are important or valued within the local context and which contribute to determining character (for example topography, vegetation and settlement patterns).

9.6.34. A photographic survey of the LCAs within the assessment study areas will be undertaken during the fieldwork. This will be used to visually record information relevant to the assessment, for example the location of important features and elements, and any variations in local character.

9.6.35. Tranquillity will be considered as part of the landscape character assessment, which will form the baseline against which the landscape effects of the Scheme will be assessed.

9.6.36. Information will also be sourced through the desk-based survey and fieldwork in relation to any forces of change on the landscape, for example changes in landscape management practice, climate change and recent new development.

9.6.37. Reference will also be made in the assessment to Highways England's internal Environmental Information System for information on the location, status and management of assets such as planting within and surrounding the strategic road network.

Visual

9.6.38. To inform the identification and assessment of the visual environment, ZTVs for the Scheme will be generated based on the reference design and will form the basis of identifying visual receptors potentially affected by the Scheme.

9.6.39. The ZTVs will take account of the height of structures such as bridges and gantries forming part of the Scheme, in accordance with guidance contained in GLVIA3 [REF 9-1]. The extents of the ZTV will be verified through fieldwork observations.

9.6.40. Fieldwork will also be undertaken to establish the value, susceptibility and sensitivity of existing views from the identified representative viewpoints. These viewpoints will provide a sample on which judgements will be made on the likely effects of the Scheme, and will be developed into detailed visualisations (photomontages) to visually demonstrate: the nature or extent of likely visual impact; a particular feature or issue; or the effectiveness of the planting strategy. These visualisations will be prepared in accordance with best practice guidance published by the Landscape Institute [REF 9-14; REF 9-15].

9.6.41. A range of additional key views will be photographed to illustrate and record the nature of existing views in the landscape, with more detailed analysis undertaken

from a range of receptor clusters grouped on the basis of having similar viewing experiences.

Consultation

9.6.42. Consultation with the relevant local authorities was undertaken in June 2018 to identify and agree the number and location of visual receptors requiring consideration in the assessment.

9.6.43. Further consultation is planned with the relevant local authorities to agree any additional viewpoints and receptors, following the development of the Scheme design and the definition of the DCO site boundary.

9.6.44. Consultation will also be carried out with the relevant local authorities, and with Natural England, to inform the development of the planting strategy for the Scheme.

9.7. Assessment Assumptions and Limitations

9.7.1. Scoping has been undertaken using published data and information on landscape character and designated landscapes, which for the purposes of the scoping exercise are assumed to be up to date and appropriate for use.

9.7.2. Observations recorded as part of fieldwork undertaken to date have been made from publicly accessible locations, for example roads and PRoW.

9.7.3. The preliminary ZTV generated for the Scheme to inform the extents of visibility and visual receptors has been based on a developing design for the Scheme in February 2019. The ZTV will be updated to reflect the reference design, once available, with the extents of visibility and visual receptors re-evaluated as required.

9.7.4. The identification of visual receptors to date has been undertaken based on the clustering of receptors within the same type or group, for example residential dwellings, where a comparable effect is envisaged, focused on those which fall within the extents of the preliminary ZTV within the 2km detailed study area.

9.7.5. For the purposes of scoping, it has been assumed that existing vegetation outside the DCO site boundary will not be affected by the Scheme, and will continue to screen of filter views from some locations and receptors.

10. NOISE AND VIBRATION

10.1. Study Area

10.1.1. This chapter presents the approach to the assessment of the noise and vibration effects of the Scheme on sensitive receptors (comprising dwellings, medical facilities, educational buildings, community facilities, designated ecological sites, scheduled monuments and public rights of way). Commercial premises are not identified as sensitive receptors unless the use is potentially sensitive, such as a recording studio or theatre.

10.1.2. Informed by the guidance provided in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 7: Noise and Vibration [REF 10-1], a 1km scoping study area has been adopted within which the potential impacts of the effects of the operational Scheme have been considered.

10.1.3. The extents of the 1km scoping study area are illustrated on Figure 10.1 in Chapter 19, and extend outwards from the new dual carriageway[4] and the existing A428 between Wyboston interchange and Caxton Gibbet junction, the existing A1 between Black Cat junction and Wyboston interchange, and the existing A421 between the Black Cat Junction and west of Roxton (the latter three being the principal existing routes that will be bypassed or improved as part of the Scheme).

10.2. Baseline Conditions

10.2.1. To inform the scoping exercise, information was gathered from a number of publicly available sources and through noise monitoring to identify likely sources of noise and noise sensitive receptors.

10.2.2. Information sources comprised the following:

- Ordnance Survey mapping and land use (address base) data.
- Traffic forecasts prepared as part of the development and selection of options for the Scheme.
- Noise action plans produced as part of the requirements of The Environmental Noise (England) Regulations 2006 (as amended) [REF 10-2].
- Baseline noise measurements monitored in November/December 2017 at a number of representative locations within the 1km scoping study area.

Noise Sources

10.2.3. Information collected during the scoping exercise identified that the existing noise climate within the 1km scoping study area is likely to be dominated by road traffic noise, predominantly from the A1, A428, A1198, A421 and associated junctions.

10.2.4. Other sources of road traffic noise include the B1428, B1043, B1046, and B1040, and a number of minor roads, in particular those in St Neots which contribute to ambient noise levels.

10.2.5. Rail noise from the East Coast Main Line which runs along the eastern edge of St Neots is likely to dominate the existing noise climate in some locations and contribute to ambient noise levels.

[4] Data relating to the noise and vibration assessment was obtained prior to development and refinement of the DCO site boundary. Although this distance covers the majority of the extents covered by the DCO site boundary, it does not extend to more remote areas within the DCO site boundary (specifically isolated parcels of land located to the north of St Neots, along the existing A428 to the south of St Neots, and south and west of Black Cat junction on the A1 and the A421) which were incorporated into the DCO site boundary late into the scoping process.

10.2.6. Recreational aircraft flying out of Bourn (approximately 2.6km east of the DCO site boundary, from Cambourne), Gransden Lodge (approximately 4.6km from the DCO site boundary, from west of Caxton Gibbet junction) and Little Gransden airfields (approximately 6km from the DCO site boundary, from west of Eltisley) are also likely to be intermittent contributors to the noise environment.

10.2.7. Further noise sources include noise associated with general urban and rural activities, for example those associated with agricultural operations.

Noise Monitoring

10.2.8. Noise monitoring was undertaken at a number of representative locations within the 1km scoping study area during the period of November to December 2017 to inform the development and selection of options for the Scheme.

10.2.9. Further noise monitoring will be undertaken in Spring 2019.

Noise Important Areas

10.2.10. Within the 1km scoping study area, there are:

- three Noise Important Areas (NIA) located on the A1 between Black Cat junction and Wyboston interchange;
- one NIA located in the locality of Church End on the A1 south of Black Cat junction;
- one NIA located on the A421 north of Roxton; and
- two NIAs located on the A428 at Wintringham and east of Caxton Gibbet.

10.2.11. Figure 10.1 in Chapter 19 illustrates the locations and geographical extents of NIAs located within the 1km scoping study area.

Noise Sensitive Receptors

10.2.12. Noise sensitive receptors within the 1km scoping study area include:

- Residential properties in the settlements of St Neots, Tempsford, Roxton, Chawston, Wyboston, Croxton and Eltisley.
- Residential properties located along Rookery Road, north of Wyboston.
- Individual dwellings located within the rural environment, for example properties located adjacent to the A428.

10.2.13. Other noise sensitive receptors include a number of schools and nurseries, a number of medical facilities, a range of community facilities mainly comprising of places of worship and village halls, numerous public rights of way and a number of scheduled monuments.

10.2.14. No statutorily designated ecological sites are located within the 1km scoping study area.

10.3. Potential Impacts

Construction

10.3.1. During construction, the Scheme has the potential to directly affect the noise and vibration levels experienced at sensitive receptors in proximity to the works, for a temporary period.

10.3.2. Construction noise impacts may occur as a consequence of construction activities within working areas and site compounds, for example activities associated with bulk

earthworks and road construction. Construction traffic noise impacts may potentially occur on the existing road network, depending on the location of construction haul routes and the quantity and type of construction-related traffic.

10.3.3. The potential for temporary construction vibration impacts will be dependent on the need for certain types of construction activities that can be a potentially significant source of vibration, for example some types of piling and ground improvement works using vibratory rollers.

Operation

10.3.4. Traffic on new and modified roads within the Scheme extents, and on surrounding affected roads, has the potential to result in both beneficial and adverse permanent noise impacts depending on the forecast changes to traffic flows and whether traffic moves closer to, or further away from, noise sensitive receptors.

10.3.5. The introduction of the Scheme in areas which are currently reasonably remote from existing roads, such as the rural areas to the south east of St Neots, has the potential to result in increases in traffic noise levels. Conversely the transfer of traffic from the existing A428 onto the new dual carriageway has the potential to result in decreases in traffic noise levels at nearby receptors.

Future Maintenance

10.3.6. The future maintenance of the Scheme is likely to involve routine inspection and maintenance activities, for example the mechanical clearance of drains, periodic carriageway resurfacing and emergency repair works.

10.3.7. Although these types of activity could potentially give rise to localised changes in noise and vibration at nearby sensitive locations, such impacts would be temporary in nature and would be comparable with standard maintenance operations already being undertaken elsewhere on the strategic and local road networks.

10.3.8. The scoping exercise concluded that the effects of these temporary impacts would be unlikely to be significant, and accordingly the consideration of future maintenance as a scenario will be scoped out of the noise and vibration assessment.

10.4. Design, Mitigation and Enhancement Measures

10.4.1. Based on the magnitude of impact that may potentially arise from construction and operation of the Scheme, the scoping exercise has identified a potential requirement for mitigation.

Construction

10.4.2. Measures that may be required to mitigate construction impacts are expected to focus on the employment of best practice techniques prior to and during the works.

10.4.3. A Construction Environment Management Plan (CEMP) will be produced for the Scheme, which will include a requirement on the contractor to apply best practicable means to minimise noise and vibration impacts at the closest noise sensitive receptors during construction. The CEMP will be developed in conjunction with the relevant local authority Environmental Health Officers.

10.4.4. Measures could include restrictions on working hours and the timing of deliveries, the selection of the most appropriate working methods and plant for particular construction activities, advanced notification of construction works to local residents, and developing a framework for the investigation and remediation of any noise/vibration issues during the works.

Operation

10.4.5. Measures to mitigate operational impacts are currently being identified as part of the design-development process. Where the requirement for mitigation is identified, measures will be incorporated into the design of the Scheme where possible. A thin surfacing system, which generates less noise than a standard hot rolled asphalt surface, is proposed along the Scheme.

10.4.6. Noise mitigation measures may include, for example, adjustments to the vertical and horizontal alignment of the Scheme and the use of bunds or barriers. Such measures will be developed in conjunction with other assessments, in particular biodiversity and landscape, and will also consider the costs and benefits of the measures, any engineering limitations, and feedback from consultation.

10.5. Description of the Likely Significant Effects

Construction

10.5.1. Given the nature of the proposed construction works and the proximity of sensitive receptors, there is the potential for significant temporary construction noise effects at nearby receptors.

10.5.2. The potential for significant temporary construction vibration effects will be dependent on the need for works that are a potentially significant source of vibration, which will be determined once further details of the works are available.

Operation

10.5.3. In relation to operational effects, the scoping exercise has identified that design-based mitigation measures are likely to reduce the significance of adverse noise and vibration effects on sensitive receptors.

10.5.4. Notwithstanding this, the scoping exercise has concluded that potential remains for significant adverse effects associated with the operation of the Scheme.

10.6. Assessment Methodology

Assessment Guidance

10.6.1. As the scoping exercise has recorded potential significant effects, a detailed assessment will be completed in accordance with the guidance and methodologies contained in DMRB [REF 10-1].

Construction Noise

10.6.2. A quantitative assessment of construction noise impacts on sensitive receptors will be undertaken using available information on the construction works.

10.6.3. Estimates of typical construction noise levels will be made for a selection of the closest receptors to the works in accordance with the methodology in British Standard 5228-1: 2009+A1: 2014 ‘Code of Practice for Noise and Vibration Control on Construction and Open Sites. Noise.’ (BS 5228-1) [REF 10-3]. This will be based on information on the number and type of construction plant required for each activity, typical ‘on-times’ for each item of plant, working areas, working times and durations.

10.6.4. The ‘ABC’ method within BS 5228-1 [REF 10-3] will be adopted in the assessment. This approach is based on setting the threshold for the onset of potentially significant adverse effects (i.e. the ‘significant observed adverse effect level’ SOAEL) depending on the existing ambient noise level. **Table 10.1**, which is adapted from BS 5228-1 [REF 10-3], sets out the construction noise SOAEL and also the Lowest Observable Adverse Effect Level (LOAEL) (defined as the threshold for the onset of adverse

effects on health and quality of life) to be used in the assessment. Construction noise levels between the LOAEL and the SOAEL have the potential to result in adverse effects but would not normally be classed as significant adverse effects

Table 10.1: Construction Noise for Residential Receptors

Time of Day	SOAEL $L_{Aeq,T}$ dB (façade)			LOAEL $L_{Aeq,T}$ dB (façade)
	A[1]	B[2]	C[3]	
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75	Existing ambient
Evenings (19:00 – 23:00 weekdays) and Weekends (13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays)	55	60	65	Existing ambient
Night-time (23:00 – 07:00)	45	50	55	Existing ambient
1 Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are less than these values 2 Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are the same as the category A values 3 Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5 dB) are higher than the category A values NOTE: if the ambient noise level exceeds the Category C threshold values then the SOAEL and LOAEL are defined as equal to the existing ambient				

10.6.5. To determine the SOAEL and LOAEL, ambient noise levels at the relevant façade of each of the selected receptors will be determined based on predicted baseline traffic noise levels for the year 2021.

10.6.6. Construction traffic noise impacts will be assessed based on the Calculation of Road Traffic Noise (CRTN) [REF 10-4] Basic Noise Level (BNL), both with and without the construction traffic, for each affected road link. The magnitude of the impact of construction traffic will be assigned based on the anticipated change in traffic noise level, in accordance with the same criteria as used for short term operational road traffic noise impacts, as detailed in **Table 10.4**.

Construction Vibration

10.6.7. Construction vibration impacts causing annoyance to humans will be assessed where activities that may be a potentially significant source of vibration (for example impact piling or the use of vibratory rollers) will be undertaken within 100m of identified sensitive receptors. Prediction methodologies and data contained within British Standard 5228-2: 2009+A1: 2014 ‘Code of Practice for Noise and Vibration Control on Construction and Open Sites. Vibration’ (BS 5228-2) [REF 10-5] on measured levels of vibration for various construction works will be referenced in the assessment.

10.6.8. **Table 10.2** details Peak Particle Velocity (PPV) vibration levels and provides a semantic scale for the description of construction vibration effects on human receptors, based on guidance contained in BS 5228-2 [REF 10-5].

Table 10.2: Construction vibration criteria for human receptors (annoyance)

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

10.6.9. For human receptors the LOAEL is defined as a PPV of 0.3 mms^{-1} (millimetres per second), this being the point at which construction vibration is likely to become perceptible. The SOAEL is defined as a PPV of 1.0 mms^{-1}, this being the level at which construction vibration can be tolerated with prior warning.

10.6.10. The levels of vibration that may cause building damage are far in excess of those that may cause annoyance. BS 7385-2: 1993 'Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from ground borne vibration' (BS 7385-2) [REF 10-6] provides guidance on vibration levels likely to result in cosmetic damage and is referenced in BS 5228-2 [REF 10-5]. BS 7385-2 [REF 10-6] states that for transient vibration, such as from individual impacts, the probability of cosmetic building damage tends towards zero at levels less than 12.5 mms^{-1} PPV. For continuous vibration, such as from vibratory rollers, the threshold is around half this value.

10.6.11. ISO 4866:2010 'Mechanical vibration and shock. Vibration of fixed structures. Guidelines for the measurement of vibrations and evaluation of their effects on structures' [REF 10-7] defines three different categories of building damage:

- cosmetic – formation of hairline cracks in plaster or drywall surfaces and in mortar joints of brick/concrete block constructions;
- minor – formation of large cracks or loosening and falling of plaster or drywall surfaces or cracks through brick/block; and
- major – damage to structural elements, cracks in support columns, loosening of joints, splaying of masonry cracks.

10.6.12. BS 7385-2 [REF 10-6] states that minor damage occurs at a vibration level twice that of cosmetic damage and major damage occurs at a vibration level twice that of minor damage. Therefore, this guidance can be used to define the potential impact identified in in **Table 10.3** for continuous vibration

Table 10.3: Construction vibration criteria for assessing building damage

Damage risk	Continuous Vibration Level PPV mms^{-1}
Major	30
Minor	15
Cosmetic	6
Negligible	<6

Operational Noise

10.6.13. Traffic noise levels are influenced by a number of factors including traffic flow, speed, composition (percentage of heavy goods vehicles (HGV)), gradient, type of road surface, distance from the road and the presence of any obstructions between the road and the receptor.

10.6.14. To assess the noise impact a single figure estimate of the overall noise level is necessary. The index adopted by the Government is the Calculation of Road Traffic Noise [REF 10-4] to assess traffic noise is $L_{A10,18h}$. As recorded in the DMRB [REF 10-1], a reasonably good correlation has been shown to exist between this index and the perception of traffic noise by residents over a wide range of noise exposures. The CRTN methodology will be followed in the calculation of road traffic noise, which will provide input to assessment of effects using the DMRB methodology [REF 10-1].

10.6.15. Although the main focus of the assessment will be on daytime impacts, in line with the requirements of DMRB [REF 10-1] an assessment of night-time traffic noise levels using the parameter L_{night}, outside (the traffic noise level over the period 23:00 to 07:00) will be undertaken. DMRB [REF 10-1] refers to three methods for calculating night-time traffic noise levels developed by the Transport Research Laboratory. The most widely used is 'Method 3' which factors the $L_{night,outside}$ from the $L_{A10,18h}$, based on the typical diurnal pattern of traffic flows in the UK.

10.6.16. Daytime and night-time traffic noise levels will be generated using noise modelling software, based on 18-hour Annual Average Weekday Traffic (AAWT) flow data for the hours of 06:00 to 24:00, including average vehicle speed and percentage HGV information derived from the traffic model of the Scheme

10.6.17. Traffic speeds for roads in the study area will be calculated in accordance with IAN 185/15 [REF 10-8] for speed-banding.

10.6.18. A number of steps will be carried out in the assessment of operational daytime and night-time noise effects, as defined in DMRB [REF 10-1].

10.6.19. The assessment will involve the identification of a study area which will comprise the Scheme, existing roads bypassed or modified by the Scheme, and all surrounding existing roads that are predicted to be subject to a change in traffic noise level as a result of the Scheme of:

- 1 dB or more in the short term (Do-Minimum opening year to Do-Something opening year).
- 3 dB or more in the long term (Do-Minimum opening year to DS 15 years after opening), subject to a minimum change of 1 dB between the Do-Minimum and DS 15 years after opening.

10.6.20. These roads are defined as 'affected routes' and are identified by analysis of the traffic data. The identification of affected routes will consider all roads with 18 hour (06:00-00:00) weekday traffic flows above the 1,000 lower cut off of the Calculation of Road Traffic Noise [REF 10-4], prediction methodology in all scenarios.

10.6.21. Prediction of 18-hour (06:00 - 00:00) and night-time (23:00 - 07:00) traffic noise levels will be undertaken at all residential properties and other sensitive receptors within 600m of the Scheme, existing roads bypassed by the Scheme and affected routes.

10.6.22. Comparisons for residential properties and other sensitive receptors will be undertaken to identify those receptors which may experience an increase or decrease in traffic noise levels and annoyance, for the following scenarios:

- The Do-Minimum scenario in the baseline year against the Do-Minimum scenario in the future assessment year (long-term).
- The Do-Minimum scenario in the baseline year against the Do-Something scenario in the baseline year (short-term).
- The Do-Minimum scenario in the baseline year against the Do-Something scenario in the future assessment year (long-term).

10.6.23. For night-time traffic noise levels, comparisons will be undertaken for the two long-term scenarios and for residential properties where the $L_{night,outside}$ level is 55 dB(A) or more in the relevant scenarios.

10.6.24. A qualitative assessment of the magnitude of impact on residential properties and other sensitive receptors located within 1km of all physical works associated with the Scheme (but beyond the 600m calculation area) will be carried out. For affected routes located beyond 1km, an assessment will be undertaken by estimating the CRTN BNL [REF 10-4] on these roads (the traffic noise level at 10m) both with and without the Scheme, with a count undertaken of the number of dwellings and other sensitive receptors within 50m of these routes.

10.6.25. DMRB [REF 10-1] provides two example classifications for the magnitude of the traffic noise impact of a road scheme, which will be used in the assessment to report the impacts of both short-term and long-term changes in noise levels, as presented in **Table 10.4**.

Table 10.4 Magnitude of Traffic Noise Impacts

Short Term Change		Long Term Change	
Noise Level Change (rounded to 0.1dB) $L_{A10,18h}$ dB	**Magnitude of Impact**	**Noise Level Change (rounded to 0.1dB) $L_{A10,18h}$ Db**	**Magnitude of Impact**
0	No change	0	No change
0.1 – 0.9	Negligible	0.1 – 2.9	Negligible
1 – 2.9	Minor	3 – 4.9	Minor
3 – 4.9	Moderate	5 – 9.9	Moderate
5+	Major	10 +	Major

10.6.26. With respect to absolute road traffic noise levels, for daytime, the SOAEL is set at 63 dB $_{LAeq,16h}$ (free field). This is equivalent to 67.5 dB $L_{A10,18h}$ (façade), which is consistent with the daytime trigger level in the Noise Insulation Regulations [REF 10-9]. The LOAEL is set at 50 dB $L_{Aeq,16h}$ (free field), based on the information provided in the World Health Organisation's Guidelines for Community Noise [REF 10-10]. This is equivalent to 55 dB $L_{A10,18h}$ (façade).

10.6.27. For night-time, the SOAEL is set at 55 dB $L_{Aeq,8h}$ (free field) for residential properties. This aligns with the interim night-time outdoor target level provided in the Night Noise Guidelines for Europe [REF 10-11]. The LOAEL is set at 40 dB $L_{Aeq,8h}$ (free field), which is explicitly defined as the LOAEL for transport noise in these guidelines [REF 10-11].

10.6.28. A preliminary indication of any properties likely to qualify under the Noise Insulation Regulations [REF 10-9] will be provided in the assessment. A full assessment would be completed once the detailed design is finalised and in accordance with the timescales set out in the Regulations [REF 10-9].

Operational Vibration

10.6.29. The potential for operational vibration impacts is generally limited to the immediate vicinity of a road.

10.6.30. In relation to traffic induced groundborne vibration, DMRB [REF 10-1] states that: *"Such vibrations are unlikely to be important when considering disturbance from new roads and an assessment will only be necessary in exceptional circumstances"*. Given this direction, no significant effects from traffic induced ground borne vibration associated with the passage of vehicles are considered likely to result from operation of the Scheme, and consequently this aspect is proposed to be scoped out of the assessment.

10.6.31. Airborne vibration is perceived by occupiers more often than ground borne vibration as it may result in detectable vibrations in building elements, for example windows and doors. To assess the magnitude of the impact of traffic induced airborne vibration on residents, DMRB [REF 10-1] recommends the use of the $L_{A10,18h}$, as the relationship between the $L_{A10,18h}$ and annoyance due to vibration is similar to that for annoyance due to steady state traffic noise, except that the percentage of people bothered by vibration is lower. For a given level of noise exposure, the percentage of people bothered very much or quite a lot by vibration is 10% lower than the corresponding figure for annoyance due to traffic noise. Below 58 dB(A) the percentage of people bothered by traffic induced vibration is assumed to be zero.

10.6.32. The relationship between annoyance due to vibration and traffic noise level in the DMRB [REF 10-1] is based on properties located within 40m of a road. Therefore, at each property within 40m of the Scheme, and at which traffic noise levels are predicted to be 58 dB, $L_{A10,18h}$ or more, the percentage of people likely to be bothered very much or quite a lot by vibration will be calculated.

Significance of Effect

10.6.33. The main factor in identifying construction noise and vibration annoyance significant effects is the magnitude of the impact relative to the SOAEL. In general, construction noise or vibration levels above the SOAEL would be considered significant, and levels below the SOAEL not significant. However, in line with best practice this initial decision on the significance of an effect is then combined with professional judgement which takes into account a range of other factors including:

- The duration of the impact. Based on the guidance in BS 5228-2 [REF 10-5] construction noise or vibration levels above the SOAEL for less than 10 days (or 10 evenings/weekends or nights) in any 15, or less than 40 days (or 40 evenings/weekends or nights) in any six month period, would not normally be considered significant.
- The circumstances of the receptor.

10.6.34. The significance of the effect of construction traffic will be considered in the same way as operational traffic, as described below.

10.6.35. For operational noise and vibration, an initial identification of significant effects will be carried out based on the change in traffic noise levels due to the Scheme. In the assessment, a negligible or minor magnitude of impact will not normally be considered significant, but a moderate or major magnitude of impact will normally be considered significant. The determination of the significance of operational effects will be informed by these ratings and, using professional judgement, will take into account the following factors:

- The absolute noise levels.

- Where the magnitude of impact in the short term lies relative to the boundaries between the bands outlined in **Table 10.4**.
- If the change in the long term is different than the short term.
- The circumstances of the receptor.
- The acoustic character of an area.
- The likely perception of a traffic noise change.
- The proportion of a designated site that is affected.

Policy Requirements

10.6.36. The National Policy Statement for National Networks (NPSNN) [REF 10-12] requires that due regard must be given to relevant sections of the following documents:

- National Planning Policy Framework [REF 10-13].
- Noise Policy Statement for England [REF 10-14].
- Planning Practice Guidance: Noise [REF 10-15].

10.6.37. The key aspect of the NPSNN are the three policy aims detailed in paragraph 5.195 which states 'The Secretary of State should not grant development consent unless satisfied that the proposals will meet, the following aims, within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life from noise as a result of the new development.
- Mitigate and minimise other adverse impacts on health and quality of life from noise from the new development.
- Contribute to improvements to health and quality of life through the effective management and control of noise, where possible.

10.6.38. The mitigation strategy for the Scheme will be informed by the requirements of these three policy aims.

Study Area

10.6.39. The geographical extents of the construction phase noise and vibration assessment will focus on sensitive receptors in close proximity to works within the Development Consent Order (DCO) site boundary that are likely to experience effects from construction of the Scheme.

10.6.40. The assessment study area for operational phase noise and vibration effects will reflect guidance contained in DMRB [REF 10-1], and will be based on the method summarised above.

Information Sources

10.6.41. The following information will be obtained:

- Ordnance Survey MasterMap and AddressBase data, to aid the identification and modelling of noise sensitive receptors, combined with any specific information from the Local Authorities.
- 18 Hour AAWT flows (including the percentage HGV) for the baseline year and future assessment year with and without the Scheme, to enable the modelling of traffic-related effects on noise sensitive receptors.

- Baseline noise monitoring to be undertaken in spring 2019 to monitor ambient noise levels at representative locations, and supplement that which was undertaken in winter 2017.
- Information on existing and proposed road noise surfacing and any existing noise barriers, to identify and model how these influence baseline noise levels.
- Information on existing and proposed ground heights.
- Information on the proposed construction works from the appointed buildability contractor.

Consultation

10.6.42. Consultation will be undertaken with the Environmental Health Officers within the relevant local authorities to agree the scope of future baseline noise monitoring to be progressed as part of the noise and vibration assessment, and to inform the development of appropriate measures to mitigate construction and operational effects on sensitive receptors.

10.7. Assessment Assumptions and Limitations

10.7.1. In the absence of information on the construction works the scoping exercise has assumed that there is the potential for significant construction effects.

10.7.2. In the absence of construction traffic information, the scoping exercise has assumed that construction traffic effects on sensitive receptors will require assessment; however, this will be evaluated once information on vehicle flows and haul routes becomes available.

10.7.3. The requirement for works that could act as potentially significant sources of vibration has yet to be established; however, for the purposes of the scoping exercise a precautionary approach has been adopted which assumes a construction vibration assessment will be carried out. The need for this assessment will be evaluated on receipt of detailed construction information and methodologies for the Scheme, once available.

10.7.4. As noted in Section 10.1, the 1km scoping study area adopted within the scoping exercise does not extend around all areas of the DCO site boundary due to limitations on information availability. The noise and vibration assessment will take full account of these areas of the DCO site boundary.

11. POPULATION AND HEALTH

11.1. Study Area

11.1.1. This chapter presents the approach to the assessment of the Scheme's effects on population and health, which comprises:

- effects on occupiers of agricultural, community and development land;
- effects on owners and users of private and commercial property;
- effects on people making journeys by vehicle;
- effects on non-motorised user (NMU) and journeys made between communities and facilities; and
- the health and wellbeing of communities.

11.1.2. The following guidance has been adopted in the scoping exercise to define appropriate study areas for each of the above receptors and resources.

Motorised Travellers

11.1.3. The scoping study area for motorised users has considered roads located within 1km of the Development Consent Order (DCO) site boundary, with a focus on routes between the Black Cat and Caxton Gibbet junctions.

View from the Road and Driver Stress

11.1.4. The consideration of potential effects in relation to changes in view from the road and changes in driver stress has referenced guidance contained in Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 9: Vehicle Travellers [REF 11-1].

Vehicle User Severance

11.1.5. The potential for severance to be imposed or relieved as a result of the Scheme has been considered as part of the scoping exercise, in order to understand the potential effects of the Scheme on vehicular users and their access to community facilities.

Non-Motorised Users

Pedestrians, Cyclists and Equestrians

11.1.6. The scoping of potential effects on NMUs has considered direct impacts of the Scheme on local journeys made on routes forming the Public Rights of Way (PRoW) network, and impacts on any feeder PRoWs between destinations, within 1km of the DCO site boundary. This has referenced guidance contained in DMRB Volume 11, Section 3, Part 8 – Pedestrians, Cyclists, Equestrians and Community Effects [REF 11-2].

Community Severance

11.1.7. Community severance relates to the separation of residents from facilities and services that they use within their community. The scoping study area for community severance reflects that applied to the pedestrians, cyclists and equestrians scope, with a focus on communities that would potentially be affected by the Scheme, using guidance contained in DMRB Volume 11, Section 3, Part 8: Pedestrians, Cyclists, Equestrians and Community Effects [REF 11-2].

Land Use

11.1.8. The scoping of potential effects on Land Use has been undertaken using guidance contained in DMRB Volume 11, Section 3, Part 6: Land Use [REF 11-3], and has been based on a scoping study area of all private assets, community land, development land and planning applications, and agricultural land and holdings within the DCO site boundary and outward to a distance of 1km.

Private Assets

11.1.9. Private assets constitute land and property outside the existing highway boundary that does not accommodate public open space or any other community facility or asset, and can comprise residential, commercial and industrial land.

Community Land

11.1.10. Community land is any area of public open space and other facilities such as schools, hospitals, libraries and recreation facilities.

Development Land and Planning Applications

11.1.11. Development land comprises land designated for a particular development purpose (for example land allocated within a local development plan), or for which planning permission has been granted or is pending.

Agricultural Land and Holdings

11.1.12. Agricultural land has been classified by the Natural England by grade, according to the extent to which chemical and physical characteristics impose long term limitations on agricultural use for food production [REF 11-4].

11.1.13. Only land potentially falling within Agricultural Land Classification (ALC) Grades 1, 2 and 3a is considered to be best and most versatile land, which comprises land best suited to adapting to the changing needs of agriculture and maintaining the competitiveness of UK agriculture against international competitors.

11.1.14. Agricultural land includes holdings that would likely be affected by the Scheme by virtue of landtake, severance and changes in their operational and commercial viability.

Human Health

11.1.15. The scoping of potential effects on the health and wellbeing has been undertaken with reference to the relevant health determinants set out in the London Healthy Urban Development Unit (HUDU) Rapid Health Impact Assessment Tool Third Addition 2017 [REF 11-5], and the requirements of paragraphs 4.79 and 4.82 of the National Policy Statement for National Networks (NPSNN) [REF 11-6].

11.1.16. The scoping study area captures the wards of: Wyboston; Great Barford; Potton; St Neots Eaton Ford; St Neots Eynesbury; St Neots Priory Park; Bourn; and Papworth and Elsworth.

11.2. Baseline Conditions

11.2.1. To inform the scoping exercise, data and records relating to the aspects to be considered within the population and health assessment were obtained from the following sources:

- Google Streetview roadside photography [REF 11-7], to establish the composition and availability of views from the road.

- Ordnance Survey mapping and aerial photography available in the public domain, to identify land use relationships and areas of community land and other facilities, for example PRoW and cycle routes.
- A review of planning applications (within the last five years) held by South Cambridgeshire District Council, Huntingdonshire District Council, Central Bedfordshire Council and Bedford Borough Council.
- A review of development plan documents [REF 11-8; REF 11-9; REF 11-10] to identify development land.
- Natural England's ALC mapping [REF 11-4].
- Official labour market statistics [REF 11-11].

11.2.2. Figure 11.1 in Chapter 19 illustrates the extents of the PRoW network, and the locations of planning applications, common land and parkland within and surrounding the DCO site boundary.

11.2.3. Figure 11.2 in Chapter 19 illustrates the coverage of ALC within and surrounding the DCO site boundary.

Views from the Road

11.2.4. The majority of the scoping study area is predominately an open and intensive arable landscape characterised by gently undulating topography and plateau areas, divided by broad shallow valleys.

11.2.5. Open or intermittent views of this countryside are possible from much of the A428 due to the absence of hedgerows alongside much of the highway boundaries. Similarly, views for vehicle travellers using the existing roads tend to be intermittent or open views of the large arable fields characteristic of the area.

11.2.6. Settlements close to the existing A428 include Croxton, Eltisley and Caxton Gibbet. However, views of these settlements tend to be glimpsed for travellers along the A428 due to the presence of noise barriers, screening vegetation and cuttings.

Driver Stress

11.2.7. The main factors contributing to driver frustration along the A428 relate to the capacity of the carriageway to accommodate current traffic volumes.

11.2.8. There is congestion at existing junctions along the A428 during peak periods which affects the speed of journeys and can cause queuing, which contributes to driver stress. Driver stress is exacerbated further during accidents or breakdown events resulting in lane closures.

11.2.9. The fear of accidents is particularly acute for drivers making journeys in adverse weather conditions, for example when spray from vehicles reduces visibility. Such conditions can also make overtaking more stressful and hazardous, increasing the fear of accidents.

11.2.10. Junctions and destinations on the A428 are adequately signposted; however, some of the distances between successive merges and diverges are not in keeping with current design practice and can contribute to route uncertainty and wrong or late choices being made by some drivers. Additionally, local accesses to lanes and isolated properties off the A428 have minimal, if any, junction tapers, which lead to slow driving or sudden speed changes.

Vehicular User Severance

11.2.11. The route conditions identified as part of the driver stress baseline currently affect journeys made by vehicle users to reach community facilities along and beyond the A428.

Public Rights of Way

11.2.12. PRoWs are important assets that provide connections between villages and community facilities for NMUs.

11.2.13. Around 50 PRoWs are located within the scoping study area, the majority of which comprise footpaths focused on land to the north and west of Black Cat junction with a further cluster located south east of St. Neots between Hen Brook and Wintringham. Further routes are associated with the settlements of Weald, Croxton and Eltisley. One PRoW (Hail Lane Byway) has five Traffic Regulation Orders in place, restricting traffic flow at certain times of the year to allow these byways to be used without hindrance or severance.

11.2.14. A number of bridleways are located around the settlements of Eltisley and Caxton.

11.2.15. The most significant walking trail is the Ouse Valley Way, a regional trail following the River Great Ouse between its source at Brackley, Northamptonshire to its mouth at the Wash at King's Lynn. The trail crosses the A421 west of Black Cat junction and continues into Chawston, from here it continues along the A1 toward Wyboston where it crosses the A428 at the Wyboston interchange and follows the A1 to Eaton Socon.

11.2.16. The Sustrans National Cycle Network Route 12 runs north-south through the scoping study area to the west of the A1, crossing the A1 to the west of Black Cat junction. This cycle route when completed will run from Enfield Lock to Spalding, passing through St Neots.

Commercial Receptors

11.2.17. Commercial based receptors within the scoping study area that are used by the community include the following:

- Service areas at Black Cat junction (including hotel and petrol garage), and at Caxton Gibbet junction including supermarket, petrol garage and cafés.
- Whitehall Industrial Estate in Croxton (adjacent to the existing A428).
- Little End Road and Howard Road industrial estates in St Neots (3km north of Black Cat junction).
- Industrial estate along Alington Road, south of St Neots (adjacent to existing A428).
- Papworth Hotel on Ermine Street, where the A1198 meets the A428 (350 metres north of the Caxton Gibbet junction).
- Kelpie Marine boat yard by Tempsford Bridge (700m south of the Black Cat junction).
- Little Barford electricity generating power station, south-east of St Neots (390m south of the existing A428, Barford Road junction).
- Businesses, including Cemex cement plant located within Wyboston Leisure Park (500m south of the A428 Wyboston interchange).
- Roxton Garden Centre (300m south-west of the Black Cat junction).

- Business (including a café, petrol garage, and independent retailers) adjoining the Great North Road in Wyboston (1km south of the Black Cat junction).
- St Neots Autograss Club motor sports circuit, located adjacent to the A428 immediately south of Black Cat (300m south west of the Black Cat junction).
- Hotels and other businesses at Wyboston interchange (155m north east of the A428 Wyboston interchange).
- Grocery superstore south of St Neots (130m north west of the A428, Barford Road Junction).
- Various farms, plantations, and associated businesses located in the countryside.

Community Facilities

11.2.18. Community facilities located within the scoping study area include the following:

- St Neots Community College (600m north of the A428 in St Neots).
- Middle Field Community Primary School (400m north of the A428 in St Neots).
- Croxton Park Registered Park and Garden west of Eltisley (440m south of the A428).
- Barford Road Pocket Park (300m from the A428 in St Neots).
- Wyboston Leisure Park (400m south east of Black Cat junction).
- Newton Primary School in Eltisley (450m south of the A428 at Eltisley).
- St Pandionia and St John the Baptist Church (125m south of the A428 at Eltisley).
- St James' Church (800m south of the A428 at Croxton).

Development Land and Planning Applications

11.2.19. The South Cambridgeshire Local Plan 2018 [REF 11-8] includes future plans for the creation of a fourth sustainable linked village at Cambourne West (Emerging Policy SS/8). The zoned land south of Caxton Gibbet junction is allocated for a sustainable mixed use development with high levels of green infrastructure, and aims to provide approximately 1,200 dwellings by 2031.

11.2.20. The Huntingdonshire Local Plan to 2036: Proposed Submission [REF 11-9] details a strategic expansion location east of St Neots. This zoned expansion area comprises 224 hectare of land east of Loves Farm designated for mixed use sustainable development and has been carried forward from the St Neots Eastern Expansion Urban Design Framework 2010 [REF 11-12]. The Framework [REF 11-12] also laid provision for green areas, green corridors and pedestrian and cyclist provisions throughout the development area.

11.2.21. The Central Bedfordshire Pre-submission Local Plan 2015 - 2035 [REF 11-10] aims to provide a minimum of 20,000 additional new homes and 24,000 new jobs between 2015 and 2035. Several development areas have been zoned within the plan for consideration. Among those areas proposed is a new market town near Tempsford. This zoned growth area would include the development of approximately 7,000 homes and a business park. The delivery of development in this area will rely on the delivery of the A428 Preferred Route and the delivery of the East-West rail improvements (described below).

11.2.22. Plans are under development for the East-West rail scheme (also known as the "Varsity Line") between Oxford and Cambridge. The section of the line connecting

Bedford to Cambridge requires a new rail connection, and a number of route options are currently being investigated by the East West Rail Company, some of which will take the new line on a corridor south of the existing A428. Should the East-West rail scheme be introduced in full, this will provide a high quality rail alternative for freight, and it is likely that a proportion of freight currently on the strategic road network will shift towards transportation by rail.

11.2.23. Development land within the scoping study area includes the following:

- Land to the east of Black Cat junction and the A1, which is designated as a Green Infrastructure Network Opportunity Zone (Lower Great Ouse Valley).
- Two allocated housing sites located adjacent to the A428 in St Neots, comprising a 21 hectare site at Barford Road and a 58 hectare site on and east of the East Coast Main Line (north of Cambridge Road). The area at Barford Road is also allocated as an employment zone, where development of industry, warehousing and distribution, office and high technology uses will be prioritised.
- The River Great Ouse valley north of the A428, which is designated as an area of strategic greenspace enhancement.

11.2.24. A number of planning applications within the last five years have been identified within the scoping study area. The significant planning permissions identified in **Table 11.1** below relate to development zones highlighted above and within the relevant local authority plans.

Table 11.1: Major Planning Applications

Planning ID	Date Received	Proposal	Location	Status
South Cambridgeshire District Council				
S/2903/14/OL	22 Dec 2014	Proposed mixed use development comprising up to 2,350 residential units, up to 5.66ha of offices/light industry, up to 0.92ha of community and leisure facilities, two primary and one secondary schools, the extension and modification of access points and additional associated works such as pedestrian and cycle routes.	Land to the West of Cambourne (Excluding Swansley Wood Farm)	Out for consultation
Huntingdonshire District Council				
1300388OUT Alternative reference PP-01795505	15 Mar 2013	Proposed development of 1,020 residential dwellings and up to 7.6ha for mixed use development including a nursery/crèche, public house, hotel, care accommodation, employment uses and onsite roads, pedestrian routes, open spaces and associated works.	Loves Farm Eastern Expansion Development Area Cambridge Road St Neots	In progress
1300178OUT	14 Feb 2013	Proposed development for approximately 2,800 dwellings and up to 63,500 square metres of mixed use urban extension including two primary schools,	Wintringham Park Cambridge Road St Neots	Refused - appeal in progress

Planning ID	Date Received	Proposal	Location	Status
		employment development, shops, recreation facilities and four new access points.		
Central Bedfordshire Council				
CB/15/04217/OAC (also referred to as 15/02551/EIAWM)	04 Nov 2015	Extension to Black Cat Quarry for the extraction of sand and gravel and restoration to agriculture and nature conservation.	Land at Black Cat junction, Great North Road, Chawston, Bedford, MK44 3BE	Awaiting decision

Agricultural Land and Holdings

11.2.25. Between Little Barford and Caxton Gibbet junction, the scoping study area predominantly comprises ALC Grade 2 (very good) land. Land in the vicinity of Black Cat junction extending northwards toward Wyboston interchange is classified as ALC Grade 1 (excellent) land. Land of ALC Grade 3 (good to moderate) occurs north of the A428 at St Neots, and south of Little Barford towards Sandy and Gamlingay.

11.2.26. The majority of land holdings within the scoping study area are large scale arable enterprises.

Human Health

11.2.27. Within the four local authority areas, those people who rate their health as 'bad' or 'very bad' (3.9%) is lower than both the regional (4.7%) and England and Wales (5.6%) averages. Similarly, rates of residents whose day-to-day activities are limited 'a lot' (6.2%) are somewhat lower than the regional (7.4%) and England and Wales (8.5%) averages.

11.2.28. The four local authorities have Index of Multiple Deprivation ratings ranging from the 148th (Bedford) to 316th (South Cambridgeshire) most deprived in England. Only 1.1% of the four local authority areas are within the top 10% most deprived areas nationally, compared to 4.1% across the East of England. Similarly, a majority (53.1%) of areas within the 4 local authorities are in the top 20% least deprived with regard to the health deprivation and disability domain, a component of the Index of Multiple Deprivation, compared to just 32.4% across the East of England [REF 11-11].

11.3. Potential Impacts

Construction

Motorised Travellers

11.3.1. Potential impacts during construction include:

- temporary increase in driver stress during the construction period;
- temporary changes in driver views experienced arising from the presence of construction activities or from diversions; and
- temporary changes including severance to vehicular user journeys for residents accessing community resources on local roads resulting from the redistribution of traffic on the wider network.

Non-Motorised Users

11.3.2. Potential impacts during construction include:

- temporary landtake, closure or diversion of routes during construction; and
- temporary disruption to PRoWs during construction and resulting severance of access to community facilities; and
- permanent landtake associated with the footprint of the Scheme.

Land Use

11.3.3. Potential impacts include land required temporarily for construction of the Scheme, the demolition of private property and extinguishment of local businesses.

11.3.4. The principal potential impacts on agricultural land, and on farm and farm-based enterprises, are likely to occur during the construction of the Scheme. Construction impacts on agricultural land and farm-based enterprises would include land requirements; severance; and the loss of, or disruption to, buildings and operational infrastructure. Other potential construction impacts would include the deposition of dust on sensitive crops, land uses or buildings; disruption to drainage, irrigation and water supply systems; unintentional pollution of soil and watercourses; spread of injurious weeds to adjacent agricultural land from soil and material stockpiles; and construction noise.

11.3.5. Permanent construction impacts would comprise: the net area of agricultural land required to accommodate the Scheme and the restoration of land required temporarily to unrestricted agriculture; permanent severance; and the permanent loss of, or impact on, farm infrastructure such as property, buildings and structures, and the consequential impacts on land uses and enterprises.

Human Health

11.3.6. Potential impacts on human health determinants during construction include changes in noise and air pollution, severance, water quality and climate change as a result of construction activities and traffic.

Operation

Motorised Travellers

11.3.7. Potential impacts during operation of the Scheme include:

- permanent decrease in driver stress related to improvements in journey time reliability and a reduction in congestion;
- possible changes in levels of driver stress across the wider road network from the redistribution of traffic; and
- changes in severance for residents of villages accessing community facilities and social infrastructure as a result of reduced traffic flows on surrounding roads.

Non-Motorised Users

11.3.8. Potential impacts during operation of the Scheme include:

- reducing severance and improving connectivity and local travel patterns through the provision of new NMU routes; and
- changes to journey times for NMUs accessing community resources, through the provision of new NMU routes, connections and crossing provisions.

Land Use

11.3.9. Other than potentially reducing severance of holdings and improving inter and intra-farm connectivity, no potentially new or additional impacts on agricultural land and holdings are likely during operation.

11.3.10. Operational impacts on private assets are likely to be associated with permanent landtake.

Human Health

11.3.11. Potential impacts on human health determinants during operation of the Scheme include:

- lifestyle changes such as encouraging travel by means other than private car, for example encouraging walking and cycling behaviours through provision of new NMU routes and potentially increased or reduced severance;
- impacts on local employment opportunities and activity through changes in access to employment resulting from reduced delays, congestion and potential reductions in severance;
- impacts on residents through changes in air quality, noise and neighbourhood amenity;
- impacts on access to key services and social infrastructure such as health facilities and education facilities arising from reduced delays, congestion and potential reductions in severance; and
- impacts on access to open space and recreation space through provision of new NMU routes.

Future Maintenance

11.3.12. Consideration was given to the activities associated with the future maintenance and management of the Scheme, and whether these have the potential to result in impacts on population and health.

11.3.13. Following a review of the typical activities associated with this phase of the Scheme (for example the routine inspection and maintenance of drains, periodic carriageway resurfacing and emergency repair works), the scoping exercise concluded that there would be limited potential of such impacts to occur, and that these activities are comparable with standard maintenance operations already being undertaken elsewhere on the strategic and local road networks.

11.3.14. Accordingly, the potential impacts on population and health associated with this phase of the Scheme will be scoped out of the assessment.

11.4. Design, Mitigation and Enhancement measures

11.4.1. The scoping exercise has identified a potential requirement for the following types of mitigation, some of which are currently being incorporated into the design of the Scheme as part of the design-development process:

- Designing the Scheme to avoid or reduce impacts on population and health resources and receptors, for example by minimising the extent of agricultural land required permanently to accommodate the Scheme by reducing the gradient of earthwork slopes.
- Incorporation of severed or redundant land parcels into the design of the Scheme, where appropriate and reasonably practicable.

- Inclusion of permanent PRoW diversions and new facilities to maintain, and where possible enhance, connectivity for NMUs, for example through the inclusion of facilities to enable the safe crossing of the new dual carriageway.
- Provision of accommodation works, for example agricultural underpasses and access tracks, to maintain access between fields and minimise impacts on current agricultural operations.
- Mitigating any temporary local road and PRoW closures during construction through the provision of information in advance of the works.
- Ensuring essential access is maintained throughout the construction period, or at least during the normal operating hours of businesses and facilities affected by the works.
- Adoption of construction best practice measures, for example the use of stock-proof fencing, measures to minimise dust deposition, and liaison with affected parties, to minimise and manage construction-related impacts.
- The use of traffic management measures to help reduce journey delays, and clear signage to reduce driver stress.

11.5. Description of the Likely Significant Effects

11.5.1. The scoping exercise has identified that both adverse and beneficial effects on population and health would likely result from the construction and operation of the Scheme.

Motorised Travellers

Construction

11.5.2. During construction of the Scheme, driver stress is likely to be temporarily increased as a result of roadworks and associated traffic delays. Users of the A428 are likely to experience temporary effects on driver stress associated with lane or road closures, lane restrictions, diversion routes and the presence of construction traffic on minor roads.

11.5.3. The composition of existing views from the road will likely be altered by construction activities, for example through the presence of construction plant and traffic management which may partially obscure views and attract the attention of vehicle travellers away from available views along the A428.

11.5.4. In relation to severance, construction of the Scheme is likely to result in temporary changes to vehicular user journeys for residents accessing community facilities resulting from traffic.

Operation

11.5.5. Once operational, it is expected that the separation of local and strategic traffic, a reduction in fear of accidents, and safer opportunities for overtaking will help reduce the factors that currently cause driver stress, and will likely contribute to a reduction in driver fear.

11.5.6. New views across the agricultural landscapes to the north and south of the A428 would become available to motorised travellers using the new dual carriageway, once operational.

11.5.7. The transfer of traffic from the A428 onto the new dual carriageway is expected to result in some benefits in relation to relieving vehicular user journey severance, with existing facilities being more accessible once the Scheme is operational.

Non-Motorised Users

Construction

11.5.8. During construction, there will likely be localised disruption to NMU journeys resulting from local road closures and temporary closures of PRoWs and public footpaths. Such effects will likely be more significant on walking or cycling routes that are regularly used for recreation and commuting purposes, for example the Ouse Valley Way.

Operation

11.5.9. Once operational, the Scheme will likely result in benefits related to greater access and movement for NMUs and local communities by enabling safer, more reliable journeys.

Land Use

Construction

11.5.10. Construction of the Scheme will require landtake to accommodate compounds, storage and welfare facilities, working areas and potential borrow pits.

11.5.11. In relation to private assets, a number of existing buildings and businesses will need to be demolished and/or extinguished as part of construction of the Scheme; these are identified in Chapter 2 and are focused around the Black Cat junction, Caxton Gibbet junction and the A1.

11.5.12. The following effects on agricultural and development land are predicted as a result of construction of the Scheme:

- The permanent loss of best and most versatile agricultural land and soils (and soils of lesser quality) and the possible downgrading of soil grades as a consequence of the stripping, movement, storage and reuse of these resources.
- The acquisition and use of land will interfere with existing uses of, and infrastructure on, that land which, in some locations, is likely to preclude current land use practices.
- Disruption to current agricultural practices, for example through construction noise and dust.
- Severance of agricultural land parcels, for example due to temporary access restrictions and diversions.
- Loss or severance of land identified for future development.

Operation

11.5.13. No effects on private assets and agricultural land are predicted once the Scheme is operational.

Human Health

Construction

11.5.14. It is predicted that construction of the Scheme will also result in effects on the health, wellbeing and quality of life of the local population as a consequence of traffic, noise, vibration, air quality and emissions, light pollution, community severance, dust, odour, polluting water, hazardous waste and pests. Similar effects are likely during the operational phase of the Scheme.

Operation

11.5.15. Once operational, the effects of the Scheme on human health determinants are expected to include the following:

- Lifestyle changes, for example encouraging travel by others modes of transport like walking and cycling through the provision of new NMU routes and potentially increased or reduced severance.
- Effects on local employment opportunities and activity, for example through changes in access to employment resulting from reduced delays, congestion and severance.
- Effects on access to key services and social infrastructure, for example health and education facilities due reduced delays, congestion and severance.
- Effects on access to open and recreation spaces, for example through provision of new NMU routes.

11.6. Assessment Methodology

Assessment Guidance

11.6.1. As the scoping exercise has recorded a likelihood of significant effects on population and health, a detailed assessment will be undertaken with reference to the following guidance and methodologies:

- DMRB Volume 11, Section 3, Part 6: Land Use [REF 11-3].
- DMRB Volume 11, Section 3, Part 8: Pedestrians, Cyclists, Equestrians and Community Effects [REF 11-2].
- DMRB Volume 11, Section 3, Part 9: Vehicle Travellers [REF 11-1].

11.6.2. For some aspects of the assessment, for example human health, guidance presented in the HUDU Rapid Health Impact Assessment Tool [REF 11-5] will be used.

11.6.3. The following sections set out the proposed methodologies and criteria to be applied in the assessment.

Motorised Travellers

11.6.4. The assessment of effects on motorised travellers will address views from the road, driver stress and vehicular user severance.

11.6.5. In relation to views from the road, driver views will be assessed in relation to the quality of the landscape along a given route, the extent to which travellers are able to view the Scheme, and whether there are any features of particular interest or prominence in the view.

11.6.6. Professional judgement will be used to determine the significance of effects associated with views from the road, referencing where appropriate DMRB guidance [REF 11-1] and the generic significance criteria presented in Chapter 5.

11.6.7. In relation to driver stress, the assessment will examine the adverse mental and psychological effects that are likely to be experienced by drivers traversing the road network. Stress in drivers can induce feelings of discomfort, annoyance, frustration, or fear culminating in physical or emotional tension that detracts from the value and safety of the journey, and can be influenced by a number of factors including: road layout and geometry; surface riding characteristics; junction frequency and speed; and flows per lane.

11.6.8. The assessment of driver stress will consider the following components of driver stress: frustration; fear; and uncertainty. In calculating existing and future levels of driver stress on the road network, traffic flows will be examined to compare the do minimum (without Scheme) and do something (with Scheme) scenarios, for the worst year in the 15 years after the Scheme opens.

11.6.9. The magnitude of impact for driver stress will be determined through a quantitative assessment of the above factors, guided by the ratings set out in DMRB guidance [REF 11-1].

11.6.10. The following criteria for determining the significance of effects relating to driver stress have been developed and will be applied:

- Very Large – where there would be a very major increase/reduction in driver stress resulting from the Scheme compared to the do minimum.
- Large – where there is a major increase/reduction in driver stress resulting from the Scheme compared to the do minimum.
- Moderate – where there is a moderate increase/reduction in driver stress resulting from the Scheme compared to do minimum
- Slight – where there is a minor increase/reduction in driver stress resulting from the Scheme compared to the base year and do minimum.
- Neutral – where no effects on driver stress is anticipated from the Scheme, or where the beneficial and adverse effects are considered balanced.

11.6.11. In relation to vehicular user severance, the assessment will consider the extent to which people making journeys would be separated (severed) from community facilities they use and visit, taking account of the following factors:

- Physical changes introduced by the Scheme.
- Changes in traffic levels on existing roads as a result of the Scheme.
- The number of people whose journeys would likely be affected.
- The road type involved.
- Mitigation measures.

11.6.12. The magnitude of impact associated with increases in, and relief from, severance, will be determined qualitatively and assessed using a scale of high, medium and low set out in DMRB guidance [REF 11-2]. The following criteria for determining the significance of effects relating to vehicular user severance have been developed, based on DMRB guidance [REF 11-2]:

- Slight effects – experienced where journey patterns are generally maintained, but there would be some hindrance to movement.
- Moderate effects – expected where some residents are likely to be dissuaded from making trips. Other trips will be made longer or less attractive.
- Severe effects – occurring where people are likely to be deterred from making trips to an extent sufficient to induce a re-organisation of their habits. Alternatively, considerable hindrance would be caused to people trying to make their existing journeys.

11.6.13. As DMRB guidance [REF 11-2] does not require sensitivity to be ascribed to the assessments of views from the road, driver stress and vehicular user severance when

assessing impacts and effects, such criteria have not been assigned and will not form part of the assessment methodology.

Non-Motorised Users

11.6.14. The assessment of effects on NMUs will focus on the impact of severance of existing routes and the resulting changes in journey lengths and times and local travel patterns. It will consider users of existing routes likely to be affected by the severance of routes, alterations in traffic distribution and flows, as well as the potential users of NMU facilities during construction and operation of the Scheme.

11.6.15. Changes in journey lengths and travel patterns will be predicted using the methodology outlined in DMRB guidance [REF 11-2], and will consider both the distance travelled and the time taken.

11.6.16. **Table 11.2** summarises the sensitivity criteria developed for application in the assessment of effects on NMUs. Receptors will be assigned a value for sensitivity based on professional judgement, taking into consideration their importance to the community and scale of use (local, regional, national).

Table 11.2: Sensitivity Criteria for the Assessment of Effects on Non-motorised Users

Sensitivity Rating	Description
Very high	Key routes used by pedestrians, cyclists and other NMUs. Routes record very high numbers of NMU journeys and/ or connect communities with employment land uses and other services with a direct and convenient NMU route. Routes are important since they offer opportunities to meet sustainable transport and public health objectives through active travel modes rather than private car use. Any interruption of these would inconvenience many people and could cause people to switch from active modes to private car use. Routes regularly used by vulnerable travellers such as the elderly, school children and people with disabilities, who may be disproportionately affected by small changes in the baseline due to potentially different needs.
High	National or regional trails and routes likely to be used for recreation that record high use. The sensitivity of these routes is judged to be high because of the number of people affected and effects upon regional leisure. Crossing points on busy roads for NMU (roads with more than 8,000 vehicles per day) which may not currently record high use, but for which limited alternatives are available. These points are sensitive because disruption to these may affect the convenience or safety of journeys for NMU.
Medium	Public rights of way and other routes close to communities which are used mainly for recreational purposes (for example dog walking), but for which alternative routes can be taken. These routes are likely to link to a wider network of routes to provide options for longer, recreational journeys. It is likely that direct and efficient journeys are not the priority for the majority of people using these routes so they would be more tolerant of disruptions and diversions. However, people are likely to be sensitive to changes to the amenity and character of the overall route.
Low	Routes which have fallen into disuse such as through past severance or which are scarcely used because they do not currently offer a meaningful route for either utility or recreational purposes. Whilst these routes would not be sensitive in terms of disruption from development proposals, they may present opportunities for enhancement if existing barriers or poor amenity can be overcome through development proposals.

11.6.17. The magnitude of impact of such changes will be determined using the following four point scale:

- Neutral – No increase or decrease in journey length and/or travel patterns and no increase or decrease in opportunities for NMUs to access the wider network and/or community infrastructure.
- Low – Slight increase/decrease in journey length and/or travel patterns and increased/decreased opportunities for NMUs to access the wider network and/or community infrastructure.
- Medium – Noticeable increase/decrease in journey length and/or travel patterns and increased/decreased opportunities for NMUs to access the wider network and/or community infrastructure.
- High – Substantial increase/decrease in journey length and/or travel patterns and increased/decreased opportunities for NMUs to access the wider network and/or community infrastructure.

11.6.18. Effects on NMUs will take account of the above, and will be rated using the generic significance criteria presented in Chapter 5.

Private Assets and Development Land

11.6.19. The assessment of impacts and effects on private assets will consider direct effects on properties, businesses and community facilities (for example public open space) arising from landtake and demolition, and will follow DMRB guidance [REF 11-3].

11.6.20. **Table 11.3** presents the sensitivity criteria to be applied in the assessment of effects on private assets.

Table 11.3: Sensitivity Criteria for the Assessment of Effects on Private Assets

Sensitivity Rating	Description
High	Residential, commercial or industrial buildings. Buildings used by the community, for example schools and community halls. Community land that attracts users nationally for example national parks. Designated public open space. Religious sites and cemeteries.
Medium	Residential, commercial or industrial land for example gardens. Land used by the community on a regional scale, for example country parks, forests and other land managed in such a way as to attract visitors from a regional catchment.
Low	Derelict or unoccupied buildings. Locally used community land, for example local parks and playing fields.

11.6.21. The magnitude of impact on private assets will be assessed as the type and amount of land to be taken, or properties to be demolished. This will adopt a five point scale of major, moderate, minor, negligible and no change.

11.6.22. The significance of effects on private assets will be determined by considering the relationship between the sensitivity of the receptor and the magnitude of impact, using the generic significance criteria presented in Chapter 5.

11.6.23. In the absence of defined assessment criteria, a combination of professional judgement and DMRB guidance [REF 11-3] will be applied to qualitatively assess the likely impacts and effects of the Scheme on development land (comprising planning applications and local authority development allocations).

Human Health

11.6.24. The assessment of human health will be undertaken qualitatively, with the impacts and effects of the Scheme identified for the specific groups likely to be affected.

11.6.25. As no consolidated methodology or practice is available to guide the assessment of effects on human health, the approach will be informed by the requirements of paragraphs 4.79 to 4.82 of the NPSNN [REF 11-6], and with reference to relevant DMRB Volume 11 guidance [REF 11-13] covering topics of relevance to human health (when applied to the assessment of highway developments), specifically: air quality; noise and vibration; and road drainage and the water environment.

11.6.26. The assessment will consider the following health and wellbeing determinants:

- Access to healthcare services and other social infrastructure.
- Access to open space and nature.
- Air quality, noise and neighbourhood amenity.
- Accessibility and active travel.
- Access to work and training.
- Social cohesion and neighbourhoods.
- Climate change.

11.6.27. The assessment will consider the potential consequences for health and wellbeing from the construction and operation of the Scheme, and will draw upon information and conclusions reported within other assessments carried out as part of the EIA, and transportation studies undertaken for the Scheme:

Agricultural Land

11.6.28. There is no nationally agreed methodology for determining the effects of a development on the loss of agricultural land. The approach that will be taken will therefore be developed from best practice, a review of approaches applied in other EIAs for major highways developments, and guidance contained in the NPSNN [REF 11-6] relating to the economic and other benefits of best and most versatile agricultural land.

11.6.29. The sensitivity of agricultural land and soils will accordingly consider the current ALC grade of land affected by the Scheme, as follows:

- High – Grade 1 or 2 agricultural land.
- Medium – Grade 3a agricultural land.
- Low – Grade 3b agricultural land.
- Negligible – Grades 4 and 5 agricultural land.

11.6.30. The magnitude of impact will be determined using a four point scale of: High; Medium; Low; and Negligible.

11.6.31. As Natural England has the statutory right to be consulted where the threshold of 20ha or more of best and most versatile land is exceeded, the 20ha threshold at and above which the magnitude impact of losses of agricultural land are assessed to be high, represents a measure of significance for the loss of such land used in land use planning for two decades or more, and is therefore deemed a justifiable threshold.

11.6.32. Impacts of medium magnitude will be determined based on the approach set out in paragraph 6 of Department of the Environment Circular 71/71 Development of Agricultural Land [REF 11-14], whereby a threshold of use of 10 acres (equating to approximately 4 ha) of best and most versatile land is considered to represent a moderate loss.

11.6.33. The overall significance criteria of the loss of agricultural land will be determined by combining the magnitude of loss and the sensitivity of the receptor, using the approaches and criteria set out in Chapter 5.

Agricultural Holdings

11.6.34. The assessment of effects on agricultural holdings from construction and operation of the Scheme will be undertaken qualitatively.

11.6.35. The sensitivity of farm holdings will consider a number of factors, for example the size of the affected holding (with larger holdings generally more able to accommodate change than smaller holdings), current farming activities, the nature of the enterprise, and its flexibility to respond to change. Non-commercial agricultural holdings will be deemed to have reduced sensitivity.

11.6.36. The magnitude of impact will be determined using the criteria presented in **Table 11.4**. Where a farm holding is predicted to experience different levels of impact for different types of impact, the higher level will be assigned in the assessment. For example, a farm holding that would lose 15% of its land (moderate impact) but would retain access to severed land via a private means of access (minor impact) would be assessed as experiencing a moderate impact.

Table 11.4: Criteria for the Assessment of Impacts on Agricultural Holdings

Impact Magnitude	Landtake	Severance	Infrastructure	Disruption
Major	>20% of all land farmed	No access available to severed land	Direct loss of farm dwelling, building or structure	Disruption discontinues land use or enterprise
Moderate	>10% - 20% of all land farmed	Access available to severed land via the public highway	Loss of or damage to infrastructure affecting land use	Disruption necessitates change to scale or nature of land use or enterprise
Minor	> 5% - 10% of all land farmed	Access available to severed land via private way	Infrastructure loss/damage does not affect land use	Disruption does not affect land use or enterprise
Negligible	5% or less of all land farmed	No new severance	No impact on farm infrastructure	No disruption on land use or enterprise

11.6.37. The significance of effect will be a product of the magnitude of impact and the sensitivity of the receptor, using professional judgement and the approaches and criteria set out in Chapter 5.

Policy Requirements

11.6.38. The NPSNN [REF 11-6] does not provide specific guidance on the identification, assessment and mitigation of effects on population and health as a topic area, but does include statements relating to journeys made on the national road network,

effects on communities and accessibility, and the need to consider land use impacts as part of development applications for nationally significant infrastructure projects

11.6.39. Accordingly, the requirements of the NPSNN [REF 11-6] will be taken account of in the assessment of population and health effects.

Study Area

11.6.40. The scoping study areas defined for each aspect considered during the scoping exercise will be adopted for the assessment of effects on population and health, and may be subject to further refinement.

11.6.41. Within the view from the road assessment, views from the B-classification roads and minor roads between Black Cat and Caxton Gibbet will be considered on a case by case basis.

Information Sources

11.6.42. In addition to the information sources referenced as part of the scoping exercise, a number of surveys will be progressed as part of the assessment.

11.6.43. Soil surveys will be undertaken to sample agricultural soils at representative locations within the DCO site boundary (where land access is obtained), the purpose of which will be to record the types and distribution of soils present and to confirm their ALC grading.

11.6.44. Engagement with landowners affected by the Scheme will be carried out via interview, the objectives being:

- to establish information including current land ownership (tenure), access arrangements, drainage regimes, husbandry, field boundary types and sizes;
- to identify the extent to which construction and operation of the Scheme would result in severance and/or the loss of land within affected land holdings (and thereby potentially affect existing operations); and
- to inform the identification of mitigation measures and their incorporation into the design of the Scheme, for example the inclusion of farm access tracks.

11.6.45. Surveys will be carried out at representative locations on PRoW and roads, the purpose being to obtain information on NMUs travelling on these routes.

11.6.46. Ordnance Survey AddressBase data will be used to establish the location and details of community facilities affected by the Scheme.

11.6.47. Traffic forecasts prepared for the Scheme will be used to inform both the assessment of vehicle user severance and driver stress.

11.6.48. The outcomes of surveys undertaken as part of the landscape assessment (see Chapter 9) will be used to inform the assessment of views from the road.

Consultation

11.6.49. Consultation will be undertaken with the four local authorities to confirm the status of planning applications identified as part of the scoping exercise, obtain additional information relating to any new planning applications coming forward post-scoping, and to verify any changes that may occur in relation to development land allocations. Information will also be sourced in relation to the status, condition and use of PRoWs, where such data is available.

11.6.50. Due to the extent of permanent landtake required by the Scheme, consultation will be undertaken with Natural England in respect of the loss of best and most versatile land.

11.6.51. Interviews will be undertaken with agricultural landowners affected by the Scheme to obtain baseline information to inform the assessment of effects on agricultural interests.

11.6.52. Engagement with affected owners of private properties and agricultural holdings will also be undertaken as part of the design-development process, which will inform the development and incorporation of mitigation measures into the design of the Scheme.

11.7. Assessment Assumptions and Limitations

11.7.1. Scoping has been undertaken using information available at the time of undertaking the exercise, obtained from publicly available sources. For the purposes of the scoping exercise, it has been assumed that this information is up to date and appropriate for use.

11.7.2. No traffic modelling data has been referenced as part of the scoping exercise to inform the identification of potential effects relating to vehicle user severance and driver stress.

11.7.3. The planning applications identified through the scoping process are all active, large scale planning applications received within the five years; however, it is acknowledged that their status is potentially subject to change between undertaking the scoping exercise and completion of the assessment.

12. ROAD DRAINAGE AND THE WATER ENVIRONMENT

12.1. Study Area

12.1.1. This chapter presents the approach to the assessment of the Scheme's effects on road drainage and the water environment.

12.1.2. A 1km scoping study area beyond the Development Consent Order (DCO) site boundary has been adopted within which the potential impacts and effects of the Scheme have been considered. A wider 2km scoping study area around the DCO site boundary has also been adopted to identify where potential hydrological connectivity between watercourses exists. Both study areas are illustrated on Figure 12.1 in Chapter 19.

12.1.3. Detailed information concerning discharge consents, pollution incidents, watercourses, abstractions, water quality, and Water Framework Directive (WFD) waterbodies within a 2km area of search[5] around the new dual carriageway was requested from the Environment Agency through the process of desk study.

12.2. Baseline Conditions

12.2.1. To inform the scoping exercise, data, information and records relating to the following aquatic resources and receptors was gathered from a number of publicly available online sources:

- Surface water features.
- Groundwater.
- Water dependant ecological areas.
- Water resources.
- Road drainage.
- Flood risk.

12.2.2. A site visit was undertaken on the 29th November 2017, in order to ground truth data relating to watercourses.

12.2.3. A water quality sampling programme has been completed for each watercourse that is likely to receive highway runoff from the operational Scheme.

12.2.4. Detailed topographical surveys have been undertaken of the River Great Ouse near Black Cat junction, with further topographical surveys carried out on smaller watercourses, which alongside ground level and aerial survey data have been used to develop an existing and proposed ground profile as part of the assessment of potential flood risk.

Surface Water Features

12.2.5. The following surface water features are found within the 1km scoping study area or within the wider 2km scoping area (where there is direct downstream hydrologic connectivity), the locations of which are illustrated on Figure 12.1 in Chapter 19:

[5] Data focused on a distance of 2km around the new dual carriageway (referred to as the 2km area of search) was obtained prior to development and refinement of the DCO site boundary. Although this distance covers the majority of the extents covered by the DCO site boundary, it does not extend to more remote areas within the DCO site boundary (specifically isolated parcels of land located to the north of St Neots, along the existing A428 to the south of St Neots, and south and west of Black Cat junction on the A1 and the A421) which were incorporated into the DCO site boundary late into the scoping process.

- Ouse (Roxton to Earith) – Main River.
- Hen Brook – Main River (downstream of railway line east of St Neots).
- West Brook – Main River.
- River Kym – Main River;
- River Ivel – Main River;
- Begwary Brook – Ordinary Watercourse.
- Duloe Brook – Ordinary Watercourse;
- Stone Brook – Ordinary Watercourse.
- Rockham Ditch – Ordinary Watercourse.
- South Brook – Ordinary Watercourse.
- Fox Brook – Main River (downstream of railway line east of St Neots).
- Gallow Brook – Ordinary Watercourse.
- Bourn Brook – Ordinary Watercourse.
- Colmworth Brook – Ordinary Watercourse;
- Upstream unnamed tributaries of the waterbodies outlined above – Ordinary Watercourses.
- Several small ponds (including ponds at Begwary Brook Nature Reserve).
- Several field drains and ditches (all Ordinary Watercourses).

12.2.6. The Environment Agency's Catchment Data Explorer website [REF 12-1] indicates that the 1km scoping study area is contained within the Anglian River Basin District, Ouse Upper and Bedford Management Catchment, and Great Ouse Lower and Cam Lower Operational Catchments.

12.2.7. There are ten WFD waterbodies or tributaries of these waterbodies within the 1km scoping study area, as illustrated on Figure 12.1 in Chapter 19, the details of which are described in **Table 12.1**. Although these waterbodies are the WFD reporting reaches, WFD principles and objectives apply to all tributaries of these watercourses.

Table 12.1: Water Framework Directive Surface Waterbodies within the 1km Scoping Study Area

Waterbody	Ecological Potential	Chemical Status	Overall Target Objective	Hydromorphological Designation	Designated Reach
Ouse (Roxton to Earith) - GB105033047921	Moderate	Good	Moderate by 2015 (due to unfavourable balance of costs and benefits and disproportionate burdens)	Heavily modified	This reach of the River Great Ouse is designated from southeast of Roxton (TL 16067 53497). It flows north through St Neots and beyond to Godmanchester before flowing in an easterly direction towards Earith (TL 38856 74783). This WFD reach is 49.3km long and has a catchment area of 162.9km^2. This waterbody would be crossed by the Scheme at TL 16781 55351.
Ouse (Roxton to Earith) - GB105033047921	Moderate	Good	Moderate by 2015 (due to unfavourable balance of costs and benefits and disproportionate burdens)	Heavily modified	This reach of the River Great Ouse is designated from southeast of Roxton (TL 16067 53497). It flows north through St Neots and beyond to Godmanchester before flowing in an easterly direction towards Earith (TL 38856 74783). This WFD reach is 49.3km long and has a catchment area of 162.9km^2. This waterbody would be crossed by the Scheme at TL 16781 55351.
Abbotsley and Hen Brooks - GB105033043240	Moderate	Good	Moderate by 2015 (due to disproportionate burdens, background condition and no technical solution being available).	Heavily modified	This waterbody is designated from its source east of Waresley (TL 26435 53975), and flows in a westerly direction to meet the River Great Ouse in St Neots at (TL 18147 60088). The watercourse is 12.9km long and has a catchment area of 58.05km^2. This waterbody would be crossed by the Scheme at TL 19949 58656.

Waterbody	Ecological Potential	Chemical Status	Overall Target Objective	Hydromorphological Designation	Designated Reach
West Brook - GB105033042730	Moderate	Good	Moderate by 2015 (due to unfavourable balance of costs and benefits. Action to get biological element to good would have significant adverse effect on use)	Heavily modified	Forms from the coalescence of numerous agricultural ditches approximately 4.5km north of the eastern extent of the scheme at Papworth St Agnes (TL 26314 64772). It then flows northwest for 8.45km to meet the River Great Ouse at TL 32074 69839. It has a catchment area of 51.57km^2. This waterbody would be hydrologically connected to the Scheme via upstream ditches and tributaries.
Stone Brook - GB105033038190	Moderate	Good	Moderate by 2015 (due to disproportionate burdens, background condition and no technical solution being available).	Heavily modified	This waterbody is designated from its source northeast of Sandy at TL 18391 49664, and flows in a northerly direction to meet the River Great Ouse to the east of Roxton (TL 16724 55185). It is 7.96km long and has a catchment area of 21.2km^2. This waterbody would not be crossed by the Scheme, but is located within 200m of the DCO site boundary.
Begwary Brook - GB105033043230	Good	Good	Good by 2015	Heavily Modified	This waterbody is designated from its source north of Duck's Cross (TL 11086 56911) and flows east for 6.5km to meet the River Great Ouse to the east of Wyboston (TL 16755 56527). It is 6.5km in length and 4.59km^2. This waterbody would be directly crossed by the Scheme at TL 16320 56511.
Bourn Brook - GB105033042690	Moderate	Good	Moderate by 2015	Heavily Modified	This waterbody is designated from its source southeast of Eltisley (TL 27575 59360), and flows southeast to meet the Cam at TL 43545 54654. It is 25.8km in length and has a catchment of 85.5km^2. This waterbody would not be crossed by the Scheme, but is located within 500m of the DCO site boundary.

Waterbody	Ecological Potential	Chemical Status	Overall Target Objective	Hydromorphological Designation	Designated Reach
Ivel (DS Langford to Roxton) - GB105033038170	Moderate	Good	Moderate by 2015	Heavily Modified	This waterbody is designated from the west of Henlow (TL 18405 38656), and flows north to meet the River Great Ouse at TL 16079 53483. It is 19.65km in length and has a catchment of 43.57km^2. This waterbody would not be crossed by the Scheme, but is located within 1km of the DCO site boundary.
Duloe Brook - GB105033043260	Moderate	Good	Moderate by 2015	Not designated artificial or heavily modified	This waterbody is designated from northeast of Duloe (TL 16377 61173), and flows southeast to meet the River Great Ouse at TL 17558 59259. It is 2.6km in length and has a catchment of 17.39km^2. This waterbody would not be crossed by the Scheme, but is located within 1km of the DCO site boundary.
Kym - GB105033043270	Moderate	Good	Moderate by 2015	Heavily modified	This waterbody is designated from the west of Great Staughton, and flows in a southeasterly direction to meet the River Great Ouse at TL 18160 61534. It is 13.95km in length and has a catchment of 30.078km^2. This waterbody would not be crossed by the Scheme, but is located within 1km of the DCO site boundary.

12.2.8. Within the catchments of the WFD waterbodies outlined in **Table 12.1**, there are also a number of other named watercourses which are described in **Table 12.2**.

Table 12.2: Significant Named Watercourses in the 1km Scoping Study Area (not WFD designated)

Name	Tributary Of	Description
Rockham Ditch	River Great Ouse	Rockham Ditch rises east of Roxton at (TL 13412 53847) and flows in a generally northeast direction to the north of Roxton before flowing east to meet the River Great Ouse at TL 16334 54885. It has an approximate length of 4.01km. There are two proposed crossings by the Scheme of the watercourse at TL 15346 55311 and TL 15996 54927. Existing crossings at these locations may also be upgraded by the Scheme.
South Brook	River Great Ouse	South Brook forms from the coalescence of various ditches close to Lady Wood, between the villages of Roxton and Wilden (TL 12640 54759). It flows towards the northeast and discharges into the River Great Ouse to the east of Chawston at TL 16915 55774. It has an approximate length of 5.09km. There is a proposed crossing of the watercourse by the Scheme at TL 16202 55829 and TL 16291 55792.
Fox Brook	Hen Brook	Fox Brook rises as an agricultural ditch to the north of Weald (TL 23374 60184), and takes a westerly course towards St Neots, where it discharges into Hen Brook (TL 18557 60060) shortly upstream of the River Great Ouse. Fox Brook is approximately 5.4km long. There is a proposed crossing of the watercourse by the Scheme at TL 22870 60254.
Gallow Brook	River Great Ouse	Gallow Brook forms from the coalescence of several agricultural ditches to the north of Croxton (TL 25499 60457). It flows in a generally westerly direction towards Little Paxton to finally discharge into the River Great Ouse at TL 19504 62323. Gallow Brook is approximately 7.5km long. There are two proposed crossings of the watercourse by the Scheme at TL 23716 60694 and TL 24361 60673.
Colmworth Brook	River Great Ouse	Colmworth Brook forms from the coalescence of several agricultural ditches to the west of Colmworth (TL 08836 58675). It flows in a generally easterly direction to meet the River Great Ouse at TL 17408 58834. It is approximately 10km long. The watercourse would not be crossed by the Scheme but is located within 1km of the DCO site boundary.

12.2.9. In addition to the watercourses described in **Table 12.1** and **Table 12.2**, there are numerous field ditches in the scoping study area that are predominantly used for agricultural drainage. These features are not protected by nature conservation designation and have limited social and economic value.

12.2.10. There are numerous surface water ponds and lakes in the 1km scoping study area associated within the floodplain of the River Great Ouse. The locations of large ponds or pond clusters are summarised in **Table 12.3**.

Table 12.3: Surface Water Ponds within the 1km Scoping Study Area

Pond Ref	National Grid Ref	Description
Pond Site 1	TL 1921 5634	Small pond adjacent to Top Farm's property within vegetation. Falls beneath the Scheme's footprint.
Pond Site 2	TL2206 5991	Several small ponds within the grounds of residential property, Wintringham Cottages, and north of Wintringham Farm.
Pond Site 3	TL 2336 6017	Small pond that appears to be the source of Fox Brook.
Pond Site 4	TL 2562 6061	Small pond within wooded area.
Pond Site 5	TL 2675 6065	Small pond North of Eltisley/Eversden landfill.
Pond Site 6	TL 2833 6062	Large pond at North East Farm.
Pond Site 7	TL 2997 6069	Small pond present alongside existing A428 .
Pond Site 8	TL 16859 56132	Two lakes in Begwary Nature Reserve, online to Begwary Brook, shortly upstream of the River Great Ouse.
Pond Site 9	TL 15720 53885	Four large (presumed gravel pit) lakes to the west of Tempsford and the A1, on the floodplain of the River Great Ouse.
Pond Site 10	TL 16713 56742	The southern lakes (former gravel pits) within the Wyboston Lakes Training and Events Centre (including golf course) fall within the 1km scoping study area.
Pond Site 11	TL 15124 56558	Two lakes adjacent to Roxton Road at the periphery of the study area.
Pond Site 12	TL 19285 55104	Small pond in the grounds of Hill's Farm.
Pond Site 13	TL 19334 57761	Small pond in the grounds of Rectory Farm.
Pond Site 14	TL 20385 58441	Small pond surrounded by trees, adjacent to Hen Brook.
Pond Site 15	TL 20979 57617	Small pond in the grounds of Lanbury Farm.
Pond Site 16	TL 21560 59052	Two small ponds in the grounds of Lower Wintringham Farm.
Pond Site 17	TL 22935 59578	Numerous small ponds around Weald Farm.
Pond Site 18	TL 23570 59635/TL 23902 59399	Two small ponds east of the village of Weald.
Pond Site 19	TL 24676 59632	Four small ponds in the village of Croxton (two are named as Mill Dole Pond and White Gate pond).
Pond Site 20	TL 26896 59659	Four small ponds in the village of Eltisley.
Pond Site 21	TL 27686 59331	Large pond adjacent to Caxton End.
Pond Site 22	TL 27713 61238	Three small ponds at Papley Grove Farm
Pond Site 23	TL 28744 60803	Small pond at Pembroke Farm.
Pond Site 24	TL 29021 60604	Small pond north of Pastures Farm. Falls beneath the Scheme's footprint.
Pond Site 25	TL 30456 60226	Small pond at Swansley Wood Farm.

12.2.11. Ecological surveys (see Chapter 8) have identified that a number of existing ponds within and surrounding the DCO site boundary are known to contain Great Crested Newt, and contain features which are important for biodiversity.

Groundwater

12.2.12. The British Geological Survey's Geology of Britain Viewer website [REF 12-2] indicates that the solid geology within the 1km scoping study area consists of Jurassic age strata, with the western section underlain by the Oxford Clay Formation

(mudstone) and the eastern section underlain predominantly by the West Walton Formation and Ampthill Clay Formation (undifferentiated).

12.2.13. The Oadby Member (Diamicton) is the main superficial deposit present beneath most of the scoping study area. Alluvium, Head and River Terrace Deposits are present near Black Cat junction, particularly in the lowland areas of the floodplain of the River Great Ouse and its tributaries, Hen Brook and Abbotsley Brook [REF 12-2].

12.2.14. Data on the MAGIC Map website [REF 12-3] indicates that the bedrock is formed of unproductive strata (these being geological strata with low permeability and negligible significance for water supply or river base flow). The majority of the superficial deposits are designated as a secondary (undifferentiated) aquifer, with the river terrace and alluvial deposits designated as Secondary A aquifer (these being permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of baseflow to rivers). Secondary (undifferentiated) aquifers are assigned in cases where it has not been possible to attribute either category A or B to a rock type.

12.2.15. Cranfield University's Soilscapes website [REF 12-4] indicates that the majority of the 1km scoping study area (with the exception of the floodplain of the River Great Ouse) is underlain by lime-rich loamy and clayey soils with impeded drainage. The floodplain of the River Great Ouse is underlain by freely draining slightly acid loamy soils.

12.2.16. Environment Agency data [REF 12-1] confirms that the 1km scoping study area is not underlain by a WFD designated groundwater body.

Water Dependent Ecological Areas

12.2.17. Data on the MAGIC Map website [REF 12-3] indicates that there are two ecologically sensitive sites present within the 1km scoping study area. These are:

- Elsworth Wood SSSI – located 850m from the DCO site boundary, to the north east of Caxton Gibbet junction; and
- St Neots Common SSSI – located 900m from the DCO site boundary, to the north of Wyboston interchange.

12.2.18. Elsworth Wood SSSI comprises mixed deciduous woodland and is not water dependent. As such, this site will be scoped out of consideration in the assessment.

12.2.19. St Neots Common SSSI is a riverside common holding alluvial grassland and associated ponds, ditches and willow carr which together provide an area of diverse wildlife habitat. This includes a wet grassland type characterised by presence of species including marsh foxtail (*Alopecurus geniculatus*) and floating sweet grass (*Glyceria fluitans*), together with a variety of sedges. The habitat is further enhanced by presence of ponds and ditches which support a good aquatic flora and fauna. There are thriving colonies of toads and frogs, the latter being rare in the county. Due to its water dependence, this site will be considered in the assessment.

Water Resources

<u>Designations</u>

12.2.20. No groundwater source protection zones (SPZ) or drinking water safeguarding zones for groundwater coincide within the 1km scoping study area.

12.2.21. The 1km scoping study area coincides with a drinking water safeguard zone for surface water, identified from the MAGIC Map website [REF 12-3].

12.2.22. A Drinking Water Protected Area, forming an arc between the south of St Neots across the north of the A428 to Croxton, is located within the 1km scoping study area.

Licensed Abstractions

12.2.23. The Environment Agency provided details of 11 surface water abstraction licenses listed in the 2km area of search around the new dual carriageway, focused around the Black Cat junction and Wyboston area, as illustrated on Figure 12.1 in Chapter 19.

12.2.24. No abstractions are located within the central and eastern parts of the 1km scoping study area.

Discharge Consents

12.2.25. The Environment Agency provided details of 17 active discharge consents within the 2km area of search around the new dual carriageway. The vast majority of these consented discharges are from pumping stations and sewage treatment works, both from sewerage undertakers and from domestic properties. There are also consented discharges relating to plant nurseries, quarrying and a retail site.

12.2.26. The locations of active discharge consents are illustrated on Figure 12.1 in Chapter 19.

Pollution Incidents

12.2.27. The Environment Agency provided details of pollution incidents within the 2km area of search around the new dual carriageway that have occurred within the period 2013-2018. This data indicated that there were 12 incidents of Category 3 (minor) relating to the water environment.

12.2.28. The causes of these incidents range from a road traffic accident causing oil and fuel spillage adjacent to the A428, to crude sewage and final effluent pollution incidents. All incidents are minor and so are not expected to have had long term consequences on receiving watercourses.

12.2.29. The locations of pollution incidents are illustrated on Figure 12.1 in Chapter 19.

Road Drainage

12.2.30. Existing road drainage in the 1km scoping study area is understood to comprise of the following infrastructure and features:

- Kerb inlet gullies and traditional kerb/gully drainage.
- Combined kerb drainage.
- Filter drains, over the edge drainage and grips.
- Grassed surface water channels.
- Oil interceptors.

12.2.31. Additionally there are four existing detention ponds located at Black Cat junction, near Croxton (two of) and at Caxton Gibbet junction.

12.2.32. From the Highways England Drainage Data Management System [REF 12-5] the following surface water outfalls from the existing road network were identified:

- South Brook south of Chawston.
- Begwary Brook at Wyboston.
- Tributary of the River Ouse south of A428 – A1 junction – which flows through the Wyboston Lakes Training Centre 250m downstream of the A428 outfall.
- Tributary to Colmworth Brook outfall north of the A428 – A1 – B4128 Junction.

- Tributary to Colmworth Brook to east of Colmworth Business Park.
- River Great Ouse.
- Tributary to River Great Ouse to east of East Coast Main Line.
- Hen Brook.
- Tributary to Hen Brook approximately 500m north east of Hen Brook.
- Tributary to Hen Brook, approximately 220m west of Cambridge Road.
- Vicars Dean Brook, Tributary to West Brook, north of Eltisley.
- Tributary to West Brook, 825m north east of Eltisley.
- Tributary to West Brook in area of Caxton Gibbet junction.

12.2.33. None of the outfalls identified above are classified as priority outfalls.

Flood Risk

12.2.34. The Environment Agency online indicative flood map for planning [REF 12-6] indicates there is a risk of fluvial flooding within Flood Zones 1, 2 and 3 associated with the River Great Ouse, Hen Brook and its tributaries, and South Brook (see Figure 12.2 in Chapter 19). There may also be a flood risk from other smaller watercourses not indicated on the Environment Agency's mapping.

12.2.35. The area of land associated with the River Great Ouse at potential risk of flooding, estimated from watercourse modelling levels, comprises a wide floodplain comprising land predominantly within Flood Zone 3. The areas at risk of flooding associated with Hen Brook and South Brook are much less extensive in the area of the A428 and the A1.

12.2.36. Surface water flood risk is classified as 'high' in the areas immediately adjacent to all watercourses, with varying extents of 'medium' and 'low' risk, depending on the size of the watercourse.

12.2.37. There are no identified locations with reports of groundwater flooding within the 1km scoping study area.

12.3. Potential Impacts

Construction

12.3.1. During the construction phase, potential impacts of the Scheme could include the following:

- Impacts on water quality due to deposition or spillage of soils, sediments, oils, fuels, or other construction chemicals, or through mobilisation of contamination following disturbance of contaminated ground or groundwater, or through uncontrolled site run-off.
- Potential increase in volume and rate of surface water runoff from new impervious areas, leading to an impact on flood risk.
- Temporary impacts on water levels and sediment dynamics within watercourses where new crossings are required due to construction works.
- Temporary disruption to navigation along the River Great Ouse.
- Impacts on any water abstractions.

Operation

12.3.2. During operation of the Scheme, the following potential impacts may occur:

- Impacts on surface water or groundwater quality from highway runoff (including the use of de-icing materials) or as a result of accidental spillages.
- Changes in the topography that may have a subsequent impact on surface water drainage patterns and river flows.
- Potential increase in volume and rate of surface water runoff from new impervious areas, leading to an impact on flood risk, upstream (afflux) and downstream of the Scheme.
- Hydromorphological impacts including changes to physical form (for example scour effects, culverting a watercourse), hydraulic processes and sediment dynamics (for example constriction of flows, flood plain disconnection, diversions) underpinning habitats in watercourses and their floodplains.
- Impacts on any surface water abstractions.

Future Maintenance

12.3.3. During the future maintenance of the Scheme, potential impacts could occur as a result of routine inspection and maintenance activities, for example the clearance of drains, periodic carriageway resurfacing and emergency repair works, which could lead to accidental spillages and pollution events on surface water and groundwater bodies.

12.4. Design, Mitigation and Enhancement Measures

12.4.1. The scoping exercise has identified a potential requirement for the following types of mitigation during the construction, operation and future maintenance stages of the Scheme to avoid or minimise impacts.

Construction

12.4.2. Construction of new watercourse crossings has the potential to impact on the hydromorphology and sediment transport dynamics within the watercourse, and floodplain connectivity. As the sensitive design of watercourse crossing points is an essential part of minimising this impact, the design-development of the Scheme is currently considering how best to minimise these types of potential impact.

12.4.3. Floodplain working will be kept to a minimum; with temporary landtake required for construction being located outside of the flood plain as far as reasonably practicable (or allowances made for floodplain control measures). Where construction works do impede on the floodplain, floodplain compensation will need to be considered to ensure there is no net loss of floodplain storage, water flows remain unobstructed, and that flood risk does not increase elsewhere.

12.4.4. A Construction Environmental Management Plan will be required during the construction stage to detail the procedures and methods that must be followed to minimise the potential environmental effects of construction activities. This will include procedures to prevent pollutants entering the drainage system or discharging directly to surface water features or to ground, and will build on the principles and measures contained in the Outline Environmental Management Plan for the Scheme. It will also describe the procedures in the event of an environmental emergency, for example a fuel or chemical spillage.

Operation

12.4.5. Road runoff from additional impermeable areas introduced by the Scheme would need to be attenuated to agreed outflow rates, to ensure that runoff does not cause or increase flooding elsewhere. Mitigation measures, for example oversized pipe networks and Sustainable Drainage Systems (SuDS), will be incorporated into the design of the Scheme.

12.4.6. Culvert and drainage network sizing, for example pipes and SuDS storage basins, will be designed with an additional allowance for climate change in accordance with Local Lead Flood Authority (LLFA) requirements.

12.4.7. SuDS provide a way to attenuate runoff from a site to a rate agreed with the Environment Agency and/or the LLFAs to avoid increasing flood risk, but they are also important in reducing the quantities and concentration of diffuse urban pollutants found in runoff. Their design and use will depend on factors, such as site specific constraints. Ponds, wetlands and swales will be the preferred sustainable solutions, as these options mimic natural drainage and can be used to deliver other environmental benefits.

12.4.8. The development of SuDS will take account of Defra guidance on the use, design and construction of SuDS [REF 12-7], and current best practice guidance on the planning for and design of SuDS treatment contained in CIRIA's SuDS Manual [REF 12-8], DMRB Volume 4, Section 2, Part 1: Vegetated Drainage Systems for Highway Runoff [REF 12-9], and DMRB Volume 4, Section 2, Part 3: Surface and Subsurface Drainage Systems for Highways [REF 12-10].

12.4.9. Compensation for floodplain loss will be required at some locations, with level for level and volume for volume compensation to be adopted in the design of the Scheme.

Future Maintenance

12.4.10. Regular inspection and maintenance of new and modified drainage systems would be carried out in accordance with good practice guidance and standard maintenance regimes, post construction of Scheme.

12.4.11. The maintenance regime for ponds, culverts and road drainage networks will be identified to reduce the residual risk from failure or improper function of the drainage system due to blockages. The associated risk of flooding will be alleviated during the design-development process by identifying potential improvements to existing drainage systems, where impermeable areas are expected to increase.

12.5. Description of the Likely Significant Effects

12.5.1. The scoping exercise has identified potential for a range of impacts, which could result in effects on resources and receptors relating to road drainage and the water environment.

12.5.2. Due to the sensitivity and importance of certain identified resources and receptors, the scoping exercise has concluded that the following adverse effects may be likely:

- Effects on surface water and groundwater quality – for example, as a result of road runoff and chemical spillages.
- Effects on morphology – for example, as a result of the introduction of new watercourse crossings.
- Effects relating to flooding and flood risk – for example, as a result of the increase in impermeable surfaces associated with new road infrastructure.

12.5.3. Should any of these effects be significant, it is expected that these can be mitigated through the development of an appropriate drainage design strategy, appropriate watercourse crossing designs, and implementation of best practice procedures during construction, operation and maintenance of the Scheme.

12.6. Assessment Methodology

Assessment Guidance

12.6.1. As the scoping exercise has recorded potential for significant effects relating to road drainage and the water environment, a detailed assessment will be undertaken in accordance with the guidance and methodologies contained within DMRB Volume 11, Section 3, Part 10: Road Drainage and the Water Environment [REF 12-11] in relation to water quality, resources, hydromorphology, and flood risk.

12.6.2. A qualitative assessment of the risk to the water environment during construction works will be undertaken, with mitigation measures developed to avoid, prevent and minimise the risk of pollution.

12.6.3. The assessment of operational effects on water quality and drainage will have regard to the advice and methodologies set out in DMRB guidance [REF 12-11].

12.6.4. The assessment of the potential ecological impacts and effects of routine runoff on surface waters from the operational Scheme will determine whether there is an environmental risk, and if pollution mitigation measures are required in specific circumstances. This will be established through the use of the Highways Agency's Water Risk Assessment Tool (HAWRAT) [REF 12-11], which will identify any potential issues with routine road drainage outfalling into receiving waterbodies. Outfalls will be assessed to highlight any areas where treatment is required, in order to protect the receiving water resources – be it surface watercourses or groundwater in the case of infiltration drainage systems.

12.6.5. An assessment of the potential impact to water resources from routine runoff arising from the operational Scheme will be undertaken using Method A contained in DMRB guidance [REF 12-11], the outcomes of which will be used to inform the development of appropriate water treatment measures. Method C [REF 12-11] would be used if a decision is made to drain road runoff to ground.

12.6.6. The risk of a serious spillage incident occurring during operation of the Scheme will be assessed using Method D [REF 12-11], which will combine various risk factors including traffic volume, percentage of heavy goods vehicles, and the risk attributed to different types of road in order to determine the probability of an accident resulting in a serious pollution incident. Information from this assessment will be used to identify any required spillage containment measures.

12.6.7. The importance of the potentially affected water environment features will be established on the basis of a four point scale, using the criteria presented in **Table 12.4** which have been modified from DMRB guidance [REF 12-11] to account for hydromorphology and groundwater resources.

Table 12.4: Evaluating the Importance of Water Environment Attributes

Importance	Type of Receptor			
	Groundwater	**Surface Water[1]**	**Morphology[2]**	**Flood Risk**
Very High	Principal aquifer providing a regionally important resource or supporting site protected under EC and UK habitat legislation SPZ1	EC Designated Salmonid/Cyprinid fishery WFD Class 'High' site protected/designated under EC or UK habitat legislation (SAC, SPA, SSSI, Ramsar site, salmonid water)/Species protected by EC legislation	Unmodified, near to or pristine conditions, with well-developed and diverse geomorphic forms and processes characteristic of river type.	Floodplain or defence protecting more than 100 residential properties from flooding
High	Principal aquifer providing locally important resource or supporting river ecosystem SPZ2	WFD Class 'Good' Major Cyprinid Fishery Species protected under EC or UK habitat legislation	Conforms closely to natural, unaltered state and would often exhibit well-developed and diverse geomorphic forms and processes characteristic of river type, with abundant bank side vegetation. Deviates from natural conditions due to direct and/or indirect channel, floodplain, and/or catchment development pressures.	Floodplain or defence protecting between 1 and 100 residential properties or industrial premises from flooding
Medium	Aquifer providing water for agricultural or industrial use with limited connection to surface water SPZ3	WFD Class 'Moderate'	Shows signs of previous alteration and/or minor flow regulation but still retains some natural features, or may be recovering towards conditions indicative of the higher category.	Floodplain or defence protecting 10 or fewer industrial properties from flooding

Importance	Type of Receptor			
	Groundwater	**Surface Water[1]**	**Morphology[2]**	**Flood Risk**
Low	Unproductive strata	WFD Class 'Poor'	Substantially modified by past land use, previous engineering works or flow regulation and likely to possess an artificial cross-section (e.g. trapezoidal) and would probably be deficient in bedforms and bankside vegetation. Could be realigned or channelised with hard bank protection, or culverted and enclosed. May be significantly impounded or abstracted for water resources use. Could be impacted by navigation, with associated high degree of flow regulation and bank protection, and probable strategic need for maintenance dredging. Artificial and minor drains and ditches would fall into this category.	Floodplain with limited constraints and a low probability of flooding of residential and industrial properties
Note 1	Professional judgement is applied when assigning an importance category to all water features. The WFD status of a watercourse is not an overriding factor and in many instances it may be appropriate to upgrade a watercourse which is currently at poor or moderate status to a category of higher importance to reflect its overall value in terms of other attributes and WFD targets for the watercourse. Likewise, a watercourse may be below Good Ecological Status, this does not mean that a poorer quality discharge can be emitted. All controlled waters are protected from pollution under the Environmental Permitting (England and Wales) Regulations 2016 [REF 12-12] and the Water Resources Act 1991 [REF 12-13] (as amended), and future WFD targets also need to be considered.			
Note 2	Based on the water body 'Reach Conservation Status' presently being adopted for the High Speed 2 project (developed originally by Atkins) and developed from EA conservation status guidance [REF 12-14; REF 12-15] as DMRB guidance [REF 12-11] does not currently provide any criteria for morphology.			

12.6.8. The magnitude of adverse or beneficial impacts will be determined on the basis of the seven point scale presented in **Table 12.5**, taking into account DMRB guidance [REF 12-11].

Table 12.5: Evaluating the Magnitude of Impact on an Attribute

Impact	Criteria	Description and Examples
Major Adverse	Results in a loss of attribute and/or quality and integrity of the attribute	**Surface Water:** Failure of both soluble and sediment-bound pollutants in HAWRAT (Method A, Annex I) and compliance failure with Environmental Quality Standard (EQS) values (Method B) Calculated risk of pollution from a spillage >2% annually (Spillage Risk Assessment, Method D, Annex I) Loss or extensive change to a fishery Loss or extensive change to a designated Nature Conservation Site *Pollution of portable source of abstraction* *Deterioration of a water body leading to a failure to meet Good Ecological Status/Potential (GES/GEP) and reduction in Class* **Groundwater:** Loss of, or extensive change to, an aquifer Potential high risk of pollution to groundwater from routine runoff – risk score >250 (Groundwater Assessment, Method C, Annex I) Calculated risk of pollution from spillages >2% annually (Spillage Risk Assessment, Method D, Annex I) Loss of, or extensive change to, groundwater supported designated wetlands **Flood Risk:** Increase in peak flood level (1% annual probability) >100 mm (Hydrological Assessment of Design Floods and Hydraulic Assessment, Methods E and F, Annex I)
Moderate Adverse	Results in an impact on integrity of attribute, or loss of part of attribute	**Surface Water:** Failure of both soluble and sediment-bound pollutants in HAWRAT (Method A, Annex I) but compliance with EQS values (Method B) Calculated risk of pollution from spillages >1% annually and <2% annually *Contribution of a significant proportion in the effluent in the receiving river but insufficient to change its water quality status* Partial loss in productivity of a fishery **Groundwater:** Partial loss or change to an aquifer Potential medium risk of pollution to groundwater from routine runoff – risk score 150-250 Calculated risk of pollution from spillages >1% annually and <2% annually Partial loss of the integrity of groundwater supported designated wetlands **Flood Risk:** Increase in peak flood level (1% annual probability) >50 mm
Minor Adverse	Results in some measurable change in attribute's quality or vulnerability	**Surface Water:** Failure of either soluble or sediment-bound pollutants in HAWRAT Calculated risk of pollution from spillages >0.5% annually and <1% annually *Measurable changes in attribute but of limited size and/or proportion* **Groundwater:** Potential low risk of pollution to groundwater from routine runoff – risk score <150 Calculated risk of

Impact	Criteria	Description and Examples
		pollution from spillages >0.5% annually and <1% annually Minor effects on groundwater supported wetlands **Flood Risk:** Increase in peak flood level (1% annual probability) >10mm
Negligible	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity	**Surface Water:** No risk identified by HAWRAT (Pass both soluble and sediment-bound pollutants) Risk of pollution from spillages <0.5% *No effect on WFD classification* **Groundwater:** No measurable impact upon an aquifer and risk of pollution from spillages <0.5% **Flood Risk:** Negligible change in peak flood level (1% annual probability) <+/- 10 mm
Minor Beneficial	Results in some beneficial impact on attribute or a reduced risk of negative effect occurring	**Surface Water:** HAWRAT assessment of either soluble or sediment-bound pollutants becomes Pass from an existing site where the baseline was a Fail condition Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is <1% annually) **Groundwater:** Calculated reduction in existing spillage risk by 50% or more to an aquifer (when existing spillage risk <1% annually) **Flood Risk:** Reduction in peak flood level (1% annual probability) >10 mm
Moderate beneficial	Results in moderate improvement of attribute quality	**Surface Water:** HAWRAT assessment of both soluble and sediment-bound pollutants becomes Pass from an existing site where the baseline was a Fail condition Calculated reduction in existing spillage by 50% or more (when existing spillage risk >1% annually) **Groundwater:** Calculated reduction in existing spillage risk by 50% or more (when existing spillage risk is >1% annually) **Flood Risk:** Reduction in peak flood level (1% annual probability) >50 mm
Major beneficial	Results in major improvement of attribute quality	**Surface Water:** Removal of existing polluting discharge, or removing the likelihood of polluting discharges occurring to a watercourse **Groundwater:** Removal of existing polluting discharge to an aquifer or removing the likelihood of polluting discharges occurring, Recharge of an aquifer **Flood Risk:** Reduction in peak flood level (1% annual probability) >100 mm

12.6.9. The significance of effects will be established by combining the importance of the attribute and the magnitude of the impact. Significant effects will be graded such that their relative significance is indicated, in accordance with the matrix presented in **Table 12.6**.

Table 12.6: Criteria for Defining the Significance of Effects on Water Environment Features

Importance of Attribute	Magnitude of Impact			
	Negligible	**Minor**	**Moderate**	**Major**
Very High	Neutral	Moderate/Large	Large/Very Large	Very Large
High	Neutral	Slight/Moderate	Moderate/Large	Large/Very Large
Medium	Neutral	Slight	Moderate	Large
Low	Neutral	Neutral	Slight	Slight/Moderate

Policy Requirements

12.6.10. Paragraphs 5.90 - 5.115 and 5.219 - 5.231 of the NPSNN [REF 12-16] specifically apply to flood risk and water quality respectively, and set out how impacts on the water environment inform the decision making process. The scope of the assessment will accordingly respond to these requirements.

12.6.11. A Flood Risk Assessment (FRA) will be undertaken in line with the assessment procedures and requirements detailed in the NPSNN [REF 12-16]. This will involve hydraulic modelling of the main watercourses and associated floodplains, with an empirical assessment undertaken of small watercourses (subject to agreement with the Environment Agency and LLFAs). The potential impacts of flooding will be modelled and the results used to inform the design-development of the engineering layout of the Scheme and the development of flood and hydromorphological mitigation measures. Allowances will also be made in the FRA and design-development process for the potential impacts of climate change.

12.6.12. The FRA will comprise a separate report appended to the Environmental Statement, the main conclusions of which will be summarised within the road drainage and the water environment assessment.

12.6.13. The compliance of the Scheme with the objectives of the WFD [REF 12-17] for designated waterbodies will be considered in the assessment. A Preliminary WFD Compliance Assessment will be undertaken to assess the potential impacts of the Scheme on WFD designated waterbodies, and will summarise opportunities and constraints for further assessment associated with the following:

- Whether the Scheme has the potential to cause deterioration in ecological status/potential of the waterbodies.
- Whether the Scheme has the potential to prevent the waterbodies from meeting their objective of good ecological status/potential.
- Whether the Scheme has the potential to prevent or compromise WFD objectives being met in other waterbodies.

12.6.14. The Preliminary WFD Compliance Assessment will be based on a combination of the desk study and a hydrogeomorphological walkover survey, and will comprise a separate report appended to the Environmental Statement, the main conclusions of which will be summarised within the road drainage and the water environment assessment.

Study Area

12.6.15. The 1km scoping study area will be adopted in the assessment to identify effects relating to road drainage and the water environment.

12.6.16. As watercourse flow impacts can propagate downstream, where relevant the assessment will also consider interests within the wider 2km study area.

12.6.17. Similarly, as the effects of flooding can impact upstream and downstream, where relevant the assessment of flood risk will also consider such effects within the wider 2km study area around the DCO site boundary.

Information Sources

12.6.18. Further desk studies are planned to augment the baseline data gathered to date, which will continue to draw on the information sources interrogated during the scoping exercise.

12.6.19. The water sampling programme will continue, with each water sample tested for a range of physico-chemical parameters, metals and hydrocarbons that may typically be found in road runoff, the objectives being to establish existing water quality and inform the water quality assessment.

12.6.20. Information, data and views obtained from engagement with relevant consultees will also be used to inform the assessment of effects and the identification of appropriate mitigation measures.

12.6.21. Traffic forecasts prepared for the Scheme will be used to inform the assessment accidental spillages.

Consultation

12.6.22. Consultation will be undertaken with the Environment Agency to identify any water related licences, consents and permits that may be required for construction and operation of Scheme.

12.6.23. Engagement will also be undertaken with the Environment Agency, LLFAs, Anglian Water, the Bedford group of Internal Drainage Boards, and other organisations to confirm the following:

- Key modelling and assessment assumptions.
- Allowable discharge rates.
- Flood risk and floodplain compensation.
- Climate change allowances.
- Impacts on local land drains.

12.7. Assessment Assumptions and Limitations

12.7.1. Scoping has been completed using data held and maintained by third parties, which for the purposes of the scoping exercise are assumed to be up to date and appropriate for use.

12.7.2. As noted in Section 12.1, the 2km area of search adopted within the scoping exercise does not extend around all areas of the DCO site boundary due to limitations on information availability. The road drainage and the water environment assessment will take full account of these areas of the DCO site boundary.

12.7.3. The entire DCO site boundary has not been subject to site walkover to inform the scoping process. Although some fieldwork has been completed, this has been limited to date in its scope and coverage by landowner agreement to access parcels of land to carry out water sampling and other investigations.

12.7.4. The drainage design strategy for the Scheme is subject to review and ongoing design-development; this will include confirmation of highway discharge rates and the exact nature of the watercourse crossings. The drainage strategy for the Scheme will

be further developed in consultation with relevant parties, and will take account of the findings of the FRA.

12.7.5. The scoping exercise has been based on the current design of the Scheme, which is subject to further development. Accordingly, further surveys will be required to confirm existing drainage networks and assess the risks to water quality and flooding associated with the reference design for the Scheme.

13. GEOLOGY AND SOILS

13.1. Study Area

13.1.1. This chapter presents the approach to the assessment of the Scheme's effects on geology and soils, which comprises the following resources and receptors:

- Geology and soils (as valuable educational, research, historical or aesthetic resources).
- Designated sites of geological importance or value.
- Controlled groundwater receptors.
- On-site and off-site human health receptors

13.1.2. Based on the guidance provided in the Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 11: Geology and Soils [REF 13-1], a 500m scoping study area has been adopted within which the potential impacts and effects of the Scheme have been considered.

13.1.3. The extents of the 500m scoping study area are illustrated in Figure 13.1 in Chapter 19.

13.2. Baseline Conditions

13.2.1. To inform the scoping exercise, information relating to the geological and soils environment was obtained from the following sources:

- British Geological Survey (BGS) mapping – Sheet 187 (Huntingdon) [REF 13-2] and Sheet 204 (Biggleswade) [REF 13-3].
- BGS Hydrogeology Map 1:100,000 scale – Hydrogeology of the area between Cambridge and Maidenhead [REF 13-4].
- Unexploded Ordnance risk maps from Zetica UK for Cambridgeshire and Bedfordshire [REF 13-5].
- Natural England's Agricultural Land Classification (ALC) mapping [REF 13-6].
- Department for Environment Food & Rural Affairs (DEFRA) MAGIC online interactive mapping [REF 13-7].
- Cranfield University Soil and Agrifood Institute Soilscapes data [REF 13-8]
- Environment Agency data relating to potentially contaminative historical and recent activities [REF 13-9]
- BGS interactive online borehole log viewer (Geoindex) [REF 13-10]

Geology

Superficial Deposits

13.2.2. Figure 13.1 in Chapter 19 illustrates the superficial geology within and beyond the 500m scoping study area.

13.2.3. The Oadby Formation is the main superficial (drift) deposit covering most of the 500m scoping study area. Alluvium, Head and River Terrace Deposits are present only in the western extents of the area near Black Cat junction, particularly in the floodplain of the River Great Ouse, Hen Brook and Abbotsley Brook that flow through the area.

Bedrock

13.2.4. Figure 13.2 in Chapter 19 illustrates the solid geology within and beyond 500m scoping study area.

13.2.5. The bedrock geology (formerly known as 'solid' geology by the BGS) beneath the 500m scoping study area consists of Jurassic age strata. The western extents of the area are underlain by the Oxford Clay Formation, while the eastern extents are underlain predominantly by the West Walton Formation.

13.2.6. The Woburn Sands Formation (WSF) outcrops approximately 2km south east of the 500m scoping study area, and the general dip of the strata is to the south.

13.2.7. The bedrock is overlain by the superficial deposits, particularly in the eastern area; however, in the central and western parts the superficial deposits are thin or absent. Here the bedrock crops out or is partially covered by the drift deposits principally adjacent to watercourses.

13.2.8. The scoping exercise has confirmed that both the drift and bedrock geology within and surrounding the 500m scoping study area comprises sedimentary rocks, a summary of which is provided in **Table 13.1**.

Table 13.1: Summary of the Geology Within and Surrounding the 500m Scoping Study Area

Geology	Formation	Description	Estimated Thickness (meters)	Relationship to the 500m Scoping Study Area
Drift (Superficial)	Alluvium	Normally soft to firm consolidated, compressible silty clay with occasional layers of silt, sand, peat and basal gravel	1 – 10m	Present only in the western and central areas in floodplains
Drift (Superficial)	River Terrace Deposits	Sand and gravel, locally with lenses of silt, clay or peat	2 – 3m	Present only in the western and central areas in floodplains
Drift (Superficial)	Oadby Member – Diamicton	Clay, brown to blue-grey and silty clay, with chalk and flint fragments. Contains lenses of sand and gravel, clay and silt. Often referred to as 'Chalky Boulder Clay'	Typically 1 – 7m	Present mainly in the east and west of the area.
Drift (Superficial)	Glaciofluvial Deposits	Sand and gravel	1 – 3m	Present only in a small portion of the western area
Solid (Bedrock)	Woburn Sands Formation	Mainly fine to coarse grain sands	7 -70m	Present beyond the south eastern boundary of the area.
Solid (Bedrock)	West Walton Formation and Ampthill Clay Formation	Undifferentiated mudstone and limestone	0 – 25m	Present mainly in the east of the area.
Solid (Bedrock)	Oxford Clay Formation – Mudstone	Silicate-mudstone, grey, generally smooth to slightly silty, with sporadic beds of argillaceous limestone nodules.	23 – 60m	Present beneath much of the area.

Designated Sites

13.2.9. In relation to designated sites, the scoping exercise has not identified any geological Sites of Special Scientific Interest (SSSI) within the 500m scoping study area. The nearest geological SSSI is associated with the Weaveley and Sand Woods SSSI, located 2.5km from the DCO site boundary, to the south east of Black Cat junction.

13.2.10. Figure 13.2 in Chapter 19 illustrates the location of the Weaveley and Sand Woods geological SSSI in relation to the DCO site boundary.

13.2.11. The scoping exercise has confirmed that there are no regionally important geological or geomorphological sites identified within the 500m scoping study area.

Soil

13.2.12. A review of the distribution of agricultural land [REF 13-6] identified that the 500m scoping study area comprises principally ALC Grade 2 (very good) quality agricultural land. In some localised areas, predominantly in the west of the 500m scoping study area, the soil is classified as Grade 1 (excellent) and Grade 3 (good).

13.2.13. A review of Soilscape data [REF 13-8] published by Cranfield University confirms that the predominant soil type within the 500m scoping study area comprises No.9: Lime-rich loamy and clayey soils with impeded drainage, which are soils generally suited to cropping due to their high fertility.

13.2.14. Other soil types comprising No. 20: Loamy and clayey floodplain soils with naturally high groundwater, and No. 6: Freely draining slightly acid loamy soils, are associated with the River Great Ouse and its surrounding floodplain, which have moderate to low fertility.

Hydrogeology (Groundwater)

13.2.15. A review of the hydrogeology of the area [REF 13-4] indicates that groundwater occurrence in the drift deposits within the 500m scoping study area is mainly in the granular units of the alluvium and in the river terrace deposits, which are found only in the river floodplains.

13.2.16. The Oadby drift deposit that covers a large part of the 500m scoping study area generally acts as a low permeability cover to the bedrock. The superficial deposits are defined as secondary aquifers of limited groundwater potential. It is likely that groundwater in the granular bands of the superficial deposits is in hydraulic continuity with and provides baseflow discharge to the surface watercourses.

13.2.17. The Oxford Clay and West Walton Formations, which are primarily the bedrock geology beneath the 500m scoping study area, have a very low intergranular permeability which inhibits groundwater flow. These strata contain very limited groundwater, and the units are defined as unproductive aquifers with negligible importance for groundwater.

13.2.18. The aquifer within the WSF is designated as a principal aquifer and forms an important aquifer that supports significant groundwater abstractions in the region. There are no Source Protection Zones (SPZ) for abstractions from the Woburn Sands aquifer.

13.2.19. A summary of the aquifer classification of the geological strata within and surrounding the scoping study area is provided in **Table 13.2**.

Table 13.2: Aquifer Classification of Strata Within and Surrounding the 500m Scoping Study Area

Geology	Geological Strata	Aquifer Classification
Superficial	Alluvium	Secondary A
Superficial	River Terrace	Secondary A
Superficial	Oadby Member	Secondary undifferentiated aquifer
Superficial	Head Deposits	Secondary A
Bedrock	Woburn Sands	Principal
Bedrock	West Walton	Unproductive
Bedrock	Oxford Clay Formation	Unproductive

13.2.20. Full details of the hydrogeology and groundwater beneath the 500m scoping study area are presented within Chapter 12.

Surface Water

13.2.21. The River Great Ouse and its tributaries comprise the main surface watercourses within the 500m scoping study area.

13.2.22. Further details of surface water features are presented within Chapter 12.

Contamination Sources

13.2.23. Based on information from the Environment Agency's website [REF 13-9], the scoping exercise has identified the following potentially contaminative historical and recent activities within and surrounding the 500m scoping study area, the locations of which are illustrated in Figure 13.1 in Chapter 19:

- A fuel and power station (Little Barford Power Station) near Gallow Hill – located approximately 1km south of Eynesbury.
- An authorised landfill site near Caxton – located approximately 2.5km west of Caxton Gibbet junction.
- Nine historical landfill sites – concentrated around Wyboston and the Wyboston Leisure Park area.

13.2.24. A review of the Unexploded Ordnance risk maps for Cambridgeshire and Bedfordshire [REF 13-5] indicate that the 500m scoping study area is located within a low-risk zone (which equates to up to 10 bombs per 1000 acres). Notwithstanding this classification, based on the wartime history of the region and the presence of former military land, it is considered that potential exists for Unexploded Ordnance to be found within the 500m study area.

13.2.25. Due to large areas of land within the 500m scoping study area being agriculturally managed, the scoping exercise has recorded potential for soil contamination from the use of fertilisers and other agricultural chemicals.

Preliminary Conceptual Site Model

13.2.26. To inform the scoping exercise, a preliminary Conceptual Site Model (CSM) on the geology and soil conditions, including contaminated land has been prepared based on current practice [REF 13-9].

13.2.27. The preliminary CSM has adopted a source-pathway-receptor approach i.e. for there to be an identifiable impact there must be a source (contaminant or activity), a receptor, and a pathway. All three elements must be present before a contaminant linkage and a potential impact can be realised.

13.2.28. **Table 13.3** presents the preliminary CSM and identifies the potential sources of contamination, potential receptors of contamination, and the potential pathways from source to receptor associated with the Scheme. This preliminary model will be updated and refined as part of the geology and soils assessment as further information regarding the Scheme becomes available.

Table 13.3: Preliminary Conceptual Site Model

Source	Receptor	Pathway
Potential contamination in the made ground, natural ground, landfill adjacent to the Scheme, and shallow groundwater along the Scheme, related to historical features/structures	Human health (Construction workers)	Direct contact via ingestion, inhalation of dusts, fibres, vapour, and gas. Dermal contact and indirect contact.
	Human health (Construction workers)	Windblown dust, ingestion. Inhalation and direct contact.
	Controlled waters (groundwater resources (Secondary and Principal Aquifers), shallow and deep groundwater and surface water receptors	Migration and leaching of contaminants following exposure of contaminated soils. Migration of soluble contaminants to the shallow and deeper groundwater or direct release to surface water.
	On-site and adjacent properties (buildings/structures)	Direct contact with contamination in soils and shallow groundwater and build-up of vapours/gases.

13.3. Potential Impacts

Construction

13.3.1. Potential impacts during construction could include the following:

- Impacts on geological and soils resources through disturbance of the baseline conditions.
- Impacts from contamination on the re-usability/suitability of soils and aggregates derived from on-site sources and imported from off-site.
- Impacts from contamination on human health, controlled waters and buildings/structures through disturbance of the baseline ground and groundwater conditions.
- Soil compaction and de-vegetation impacting water flows, quality and surface run-off.

Operation

13.3.2. As the operational phase would not involve ground disturbance, it is considered that the potential for impacts on geological and soils resources from the operation of the Scheme are unlikely. For these types of receptor, these impacts will be scoped out of the assessment.

13.3.3. As potential pathways to human health receptors would be limited to the construction phase, for example when earthworks are being undertaken and potentially contaminated soils exposed, the potential for contamination movement from soils to off-site human health receptors during operation of the Scheme is considered to be limited. Accordingly, such effects will be scoped out of the assessment.

13.3.4. In relation to groundwater resources, the release of potential pollutants such as dust, oils and fuels (either due to combustion or accidental spillages) could result in

potential impacts during operation of the Scheme. The nature and magnitude of such impacts will depend on a number of factors including: the volume and type of vehicles; provision of adequate pollution control measures; the potential for pollutants to arrive at a receptor; and the sensitivity of the receptor.

Future Maintenance

13.3.5. Consideration was given to the activities associated with the future maintenance and management of the Scheme, and whether these have the potential to result in impacts on receptors.

13.3.6. Following a review of the typical activities associated with this phase of the Scheme (for example the routine inspection and maintenance of drains, periodic carriageway resurfacing and emergency repair works), the scoping exercise concluded that limited potential exists for workers responsible for undertaking future maintenance activities on the Scheme to be exposed to, or affected by, contamination. Accordingly, impacts on such receptors associated with this phase of the Scheme will be scoped out of the assessment.

13.4. Design, Mitigation and Enhancement Measures

13.4.1. The scoping exercise has identified a potential requirement for mitigation during the construction and operational stages of the Scheme to avoid or minimise impacts.

13.4.2. Mitigation measures will be incorporated into the Scheme as part of the design-development process, the objectives being to control and limit potential pathways between contaminant sources and receptors relating to human health and groundwater. The form and nature of these measures will be determined through risk assessments undertaken as part of the geology and soils assessment.

13.4.3. An Outline Environmental Management Plan will be prepared for the Scheme, which will detail measures that would be undertaken during construction of the Scheme to mitigate impacts on receptors. These measures are likely to focus on the following:

- Management of construction activities with the potential for generating for contamination through run-off/accidental spillage or by disturbance of in-situ materials.
- Management of excavated materials as a result of construction works.
- Management of human receptors associated with the construction workforce.

13.5. Description of the Likely Significant Effects

13.5.1. Based on the current understanding of the background conditions and the preliminary assessment undertaken as part of the scoping exercise, it is considered that adverse effects associated with construction and operation of the Scheme would be limited.

13.5.2. During construction, it is likely that substantial earthworks will be required involving major excavations. Unless contaminated soils are excavated, it is considered that there will be no likelihood of significant effects on geology or soils (other than the loss of these attributes associated with their replacement by new highway infrastructure).

13.5.3. Any effects on groundwater during construction will mainly be associated with dewatering of excavations and the potential movement of contaminated groundwater following any disturbance and exposure of contaminated materials. However, as the groundwater receptors within the 500m scoping study area are generally of limited value and importance, it is considered unlikely that significant adverse effects will occur. Potential effects on groundwater receptors are discussed further within Chapter 12.

13.5.4. The removal or remediation of any areas of contaminated soils identified would have a potential beneficial effect.

13.5.5. It is considered unlikely that significant effects on soils and geology will occur as a consequence of Scheme operation. Effects on groundwater will be associated mainly with water management from new and/or modified carriageways. As the groundwater receptors within the 500m scoping study area are generally of limited value and importance, it is considered unlikely that significant adverse effects will occur.

13.6. Assessment Methodology

Assessment Guidance

13.6.1. As the scoping exercise has recorded limited likelihood of significant effects on geology and soils, a simple assessment will be undertaken in accordance with the guidance and methodologies contained in DMRB Volume 11, Section 3, Part 11: Geology and Soils [REF 13-1].

13.6.2. The assessment will be desk-based in its approach, and will be based on a source-pathway-receptor model. The assessment will be informed by further background investigations and a contaminated land investigation, which will be used to refine the detailed ground conditions, groundwater pathways and receptors associated with the Scheme.

Value or Importance of Receptors

13.6.3. The assessment will adopt criteria to determine the value of identified geological and soils attributes within the scoping study area, the magnitude of impact, and the significance of effect. These criteria have been developed from the generic guidance contained in DMRB Volume 11, Section 2, Part 5: Assessment and Management of Environmental Effects [REF 13-11].

13.6.4. The sensitivity of a geology or soil receptor will be established through the identification and evaluation of the susceptibility of the receptors ability to changes arising from the Scheme, and the value attached to these.

13.6.5. Susceptibility relates to the ability of geology or soil receptor to accommodate change without undue consequences. Sensitive receptors will include the following:

- Receptors susceptible to land contamination and ground hazard impacts – for example human, ecological, hydrological receptors.
- Soil and geological resources – for example international, national or regionally designated sites, soils of high nature conservation or landscape importance, mineral reserves, demand on waste management infrastructure through disposal of soils.
- Agricultural soil resources – for example high quality ALC Grade 1 soils.

13.6.6. **Table 13.4** presents the criteria to be applied when determining the value or importance of attributes. The overall value or importance is ranked from high to very low base on variables such as distance from the Scheme, quality of the receptor or its value as a resource. These criteria may be developed further, based on a combination of professional judgement and the findings from planned surveys and investigations.

Table 13.4: Criteria to Determine the Value or Importance of Attributes

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

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

Magnitude of Impact

13.6.7. The assessment of the magnitude of impacts will consider the scale and duration of the predicted change to the baseline conditions, and whether these will be temporary or permanent, using the criteria presented in **Table 13.5**.

Table 13.5: Magnitude of Impact Criteria

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

Magnitude	Criteria	Receptors Susceptible to Land Contamination and Ground Hazard Impacts	Soil and Geology	Agricultural Soil Resources
Low	Results in some measurable change in attributes quality or vulnerability	Human Health: Slight reversible short- term effects to human health. Surface waters and/or groundwater: Slight pollution of non-sensitive water resources. Ecology: Some change to population densities of non-sensitive species with no negative effects on the function of the ecosystem. Built Environment: Easily reparable effects of damage to buildings or structures. Landscaping/Agriculture: Slight or short term health effects which result in slight reduction in value.	Minor impact on feature or attribute. Earthworks resulting in low volume of surplus soil for off-site disposal	Loss of less than 20ha of agricultural land Grades 1, 2 and 3a or the loss of any quantity of Grades 3b, 4 or 5. Re-use of all topsoil resource within the development. Soil sealing <50%
Very Low	Results in effect on attribute, but of insufficient magnitude to affect the use or integrity.	Human Health: No measurable effects on humans. Surface waters and/or groundwater: Insubstantial pollution to non-sensitive water resource. Ecology: No significant changes to population densities in the environment or in any ecosystem. Built Environment: Very slight non- structural damage or cosmetic harm to buildings or structures. Landscaping/Agriculture: No significant reduction in landscape value.	Impact of insufficient magnitude to affect use or integrity of feature or attribute. No off-site disposal of surplus soil required	No loss of agricultural land. Minor disturbance to soils. Soil sealing unlikely to occur.

Significance of Effect

13.6.8. A qualitative approach to determine the significance of effects will be used in the assessment considering the value/importance of the attribute and the predicted magnitude of impact, guided by the classifications within the matrix presented in **Table 13.6**.

Table 13.6: Significance of Effect Criteria

Magnitude	Value/Importance of Receptor			
	High	**Medium**	**Low**	**Negligible**
High	Major	Moderate	Moderate	Minor
Medium	Moderate	Moderate	Minor	Negligible
Low	Moderate	Minor	Negligible	Negligible
Very Low	Minor	Negligible	Negligible	Negligible

13.6.9. Should potential be identified through the assessment process for significant effects to occur as a result of the construction and operation of the Scheme, a detailed assessment will be undertaken in line with DMRB guidance [REF 13-1].

13.6.10. In relation to the assessment of Unexploded Ordnance, a tiered approach will be adopted. This will initially involve undertaking a screening exercise to identify the risk rating and the areas which may require more detailed assessment. Based on the outcomes of this, the potential effects posed to human health during construction of the Scheme will be reviewed and risk mitigation measures identified, where necessary.

Policy Requirements

13.6.11. The National Policy Statement for National Networks (NPSNN) [REF 13-12] acknowledges that the construction and operation of highway infrastructure has the potential to affect geology and soils, and provides guidance on the identification, assessment and mitigation of effects on these resources.

13.6.12. The requirements of the NPSNN [REF 13-12] in relation to identifying agricultural land and potential land contamination, and then assessing and mitigating the effects of the Scheme on such assets and potential land constraints, will been taken account of in the assessment.

Study Area

13.6.13. The 500m scoping study area will be adopted within the assessment of geology and soils. Extensions to this study area will be made, where required, to identify and assess any impacts and effects associated with contamination migration, ether on- or off-site.

Information Sources

13.6.14. In addition to the information sources already referenced as part of the scoping exercise, the assessment will be informed by the outcomes of the following surveys, investigations and assessments relating to land within and (where appropriate) beyond the DCO site boundary:

- Intrusive ground investigations.
- Agricultural soil sampling surveys (see Chapter 11).
- The CSM prepared for the Scheme.

Consultation

13.6.15. Based on the limited potential for significant effects to occur as a result of construction and operation of the Scheme, no consultation is planned with environmental organisations or bodies with an interest in geology and soils as part of the assessment.

13.6.16. The scope of the ground investigation to establish the prevailing ground conditions has yet to be fully defined. Depending on the location and extent of intrusive sampling, consultation may be undertaken with the relevant local authorities and the Environment Agency prior to undertaking the works.

13.7. Assessment Assumptions and Limitations

13.7.1. Scoping has been undertaken using information and data available from third party organisations, which has not been subject to independent verification. For the purposes of the scoping exercise, this information is assumed to be up to date and appropriate for use.

13.7.2. The scoping exercise has been informed by desk-based study, with no detailed geological or soil surveys, or ground investigations undertaken to date.

14. MATERIAL ASSETS AND WASTE

14.1. Study Area

14.1.1. The chapter presents the approach to the assessment of the Scheme's effects on material assets and waste.

14.1.2. Material resources are defined in Interim Advice Note (IAN) 153/11: Materials [REF 14-1] as "*the materials and construction products required for the construction, improvement and maintenance of the trunk road network. Material resources include primary raw materials such as aggregates and minerals, and manufactured construction products*".

14.1.3. Waste is defined as per the EU Waste Framework Directive (2008/98/EC) [REF 14-2] as "*any substance or object which the holder discards or intends or is required to discard*".

14.1.4. For the purposes of the scoping exercise, material assets and waste are defined as comprising the use of material resources, and the generation and management of waste.

14.1.5. The material resources scoping study area has been defined by the extents of the Development Consent Order (DCO) site boundary. This covers material resources likely to be used to construct the Scheme, and also considers the potential sterilisation of active and allocated minerals extraction sites, mineral safeguard areas, peat resources, waste management facilities and areas for waste management facilities.

14.1.6. The waste generation scoping study area has been defined by the extents of the DCO site boundary and covers the area within which waste arising from Scheme construction could be generated.

14.1.7. The waste management scoping study area comprises the wider region within which waste management infrastructure is located. The scoping exercise has assumed this to be the East of England region. This comprises the sub-regions of Bedfordshire (including Central Bedfordshire), Cambridgeshire, Essex, Hertfordshire, Norfolk and Suffolk, together with the adjacent sub-regions of Northamptonshire and Buckinghamshire (due to their proximity to the Scheme).

14.2. Baseline Conditions

14.2.1. To inform the scoping exercise, data, information and records were obtained from publicly available sources, comprising data on regional and sub-regional landfill capacity published by the Environment Agency [REF 14-3] within the defined waste management scoping study area.

14.2.2. The baseline target for the recovery of non-hazardous construction and demolition waste is at least 70% by weight by 2020, as set out in the EU Waste Framework Directive [REF 14-2], as transposed by the Waste (England and Wales) Regulations 2011 (as amended) [REF 14-4] and the Waste Management Plan for England [REF 14-5]. Uncontaminated excavated soil and stones (European Waste Code 17 05 04) are specifically excluded from this target.

14.2.3. The baseline targets for alternative aggregate materials (comprising secondary aggregates recovered from industrial and mining operations, and recycled aggregates produced from inert waste) are set out in the National and Regional Guidelines for Aggregates Provision in England 2005 to 2020 [REF 14-6].

14.3. Potential Impacts

Construction

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

- Impacts on the availability and use of primary (non-recycled) material resources and reused, recycled and secondary aggregate materials used for construction.
- Impacts from on-site generated materials, for example excavated materials and soils, and waste arisings on the existing capacity of landfill infrastructure.

14.3.2. Impacts associated with the extraction of raw materials and the manufacture of products are not proposed to be included in the scope of the assessment, as these impacts (for example the depletion of non-renewable resources and the production of waste at the point of extraction and manufacturing) will occur off-site, and possibly outside of the UK.

Operation

14.3.3. Operational impacts of the Scheme will be limited because it is not expected the Scheme, in and of itself, will generate wastes or material with the potential for reuse. Material use and waste generation is therefore expected to be very small during this phase of the Scheme.

14.3.4. Accordingly, the potential impacts on material assets and waste associated with the operational phase of the Scheme will be scoped out of the assessment.

Future Maintenance

14.3.5. Routine maintenance of the Scheme is likely to include gully emptying and litter collection. Periodically, maintenance activities such as resurfacing would be required.

14.3.6. Waste arising from these types activities is expected to be generally comparable (in both type and quantity) to that generated by the existing road network, with such waste managed using the established procedures and facilities that are used across the strategic highways network.

14.3.7. For these reasons, consideration of material resources and waste associated with the future maintenance of the Scheme will be scoped out of the assessment.

14.4. Design, Mitigation and Enhancement Measures

14.4.1. The Scheme will be developed with the aim of prioritising waste prevention, followed by preparing for re-use, recycling and recovery and lastly disposal to landfill (as per the internationally recognised waste hierarchy).

14.4.2. The scoping exercise has identified a potential requirement for the following types of mitigation, which will be considered as part of the design-development and construction phases:

- Waste will be prevented and designed out, where possible.
- Opportunities to re-use material resources will be sought where practicable, for example the reuse of excavated materials and the recycling of demolition materials within the Scheme.
- Opportunities to support the circular economy will be considered, including using other recycled and secondary materials during construction where practicable.
- Where waste prevention or re-use are not possible, waste arisings will be managed in line with the waste hierarchy.

14.4.3. An Outline Environmental Management Plan (OEMP) will be prepared as part of the environmental impact assessment of the Scheme, the content of which will be developed in parallel with the development of the Scheme design and construction methodology. Measures within the OEMP will include design, construction and operational mitigation, which have been defined in part by the requirements arising from the technical assessments undertaken.

14.4.4. The construction of the Scheme will be subject to measures and procedures defined within a Construction Environmental Management Plan (CEMP). The CEMP will be based on the measures contained in the OEMP, and will include the implementation of industry standard practice and control measures for environmental impacts arising during construction, for example:

- all hazardous materials including fuels, chemicals, cleaning agents, solvents and solvent containing products will be properly sealed in containers at the end of each day, prior to storage in appropriately protected and bunded storage areas;
- the segregation of waste at source, where practical, to facilitate a high proportion and high quality recycling;
- reviewing material quantity requirements to avoid over-ordering and the generation of waste materials due to surplus;
- implementing agreements with material suppliers to reduce the amount of packaging, or to participate in a packaging take-back scheme; and
- materials requiring removal from the site will be transported using licensed carriers, and records would be kept detailing the types and quantities of waste moved and the destinations of this waste.

14.4.5. The CEMP will be produced by the contractor prior to works commencing, in accordance with guidance presented in IAN 183/14: Environmental Management Plans [REF 14-7], noting that the CEMP will include secondary plans, for example a Site Waste Management Plan.

14.5. Description of the Likely Significant Effects

14.5.1. For road construction projects, significant effects often arise from the management and use of excavated materials. Based on the current design of the Scheme, the scoping exercise has identified that the cut and fill material balance for the Scheme is estimated to produce a deficit of excavated materials, and that there a large surplus of excavated materials requiring off site management is not expected.

14.5.2. **Table 14.1** presents the likely types of materials used and wastes that may be generated during construction of the Scheme, which could lead to adverse effects in relation to material assets and waste.

Table 14.1: Potential Material Resources Use and Waste Arisings from Scheme Construction

Project Activity	Material Resources Use	Potential Waste Arisings
Site remediation/ preparation/ earthworks	Fill material for construction purposes. Primary/secondary/recycled aggregates for ground stabilisation. Topsoil and subsoil for landscaping and restoration.	Surplus excavated materials. Surplus topsoil and subsoil. Unsuitable and contaminated soils and excavated materials. Vegetation/wood from site clearance. Clearance of redundant highway infrastructure.
Demolition	Materials are not required for demolition works	Waste arisings from the demolition of any existing buildings or structures
Site construction	Construction materials including: • aggregates; • asphalt and bituminous materials; • in-situ cast concrete; • precast concrete products; • structural steelwork; • steel reinforcing bar; • timber and timber products; • geotextile; • drainage systems; and • fencing and barriers.	Packaging from materials delivered to site. Excess, offcuts and broken/ damaged construction materials. Existing highway infrastructure and technology removed during works. Construction worker wastes from offices and rest areas/canteens. Waste oils from construction plant.

14.6. Assessment Methodology

Assessment Guidance

14.6.1. As the scoping exercise has recorded a likelihood of significant effects on material assets and waste, a detailed assessment will be undertaken in accordance with the guidance and methodologies contained in IAN 153/11 [REF 14-1].

14.6.2. Reference will also be made to the general assessment guidance contained in Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1: Aims and Objectives of Environmental Assessment [REF 14-8].

14.6.3. The assessment of impacts and effects on material resources and waste, and the development of mitigation measures, will be informed by the legislation, regulations and policies contained in the following documents:

- National Policy Statement for National Networks (NPSNN) [REF 14-9].
- National Planning Policy Framework [REF 14-10].
- Waste Management Plan for England [REF 14-5].
- National Planning Policy for Waste [REF 14-11].
- Waste Framework Directive (2008/98/EC) [REF 14-2].
- Waste (England and Wales) Regulations 2011 (as amended) [REF 14-4].
- The Environmental Permitting (England and Wales) Regulations 2016 [REF 14-12].
- Hazardous Waste (England and Wales) Regulations 2005 (as amended) [REF 14-13].

- Environmental Protection Act 1990 (as amended) [REF 14-14].

14.6.4. Reference will also be made in the assessment to current local planning policies concerning material resources and waste management within the relevant local authorities.

14.6.5. The assessment will identify the likely impacts and effects on receptors (comprising material resources used for construction and waste management infrastructure (landfill capacity)) associated with material resources and waste arisings, and the mitigation measures to be implemented. This will identify and quantify, where possible, the following:

- The types and quantities (where appropriate to the assessment) of materials required for the Scheme.
- Details of the sources of materials, including the use of site-won materials and reused, recycled and secondary aggregates (where appropriate to the assessment).
- The cut and fill balance of the Scheme.
- The types and quantities of forecast waste arisings from the Scheme.
- Waste requiring storage on site prior to reuse, recycling or disposal.
- Materials and wastes to be pre-treated on site for reuse within the Scheme.
- Materials and waste requiring treatment and/or disposal off-site.
- Impacts that may arise from the issues identified in relation to materials and waste.

14.6.6. The magnitude of material resource impacts and the significance of their effects will be assessed by:

- estimating the likely types and quantities (where appropriate to the assessment) of the main materials that would be required during construction of the Scheme;
- estimating the likely proportion of non-hazardous construction and demolition waste arisings that would be recovered;
- estimating the proportion of reused, recycled or secondary aggregate that would be imported to site for use during construction;
- comparing the likely waste recovery rate and proportion of reused, recycled or secondary aggregate with the relevant targets; and
- identifying any direct impacts on mineral safeguard sites or peat resources within the DCO site boundary.

14.6.7. The magnitude of waste impacts and the significance of their effects will be assessed by:

- establishing the baseline for landfill capacity in the region in proximity to the Scheme;
- estimating the likely types and quantities of waste that would be generated during construction of the Scheme;
- estimating the recovery rates likely to be achieved for each waste type and the quantity of waste that may require off-site management or disposal;
- comparing the likely waste arisings and the quantity requiring off-site disposal to the baseline landfill capacity and assessing the likely impact on that capacity; and

- identifying any direct impacts on waste management infrastructure within the DCO site boundary.

14.6.8. The criteria used for assessing the magnitude of impacts and the significance of effects are detailed within **Table 14.2**.

Table 14.2: Magnitude of Impact and Significance of Effect Criteria

Magnitude of Impact	Significance of Effect	Material Resources Criteria	Waste Criteria
Neutral	Not significant	The Scheme achieves >99% overall material recovery/recycling (by weight) of non-hazardous construction and demolition waste (CDW), (excluding naturally occurring materials with Waste Code 17 05 04) to substitute use of primary materials; and aggregates required to be imported to site comprise >99% (by weight) reused, recycled or secondary content.	No reduction or alteration in the capacity of waste infrastructure at a regional scale.
Slight	Not significant	The Scheme achieves 70-99% overall material recovery/recycling (by weight) of non-hazardous CDW (excluding naturally occurring materials with Waste Code 17 05 04) to substitute use of primary materials; and aggregates required to be imported to site comprise reused, recycled or secondary content in line with the relevant regional percentage target (by weight).	≤1% reduction or alteration in the regional capacity of waste infrastructure; and waste infrastructure has sufficient capacity to accommodate waste from the Scheme, without compromising the integrity of the receiving infrastructure (design life or capacity) within the region.
Moderate	Significant	The Scheme achieves <70% overall material recovery/recycling (by weight) of non-hazardous CDW (excluding naturally occurring materials with Waste Code 17 05 04) to substitute use of primary materials; and aggregates required to be imported to site comprise reused, recycled or secondary content below the lower of the relevant regional or national percentage target (by weight).	>1% reduction or alteration in the regional capacity of waste infrastructure as a result of accommodating waste from the Scheme; and 1-50% of waste from the Scheme requires disposal outside of the region.

Magnitude of Impact	Significance of Effect	Material Resources Criteria	Waste Criteria
Large	Significant	The Scheme achieves <70% overall material recovery/recycling (by weight) of non-hazardous CDW (excluding naturally occurring materials with Waste Code 17 05 04) to substitute use of primary materials; and aggregates required to be imported to site comprise <1% (by weight) reused, recycled or secondary content; and the Scheme sterilises ≥1 mineral safeguarding site and/or peat resource.	>1% reduction or alteration in the regional capacity of waste infrastructure as a result of accommodating waste from the Scheme; and >50% of waste from the Scheme requires disposal outside of the region.
Very Large	Significant	No additional criteria.	>1% reduction or alteration in national capacity of waste infrastructure as a result of accommodating waste from the Scheme; or the Scheme would require new (permanent) waste infrastructure to be constructed to accommodate waste.

Policy Requirements

14.6.9. The NPSNN [REF 14-9] sets out policies in relation to waste management on transportation schemes. This states that applicants should set out their arrangements for managing any waste produced, and should include information on the proposed waste recovery and disposal system for all waste generated by the development. It also states that applicants should seek to minimise the volume of waste produced and the volume of waste sent for disposal, unless it can be demonstrated that the alternative is the best overall environmental outcome.

14.6.10. The requirements of the NPSNN [REF 14-9] in relation to minimising and managing waste will be taken into account as part of the design-development of the Scheme, and in developing the planned approach to its construction.

14.6.11. The assessment will take account of these requirements by estimating and assessing materials and waste associated with the Scheme, and through the identification of measures that would be implemented during construction of the Scheme to ensure both on-site and off-site waste is minimised, and managed and disposed of appropriately.

Study Area

14.6.12. The assessment of effects on material assets and waste will be undertaken within the extents of the study areas adopted as part of the scoping exercise. These extents may be subject to refinement as the assessment is undertaken and information relating to construction of the Scheme becomes available.

Information Sources

14.6.13. The information sources referenced as part of the scoping exercise will continue to be used as part of the material assets and waste assessment.

14.6.14. Information will be sourced on active and allocated minerals extraction sites, mineral safeguard areas, peat resources, waste management facilities and areas for waste management facilities within the DCO site boundary from local minerals and waste plans, and from other publicly available sources.

14.6.15. Scheme construction information will be collated as part of the design-development process, which will identify:

- the likely quantities and categories of material resources required to construct the Scheme (for example aggregates and other raw materials);
- the main types and quantities of excavated materials arising from, and to be used in, the construction of the Scheme (for example topsoil and demolition arisings); and
- the likely quantities, types and classifications of waste arisings, including potential management routes for any surplus material that cannot be reused (including recovery rates).

Consultation

14.6.16. No consultation is planned to be undertaken as part of the assessment.

14.7. Assessment Assumptions and Limitations

14.7.1. The scoping exercise has been undertaken using information and data which has been assumed to be up to date and appropriate for use.

15. CLIMATE

15.1. Study Area

15.1.1. This chapter presents the approach to the assessment of the Scheme's effects on climate, which considers three aspects relating to the Scheme:

- Greenhouse gas (GHG) impact assessment – effects on the climate of greenhouse gas emissions arising from the Scheme, including how the Scheme will affect the ability of Government to meet its carbon reduction plan targets.
- Climate change resilience assessment – the resilience of the Scheme to climate change impacts, including how the Scheme will take account of the projected impacts of climate change.
- In-combination climate change impact assessment – the combined effects of a changing climate and the Scheme on the environment.

15.1.2. The requirements of the EIA Regulations 2017 [REF 15-1] and the National Policy Statement for National Networks (NPSNN) [REF 15-2] have been considered when defining the spatial extents and time periods for the climate assessment.

15.1.3. For the purposes of the scoping exercise, climate information and data has been obtained and considered at both the regional and national level.

15.2. Baseline Conditions

15.2.1. To inform the scoping exercise, data, information and records were obtained from the following sources:

- Met Office historical climate data [REF 15-3].
- The UK Climate Change Risk Assessment 2017 [REF 15-4].
- UK Climate Projections for 2018 (UKCP18) [REF 15-5].

15.2.2. Historic climate data obtained from the Met Office website [REF 15-3] recorded by the closest meteorological station to the Scheme (Bedford Weather Station) for the period 1981-2010 indicates the following:

- Average annual maximum daily temperature was 13.9°C.
- Warmest month on average was July (mean maximum daily temperature of 22.1°C).
- Coldest month on average was February (mean daily minimum temperature of 0.8°C).
- Mean annual rainfall levels were 597.6mm.
- Wettest month on average was October (62.5mm of rainfall on average for the month).
- Driest month on average was February (36.7mm of rainfall on average for the month).
- Windiest month on average was January.
- Least windy month was July.

15.2.3. The Met Office baseline climate averages for the East Anglia region [REF 15-3] identify gradual warming (although not uniformly so) between 1969 and 2018, with

slightly increased rainfall. Mean maximum annual temperatures rose from 13.5°C to 14.7°C while mean annual rainfall has fluctuated between 567mm and 663mm.

15.2.4. The UK Climate Change Risk Assessment [REF 15-4] identifies two key risks for transport infrastructure:

- Changes in extreme weather conditions which will affect infrastructure, in particular through storm damage, flooding and high temperatures.
- Flooding of transport, including roads and rail is likely to increase, affecting both urban and rural access routes.

15.2.5. Projections within the UKCP18 [REF 15-5] have been developed to provide projections for future climate scenarios and trends, and provide climate change projections for pre-defined 30-year time slices (for example 2010-2039, 2040-2069, and 2070-2099) at annual and seasonal levels for changes to mean climatic conditions over land areas. As part of scoping exercise, UKCP18 [REF 15-5] projections for the following average climate variables have been obtained and analysed:

- Mean summer temperature.
- Mean winter temperature.
- Mean summer precipitation.
- Mean winter precipitation.

15.2.6. A range of possible pathways selected from the Intergovernmental Panel on Climate Change's Fifth Assessment Report [REF 15-6], have been used by UKCP18 [REF 15-5] to inform differing future emission trends. The four scenarios are RCP2.6, RCP4.5, RCP6.0 and RCP8.5.

15.2.7. Taking into account the expected design life of the Scheme, the RCP8.5 pathway has been applied to the location of the closest weather station to the Scheme (Bedford Weather Station).

15.2.8. **Table 15.1** summarises climate projections for the 2050s and 2080s time periods, with the results presented as anomalies relative to the 1981 - 2010 average.

Table 15.1: Summary of Climate Projections for the 2050s and 2080s Time Periods

Climate Variable		**2050s**	**2080s**
Mean winter air temperature anomaly at 1.5m (°C)	50%* probability (central estimate)	+1.7°C	+3.1°C
	Range	+0.5 to + 2.9°C	+1.1 to +5.1°C
Mean summer air temperature anomaly at 1.5m (°C)	50% probability (central estimate)	+2.5°C	+4.9°C
	Range	+1.0 to +4.1°C	+2.3 to +7.7°C
Winter precipitation rate anomaly (%)	50% probability (central estimate)	+10%	+21%
	Range	-4 to +26%	+1 to +46%
Summer precipitation rate anomaly (%)	50% probability (central estimate)	-21%	-34%
	Range	-45 to +3%	-64 to -3%
* 50% probability is consistent with the requirements of the NPSNN [REF 15-2]			

15.3. Potential Impacts

Construction

Greenhouse Gas Assessment

15.3.1. Potential impacts during construction of the Scheme are presented in **Table 15.2** and have been categorised in line with the Highways England carbon emissions calculation tool [REF 15-7] and guidance on lifecycle stages set out in PAS 2080:2016 [REF 15-8].

Table 15.2: Key Potential Greenhouse Gas Emissions Sources (Construction)

PAS 2080 Lifecycle Stage	Carbon Tool Reporting Category	Activity	Description of Emissions Source
Product phase	Embodied carbon in raw materials	Use of products and/or materials required to construct the Scheme.	Embodied GHG emissions in construction materials.
Construction process phase	Fuel, energy and water	Energy and water consumption used for the construction of the Scheme.	GHG emissions from grid electricity. GHG emissions from fuel consumed. GHG emissions from the provision of water and treatment of wastewater.
	Business and employee travel	Transportation of construction workers to the site.	GHG emissions arising from the fuel consumed for worker commuting.
	Waste and waste transport	Waste generated and transported during the construction phase.	Emissions arising from the transportation and treatment of waste.

Climate Change Resilience Assessment

15.3.2. During construction of the Scheme, construction phase receptors (i.e. workforce, plant, and machinery) may be vulnerable to a range of short term (2020s) climate risks. Potential impacts during the construction phase may include the following:

- Inaccessible construction site(s) due to severe weather events associated with flooding, snow and ice, and storms restricting working hours and delaying operations.
- Health and safety risks to the workforce during severe weather events.
- Increased frequency and severity of unsuitable conditions, for example due to very hot weather or very wet weather during construction activities involving laying pavement materials and the delivery of construction plant, thereby increasing the need to repeat certain works.
- Increased frequency and severity of damage to materials, plant and equipment, including damage to temporary buildings/facilities such as offices, compounds, material storage areas and worksites, temporary access, temporary bridges and haul routes.

Operation

Greenhouse Gas Assessment

15.3.3. Potential impacts likely during the operation, use and future maintenance stages of the Scheme, as set out in PAS 2080:2016 [REF 15-8], are presented in **Table 15.3**.

Table 15.3: Greenhouse Gas Emissions Impacts (Operation)

PAS 2080 Lifecycle Stage	Activity	Primary Emission Impacts
Operational	Operation of the associated road including lighting, overhead gantries etc.	GHG emissions from energy consumed (grid electricity and fuel).
Maintenance	Maintenance activities	Embodied emissions associated with maintenance activities (fuel) and embedded carbon in materials.
Use	Vehicles using the road	GHG emissions from vehicle fuel use.

Climate Change Resilience Assessment

15.3.4. Once operational, the Scheme has the potential to be impacted by a changing climate and, in particular, more frequent severe weather events in the medium to long term (2050s and 2080s respectively).

15.3.5. Potential impacts on the Scheme could occur during the operational phase on the following types of receptor:

- The highway assets and their operation, maintenance and refurbishment (i.e. pavements, structures, earthworks and drainage, technology assets, etc.).
- End-users (i.e. members of public, commercial operators etc.).

15.3.6. Potential impacts include the following:

- Material and asset deterioration due to high temperatures.
- Overheating of electrical equipment, for example information and communication systems.
- Health and safety risks to road users.
- Changes in travel patterns of network users.
- Longer vegetation growing seasons resulting in increased periods of tree fall and increased maintenance and management requirements.
- Damage to roads from periods of heavy rainfall.
- Flood risk (surface, groundwater, fluvial and snow/ice melt) on the network and damage to drainage systems, with the potential for increased runoff from adjacent land contributing to surface water flooding.
- Increased slope instability as a result of prolonged or heavy precipitation, leading to subsidence.
- Storm damage to structures.
- Inaccessibility of the network during severe weather events.

Future Maintenance

15.3.7. As the future maintenance and management of the Scheme forms an important part of the life cycle assessment of GHG emissions, the assessment will consider the impacts associated with this phase of the Scheme (as noted in the scope of potential operational impacts).

15.3.8. GHG emissions associated with the end of life stage of the Scheme will be scoped out of the assessment, on the basis that it is very unlikely that the Scheme would be decommissioned in the future (as it will become an integral part of nationally important infrastructure).

15.4. Design, Mitigation and Enhancement Measures

15.4.1. The scoping exercise has identified a requirement for mitigation measures to address climate impacts.

15.4.2. Through the design-development and assessment processes, mitigation measures will be incorporated into the design of the Scheme to reduce carbon emissions and provide climate change resilience. Example measures include:

- the incorporation of sustainable drainage systems to handle road runoff and provide resilience against potential future flood events associated with climate change;
- the use of energy efficient road lighting to reduce energy consumption; and
- the inclusion of new or diverted public rights of way to preserve and, where possible, improve connectivity and journeys for non-motorised users and thereby promote alternative modes of transport that do not generate GHG emissions.

15.4.3. A number of construction-based mitigation measures will be identified, which would be implemented by the contractor to reduce the impacts on GHG emissions during this phase of the Scheme. Example measures include:

- developing and implementing a management plan to reduce energy consumption and associated GHG emissions during construction;
- the recording and reporting of energy consumption and materials use during construction;
- implementing measures to manage material resources, such as using materials with lower embedded GHG emissions and recycled or secondary materials; and
- the sustainable reuse of soils and aggregates won from excavation and demolition activities, where feasible, to minimise GHG emissions associated with importation of materials.

15.4.4. Highways England will also commit to reducing carbon emissions from activity on its network by implementing the following mitigation hierarchy:

- Avoidance/prevention – to maximise potential for reusing and/or refurbishing existing assets.
- Reduction – through the application of low carbon solutions including technologies, materials and products to minimise resource consumption across the lifecycle of the project.
- Remediation – applied to further reduce carbon through on or off-site offsetting or sequestrations.

15.5. Description of the Likely Significant Effects

15.5.1. The scoping exercise has identified a likelihood of climate effects resulting from the construction, operation and future maintenance of the Scheme.

Greenhouse Gas Assessment

15.5.2. Based on the lifecycle stages presented in **Table 15.2** and **Table 15.3**, the scoping exercise has identified that the embodied carbon associated with materials use is likely to be the largest contributor to the carbon footprint of the Scheme, and therefore the largest source of GHG effects. This is because materials such as steel, concrete and bitumen can have high embodied carbon content, depending on the specifications used.

15.5.3. Effects are also predicted in relation to the transportation of materials, which are also likely to contribute to the carbon footprint of the Scheme.

15.5.4. When placing the likely GHG effects of the Scheme into the wider context of the UK Strategic Road Network (SRN), the length of the Scheme represents less than 0.1% of the 4,400 mile UK SRN [REF 15-9]. Based on the implementation of mitigation measures into the design of the Scheme, any increase in GHG emissions is expected to be minimal when considered in the national context. Furthermore, the five year carbon budgets and associated carbon reduction targets already allow for a proportion of carbon emissions resulting from the existing road network.

Climate Resilience Assessment

15.5.5. The scoping exercise has identified that climate resilience effects on the Scheme during the construction phase are unlikely to be significant due to the relatively short duration and nature of construction activities associated with the Scheme.

15.5.6. The scoping exercise has also identified that the Scheme may be vulnerable to a range of climate risks once operational and under maintenance, with hazards and disruption to the road network possible. Such effects may arise from more extreme temperature fluctuations, an increase in the frequency of storms, and the risk of flash flooding. With appropriate mitigation measures incorporated into the design, these effects are not likely to be significant.

In-combination Climate Change Impact Assessment

15.5.7. As the in-combination climate change impact assessment relies on an understanding of the effects of other topic assessments, it is not possible at the scoping stage to fully establish the likelihood or consequence of the combined effects of future climate change and those associated with the Scheme.

15.5.8. The climate assessment will take full account of any such interactions and their effects to determine their significance.

15.6. Assessment Methodology

Assessment Guidance

<u>Greenhouse Gas Assessment</u>

15.6.1. The scope of the GHG assessment will include GHG emissions arising from the construction and operation of the Scheme, to understand what additional emissions will arise as a result of the Scheme in additional to those already forecast.

15.6.2. The approach to calculating GHG emissions will be in line with the guidance set out in Interim Advice Note (IAN) 114/08: Highways Agency Carbon Calculation and Reporting Requirements [REF 15-10], which provides a methodology and guidance

on estimating the likely contribution from construction activities (also referred to as 'construction carbon') and maintenance/refurbishment activities.

15.6.3. The guidance and methodologies within IAN 114/08 [REF 15-10] are supplemented by use of Highways England's Carbon Reporting Tool [REF 15-7], which will also be referenced in the assessment. Both are in line with the World Business Council for Sustainable Development (WBCSD)/World Resources Institute (WRI) Greenhouse Gas Protocol guidelines [REF 15-11].

15.6.4. Data collection for input to the Carbon Reporting Tool [REF 15-7] will be based on the following set of standard data quality principles, detailed in the Protocol guidelines [REF 15-11]:

- Age – the GHG assessment will be based on activity data and GHG emissions factors applicable to the study period.
- Geography – activity data reflects the design of the Scheme. GHG emissions factors in the Carbon Tool are representative of the UK construction industry and UK transport sector.
- Technology – the default solution will be to apply data which is representative of the UK construction industry and transport sector.
- Methodology – activity data will be gathered directly from the Scheme's engineering and design teams to enable consistency and completeness of data collection.
- Competency – activity data will be generated by the engineering and design teams in line with applicable industry standards.

15.6.5. GHG emissions outputs from the Carbon Tool are reported as tonnes of carbon dioxide equivalent (tCO_2e), and consider the six Kyoto Protocol gases:

- Carbon dioxide (CO_2).
- Methane (CH_4).
- Nitrous oxide (N_2O).
- Sulphur hexafluoride (SF_6).
- Hydrofluorocarbons (HFCs).
- Perfluorocarbons (PFCs).

15.6.6. GHG emissions for construction and maintenance will be assessed within the Carbon Tool [REF 15-7] using a calculation-based methodology, as per the below equation:

- Activity data x GHG emissions factor = GHG emissions value

15.6.7. Road user emissions will be calculated using the regional assessment methodology provided in Design Manual for Roads and Bridges (DMRB) Volume 11, Section 3, Part 1: Air Quality [REF 15-12], which estimates the contribution from traffic on the road (also referred to as 'road user carbon').

15.6.8. The UK Government Strategy 'Road to Zero' [REF 15-13] sets out a route map for the UK to move towards cleaner road transportation. Although the uptake of lower carbon fuels, electric vehicles (EVs) and increased vehicle technology is not accounted for in the DMRB regional assessment methodology [REF 15-12], commentary will be provided on the potential impact on GHG emissions from the use of the Scheme due to these technological advances in the assessment.

15.6.9. As technological advances and the future decarbonisation of the grid may have an impact upon the GHG emissions associated with the operation of the Scheme, commentary will be provided on the impact of these changes as they are expected to beneficially reduce GHG emissions in the next 20 to 30 years.

15.6.10. Whilst the scope of the GHG assessment covers the lifecycle stages of the project, the assessment will comprise two parts reflecting both the level of certainty of future activity and GHG emissions, and the extent that the predicted GHG emissions would be additional to the existing GHG inventory.

15.6.11. The first part will consider the construction of the Scheme itself. The majority of these emissions will be additional to the existing National GHG inventory and will be compared to the relevant UK carbon budgets.

15.6.12. The second part will comprise the operation and use of the Scheme i.e. those emissions resulting from mechanical and electrical energy use. As at least part of the GHG emissions associated with the operation of the Scheme are expected to be displaced from other parts of the road network (e.g. road users), they are not considered additional to the UK GHG inventory. Identifying and quantifying the balance of what is additional versus displaced with any level of certainty is challenging; however, the operational GHG assessment will be developed on a scenario basis with quantification of two scenarios (to provide a range for the additional GHG emissions associated with the Scheme):

- The first scenario is a do-minimum scenario whereby the Scheme is not implemented.
- The second scenario is a do-something scenario, whereby the Scheme is progressed and the GHG emission reductions from any mitigation measures incorporated into its design are taken into account.

15.6.13. All GHG emissions would contribute to global climate change and can therefore be considered to have some level of significance. The UK has legally binding GHG reduction targets, and therefore the level of significance will consider how the Scheme would contribute to the National GHG inventory and the UK achieving its reduction targets. In addition, the Scheme's calculated emissions will be assessed against GHG emissions allocated for the UK transport sector within the UK's carbon budgets.

15.6.14. The significance of GHG effects will be assessed by comparing the estimated GHG emissions arising from the Scheme with the relevant UK carbon budgets, and the associated reduction targets, in line with the guidance contained in the NPSNN [REF 15-2]. This will compare GHG emissions for both the do-minimum and do-something scenarios in the year of opening of the Scheme, and a future year (2040) in line with DMRB guidance [REF 15-12].

15.6.15. Not all journeys made on the new dual carriageway will result in additional emissions to the associated carbon budget, as it is likely that a proportion of these journeys would have been made anyway via different routes.

Climate Resilience Assessment

15.6.16. The consideration of climate change adaptation within environmental impact assessments is an area of emerging practice, and currently there is no single prescribed format for undertaking such assessments. Therefore, the approach will follow new and emerging guidelines [REF 15-14] and good practice sourced from other similar studies.

15.6.17. The climate change resilience assessment will consider the strategic aims and objectives encompassed within the Government's, Highways England's and local planning strategy and policy, which has the overarching aim of minimising the adverse impacts of climate change whilst requiring new development to take climate change considerations into account within design. Accordingly, through the assessment, measures will be identified to improve the resilience of the Scheme to climate change.

15.6.18. A review of climate change resilience will be undertaken to identify potential climate change impacts, and to consider their potential consequence and likelihood of occurrence. The assessment will include all infrastructure and assets associated with the Scheme, and will assess resilience against both gradual climate change and the risks associated with an increased frequency of severe weather events, as per the UKCP18 climate change projections [REF 15-5].

15.6.19. The project lifetime is considered to include construction and operational stages, and is taken to be 60 years. With respect to the construction phase, as this is planned to occur over a much shorter period compared to the operation of the road and within the next 10 years, future climate change is less relevant and the assessment of potential impacts will follow a more descriptive approach.

15.6.20. For the operational assessment, the likelihood and consequence of impacts and effects on receptors will be assessed based on a future time frame of operation (2080s).

15.6.21. Criteria for the measure of likelihood and consequence of impact to be applied in the assessment are outlined in **Table 15.4** and **Table 15.5**.

Table 15.4: Measure of Likelihood

Likelihood Category	Description (probability and frequency of occurrence)
Very high	The event occurs multiple times during the lifetime of the project (60 years) e.g. approximately annually, typically 60 events.
High	The event occurs several times during the lifetime of the project (60 years) e.g. approximately once every five years, typically 12 events.
Medium	The event occurs limited times during the lifetime of the project (60 years) e.g. approximately once every 15 years, typically 4 events.
Low	The event occurs during the lifetime of the project (60 years) e.g. once in 60 years.
Very low	The event may occur once during the lifetime of the project (60 years).
The event is defined as the climate event (such as heatwave) and the hazard (such as overheated electrical equipment) occurring in combination.	

Table 15.5: Measure of Consequence of Impact

Consequence of Impact	Description
Very large adverse	National level (or greater) disruption to strategic route(s) lasting more than 1 week.
Large adverse	National level disruption to strategic route(s) lasting more than 1 day but less than 1 week OR Regional level disruption to strategic route(s) lasting more than 1 week.
Moderate adverse	Regional level disruption to strategic route(s) lasting more than 1 day but less than 1 week.
Minor adverse	Regional level disruption to strategic route(s) lasting less than 1 day.
Negligible	Operational Phase: disruption to an isolated section of a strategic route lasting less than 1 day.

15.6.22. The identification of the likely significant effects on receptors will be undertaken using professional judgement, and will involve the combination of measure of likelihood with the predicted consequence of impact, as shown in **Table 15.6**.

Table 15.6: Significance Measure

		Measure of Likelihood				
		Very Low	**Low**	**Medium**	**High**	**Very High**
Measure of Consequence	**Negligible**	NS	NS	NS	NS	NS
	Minor Adverse	NS	NS	NS	S	S
	Moderate Adverse	NS	NS	S	S	S
	Large Adverse	NS	S	S	S	S
	Very Large Adverse	NS	S	S	S	S
S = Significant **NS = Not Significant**						

In-combination Climate Change Impact Assessment

15.6.23. Projected changes to average climatic conditions, as a result of climate change, and an increased frequency and severity of extreme weather events have the potential to impact the ability of the surrounding natural environment to adapt to climate change.

15.6.24. Accordingly, an in-combination climate impact assessment will be undertaken to evaluate the combined impacts of future climate change and the Scheme on identified receptors.

15.6.25. UKCP18 projections [REF 15-5] for temperature and precipitation variables will be analysed to identify potential climate hazards that may impact receptors; these hazards may include increased average temperatures, more frequent and heavier precipitation events, and an increase in the frequency of severe storms.

15.6.26. The likelihood of climate hazards leading to an in-combination impact will consider both the likelihood of an impact occurring (for example contaminant soil exposure due to ground movements) and the confidence levels associated with the change in climate hazard within the timescale (for example intense rainfall would increase contaminant soil migration).

15.6.27. Likelihood will be defined using the criteria outlined in **Table 15.7**, which consider the UKCP18 projections [REF 15-5] and professional judgement.

Table 15.7: Likelihood Criteria for In-combination Impacts

Likelihood of Impact Occurring	Confidence of Climate Hazard Occurring	
	Low	High
Low	Low	Medium
High	Medium	High

15.6.28. The consequence of in-combination impacts will evaluate the change to the significance of the effect of the Scheme on the resource or receptor for each relevant environmental topic, taking into account any mitigation measures detailed in the relevant topic assessment, as shown in **Table 15.8**.

Table 15.8: Consequence Criteria for In-combination Impacts

Consequence	Consequence Criteria
High	The climate change parameter in-combination with the effect of the Scheme causes the significance of the effect of the Scheme on the resource/receptor, as defined by the topic, to increase from moderate to major.
Medium	The climate change parameter in-combination with the effect of the Scheme causes the significance of the effect of the Scheme on the resource/receptor, as defined by the topic, to increase from low to moderate.
Low	The climate change parameter in-combination with the effect of the Scheme causes the significance of the effect of the Scheme on the resource/receptor, as defined by the topic, to increase from negligible to low.
Very Low	The climate change parameter in combination with the effect of the Scheme does not impact the significance of the effect of the Scheme on the resource/receptor, as defined by the topic.

15.6.29. The significance of effects will be determined by combining likelihood and consequence, as shown in **Table 15.9**.

Table 15.9: Significance Criteria for In-combination Effects

Consequence	Likelihood		
	Low	Medium	High
Very Low	Negligible	Negligible	Minor
Low	Negligible	Minor	Moderate
Medium	Minor	Moderate	Major
High	Moderate	Major	Major

Policy Requirements

15.6.30. The NPSNN [REF 15-2] sets out how climate change should be taken into account when developing highway infrastructure, and requires evidence of the carbon impact of projects and an assessment against the Government's carbon budgets to be provided. It also notes that evidence of mitigation is required.

15.6.31. In relation to the effects of the Scheme on the ability of the UK to meet its binding GHG reduction targets, the NPSNN [REF 15-2] acknowledges that the impact of a single highway development is unlikely to affect this. Notwithstanding this, as the

UK's trajectory to this overall target is defined by a series of five year carbon budgets, the GHG impact of the Scheme will be considered against these budgets.

15.6.32. The potential impacts of climate change will be considered as part of the assessment, with appropriate mitigation identified through the design-development process in relation to the planning, location, design, build and operation of the Scheme.

Study Area

Greenhouse Gas Assessment

15.6.33. The GHG assessment study area will cover all direct GHG emissions likely to arise from activities undertaken within the Development Consent Order (DCO) site boundary associated with construction and operation of the Scheme. It will also consider indirect emissions embedded within construction materials arising as a result of the energy used for their extraction and production, as well as emissions arising from the transportation of materials, waste and construction workers to and from the site.

15.6.34. The GHG study area for construction phase will cover the area of construction works falling within the DCO site boundary, and the GHG study area for the operational phase will include both direct emissions arising from energy use within the Scheme boundary and emissions from road users.

Climate Change Assessment

15.6.35. The climate resilience assessment study area will comprise the DCO site boundary, which captures all highway assets and infrastructure associated with the Scheme (including all temporary works).

In-combination Climate Change Assessment

15.6.36. The in-combination climate assessment study area will reflect the study areas adopted within the individual environmental topic assessments, where in-combination climate change impacts are predicted to occur.

Information Sources

15.6.37. The information sources referenced as part of the scoping exercise will continue to be used as part of the climate assessment.

15.6.38. To assess the GHG emissions arising from the construction and operation of the Scheme, the lifecycle assessment approach will be undertaken using information relating to the design of the Scheme and the planned approach to its construction. This will include information on energy use, types and quantities of materials used and waste generated, which will be used to calculate the associated carbon emissions from their production and transportation to site. Available transportation data will also be referenced in the GHG assessment.

15.6.39. The outcomes of assessments for topics including air quality, material assets and waste, and road drainage and the water environment will be referenced as part of the in-combination climate change assessment.

Consultation

15.6.40. Consultation will be undertaken with the Environment Agency and the relevant local authorities to agree data sets to be used in the GHG assessment and to obtain UKCP18 climate change projection data.

15.7. Assessment Assumptions and Limitations

15.7.1. Scoping has been undertaken using information and data contained in tools and databases held and maintained by third parties, which for the purposes of the scoping exercise are assumed to be up to date and appropriate for use.

15.7.2. Greenhouse gas emissions from the end of life stage of the Scheme have been scoped out of the assessment, due to its anticipated operational timeframe.

16. ASSESSMENT OF CUMULATIVE EFFECTS

16.1. Cumulative Assessment Methodology

Scope of the Assessment

16.1.1. The requirement to consider cumulative effects is set out in Schedule 4 of the EIA Regulations [REF 16-1].

16.1.2. The NPSNN [REF 16-2] acknowledges this requirement, and states in paragraph 4.16 that when considering significant cumulative effects, the Environmental Statement should provide information on how the effects of the applicant's proposal would combine and interact with the effects of other development (including projects for which consent has been granted, as well as those already in existence).

16.1.3. Accordingly, the cumulative effects assessment of the Scheme will consider the following types of effect:

- **Combined Effects**: these effects derive from combinations of Scheme-specific impacts which, when acting together, would result in a new or different likely significant effect or an effect of greater significance that one impact would result in when considered in isolation.
- **Cumulative Effects**: these effects derive from Scheme-specific impacts which, when considered together with the impacts of other planned developments, could result in a new or different likely significant effect or an effect of greater significance than the Scheme's effect when considered in isolation.

Assessment Guidance

16.1.4. In conjunction with professional judgement, the following guidance will be used to inform the scope of the combined and cumulative effects assessments, and to assist the identification and mitigation of likely significant effects:

- Design Manual for Roads and Bridges (DMRB) Volume 11, Section 2, Part 5: Assessment and Management of Environmental Effects [REF 16-3]: This guidance will be used to inform the development of criteria to be applied within the assessment of combined and cumulative effects.
- Cumulative Effects Assessment – Advice note seventeen: Cumulative effects assessment relevant to nationally significant infrastructure projects [REF 16-4]: This guidance will be applied when undertaking a staged process of identification and assessment of other planned developments within the assessment of cumulative effects.

16.1.5. The application of this guidance [REF 16-3, REF 16-4] will build on the overarching EIA methodology and guidance presented in Chapter 5.

Assessment Criteria

16.1.6. The significance of both combined and cumulative effects will be determined in accordance with the criteria set out in **Table 16.1**, which draws upon the guidance presented within DMRB Volume 11 [REF 16-3].

Table 16.1: Combine and Cumulative Effects Significance Criteria

Significance Category	Typical Descriptors of Effect
Very large (typically adverse only)	Where the combined impacts of the Scheme or cumulative impacts of the Scheme in association with other development upon an individual or collection of environmental receptors would be very highly significant (positive or negative). Effects would be permanent for receptors of very high value.
Large (adverse or beneficial)	Where the combined impacts of the Scheme or cumulative impacts of the Scheme in association with other development upon an individual or collection of environmental receptors would be highly significant (positive or negative). Effects would be: • Widespread/large scale for a receptor of high value • permanent for a receptor or receptors of high value; • localised for a receptor or receptors of very high value; or • temporary for a receptor or receptors of very high value.
Moderate (adverse or beneficial)	Where the combined impacts of the Scheme or cumulative impacts of the Scheme in association with other development upon an individual or collection of environmental receptors would be significant (positive or negative). Effects would be: • permanent for a receptor or receptors of medium value; • localised for a receptor or receptors of high value; or • temporary for a receptor or receptors of high value.
Slight (adverse or beneficial)	Where the combined impacts of the Scheme or cumulative impacts of the Scheme in association with other development upon an individual or collection of environmental receptors would be noteworthy but not significant (positive or negative). Effects would be: • permanent for receptors of low value; • localised for a receptor or receptors of medium value; or • temporary for a receptor or receptors of medium value.
Neutral	Where the combined impacts of the Scheme or cumulative impacts of the Scheme in association with other development upon an individual or collection of environmental receptors would be negligible and not significant (positive or negative).

16.1.7. Within the assessment, the value (or sensitivity) of receptors will be based on the highest rating within the relevant environmental topic assessments. For example, if a receptor is high value for landscape and moderate value for noise, the assessment will deem this to be of high value for the purposes of the combined effects assessment.

16.1.8. Combined and cumulative effects that are of moderate, large or very large significance will be deemed to be significant effects in the context of the EIA Regulations [REF 16-1].

Traffic-related Effects

16.1.9. A traffic model covering the locality associated with the strategic and local road network has been developed by Highways England to forecast future traffic flows, both with and without the Scheme.

16.1.10. The traffic model is currently being refined in parallel with the design-development of the Scheme. The traffic model takes account of the influence that other development projects in the region of the Scheme are predicted to have on future traffic flows, these being developments for which their implementation is ‘near certain’ or ‘more than likely’.

16.1.11. The following assessments will rely, either wholly or in part, on the forecasts derived from the traffic model for the Do Minimum scenario – this being representative of the conditions that would exist at a given point in the future without the Scheme in place, but accounting for other development projects being implemented:

- Air Quality.
- Noise and Vibration.
- Population and Health (as part of the calculations of driver stress and traffic-related severance).
- Road Drainage and the Water Environment (as part of the calculations of road runoff and accidental spillages).

16.1.12. As the influence of other development projects will form an inherent part of the traffic forecasts upon which the assessments of the Scheme's effects within these topics will be based, by default the cumulative effects will be included and reported within their operational assessments. This will also apply to the conclusions drawn in other topics where there is a reliance on the findings and results of these particular assessments.

Limitations and Assumptions

16.1.13. Limitations and assumptions identified during the scoping of the cumulative effects assessment are described as part of the general assumptions and limitations presented in Chapter 5.

Initial Screening of Other Development Projects and Allocations

16.1.14. As part of the scoping exercise, a preliminary review has been undertaken to identify other development projects and development plan allocations that are likely to require consideration within the cumulative effects assessment, or which may influence the future baseline conditions within which the Scheme would be implemented. The form and location of these proposals are described as part of the summary of 'development land' presented in Chapter 2 and Chapter 11.

16.1.15. A detailed review of other development projects and allocations will be undertaken as part of the EIA process, following the methodology and guidance presented within Section 16.3.

16.2. Assessment of Combined Effects

16.2.1. The assessment of combined effects will consider whether an individual environmental receptor or resource would likely be affected by more than one type of impact as a result of the construction and operation of the Scheme. For example, a residential occupant could be exposed to noise and air quality impacts at the same time as a result of earth moving activities during the construction phase.

16.2.2. The assessment methodology will involve the identification of impact interactions associated with the Scheme upon separate environmental receptors and resources, in order to understand the overall environmental effect of the Scheme.

16.2.3. Potential interactions will be identified by reviewing the topic conclusions within the environmental assessment topics identified within Chapters 6 – 15, in order to establish where individual impacts may combine and result in likely significant effects.

16.2.4. The significance of combined effects upon environmental receptors and resources will be determined using professional judgement, with input provided by from those responsible for the production of the individual environmental assessments.

16.3. Assessment of Cumulative Effects

16.3.1. The assessment of cumulative effects will consider the effects on environmental receptors and resources that would likely occur from the incremental changes arising from construction and operation of the Scheme in conjunction with other planned developments. For example, a public right of way user could have the amenity of their existing view reduced as a result of both the Scheme and another development emerging as new, visually conspicuous elements in their outlook.

16.3.2. The assessment of cumulative effects will be guided by the following considerations:

- Understanding the temporal and spatial limits of the effects associated with the Scheme and those of other planned developments.
- The sensitivity, value or importance of environmental receptors and resources, and their susceptibility to effects.
- Whether different types of effect would occur and interact in a way that alters their significance.
- Whether effects would be temporary or permanent in duration, what their timescales would be, and whether the frequency of such effects would be intermittent or constant.
- The degree of certainty and confidence relating to the effects.

16.3.3. In accordance with the approach contained within Advice note seventeen [REF 16-4], the following tasks will be undertaken within the cumulative assessment.

Stage 1

16.3.4. This stage will involve establishing the Scheme's Zones of Influence (ZoI) associated with the topic areas assessed, within which a long list of other planned developments and development allocations will be identified.

16.3.5. The following distances are proposed to be adopted in Stage 1:

- Largest topic ZoI + 1km buffer – to be applied when searching for other planned developments and development allocations associated with relevant local authorities.
- Largest topic ZoI + 3km buffer – to be applied when searching for Nationally Significant Infrastructure Projects, and highway developments proposed to be implemented on the strategic road network.

16.3.6. The search will commence with the identification of all transport infrastructure, developments and allocations included within the traffic model that are considered to be 'near certain' or 'more than likely' to be implemented in the future.

16.3.7. For planned developments and allocations not included within the traffic model, for example those which may come forward or have a change in status after completion of the modelling, the following search criteria will be applied:

- Planning applications that are considered to be 'major developments' i.e.:
  - Employment proposals of a size 1000m^2 or greater.
  - Residential proposals with ten or more houses or, where the number of houses is not known, a site area of 0.5ha or greater.
  - Minerals or waste sites with an area of 1ha or greater.
  - Transport infrastructure proposals with an area of 1ha or greater.

- Development Consent Order applications for Nationally Significant Infrastructure Projects.
- Any major development projects being progressed through other statutory procedures, for example Hybrid Bills.

16.3.8. Each development within the long list will be reviewed to determine its status at the time of undertaking the assessment, and will be assigned a status (or tier). This will be informed, for example, by feedback from relevant local authorities and information published on their online planning portals, in order to establish the level of certainty and detail available for these developments.

Stage 2

16.3.9. This stage will involve a review of the long list of planned developments, in order to identify those to be taken forward into the cumulative effects assessment.

16.3.10. In determining which of the developments should be shortlisted for consideration in the assessment, a minimum level of information will be necessary. It is proposed that only those developments with at least a Scoping Report or Environmental Assessment Report (or similar) available shall be considered for shortlisting. A level of certainty will be applied using a tiered approach, in accordance with the guidance and levels presented within Advice note seventeen [REF 16-4].

16.3.11. Developments and projects that are already in existence i.e. those which are completed and operational, shall be considered to form part of the environmental baseline conditions within which the Scheme would be implemented. Similarly where other projects are expected to be completed prior to Scheme construction, and where the effects of those projects are fully determined these will also be considered within the environmental baseline.

16.3.12. Developments will be shortlisted for Stage 3 if a sufficient amount of environmental information is available to allow a meaningful cumulative effects assessment to be conducted, and the development project or allocation is considered to have enough certainty to justify its inclusion.

Stage 3

16.3.13. This stage will involve reviewing the available information relating to the shortlisted developments, in order to establish the details of their likely environmental effects. This is expected to include, but not be limited to, the following:

- The location and boundary of the development project or allocation.
- Design information, for example elevation drawings and layout plans.
- Programmes for construction, operation and decommissioning and temporal (timescale) overlaps.
- Baseline information relating to environmental receptors and resources.
- Details of potential or likely significant effects.
- The ZoI of environmental topics assessed.

Stage 4

16.3.14. Those developments which meet the inclusion criteria set out in the above stages shall be incorporated into the cumulative effects assessment, which will involve identifying where effects are likely to occur and assessing the significance of those effects on environmental receptors and resources, taking into account any mitigation measures.

17. SUMMARY

17.1. Summary of Assessment Scope

17.1.1. Based on the outcomes of the scoping exercise, **Table 17.1** summarises the environmental topics scoped into the Environmental Impact Assessment (EIA) and the level of assessment that will be undertaken for each.

Table 17.1: Topics Scoped Into the Environmental Impact Assessment

Environmental Impact Assessment Topic	Scoping Report Chapter Reference	Level of Assessment
Air Quality	Ch. 6	This topic has been scoped into the EIA and a detailed assessment will be undertaken and reported within the Environmental Statement, due to the likelihood of significant environmental effects occurring as a result of the Scheme in relation to the following: • Effects on sensitive receptors within 200m from the DCO site boundary from construction activities, vehicle movements and plant emissions during construction of the Scheme. • Effects on sensitive receptors from local changes in NO_2 concentrations as a result of the operation of the Scheme, and possible changes to regional air quality for NO_2, PM_{10} and CO_2.
Cultural Heritage	Ch. 7	This topic has been scoped into the EIA and a detailed assessment will be undertaken and reported within the Environmental Statement, due to the likelihood of significant environmental effects occurring as a result of the Scheme in relation to the following: • The loss of a Grade II listed building and milestone. • Effects on recorded assets such as cropmarks, ditches and a medieval green. • Physical effects on a scheduled monument. • Changes to the setting of scheduled monuments, listed buildings and other heritage assets. • Potential effects on buried (unknown) archaeology.

Environmental Impact Assessment Topic	Scoping Report Chapter Reference	Level of Assessment
Biodiversity	Ch. 8	This topic has been scoped into the EIA and a detailed assessment will be undertaken and reported within the Environmental Statement, due to the likelihood of significant environmental effects occurring as a result of the Scheme in relation to the following: • Indirect effects during construction on two county wildlife sites and a protected road verge, and indirect effects on these and potentially other non-statutorily designated sites during the operational phase. • Direct loss of habitats of varying importance, including those associated with watercourses such as the River Great Ouse and those identified in local Biodiversity Action Plans during construction. • Effects on habitats during operation of the Scheme, for example from vehicle emissions and alterations to the hydrology of watercourses. • Direct and indirect effects on species, for example through landtake during construction and disturbance associated with the use of road lighting once the Scheme is operational.
Landscape	Ch. 9	This topic has been scoped into the EIA and a detailed assessment will be undertaken and reported within the Environmental Statement, due to the likelihood of significant environmental effects occurring as a result of the Scheme in relation to the following: • Temporary effects on landscape character areas during construction, which may affect the setting of important features such as the River Great Ouse and historic landscape features. • Visual intrusion during construction associated with temporary infrastructure and activity featuring in existing views from a range of sensitive receptors such as residential dwellings and public rights of way. • Long term changes to landscape character and the visual environment from the permanent presence and operation of the Scheme and its associated traffic, the loss of character-forming elements and trees protected by Tree Preservation Order, and the introduction of new points of focus (for example road lighting) into existing views. • Beneficial effects on the setting of Croxton Park from the reassignment of traffic away from the existing A428, and from improvements to recreational routes which will enhance accessibility through the landscape.

Environmental Impact Assessment Topic	Scoping Report Chapter Reference	Level of Assessment
Noise and Vibration	Ch. 10	This topic has been scoped into the EIA and a detailed assessment will be undertaken and reported within the Environmental Statement, due to the likelihood of significant environmental effects occurring as a result of the Scheme in relation to the following: • Temporary effects associated with changes in noise and vibration levels during construction of the Scheme at noise sensitive receptors. • Long term effects associated with changes in noise and vibration levels during operation of the Scheme, principally relating to changes in traffic flows in proximity to noise sensitive receptors.
Population and Heath	Ch. 11	This topic has been scoped into the EIA and a detailed assessment will be undertaken and reported within the Environmental Statement, due to the likelihood of significant environmental effects occurring as a result of the Scheme in relation to the following: • Adverse and beneficial effects on motorised travellers in relation to changes in driver stress, views from the road and traffic-related severance, during both construction and operation of the Scheme. • Adverse and beneficial effects on non-motorised users during construction and operation of the Scheme, associated with changes to existing journey patterns and movements between community facilities. • Adverse effects relating to the loss of agricultural soils and farm/business viability due to landtake and severance, and through the demolition of private property. • Adverse effects relating to the loss or severance of land identified for future development. • Adverse and beneficial effects on human health as a consequence of changes in, for example, traffic flows, noise, vibration, air quality, emissions, waste and accessibility.
Road Drainage and the Water Environment	Ch. 12	This topic has been scoped into the EIA and a detailed assessment will be undertaken and reported within the Environmental Statement, due to the likelihood of significant environmental effects occurring as a result of the Scheme in relation to the following: • Effects on surface water and groundwater quality, watercourse morphology, and changes to flood risk as a result of construction and operation of the Scheme.

Environmental Impact Assessment Topic	Scoping Report Chapter Reference	Level of Assessment
Geology and Soils	Ch. 13	This topic has been scoped into the EIA and a simple assessment will be undertaken and reported within the Environmental Statement, due to the limited likelihood of significant effects occurring as a result of the Scheme. Such effects on geological and soils resources are likely to be associated with the movement of earth and material, dewatering activities, and the potential removal or remediation of contaminated soils. *Note: Should potential be identified through the assessment process for significant effects to occur as a result of the Scheme, a detailed assessment will be undertaken.*
Material Assets and Waste	Ch. 14	This topic has been scoped into the EIA and a detailed assessment will be undertaken and reported within the Environmental Statement, due to the likelihood of significant environmental effects occurring as a result of the Scheme in relation to the following: • Construction activities such as demolition, clearance, remediation and earthworks which could lead to effects associated with the use of materials and the reuse or disposal of waste arisings.
Climate	Ch. 15	This topic has been scoped into the EIA and an assessment will be undertaken and reported within the Environmental Statement in relation to the following: • Contributions to the carbon footprint of the Scheme associated with the transportation of materials and embodied carbon contained within materials such as steel and bitumen. • The vulnerability of the Scheme to climate risks once operational and under maintenance. • Combined impacts on climate change associated with other related environmental topics. *Note: No guidance is available within Volume 11 of the Design Manual for Roads and Bridges [REF 17-1] in relation to the topic of climate or what constitutes a simple or detailed assessment. Accordingly, the assessment will be progressed to a level of detail sufficient to identify the climate effects of the Scheme and evaluate their significance.*

Environmental Impact Assessment Topic	Scoping Report Chapter Reference	Level of Assessment
Cumulative Effects	Ch. 16	This topic has been scoped into the EIA and an assessment will be undertaken and reported within the Environmental Statement in relation to the following: • The combined effects of the Scheme on environmental resources and receptors, for example an ecological receptor which may be subjected to noise and dust deposition during construction. • The cumulative effects of the Scheme, when considered together with the impacts and effects of other planned development projects. *Note: This assessment will be progressed to a level of detail sufficient to identify the combined and cumulative effects of the Scheme (when considered in isolation and with other developments) and evaluate their significance.*

17.1.2. The scoping exercise has concluded that heat and radiation are not relevant matters requiring consideration in the EIA given that the form and nature of the Scheme was such that these emissions will not occur (see Chapter 5). Accordingly, these matters will be scoped out of the EIA.

17.1.3. A screening exercise has been undertaken to identify whether the Scheme will be vulnerable to risks associated with major accidents and disasters (see Appendix 5.1), and whether these could potentially result in any change to the effects that will be identified and reported within other topics scoped into the EIA. This has concluded that the vulnerability of the Scheme to such events will be low, and that the Scheme will not be a contributing factor to causing or exacerbating these types of event. Accordingly, the topic of major accidents and disasters will be scoped out of the EIA.

17.1.4. A screening exercise has been undertaken to identify whether the Scheme will result in transboundary effects on other European Economic Area (EEA) States (see Appendix 5.2). This has concluded no significant potential for transboundary effects to occur, this being attributed to factors such as the characteristics of the Scheme, the geographical area of which effects would be confined, and the intervening distance to the nearest EEA States. Accordingly, transboundary effects will be scoped out of the EIA.

17.1.5. The scope of the EIA will be refined as necessary, following the receipt and review of the Inspectorate's formal Scoping Opinion.

18. REFERENCES AND GLOSSARY

18.1. References

18.1.1. **Table 18.1** lists the documents and information sources referenced within this Scoping Report.

Table 18.1: References Used in the Scoping Report

Number	Reference
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18.2. Glossary

18.2.1. **Table 18.2** provides definitions for terminology and abbreviations used within this Scoping Report.

Table 18.2: Terms Used in the Scoping Report

Term	Abbreviation or Acronym	Definition
A		
Above Ordnance Datum	AOD	Above the mean sea level at Newlyn in Cornwall calculated between 1915 and 1921, taken as a reference point for the height data on Ordnance Survey maps.
Accommodation works		Works undertaken to accommodate the needs of land owners affected by a development project, such as the provision of new means of access, fencing and walls.
AddressBase data		An Ordnance Survey data product which enables property information to be linked to addresses on a map.
Affected Road Network		Parts of the road network which are identified as likely to be affected by changes in air quality as a result of a development project.
Aggregate		Granular material (e.g. sand and gravel or crushed rock) that can be used for building and/or civil engineering purposes (e.g. for concrete production).
Agricultural Land Classification	ALC	The system devised and introduced by the Ministry of Agriculture, Fisheries and Food to classify agricultural land according to the extent to which its physical or chemical characteristics impose long-term limitations on agricultural use. Land is graded between 1 (excellent quality) to 5 (very poor quality), with grade 3 subdivided into agricultural subgrades 3a and 3b.
Air Quality Action Plan		A plan that must be compiled by a local authority if they declare an air quality management area.
Air Quality Dispersion Modelling System	ADMS	An advanced dispersion model used to model the air quality impact of projects.
Air quality exceedance		Where pollutant concentrations exceed an air quality standard.
Air quality limit value		A maximum pollutant concentration to be achieved in the atmosphere, either without exception or with a permitted number of exceedances. Limit values are defined in European Union Directives and implemented in United Kingdom legislation.
Air Quality Management Area	AQMA	If a local authority identifies any locations within its boundaries where the air quality objectives are not likely to be achieved, it must declare the area as an air quality management area. The local authority is subsequently required to put together a local air quality action plan.
Air quality objective		Objectives are policy targets generally expressed as a maximum ambient pollutant concentration to be achieved. The objectives are set out in the UK Government's Air Quality Strategy for the key air pollutants.

Term	Abbreviation or Acronym	Definition
Air Quality Standard	AQS	Concentrations recorded over a given time period, which are considered to be acceptable in terms of what is scientifically known about the effects of each pollutant on health and on the environment. They can also be used as a benchmark to indicate whether air pollution is getting better or worse.
Alluvial deposits		Natural materials deposited within and adjacent to rivers.
Ambient noise		A sound that is totally encompassing in a given situation at a given time usually composed of sound from many sources near and far.
Amenity		The benefits of enjoyment and well-being which are gained from a resource in line with its intended function. Amenity may be affected by a combination of factors such as: sound, noise and vibration; dust/air quality; traffic/congestion; and visual impacts.
Ancient woodland		Land that has been continually wooded since at least the year 1600AD.
Anno Domini	AD	The term used to describe a division of time that falls within the Christian era.
Annual Average Daily Traffic	AADT	The total volume of vehicle traffic on a road flowing past a certain point over a year, divided by 365 days.
Annual Average Weekday Traffic	AAWT	The average 24-hour traffic volume occurring on weekdays throughout a full year.
Annual Exceedance Probability	AEP	Flood frequency is expressed in terms of an annual exceedance probability, which is the inverse of the annual maximum return period. For example, the 100-year flood (a flood likely to occur once every 100 years) can be expressed as the 1% AEP flood, which has a 1% chance of being exceeded in any year.
Aquifer		An underground layer of water-bearing permeable rock, rock fractures or unconsolidated materials (gravel, sand or silt).
Area of Outstanding Natural Beauty	AONB	Land protected by the Countryside and Rights of Way Act 2000. It protects the land to conserve and enhance its natural beauty.
A-Road		A type of road prefixed with the letter 'A'. These are the busiest and most direct main roads, apart from motorways, and can be of different standard.
Assemblage		A group of species found in the same location.
At-grade		On the same level. For example, when a road is on the current ground level.
B		
Barrow (bowl)		A type of burial mound.
Baseline conditions		The environment as it appears (or would appear) immediately prior to the implementation of the project together with any known or foreseeable future changes that will take place before completion of the project.
Basic Noise Level	BNL	A measure of source noise at a reference distance of 10m from the nearside carriageway edge.
Bedrock		Rock that underlies loose deposits such as soil or alluvium.

Term	Abbreviation or Acronym	Definition
Best and most versatile (land)		Land defined as grades 1, 2 and 3a of the Agricultural Land Classification. This land is considered the most flexible, productive and efficient and is most capable of delivering crops for food and non-food uses.
Biodiversity		The variety of life in the world or in a particular habitat or ecosystem.
Biodiversity Action Plan	BAP	A plan that identifies threatened species and habitats and seeks to protect and restore biological systems.
Biodiversity offsetting		A system used predominantly by planning authorities and developers to fully compensate for biodiversity impacts associated with economic development, through the planning process. In some circumstances, biodiversity offsets are designed to result in an overall biodiversity gain.
Borehole		A hole bored into the ground, usually as part of investigations, typically to test the depth and quality of soil, rock and groundwater. A borehole can also be used to dewater the ground.
Bridleway		A path or track along which horse riders have a right of way.
British Geological Survey	BGS	A body which aims to advance geoscientific knowledge of the United Kingdom landmass and its continental shelf by means of systematic surveying, monitoring and research
British Standard	BS	Standard produced by the British Standards Institution.
British Standards Institution		A group which produces British Standards across industry sectors and which is formally designated as the National Standards Body for the UK.
B-road		Numbered distributor roads that have lower traffic densities than trunk roads or A-roads.
Buffer		Specified area or distance surrounding a site or feature of interest.
Built heritage		A structure or building of historic value. These structures are visible above ground level.
Bund		An embankment which acts as a visual or noise screen, or acts as a barrier to control the spillage of fluids.
Buried archaeology (or buried heritage)		An archaeological asset beneath ground level, which may include earthworks.
Bypass		The diversion of a major road to carry traffic around a built up area, constructed to improve the journey of through traffic and/or improve the environmental conditions along the original route.
Byway		A track, often rural, which is too small to be called a road but which may be open to use by all vehicular traffic or have restrictions on use by non-mechanically propelled vehicles.
C		
Calculation of Road Traffic Noise	CRTN	A technical memorandum that describes the procedures for calculating noise from road traffic.
Campaign to Protect Rural England's	CPRE	A charity organisation set up to prevent urban sprawl and ribbon development by lobbying the public and all levels of the government.

Term	Abbreviation or Acronym	Definition
Carbon footprint		The total greenhouse gas emissions associated with a particular policy or development.
Carbon monoxide		A pollutant gas generated by combustion sources. At very high concentrations it can be a dangerous asphyxiant.
Carriageway		The width of a highway that can be used by motorised vehicles and non-motorised users, formed by a number of lanes.
Catchment		A drainage/basin area within which precipitation drains into a river system and eventually into the sea.
Chartered Institute of Ecology and Environmental Management	CIEEM	The leading professional membership body representing and supporting ecologists and environmental managers in the UK, Ireland and abroad.
Clay		An inorganic component of soil derived from the weathering of rock and comprising particles less than 0.002mm in equivalent diameter.
Climate		The climate can be described simply as the 'average weather', typically looked at over a period of 30 years. It can include temperature, rainfall, snow cover, or any other weather characteristic.
Climate change		This refers to a change in the state of the climate, which can be identified by changes in average climate characteristics which persist for an extended period, typically decades or longer.
Closed Circuit Television	CCTV	A TV system in which signals are not publicly distributed but are monitored, primarily for surveillance and security purposes.
Combined effect		A type of cumulative effect which occurs when different types of activity combine to have an effect on a specific receptor or resource.
Community facilities		Facilities designed for the use and benefit to the local population.
Compensation (environmental)		Mitigation measures applied where nothing can be done to reduce an environmental impact or effect. An example is habitat and species relocation.
Conceptual site model	CSM	The conceptual site model is a written and/or illustrative representation of the physical, chemical and biological processes that control the transport, migration and actual/potential impacts of contamination (in soil, air, ground water, surface water and/or sediments) to human and/or ecological receptors.
Congestion		A situation where the volume of traffic is too great for the road, causing vehicles to slow down or stop, often caused by bottlenecks, traffic incidents and junction design.
Connectivity		A measure of the availability of the habitats needed for a particular species to move through a given area.
Conservation area		An area designated under section 69 of the Planning (Listed Buildings and Conservation Areas) Act 1990 as being of special architectural or historic interest and with a character or appearance which is desirable to preserve or enhance.

Term	Abbreviation or Acronym	Definition
Conservation status		The state of a species or habitat including for example, extent, abundance, distribution and their trends.
Construction and Demolition Waste	CDW	Waste debris arising from the destruction of buildings or hard infrastructure. The debris varies from insulation, electrical wiring, rebar, wood, concrete, and bricks. It also may contain lead, asbestos or different hazardous materials.
Construction compound		Construction compounds will generally act as the points of entry to the worksites from the public highway. They may also be used for major stockpiling of materials such as top soil, and to facilitate transfer of materials to and from the site.
Construction Environmental Management Plan	CEMP	A plan prepared by a contractor which sets out how a construction project will avoid, minimise or mitigate effects on the environment and surrounding area and the protocols to be followed in implementing these measures, in accordance with environmental commitments.
Construction plant		Portable construction machinery and equipment.
Consultation Report		A report which summarises all consultation responses received and explains how the applicant of a nationally significant infrastructure project has given regard to those responses.
Contractor		A general term used to describe an individual or company appointed by a developer to construct or manage a project at a certain price or rate.
Controlled waters		Rivers, streams, estuaries, lakes, canals, ditches, ponds and groundwater as far out as the UK territorial limit. The statutory definition is provided in section 104 (1) of the Water Resources Act 1991 and section 30A (d) of the Control of Pollution Act 1974.
County Wildlife Site	CWS	A conservation designation in the United Kingdom, which despite conferring no statutory protection onto a site, does affirm a site's importance and value for wildlife in its county context.
C-road		Roads and lanes with low traffic densities which are sometimes designated as unclassified roads.
Cropmark		Cropmarks are a means through which sub-surface archaeological, natural and recent features may be visible from the air or a vantage point on higher ground or a temporary platform.
Culvert		A tunnel (pipe or box shaped) that carries a stream or open drain under a road or railway.
Cumulative effect (or impact)		A cumulative impact (or effect) may arise as the result of: the combined impact of a number of different environmental topic-specific impacts from a single environmental impact assessment project on a single receptor/resource; and the combined impact of a number of different projects within the vicinity (in combination with the environmental impact assessment project) on a single receptor/resource.

Term	Abbreviation or Acronym	Definition
Cut-fill balance		A construction process whereby the amount of material obtained from earthwork cuttings broadly matches the amount of fill material required to form embankments, thereby minimising the amount of material needed to be imported into, or exported from, a construction site.
Cutting (earthwork)		Excavation of earth material to lower the ground level on which a road would be positioned, in order to help to reduce noise and/or visual impact.
D		
Decibel	dB	The scale used to measure noise is the decibel scale which extends from 0 to 140 decibels, corresponding to the intensity of the sound pressure level.
Decision-maker		The Secretary of State (in England).
Decommission		Withdraw something from service.
Delay		For pedestrians, this is the increase in the 'person-minutes' of the journey times of pedestrians and other non-motorised travellers. For traffic, this is the increase in journey times for drivers and passengers.
Department for Environment, Foods & Rural Affairs	Defra	The Government department responsible for policy and regulations on environmental, food and rural issues. The department's priorities are to grow the rural economy, improve the environment and safeguard animal and plant health.
Department for Transport	DfT	The national government body responsible for transport in Britain, and therefore in overall control of the road network. It is mainly responsible for policy decisions, and its responsibilities are carried out by a range of agencies and local authorities.
Deposition (dust)		The vertical passage of a substance (e.g. dust) to a surface or the ground.
Deposition (sediment)		The laying down of part, or all, of the sediment load of a stream on the bed, banks or floodplain which forms various sediment features such as bars, berms and floodplain deposits.
Design Manual for Roads and Bridges	DMRB	A set of documents that provide a comprehensive manual system which accommodates all current standards, advice notes and other published documents relating to the design, assessment and operation of trunk roads (including motorways).
Design-development		The process in which technical specialists (engineers and environmentalists) refine the design for the various elements of a development project.
Detailed assessment		A method applied to gain an in-depth appreciation of the beneficial and adverse consequences of the project and to inform project decisions. Detailed Assessments are likely to require detailed field surveys and/or quantified modelling techniques.
De-trunked		The transfer of trunk roads from Highways England's responsibility to the local highway authority.

Term	Abbreviation or Acronym	Definition
Development allocation (or zone)		Areas or zones of land allocated by a local planning authority for a particular type of development.
Development Consent Order	DCO	The consent for a Nationally Significant Infrastructure Project required under the Planning Act 2008.
Development Consent Order Site Boundary		The maximum extents of land likely to be required to construct, operate and maintain a Nationally Significant Infrastructure Project.
Development plan		Documentation which seeks to guide development and planning in a local authority area for a set period of time.
Diffusion tube		Passive devices used in air quality monitoring to measure weekly or monthly average pollutant concentrations.
Directive		Legal obligations imposed on European member states by the European Union.
Discharge consent		A consent or permit to discharge effluent that could harm the environment.
Diverge		The point where two streams of traffic split and go in different directions.
Do Minimum		The conditions that would persist in the absence of the implementation of a construction or improvement project, but given that maintenance on the road network is ongoing.
Do Nothing		The conditions that would persist in the absence of the implementation of a construction or improvement project.
Do Something		The conditions that would occur as a consequence the implementation of a construction or improvement project.
Drift geology		Materials of glacial origin including sediments and large rocks derived from erosion, transportation and deposition by glaciers.
Drinking Water Protected Area		Areas in which the use of certain substances must be carefully managed to prevent the pollution of raw water sources that are used to provide drinking water.
Driver stress		The adverse mental and physiological effects experienced by a driver traversing a road network. Factors influencing the level of stress include road layout and geometry, surface riding characteristics, junction frequency, and speed and flow.
Dual carriageway		A road with a dividing strip between the traffic in opposite directions, and usually two or more lanes in each direction
Dumbbell		A type of grade-separated junction which takes the form of a roundabout either side of a major road, linked by a bridge.
Dust		All airborne particulate matter.
E		
Early Assessment and Sifting Tool	EAST	A Department for Transport tool developed to quickly summarise and present evidence on options in a clear and consistent format, to provide decision-makers with comparative evidence on how they perform.
Earthworks		The removal or placement of soils and rocks such as in cuttings, embankments and environmental mitigation, including the in-situ improvement of soils/rocks to achieve the desired properties.

Term	Abbreviation or Acronym	Definition
East Coast Main Line		A 393-mile long major railway between London and Edinburgh via Peterborough, Doncaster, York, Darlington, Durham and Newcastle.
Ecological potential		Surface waters identified as Heavily Modified Water Bodies or Artificial Water Bodies must achieve 'good ecological potential' (good potential is a recognition that changes to morphology could make Good Ecological Status very difficult to achieve).
Ecological status		The state of a water body, derived from a number of factors, including: the abundance of aquatic flora and fauna, nutrient availability, salinity, temperature and chemical pollution levels.
Ecosystem		Biological community of interacting organisms (e.g. plants and animals) and their environment.
Effect		Term used to express the consequence of an impact (expressed as the 'significance of effect'), which is determined by correlating the magnitude of the impact (or change) to the importance, value or sensitivity of the receptor or resource, in accordance with defined significance criteria.
Electric vehicles	EV	A vehicle which uses one or more electric motors for propulsion.
Elements		Individual parts which make up the landscape, such as trees, hedges and buildings.
Embankment		Artificially raised ground, commonly made of earth material, such as stone, on which the carriageway is laid.
Embedded mitigation		Mitigation measures incorporated (embedded) into the design of a development project, for example earthworks to visually screen traffic movements in available views.
Enclosure		Enclosure (sometimes inclosure) was the legal process in England of consolidating (enclosing) small landholdings into larger farms.
Enhancement		A measure that is over and above what is required to mitigate the adverse effects of a project.
Environment Agency		Government agency established to protect and improve the environment and contribute to sustainable development in England. Responsibilities include: water quality and resources, flooding and coastal risk management and contaminated land.
Environmental assessment		A method and process by which information about environmental effects is collected, assessed and used to inform decision-making.
Environmental Health Officer	EHO	A local authority officer with responsibilities for protecting public health through the administration and enforcement of environmental health legislation.
Environmental Impact Assessment	EIA	The statutory process through which the likely significant effects of a development project on the environment are identified and assessed.

Term	Abbreviation or Acronym	Definition
Environmental Impact Assessment Directive	EIA Directive	Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014, amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment.
Environmental Impact Assessment Regulations	EIA Regulations	The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017.
Environmental Masterplan		A plan which illustrates the environmental measures integrated into the design of the Scheme.
Environmental Statement		A document produced in accordance with the EIA Directive, as transposed into UK law by the EIA Regulations, which the outcomes of an Environmental Impact Assessment.
Environmental Quality Standard	EQS	Standards that have been developed with the aim to meet the requirements of the WFD Directive.
Environmental Statement		A document which reports the EIA process, produced in accordance with the EIA Directive as transposed into UK law by the EIA Regulations.
European Economic Area	EEA	The European Economic Area (EEA) was established via the EEA Agreement, an international agreement which allows for the extension of the EU's single market to non-EU member parties.
European Protected Species		Species of plants and animals (not birds) which are protected by European law.
European site		The generic term used to describe the following designated sites: • Special Areas of Conservation (SACs) and Special Protection Areas (SPAs); • Sites that are in the process of designation as SACs and SPAs -these are known as proposed SACs (pSACs), candidate SACs (cSACs), potential SPAs (pSPAs) and Sites of Community Importance (SCIs), depending on the type of designation and point of progression through the designation process; and • Ramsar Sites.
European Union	EU	An economic and political union of 28 countries which operates an internal (or single) market which allows the free movement of goods, capital, services and people between member states.
Evaluation		The determination of the significance of effects. Evaluation involves making judgements as to the value of the receptor/resource that is being affected and the consequences of the effect on the receptor/resource based on the magnitude of the impact.
Excavated material		Largely natural soil and rock material that is removed from the ground during construction.
F		
Fill		Material used to artificially raise the existing ground levels.
Find spot		A term used to describe the location at which an archaeological find was discovered.

Term	Abbreviation or Acronym	Definition
Flood Risk Assessment	FRA	The process of assessing potential flood risk to a site and identifying whether there are any flooding or surface water management issues that may warrant further consideration or may affect the feasibility of a development.
Flood Zone 1		Flood Zone 1: land outside the floodplain. There is little or no risk of flooding in this zone;
Flood Zone 2		Flood Zone 2: the area of the floodplain where there is a low to medium flood risk; and
Flood Zone 3		Flood Zone 3: the area of the floodplain where there is a high risk of flooding.
Floodplain		Land adjacent to a watercourse over which water flows or would flow in times of flood, but for defences in place.
Fluvial		A term that relates to rivers and streams and the processes that occur within them.
Formation (geological)		A group of related rock strata with some common properties.
Fragmentation (ecological)		The breaking up of a habitat, ecosystem or land use types into smaller parcels.
Free-flow link		A section of road on a junction that links two roads and enables traffic to move without stopping.
Fugitive (emissions)		Visible emissions of dust that does not come from a definable point source, for example a smoke stack. Typical examples would include stored piles of soil, dry bare earth on construction sites or haul roads etc.
Future baseline		The situation and conditions that would prevail should a proposed development not proceed. Predicted impacts are compared against this theoretical scenario.
G		
Regionally Important Geological Sites		Locally designated sites of importance for geodiversity.
Geomorphology		The study of landforms and the processes which create them.
Geophysical survey		A process involving ground-based physical sensing techniques to determine the presence or absence of anomalies likely to be caused by archaeological features, structures or deposits.
Grade-separated		A type of junction where the major route (or routes) through the junction do not stop and do not cross any other road on the level. Movements to other roads are made using sliproads and bridges.
Great Crested Newt	GCN	A newt in the family Salamandridae, found across Europe and parts of Asia, which are protected under the Conservation of Habitats and Species Regulations 2017.
Greenhouse gases	GHG	Atmospheric gases such as carbon dioxide, methane, chlorofluorocarbons, nitrous oxide, ozone, and water vapour that absorb and emit infrared radiation emitted by the Earth's surface, the atmosphere and clouds.
Ground investigation		An intrusive investigation undertaken to collect information relating to the ground conditions, normally for geotechnical or land contamination purposes.

Term	Abbreviation or Acronym	Definition
Ground-borne vibration		Vibration generated by an event such as the pass-by vehicles in a tunnel, propagated through the ground or structure (i.e. not the air) into a receiving building.
Groundwater		All water which is below the surface of the ground and within the permanently saturated zone.
Groundwater source protection zone		Areas defined by the Environment Agency which show the risk from contamination/pollution to groundwater that is extracted for drinking water.
Guidelines for Landscape and Visual Impact Assessment	GLVIA3	The third edition of best practice guidelines relating to undertaking and reporting landscape, townscape and visual impact assessments of development projects.
Gyratory		A generalised term used to describe a large roundabout.
H		
Habitat		The natural home or environment of an animal, plant, or other organism.
Haul road		A temporary road provided within a contractor's site area to allow for the movement of construction material, construction machinery and/or construction labour around the site.
Healthy Urban Development Unit	HUDU	A London organisation which helps to create healthy sustainable communities and ensure that new developments are planned with health in mind.
Heavy Duty Vehicle		See Heavy Goods Vehicle.
Heavy Goods Vehicle	HGV	A commercial carrier vehicle with a gross vehicle weight of more than 3.5 tonnes.
Hectare	ha	A metric unit of measurement, equal to 2.471 acres or 10,000 square metres.
Heritage asset		A building, monument, site, place, area or landscape of historic value.
Highways England		A government-owned company charged with operating, maintaining and improving England's motorways and major A-roads.
Highways England Drainage Data Management System		Management system used to store technical information about the location and condition of drainage infrastructure on the network.
Highways Agency Water Risk Assessment Tool	HAWRAT	A spreadsheet based application used to determine whether highway runoff is likely to have an ecological impact on surface watercourses.
Highways England	HE	The government agency responsible for the operation, maintenance and improvement of England's trunk roads and motorways.

Term	Abbreviation or Acronym	Definition
Historic England		Executive non-departmental public body created under section 32 of the National Heritage Act 1983 to: • secure the preservation of ancient monuments and historic buildings situated in England; • promote the preservation and enhancement of the character and appearance of conservation areas situated in England; and • promote the public's enjoyment of, and advance their knowledge of, ancient monuments and historic buildings situated in England and their preservation.
Historic Environmental Record	HER	A record of all known archaeological finds and features and historic buildings and historic /landscape features, relating to all periods from the earliest human activity to the present day; maintained by each County and Unitary Authority in the United Kingdom.
Hot rolled asphalt		A common type of road surfacing comprising a dense mixture of mineral aggregate, sand and bitumen.
Hybrid Bill		A set of proposals for introducing new laws, or changing existing ones, typically used to secure powers to construct major infrastructure projects of national importance.
Hydrofluoro-carbons	HCF	A group of industrial chemicals primarily used for cooling and refrigeration.
Hydrology		The scientific study of the movement, distribution, and quality of water on Earth and other planets, including the water cycle, water resources and environmental watershed sustainability.
Hydrogeology		The nature, distribution and movement of groundwater in soils and rocks, including in aquifers.
Hydro-morphology		The physical characteristics of the shape, boundaries and content of a water body.
I		
Impact		Change that is caused by an action; for example, land clearing (action) during construction which results in habitat loss (impact).
Inert waste		Defined in Article 2(e) of EU Landfill Directive (1999/31/EC) as waste that does not undergo any significant physical, chemical or biological transformations: inert waste does not dissolve, burn or otherwise physically or chemically react, biodegrade or adversely affect other matter with which it comes into contact in a way likely to give rise to environmental pollution or harm to human health; and the total leachability and pollutant content and the ecotoxicity of its leachate are insignificant and, in particular, do not endanger the quality of any surface water and/or groundwater.
Institute of Air Quality Management	IAQM	The professional body for air quality practitioners.

Term	Abbreviation or Acronym	Definition
Institute of Environmental Management and Assessment	IEMA	The professional body for environmental practitioners.
Interchange		A term used to describe a grade separated junction that provides free flow from one mainline to another.
Interim Advice Note	IAN	Guidance notes issued by Highways England which incorporate amendments or additions to the Design Manual for Roads and Bridges.
Inspectorate		See Planning Inspectorate.
Intervention		Types or groups of highways works, for example online options, designed to meet a series of project objectives.
Invasive species		Non-native UK plants that are invasive, for example Japanese Knotweed.
J		
Junction		A place where two roads meet, regardless of design or layout.
K		
Key characteristics (landscape)		The combination of elements that are particularly important to the current character of the landscape and help to give an area its particularly distinctive sense of place.
Kilometre	km	A unit of measurement.
L		
Land use		What land is used for, based on broad categories of functional land cover, such as urban and industrial use and the different types of agriculture and forestry.
Landform		The shape and form of the land surface which has resulted from combinations of geology, geomorphology, slope, elevation and physical processes.
Landscape character area	LCA	Areas of landscape that have a broadly consistent pattern of topography, land use and vegetation cover.
Landtake		The extent of land required temporarily or permanently to construct, operate and maintain a development project.
Lane		A section of carriageway marked out for the use of traffic, and typically intended for use in one direction.
Lead Local Flood Authority	LLFA	Authority responsible for developing, maintaining and applying a strategy for local flood risk management in their areas and for maintaining a register of flood risk assets.
Light goods vehicle		A motor vehicle used to carry goods with a total mass of up to 3.5 tonnes.
Limits of deviation		The maximum lateral and vertical extents within which a highway project can be built.
Link (road)		A section of road between two junctions.
Listed building		A building of special architectural or historic interest. Listed buildings are graded I, II* or II, with Grade I being the highest. Listing includes the interior as well as the exterior of the building.

Term	Abbreviation or Acronym	Definition
Local Air Quality Management	LAQM	A key part in the UK Government's and the Devolved Administrations' strategies to achieve the air quality objectives.
Local Biodiversity Action Plan	LBAP	A local plan that identifies threatened species and habitats and seeks to protect and restore biological systems.
Local Nature Reserve	LNR	A Local Nature Reserve (LNR) is a statutory designation made under Section 21 of the National Parks and Access to the Countryside Act 1949 by principal local authorities.
Local authority		The authority or council that is empowered by law to exercise planning functions.
Lowest Observable Adverse Effect Level	LOAEL	The lowest concentration or amount of a substance found by experiment or observation that causes an adverse alteration of morphology, function, capacity, growth, development, or lifespan of a target organism distinguished from normal organisms of the same species under defined conditions of exposure.
M		
Made ground		Land where natural and undisturbed soils have largely been replaced by man-made or artificial materials. It may be composed of a variety of materials including imported natural soils and rocks with or without residues of industrial processes (such as ash) or demolition material (such as crushed brick or concrete).
Magnitude		The size of something.
MasterMap		A source of highly-detailed geographic data of Great Britain, provided by Ordnance Survey.
Main River		A river maintained directly by the Environment Agency. They are generally larger arterial watercourses.
Mainline		The carriageway carrying the main flow of traffic, generally traffic passing straight through a junction or interchange.
Merge		The point where two different traffic flows come together and continue as one.
Metapopulation		A group of spatially separated populations of the same species which interact at some level.
Met Office		The United Kingdom's national weather service.
Methane	CH_4	The main constituent of natural gas, and the second most important greenhouse gas.
Metre	m	A unit of measurement.
Microgram	µg	One millionth of a gram.
Mineral safeguarding areas		Areas defined by mineral planning authorities with known mineral resources that are of identified economic or conservation value.
Mitigation		Measures intended to avoid, reduce and, where possible, remedy significant adverse environmental effects.
Modelling		The process of estimating changes within an area of interest under a specific set of conditions.

Term	Abbreviation or Acronym	Definition
Monitoring		A continuing assessment of the performance of the project, including mitigation measures. This determines if effects occur as predicted or if operations remain within acceptable limits, and if mitigation measures are as effective as predicted.
Motorway		A special type of road reserved for motorised traffic only, the numbers of which are prefixed with the letter 'M'.
Movement (traffic)		A movement is one of the turns or changes in direction that a junction allows.
Multi-Agency Geographic Information Service	MAGIC	A website which provides geographic information about the natural environment.
N		
National Character Area	NCA	Areas of England defined by their unique combination of landscape, biodiversity, geodiversity, history and cultural an economic activity.
National Cycle Network	NCN	A national cycling route network of the United Kingdom, which was established to encourage cycling throughout Britain, as well as for the purposes of bicycle touring.
National Heritage List for England	NHLE	A database of designated heritage assets.
National Planning Policy Framework	NPPF	A planning framework which sets out the Government's planning policies for England and how these are expected to be applied.
National Policy Statement for England	NPSE	Statements prepared and designated by the Secretary of State under the Planning Act 2008, which establish national policy for Nationally Significant Infrastructure Projects, including energy, transport and water, waste water and waste and against which applications for Development Consent Orders are assessed.
National Policy Statement for National Networks	NPSNN	A statement setting out the need for, and Government's policies to deliver, the development of nationally significant infrastructure projects on the national road and rail networks in England.
Nationally Significant Infrastructure Project	NSIP	A type of project listed in the Planning Act 2008, which must be consented by a Development Consent Order.
Natural England		Executive non-departmental public body constituted under the Natural Environment and Rural Communities Act 2006 (section 2(1)) to ensure that the natural environment is conserved, enhanced and managed for the benefit of present and future generations, thereby contributing to sustainable development.
Nitrogen dioxide	NO_2	A gas produced when fuels are burned and is often present in motor vehicle and boiler exhaust fumes. It is an irritant to the respiratory system.

Term	Abbreviation or Acronym	Definition
Nitrogen oxides	NO_X	A group of chemical compounds consisting only of nitrogen and oxygen which may be interconverted in the atmosphere. The principal oxides of nitrogen are nitric oxide and nitrogen dioxide.
Nitrous oxide	N_2O	A naturally occurring gas that is colourless and non-flammable.
Noise barrier		A solid construction that reduces unwanted sound. It may take many forms including: engineering cutting; retaining wall; noise fence barrier; landscape earthworks; a 'low level' barrier on a viaduct; a parapet barrier on a viaduct; or any combination of these measures. Also called an attenuation barrier.
Noise Important Area	NIA	Areas identified with respect to noise from major roads and from roads within agglomerations where 'the 1% of the population that are affected by the highest noise levels from major roads' are located according to the results of the strategic noise mapping.
Noise Insulation Regulations	NIR	Noise Insulation Regulations 1975 made under Part II of the Land Compensation Act 1973.
Non-hazardous waste		Any waste not defined as 'hazardous' under Directive 91/689/EEC. Examples include soils from ground/site clearance and demolition wastes.
Non-statutory consultation		Engagement with members of the public, local groups or stakeholders which is not determined or governed by statutory requirements.
Non-motorised users	NMU	A collective term used to describe pedestrians, cyclists and equestrians (horse riders).
O		
Offline		Highway development on land under non-highway use, for example a new dual carriageway constructed on agricultural land.
Online		Highway development proposed along, or on the line of, an existing road, for example road widening.
Operational		The functioning of a project on completion of construction.
Ordinary Watercourse		Ordinary Watercourses include every river, stream, ditch, drain, cut, dyke, sluice, sewer (other than a public sewer) and passage through which water flows and which does not form part of a main river.
Ordnance Survey		The national mapping agency for the UK.
Outline Environmental Management Plan	OEMP	A framework document which sets out the matters that the contractor will need to include in their Construction Environmental Management Plan.
Overbridge		A bridge crossing over a transport corridor (e.g. a highway).
P		
Particulate matter	PM_{10} or $PM_{2.5}$	Discrete particles in ambient air, with diameters ranging between nanometres (billionths of a metre) to micrometres (millionths of a metre).
Pathways		The routes by which pollutants are transmitted through air, water, soils, plants and organisms to their receptors.

Term	Abbreviation or Acronym	Definition
Peak Particle Velocity	PPV	A vibration metric which has the unit millimetres per second.
Perfluoro-carbons	PFC	Powerful colourless greenhouse gases with a high density.
Phase 1 Habitat survey		A habitat classification and field survey technique to record semi-natural vegetation and other wildlife habitats.
Photomontage		Inserting an image of a proposed development onto a photograph for the purposes of creating an illustrative representation of potential changes to existing views.
Planning Act 2008	PA2008	An Act of Parliament in the UK intended to speed up the process of approving major new infrastructure projects.
Planning Inspectorate		An executive agency with responsibilities for planning appeals, national infrastructure planning applications, local plan examinations and other planning-related casework in England and Wales. Referred to as 'the Inspectorate'.
Planning Practice Guidance		Planning guidance documents which add further context to the National Planning Policy Framework.
Pollution Climate Mapping	PCM	A collection of models designed to fulfil part of the UK's EU Directive (2008/50/EC) requirements to report on the concentrations of particular pollutants in the atmosphere.
Preferred option		The chosen design option that most successfully achieves the project objectives and becomes subject to further design and assessment.
Preferred Route Announcement		An announcement made by Highways England following the selection of a preferred option or solution for a given road project.
Preliminary Environmental Information Report		A report prepared as part of an applicant's pre-application consultation duties which contains the environmental information required by the EIA Regulations, the purpose of which is to enable the local community to understand the environmental effects of a nationally significant infrastructure project.
Principal Aquifer		Aquifers previously designated as major aquifer.
Private Means of Access		Routes which connect premises such as homes, businesses and community facilities to the public highway network.
Protected Road Verge		A section of road verge protected because of their special habitat, species or ecological interest.
Protected species		Species of wild plants, birds and animals which are afforded protection through legislative provisions.
Public right of way	PRoW	A highway where the public has the right to walk. It can be a footpath (used for walking), a bridleway (used for walking, riding a horse and cycling), or a byway that is open to all traffic (including motor vehicles).
R		
Ramsar (site)		Wetland sites that are of international importance, as designated under Article 2(1) of the Convention on Wetlands of International Importance especially as Waterfowl Habitat. Ramsar (Iran), 2 February 1971. UN Treaty Series No. 14583.

Term	Abbreviation or Acronym	Definition
Receptor		A defined individual environmental feature usually associated with population, fauna and flora that has potential to be affected by a project.
Reference design		A term used to describe the design information upon which an Environmental Impact Assessment is based.
Register of Environmental Actions and Commitments		A Register of Environmental Actions and Commitments which is based on mitigation as defined in the Environmental Statement.
Register of Historic Parks and Gardens		Historic England's non-statutory register which identifies over 1,600 sites of historic interest in England assessed to be of national importance. Its purpose is to offer them protection and to encourage a greater understanding of their significance.
Remediation (contaminated land)		The process of removing a pollution linkage (i.e. by removing one or more of the elements in a source-pathway-receptor linkage) in contaminated land in order to render an acceptable risk. Usually this involves a degree of removal of contaminants and/ or blockage of pathways.
Resource		A defined but generally collective environmental feature usually associated with soil, water, air, climatic factors, landscape, material assets, including the architectural and archaeological heritage that has potential to be affected by a project.
Ribbon development		The building of houses along a main road, especially one leading out of a town or village.
Riparian		Relating to or situated on the banks of a river.
Risk assessment		An assessment of the probability of a hazard occurring that could result in an impact.
Road Investment Strategy	RIS	A document which sets out a long-term vision for England's motorways and major roads, outlining how smooth, smart and sustainable roads will be achieved through investment over a five year period (2015 - 2020).
Rochdale Envelope		An approach to consenting and environmental impact assessment, named after a UK planning law case, which allows the promoters of development projects to broadly define their schemes within agreed parameters to retain flexibility of design.
Roundabout		A circular, one-way junction at which other roads meet and terminate.
Runoff		The flow of water over the ground surface.
S		
Sand		Soil particles from 0.06mm-2.0mm in equivalent diameter. Fine sand particles are from 0.06mm-0.2mm; medium sand from 0.2mm-0.6mm; and coarse sand from 0.6mm-2.0mm.
Scheduled Monument		Nationally significant heritage assets protected by the 1979 Ancient Monuments and Archaeological Areas Act.

Term	Abbreviation or Acronym	Definition
Scoping		The process of identifying the issues to be addressed by the Environmental Impact Assessment process. It is a method of ensuring that an assessment focuses on the important issues and avoids those that are considered to be not significant.
Scoping Opinion		The written opinion of the relevant authority, following a request from the applicant for planning permission, as to the information to be provided in an Environmental Statement.
Scoping Report		A report which records the outcomes of the scoping process and is typically submitted as part of a formal request for a Scoping Opinion.
Scheme		The A428 Black Cat to Caxton Gibbet Improvements.
Screening		The formal process undertaken to determine whether it is necessary to carry out a statutory Environmental Impact Assessment and publish an Environmental Statement in accordance with the EIA Regulations.
Secondary aquifer		There are two types of secondary aquifer designations: Secondary A: permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers. These are generally aquifers formerly classified as minor aquifers; and Secondary B: predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering. These are generally the water-bearing parts of the former non-aquifers.
Secretary of State		The cabinet minister who (among other things) acts as decision-maker on all national infrastructure applications for development consent.
Sediment		Organic and inorganic material that has precipitated from water to accumulate on the floor of a water body, watercourse or trap.
Setting (cultural heritage)		The surroundings in which a heritage asset is experienced. Its extent is not fixed and may change as the asset and its surroundings evolve. Elements of a setting may make a positive, negative or neutral contribution to the significance of an asset and may affect the ability to appreciate it.
Severance (land)		The splitting of a land holding into more than one part, for example through the introduction of a new section of road.
Severance (non-motorised users)		The perceived separation of residents from facilities and services they use within their community caused by new or improved roads, or by changes in traffic flows.
Sewage Treatment Works		Sewage treatment is the process of removing contaminants from municipal wastewater, containing mainly household sewage plus some industrial wastewater.
Significance (of effect)		A measure of the importance or gravity of the environmental effect, defined by generic significance criteria or criteria specific to an environmental topic.

Term	Abbreviation or Acronym	Definition
Significant Observed Adverse Effect Level	SOAEL	The level of noise exposure above which significant adverse effects on health and quality of life occur.
Silt		Soil particles from 0.002mm to less than 0.06mm in equivalent diameter.
Simple Assessment		Initial, brief assessment activity based on the assembly of data and information that is readily available, to fulfil one of the following functions: • to address unknown aspects in the Scoping assessment level; • to reach an understanding of the likely environmental effects to inform the final design and assessment; or, • to reach an understanding of the likely environmental effects that identifies the need for a Detailed Assessment.
Single carriageway		A single carriageway or undivided highway is a road with one, two or more lanes arranged within a single carriageway with no central reservation to separate opposing flows of traffic.
Site of Special Scientific Interest	SSSI	Area of land notified by Natural England under section 28 of the Wildlife and Countryside Act 1981 as being of special interest due to its flora, fauna or geological or physiological features.
Site Waste Management Plan		A plan that is used to outline how a construction project will avoid, minimise or mitigate effects on waste production and handling on the environment and surrounding area.
Site-won		Material derived from a construction site rather than being imported.
Slip road		A connector road within a junction between a mainline carriageway and the local highway network, or vice versa, which meets the local highway network at-grade.
Soil		The upper layer of the earth's crust, in which plants grow. It consists of weathered rock, organic matter, air spaces and water. Descriptions usually identify the relevant characteristics of its (usually) horizontal layers in terms of their significance for soil characteristics and crop growth, usually to a depth of 1.2m.
Soil erosion		The detachment and movement of soil by the action of water and/or wind.
Soil resource		The textures, structures and volume of different qualities of topsoil and subsoil that have a potential for beneficial reuse.
Sound pressure level		The parameter by which sound levels are measured in air. It is measured in decibels. The threshold of hearing has been set at 0dB, while the threshold of pain is approximately 120dB. Normal speech is approximately 60dB at a distance of 1 metre and a change of 3dB in a time varying sound signal is commonly regarded as being just detectable. A change of 10dB is subjectively twice, or half, as loud.
Source Protection Zone	SPZ	Zones defined by the Environment Agency to protect groundwater sources such as wells, boreholes and springs from potential contamination.

Term	Abbreviation or Acronym	Definition
Span		The horizontal distance between the two supports of a structure (for example the piers of a bridge or viaduct).
Spatial scope		The geographic area over which environmental impacts and effects could occur as a result of a development project.
Special Area of Conservation	SAC	Sites designated under EU legislation for the protection of habitats and species considered to be of European interest.
Species of Principal Importance		Habitats and species of principal importance in England. Section 41 (S41) of the Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England.
Stakeholder		An organisation or individual with a particular interest in a development project.
Standard mitigation		Measures comprising standard techniques and activities which are implemented during the construction of a development project to protect the environment and/or mitigate adverse effects, for example the covering of exposed materials to reduce dust emissions.
Statement of Community Consultation	SoCC	A document detailing how an applicant of a nationally significant infrastructure project intends to undertake consultation on its proposals.
Statutory consultation		Engagement with stakeholders determined or governed by statutory requirements.
Statutory consultee		Organisations and bodies, defined by statute, which must be consulted on relevant planning matters.
Statutory undertaker		Companies and agencies with legal rights to carry out certain types of development and/or highways works.
Strategic Outline Business Case		The reasoning for initiating a project or task or making major investment decisions.
Strategic road network		The network of motorways and trunk roads in England.
Study area		The spatial area within which environmental effects are assessed (i.e. extending a distance from the project footprint in which significant environmental effects are anticipated to occur).
Subsoil		Weathered soil layer extending between the natural topsoil and the unweathered basal layer (geological parent material) below, or similar material on which topsoil can be spread. Subsoil has lower organic matter and plant nutrient content than topsoil. In most cases topsoil requires a subsoil to perform one or a number of natural soil functions.
Sulphur dioxide		A gas primarily arising from anthropogenic activities and more specifically combustion of fuels containing sulphur and sulphur compounds. Sulphur dioxide is emitted in negligible quantities during the combustion of natural gas but generally at higher concentrations for liquid fuels which have a higher sulphur content.
Sulphur hexafluoride	SF_6	An inorganic, colourless and potent greenhouse gas.

Term	Abbreviation or Acronym	Definition
Superficial deposit		A geological deposit that was laid down during the Quaternary period. Such deposits were largely formed by river, marine or glacial processes but can also include wind-blown deposits known as loess.
Surface water		Waters including rivers, lakes, loughs, reservoirs, canals, streams, ditches, coastal waters and estuaries.
Sustainable development		development that meets the needs of the present without compromising the ability of future generations to meet their own needs
Sustainable drainage systems	SuDS	Measures designed to control surface runoff close to its source, including management practices and control measures such as storage tanks, basins, swales, ponds and lakes. Sustainable drainage systems allow a gradual release of water and thereby reduce the potential for downstream flooding.
Sustrans		A UK charity which aims to make it easier for people to walk and cycle, and which promotes the National Cycle Network.
Swale		A low or hollow place, especially a marshy depression between ridges.
T		
Temporal scope		The duration of time over which environmental impacts and effects could occur as a result of a development project.
Thin surfacing system		A generic term covering proprietary surface course materials that are laid at a thickness less than 50mm, which provides a high performance, rut resistant, low noise and skid resistant layer that supports the high volume of traffic found on the strategic road network.
Till		Unsorted glacial sediment deposited directly by a glacier.
Tonnes of carbon dioxide equivalent	tCO_2e	A measure that allows the different greenhouse gases to be compared on a like-for-like basis relative to one unit of CO_2.
Topsoil		Upper layer of a soil profile, usually darker in colour (because of its higher organic matter content) and more fertile than subsoil, and which is a product of natural biological and environmental processes.
Traffic Regulation Order		A legal instrument that enables the highway authority to regulate or prohibit the movement of traffic.
Transboundary effects		The term used to describe the significant environmental effects of a development project which extend beyond the boundary of the European Economic Area State within which it would be implemented.
Transport Analysis Guidance	TAG	Guidance produced by the Department for Transport for undertaking transportation studies, appraisals and modelling. Also referred to as WebTAG.
Transport Research Laboratory		A global centre for innovation in transport and mobility.

Term	Abbreviation or Acronym	Definition
Tree Preservation Order	TPO	An order made by a local planning authority, under the Town and Country Planning Act 1990, in respect of trees or woodlands. The principal effect of a tree preservation order is to prohibit the cutting down, uprooting, topping, lopping, willful damage or willful destruction of trees without the local planning authority's consent.
Trial trenching		A method of on-site archaeological investigation where trenches are dug at intervals across a site to identify any archaeological remains.
Trunk road		A road operated and maintained in England by Highways England.
U		
UK Climate Projections 2018	UKCP18	A climate analysis tool used to guide decision-making and boost resilience to climate change.
Unclassified (road)		A road which has no number.
Underbridge (or underpass)		A bridge crossing under a transport corridor (e.g. a highway).
Unexploded ordnance		Explosives that did not explode when deployed and thus still pose a risk of detonation.
Unproductive strata		Layers of rock or superficial deposits with low permeability or porosity that have a negligible significance for water supply.
Upgrade		Refers to the physical improvement of a road, through widening of the carriageway or rebuilding a junction.
Utilities		The term utilities can refer to the set of services provided by these organisations consumed by the public: Coal, electricity, natural gas, water, sewage, telephone, and transportation. Broadband internet services (both fixed-line and mobile) are increasingly being included within the definition.
V		
Variable Message Signs		An electronic traffic sign that provides travellers with information, for example alerts concerning special events or weather conditions.
Vehicle movement		A journey made by a vehicle. This can either be a one way or two way trip.
Vehicle recovery area		An area designated explicitly for vehicle recovery.
Viewpoint		A place from which something can be viewed.
Visual amenity		The overall pleasantness of the views people enjoy of their surroundings, which provides an attractive visual setting or backdrop for the enjoyment of activities of the people living, working, recreating, visiting or travelling through an area.
Visual receptor		People who may have a view of a proposed development during construction or operation.

W		
Water Framework Directive	WFD	A European Union Directive which commits member states to achieve good status of all waterbodies (both surface and groundwater), and also requires that no such waterbodies experience deterioration in status. Good status is a function of good ecological and good chemical status, defined by a number of elements.
-	WebTAG	See Transport Analysis Guidance.
Worst-case assumption (or scenario)		An assumption adopted within an environmental impact assessment which identifies a scenario or parameter that would likely result in the maximum environmental effect (termed the worst-case). This is typically applied where uncertainty exists over the detail of a particular development component or approach to project delivery, for which a basis of assessment is needed.
Written Schemes of Investigation	WSI	Documents which set out the approach to undertaking archaeological monitoring of ground investigation works.
Z		
Zone of Influence	ZoI	The temporal and spatial influence of a development project.
Zone of theoretical visibility	ZTV	The likely (or theoretical) extent of visibility of a development project, usually shown as an area on a map.

19. LOCATION AND DESIGN PLANS

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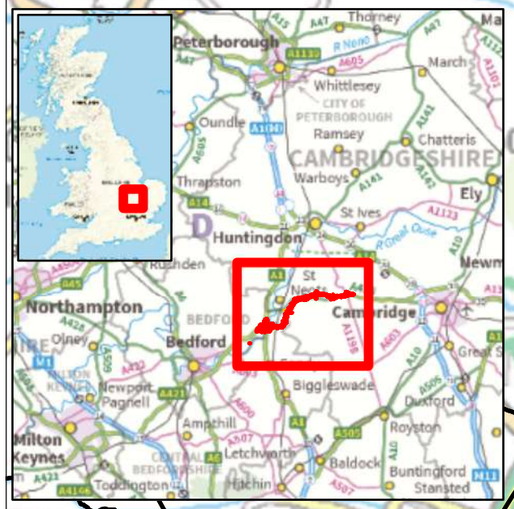

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N

NOTES

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LEGEND

- DCO Site Boundary
- Administrative Areas

Revision Details	By / Check	Date	Suffix
FIRST ISSUE	SW / JG	28/03/19	P01

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 2.1 LOCATION PLAN

Designed	Drawn	Checked	Approved	Date
SW	SW	MM	JG	28/03/19

Internal Project No	Suitability
60541541	
Scale @ A3: 1:60,000	Zone

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number

Rev: P02

Filename: P:\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\EIA Scoping Report\Fig 1.1 Location Plan - A428 Scoping Report 20190220 RETROSAVE.mxd

N

STEEPLE/ GARDEN WOODS

BUSHMEAD WOOD

PALACEYARD WOOD

LADY WOOD

WOODBURY SINKS

Weaveley and Sand Woods

FOXHOLE WOOD

LORDS WOOD

Bedford Borough

Central Bedfordshire

A1

A421

A4280

A428 Cambridge

A1Tempsford Road

A1London Road

Duloe Brook

Fox Brook

Honeydon Brook

Colmworth Brook

Begwary Brook

River Great Ouse

Hen Brook

Abbotsley Brook

Rockham Ditch

Dean Ditch

Gadsey Brook

South Brook

Colmworth

Honeydon

Eaton Socon

Wyboston

Little Barford

Roxton

Tempsford

Everton

Blunham

Chalton

Willington

Sevick End

Workhouse End

Channel's End

Colesden

East End

Wilden

Roothams Green

Wintringham

Abbotsley

Gamlingay Great Heath

Woodbury

Kilometers

0 1 2 3 4 5

Filename: P:\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\Environmental\A428_Environmental_Constraints_Ecological_20190226.mxd

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

- DCO Site Boundary
- The Scheme
- Watercourse
- 5km Scoping Study Area
- 1km Scoping Study Area
- Site of Special Scientific Interest
- Local Nature Reserves
- Ancient Woodland
- Flood Zone 3
- Flood Zone 2
- Administrative Areas

Revision Details	By / Check	Date	Suffix
FIRST ISSUE	RF / JG	28/03/19	?

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 2.2 ENVIRONMENTAL CONSTRAINTS NATURAL ENVIRONMENT

Designed	Drawn	Checked	Approved	Date
RF	RF	MM	JG	28/03/19

Internal Project No: 60541541

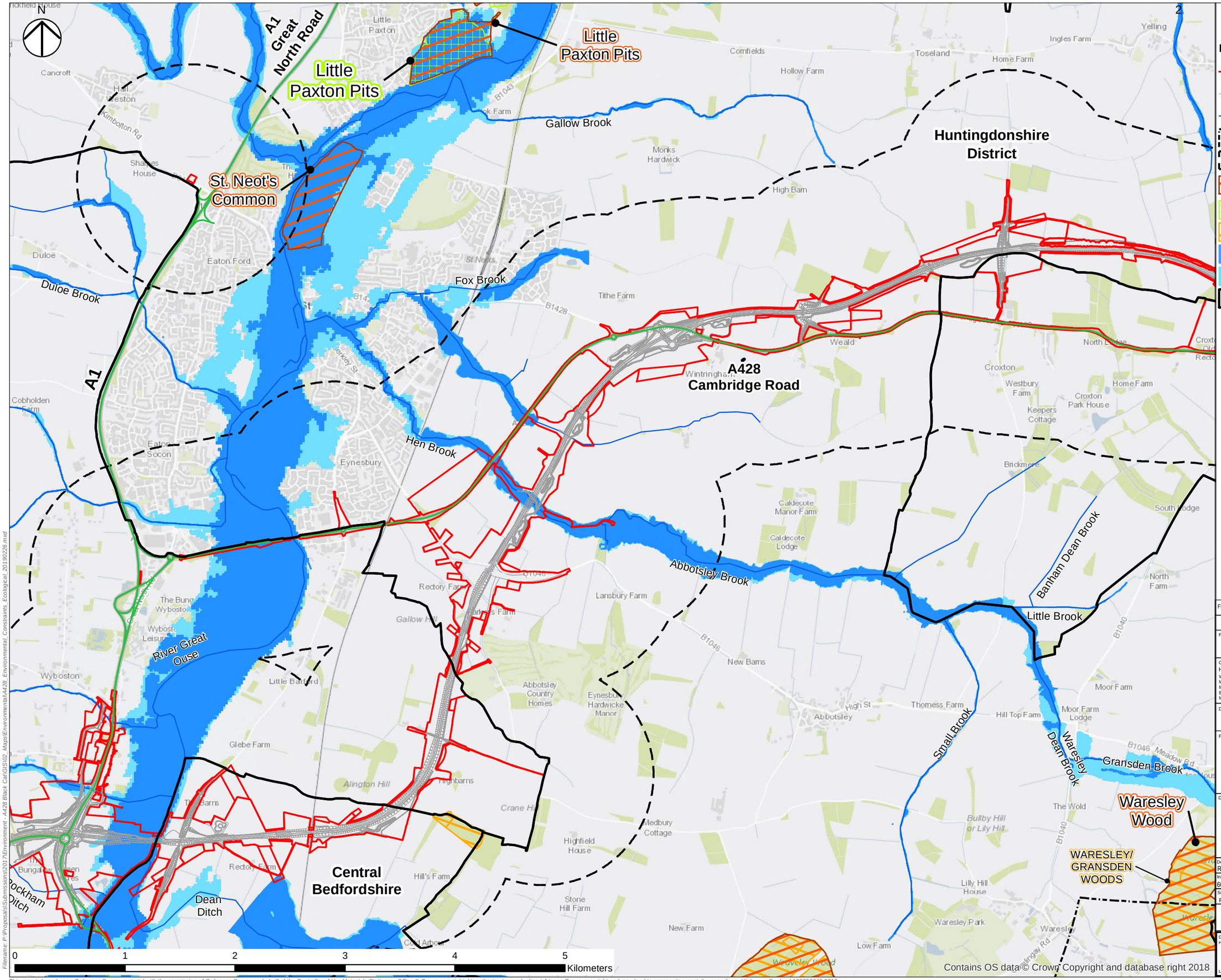
Suitability:

Scale @ A3: For illustrative purposes only

Zone:

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number

Rev



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- Watercourse
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- 1km Scoping Study Area
- Site of Special Scientific Interest
- Local Nature Reserves
- Ancient Woodland
- Flood Zone 3
- Flood Zone 2
- Administrative Areas

FIRST ISSUE	RF / JG	28/03/19	?
Revision Details	By / Check	Date	Suffix

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 2.2 ENVIRONMENTAL CONSTRAINTS NATURAL ENVIRONMENT

Designed	Drawn	Checked	Approved	Date
RF	RF	MM	JG	28/03/19

Internal Project No: 60541541

Suitability:

Scale @ A3: For illustrative purposes only

Zone:

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number | Rev

Filename: P:\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\Environmental\A428_Environmental_Constraints_Ecological_20190226.mxd

N

Little Paxton Pits

Little Paxton Pits

Gallow Brook

Huntingdonshire District

A1198 St Ives Road

Papworth Wood

A1198 Ermine Street South

Fox Brook

A428 Cambridge Road

South Cambridgeshire District

ELTISLEY WOOD

Hen Brook

Abbotsley Brook

Banham Dean Brook

Eastern Brook

Little Brook

Small Brook

Waresley Dean Brook

Gransden Brook

A1198 Old North R

Waresley Wood

WARESLEY/ GRANSDEN WOODS

College Farm
Comfields
Hollow Farm
Toseland
Home Farm
Ingles Farm
Yelling
Hill Farm
Papworth Everard
Elsworth Lodge
Monks Hardwick
High Barn
Hunters Chase
Broadview
Fairview Farm
Papworth Hotel
Pembroke Farm
North East Farm
Tithe Farm
Weald
Croxton
Westbury Farm
Keepers Cottage
Croxton Park House
Home Farm
Eltisley
Brickmare
Caldecote Manor Farm
Caldecote Lodge
South Lodge
Caxton
Rectory Farm
Lansbury Farm
New Barns
Abbotsley Country Homes
Eynesbury Hardwicke Manor
Abbotsley
Thorness Farm
High St
Hill Top Farm
Moor Farm
Moor Farm Lodge
North Farm
Leycourt Farm
Leycourt Cottage
Redwood Farm
Hardwicke Farm
Hardwicke Villa
Woodhams Farm House
Dunton Poultry Farm
Claypit Cottages
Common Farm
Great Gransden
Lodge Farm
Pastures Farm
Swansley Wood Farm
Highbarns
Crane Hill
Medbury Cottage
Highfield House
Hill's Farm
Stone Hill Farm
Bullby Hill or Lily Hill
The Wold
Lilly Hill House
Little Gransden

0 1 2 3 4 5 Kilometers

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

- DCO Site Boundary
- The Scheme
- Watercourse
- 5km Scoping Study Area
- 1km Scoping Study Area
- Site of Special Scientific Interest
- Local Nature Reserves
- Ancient Woodland
- Flood Zone 3
- Flood Zone 2
- Administrative Areas

Revision Details	By	Check	Date	Suffix
FIRST ISSUE	RF	JG	28/03/19	?

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 2.2 ENVIRONMENTAL CONSTRAINTS NATURAL ENVIRONMENT

Designed	Drawn	Checked	Approved	Date
RF	RF	MM	JG	28/03/19

Internal Project No	Suitability
60541541	
Scale @ A3: For illustrative purposes only	Zone

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number | Rev

Filename: P:\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\Environmental\A428_Environmental_Constraints_Ecological_20190226.mxd

N

4

A1198

A1198 St Ives Road

A14 Huntingdon Road

Graveley

Papworth Everard

Papworth Wood

Yelling

Elsworth

Boxworth

Lolworth

Knapwell

Overhall Grove

Elsworth Wood

A1198 Ermine Street South

Huntingdonshire District

South Cambridgeshire District

A428

Croxton

Eltisley

ELTISLEY WOOD

Lower Cambourne

Cambourne

Childerley Gate

Hardwick

Highfields Caldecote

Caxton

Eastern Brook

Banham Dean Brook

Little Brook

B1040

Caldecote Meadows

Hardwick Wood

A1198 Old North Road

Crow End

Bourn

Small Brook

Waresley Dean Brook

Gransden Brook

Great Gransden

Waresley Wood

WARESLEY/ GRANSDEN WOODS

Little Gransden

Longstowe

Kingston Amenity Area

New Ditch

Kingston

Toft

B1046

Bourn Brook

Dean Brook

Kingston Wood

Callow Brook

Childerley

0 1 2 3 4 5 Kilometers

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NOTES

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Legend

- DCO Site Boundary
- The Scheme
- Watercourse
- 5km Scoping Study Area
- 1km Scoping Study Area
- Site of Special Scientific Interest
- Local Nature Reserves
- Ancient Woodland
- Flood Zone 3
- Flood Zone 2
- Administrative Areas

FIRST ISSUE	RF / JG	28/03/19	?	
Revision Details	By / Check	Date	Suffix	

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

highways england

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 2.2 ENVIRONMENTAL CONSTRAINTS NATURAL ENVIRONMENT

Designed	Drawn	Checked	Approved	Date
RF	RF	MM	JG	28/03/19

Internal Project No: 60541541

Suitability:

Scale @ A3: For illustrative purposes only

Zone:

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number | Rev

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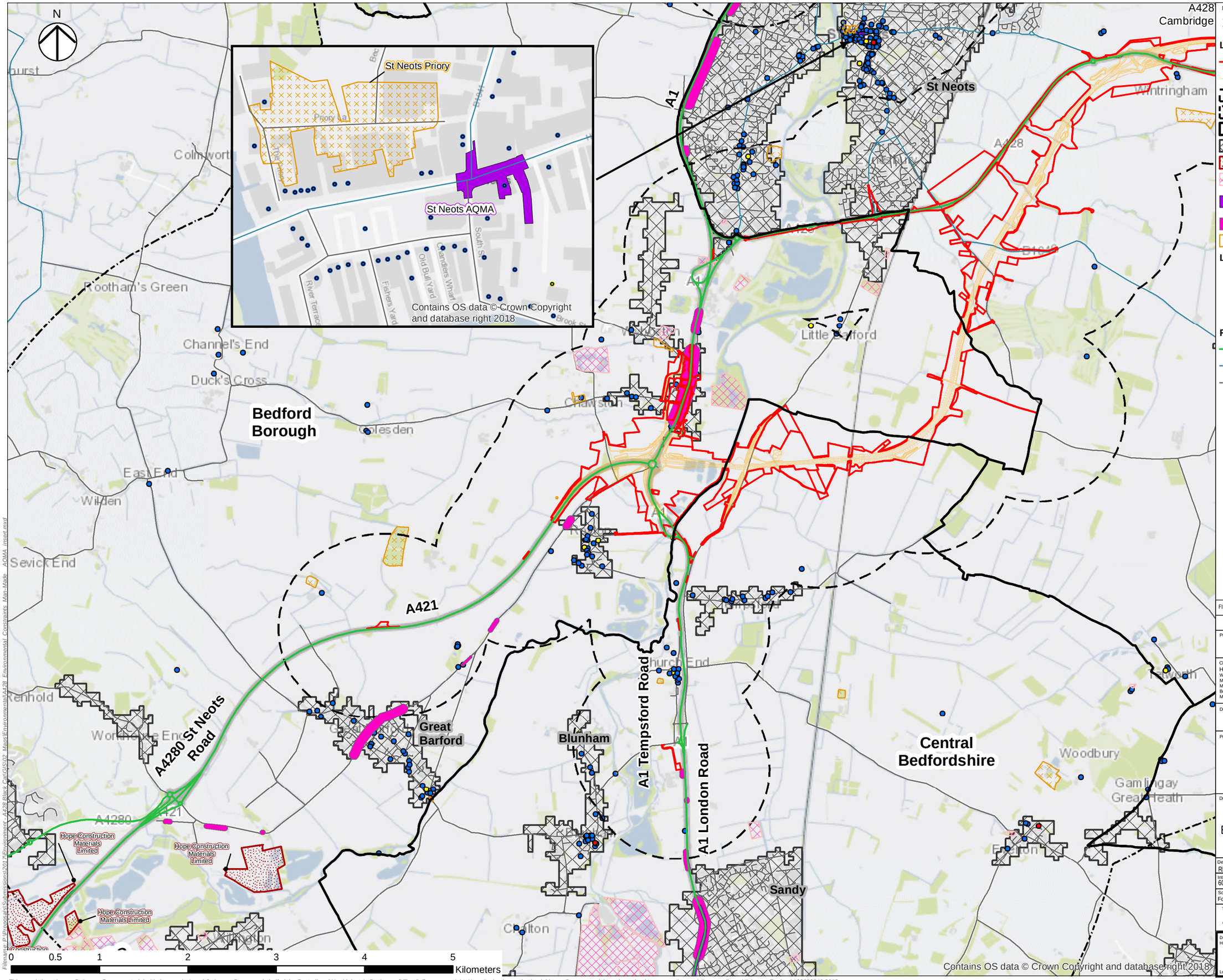

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

LEGEND

- DCO Site Boundary
- The Scheme
- 1km Scoping Study Area
- 5km Scoping Study Area
- Administrative Areas
- Built up Areas
- Authorised Landfill Site
- Historic Landfill Site
- Air Quality Management Area (AQMA)
- Noise Important Areas
- Scheduled Monuments

Listed Buildings - Grade:

- I
- II
- II*

Roads

- A Road
- B Road
- Unclassified

Revision Details	By / Check	Date	Suffix
FIRST ISSUE	RF / JG	28/03/19	

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

Drawing Title: FIGURE 2.3 ENVIRONMENTAL CONSTRAINTS - BUILT ENVIRONMENT

Designed	Drawn	Checked	Approved	Date
RF	RF	MM		28/03/19

Internal Project No: 60541541

Suitability:

Scale @ A3: For illustrative purposes only

Zone: A428

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number

Rev

Filename: P:\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\Environmental\A428_Environmental_Constraints_Man-Made_AQMA_inset.mxd

N

A1 Great North Road

Little Paxton

St Neots

Huntingdonshire District

A428 Cambridge Road

A1

Wyboston

Abbotsley

Waresley

Yelling

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0 1 2 3 4 5 Kilometers

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

LEGEND

- DCO Site Boundary
- The Scheme
- 1km Scoping Study Area
- 5km Scoping Study Area
- District Boundaries
- Built up Areas
- Authorised Landfill Site
- Historic Landfill Site
- Air Quality Management Area (AQMA)
- Noise Important Areas
- Scheduled Monuments

Listed Buildings - Grade:

- I
- II
- II*

Roads

- A Road
- B Road
- Unclassified

FIRST ISSUE	RF / JG	28/03/19	
Revision Details	By / Check	Date	Suffix

Purpose of Issue

FOR INFORMATION

Client
Highways England
Woodlands
Manton Lane
Manton Industrial Estate
Bedford
MK41 7LW

Development Consent Order Number

Project Title

A428 BLACK CAT TO CAXTON GIBBET

Drawing Title

FIGURE 2.3
ENVIRONMENTAL CONSTRAINTS - BUILT ENVIRONMENT

Designed	Drawn	Checked	Approved	Date
RF	RF	MM		28/03/19

Internal Project No 60541541	Suitability
Scale @ A3 For illustrative purposes only	Zone A428

Drawing Number
Highways England Pin | Originator | Volume | Location | Type | Role | Number | Rev

Filename: P:\Projects\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\Environmental\A428_Environmental_Constraints_Man-Made_20190226.mxd

N

Eaton Tractors Ltd

Little Paxton

St Neots

Huntingdonshire District

A428 Cambridge Road

Yelling

Eversden Landfill

Eltisley

A1198 St Ives Road

Papworth Everard

A1198

Caxton

Abbotsley

Great Gransden

Little Gransden

Waresley

College Farm
Cornfields
Hollow Farm
Ingles Farm
Home Farm
Brook Farm
Monks Hardwick
Tithe Farm
Weald
Wintringham
Croxton
Keepers Cottage
Brickmere
Caldecote Manor Farm
Caldecote Lodge
South Lodge
Eltisley Wood
Rectory Farm
Lansbury Farm
Gallow Hill
Parnells Farm
New Barns
Abbotsley Country Homes
Eynesbury Hardwicke Manor
Thomess Farm
Hill Top Farm
Moor Farm
Moor Farm Lodge
Highbarns
Crane Hill
Medbury Cottage
Highfield House
Hill's Farm
Stone Hill Farm
The Wold
Bullby Hill or Lily Hill
Lily Hill House
Gransden Wood
Waresley Wood
North Farm
Leycourt Farm
Leycourt Cottage
Hardwicke Farm
Redwood Farm
Hardwicke Villa
Dunton Poultry Farm
Claypit Cottages
Woodhams Farm House
Common Farm
Lodge Farm
Home Farm
Hunters Chase
Broadview
Fairview Farm
North East Farm
Pembroke Farm
Papworth Hotel
Common Farm Cottages
Swansley Wood Farm
Pasture Farm
Elsworth Lodge
Hill Farm

0 1 2 3 4 5 Kilometers

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NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

LEGEND

- DCO Site Boundary
- The Scheme
- 1km Scoping Study Area
- 5km Scoping Study Area
- District Boundaries
- Built up Areas
- Authorised Landfill Site
- Historic Landfill Site
- Air Quality Management Area (AQMA)
- Noise Important Areas
- Scheduled Monuments

Listed Buildings - Grade:

- I
- II
- II*

Roads

- A Road
- B Road
- Unclassified

Revision Details	By / Check	Date	Suffix
FIRST ISSUE	RF / JG	28/03/19	

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

Drawing Title: FIGURE 2.3 ENVIRONMENTAL CONSTRAINTS - BUILT ENVIRONMENT

Designed	Drawn	Checked	Approved	Date
RF	RF	MM		28/03/19

Internal Project No	Suitability
60541541	

Scale @ A3	Zone
For illustrative purposes only	A428

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number | Rev

Filename: P:\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02 Maps\Environmental\A428_Environmental_Constraints_Man-Made_20190226.mxd

N

Papworth St Agnes

A1198 St Ives Road

Papworth Everard

A1198

Yelling

Elsworth

Knapwell

A14 Huntingdon Road

Boxworth

Lolworth

Bar Hill

Childerley

A1198

Eversden Landfill

South Cambridgeshire District

A428

Croxton

Eltisley

Lower Cambourne

Caxton

Caldecote

Hardwick

Crow End

A1198 Old North Road

Bourn

Toft

B1046

Great Gransden

Little Gransden

Waresley

Longstowe

Kingston

0 1 2 3 4 5 Kilometers

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

LEGEND

- DCO Site Boundary
- The Scheme
- 1km Scoping Study Area
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Listed Buildings - Grade:

- I
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- II*

Roads

- A Road
- B Road
- Unclassified

Revision Details	By / Check	Date	Suffix
FIRST ISSUE	RF / JG	28/03/19	

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

Drawing Title: FIGURE 2.3 ENVIRONMENTAL CONSTRAINTS - BUILT ENVIRONMENT

Designed	Drawn	Checked	Approved	Date
RF	RF	MM		28/03/19

Internal Project No	Suitability
60541541	

Scale @ A3	Zone
For illustrative purposes only	A428

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number | Rev

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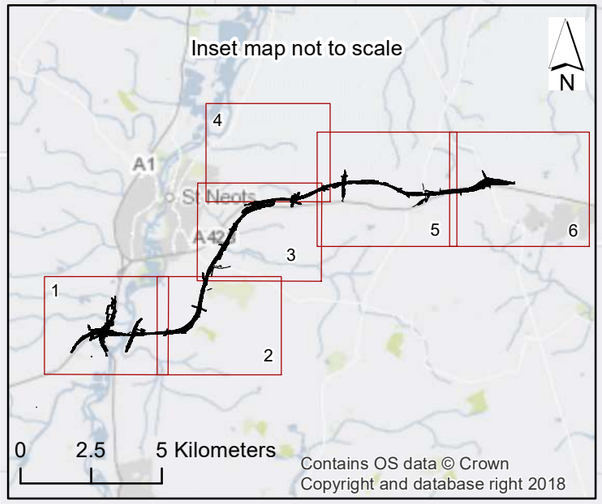


NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

The Scheme

FIRST ISSUE	RF / JG	29/03/19	
Revision Details	By / Check	Date	Suffix

Purpose of Issue

FOR INFORMATION

Client

Highways England
Woodlands
Manton Lane
Manton Industrial Estate
Bedford
MK41 7LW

Development Consent Order Number

Project Title

A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title

FIGURE 2.4

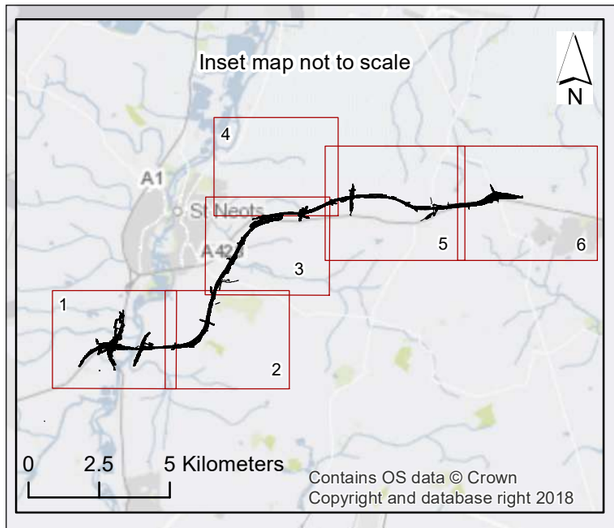
GENERAL ARRANGEMENT

Designed	Drawn	Checked	Approved	Date
JG	RF	JG	JG	29/03/19

Internal Project No	Suitability
60541541	
Scale @ A3	Zone
1:15,000	

Drawing Number
Highways England Pin | Originator | Volume | Location | Type | Role | Number | Rev

Filename: C:\Users\Rebecca.Furlong\Desktop\Fig 2.4 General_Arrangement_A428_20190330_v2.mxd



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NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

The Scheme

FIRST ISSUE	RF / JG	29/03/19	
Revision Details	By / Check	Date	Suffix

Purpose of Issue

FOR INFORMATION

Client

Highways England
Woodlands
Manton Lane
Manton Industrial Estate
Bedford
MK41 7LW

Development Consent Order Number

Project Title

A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title

FIGURE 2.4

GENERAL ARRANGEMENT

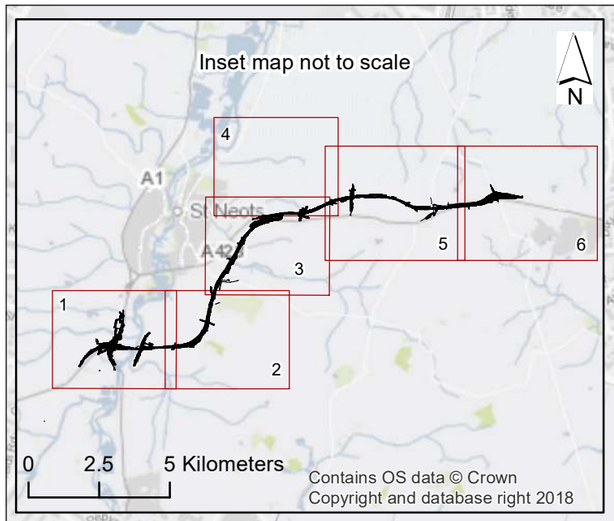
Designed	Drawn	Checked	Approved	Date
JG	RF	JG	JG	29/03/19

Internal Project No 60541541	Suitability
Scale @ A3 1:15,000	Zone

Drawing Number
Highways England Pin | Originator | Volume | Location | Type | Role | Number

Rev

Filename: C:\Users\Rebecca.Furlong\Desktop\Fig 2.4 General_Arrangement_A428_20190330_v2.mxd



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THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

The Scheme

Revision Details	By / Check	Date	Suffix
FIRST ISSUE	RF / JG	29/03/19	

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 2.4

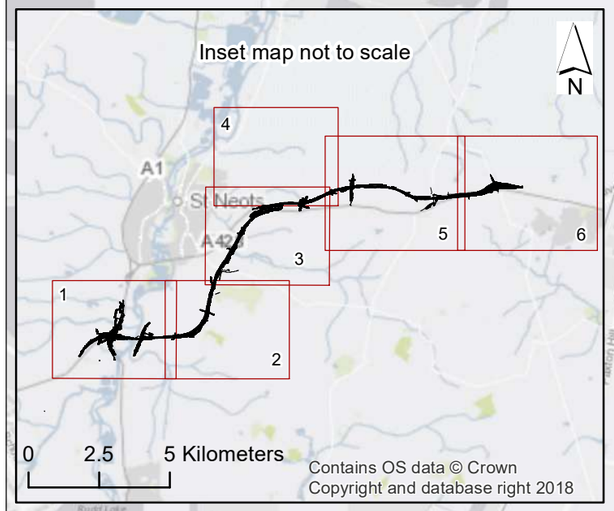
GENERAL ARRANGEMENT

Designed	Drawn	Checked	Approved	Date
JG	RF	JG	JG	29/03/19

Internal Project No	Suitability
60541541	
Scale @ A3: 1:15,000	Zone

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number | Rev

Filename: C:\Users\Rebecca.Furlong\Desktop\Fig 2.4 General_Arrangement_A428_20190330_v2.mxd



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NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

The Scheme

Revision Details	By / Check	Date	Suffix
FIRST ISSUE	RF / JG	29/03/19	

Purpose of Issue

FOR INFORMATION

Client
Highways England
Woodlands
Manton Lane
Manton Industrial Estate
Bedford
MK41 7LW

Development Consent Order Number

Project Title

A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title

FIGURE 2.4

GENERAL ARRANGEMENT

Designed	Drawn	Checked	Approved	Date
JG	RF	JG	JG	29/03/19

Internal Project No	Suitability
60541541	
Scale @ A3	Zone
1:15,000	

Drawing Number
Highways England Pin | Originator | Volume | Location | Type | Role | Number

Rev

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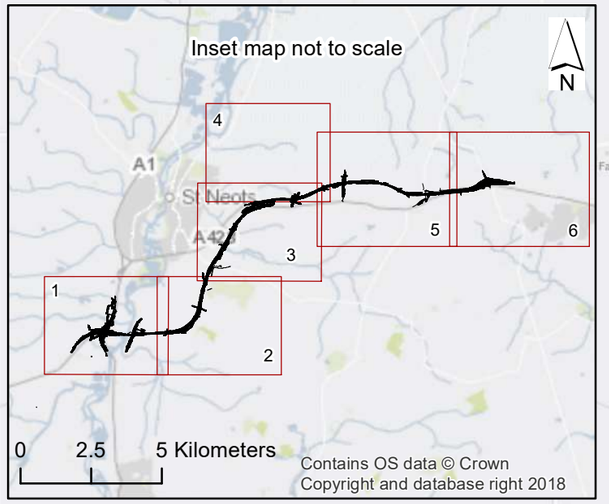
Filename: C:\Users\Rebecca.Furlong\Desktop\Fig 2.4 General_Arrangement_A428_20190330_v2.mxd



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THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

The Scheme

FIRST ISSUE	RF	JG	29/03/19	
Revision Details	By	Check	Date	Suffix

Purpose of Issue

FOR INFORMATION

Client
Highways England
Woodlands
Manton Lane
Manton Industrial Estate
Bedford
MK41 7LW

Development Consent Order Number

Project Title

A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title

FIGURE 2.4

GENERAL ARRANGEMENT

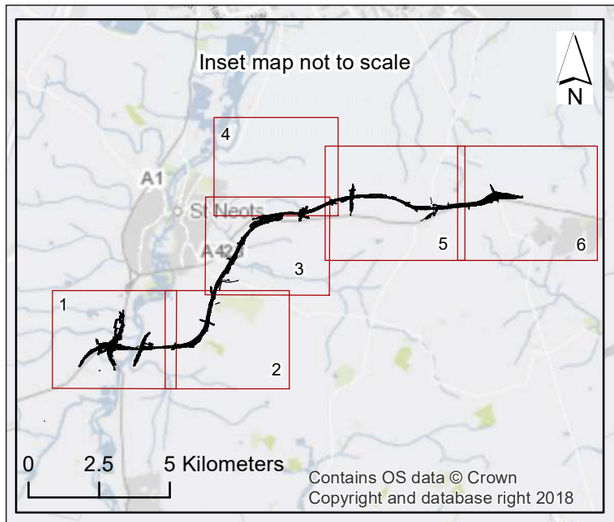
Designed	Drawn	Checked	Approved	Date
JG	RF	JG	JG	29/03/19

Internal Project No 60541541	Suitability
Scale @ A3 1:17,000	Zone

Drawing Number
Highways England Pin | Originator | Volume
Location | Type | Role | Number

Rev

Filename: C:\Users\Rebecca.Furlong\Desktop\Fig 2.4 General_Arrangement_A428_20190330_v2.mxd



NOTES

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Legend

The Scheme

Revision Details	By / Check	Date	Suffix
FIRST ISSUE	RF / JG	29/03/19	

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 2.4

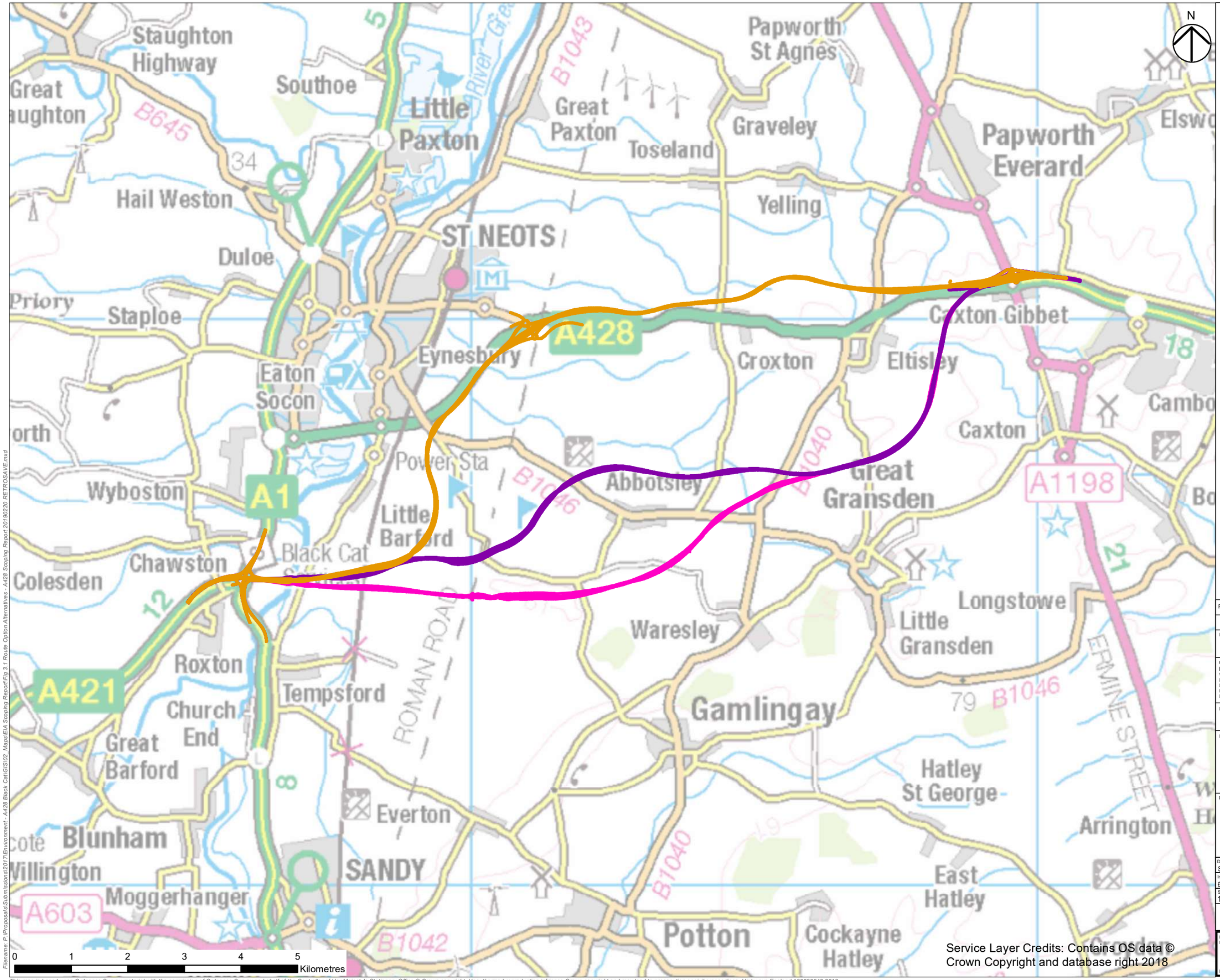
GENERAL ARRANGEMENT

Designed	Drawn	Checked	Approved	Date
JG	RF	JG	JG	29/03/19

Internal Project No	Suitability
60541541	
Scale @ A3: 1:17,000	Zone

Drawing Number: Highway England Pin | Originator | Volume | Location | Type | Role | Number | Rev

Filename: C:\Users\Rebecca.Furlong\Desktop\Fig 2.4 General_Arrangement_A428_20190330_v2.mxd



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NOTES

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LEGEND

- Orange Route Option
- Purple Route Option
- Pink Route Option

FIRST ISSUE	SW / MM	26/03/19	P01
Revision Details	By / Check	Date	Suffix

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 3.1 ROUTE OPTION ALTERNATIVES

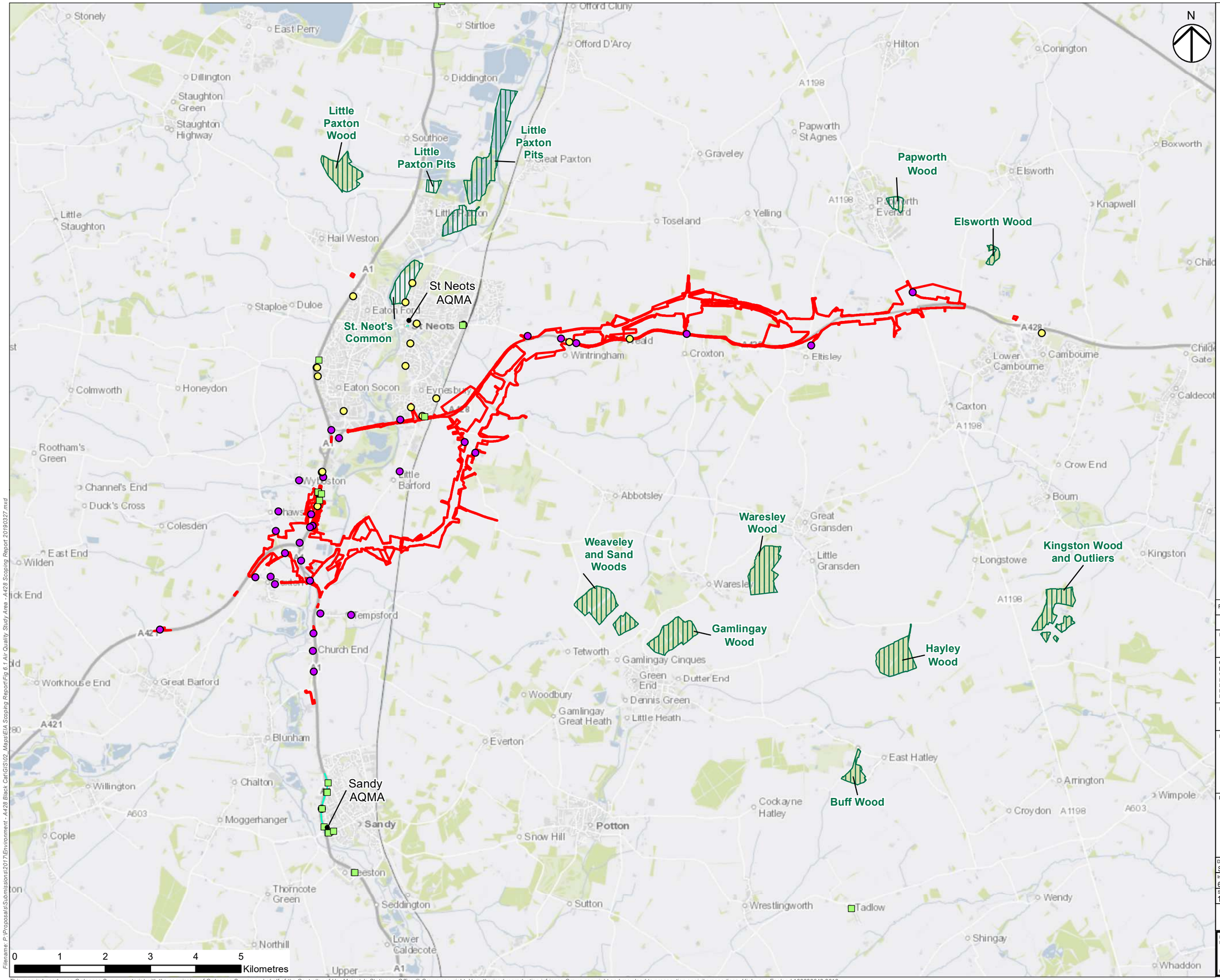
Designed	Drawn	Checked	Approved	Date
SW	SW	MM	JG	26/03/19

Internal Project No: 60541541	Suitability:
Scale @ A3: 1:60,000	Zone:

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number

Rev: P02

Filename: P:\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\EIA Scoping Report\Fig 3.1 Route Option Alternatives - A428 Scoping Report 20190220 RETROSAVE.mxd



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

- Local Authority Monitoring Locations
- Highways England Monitoring Locations
- Additional Monitoring Locations
- Site of Special Scientific Interest (SSSI)
- Air Quality Management Area (AQMA)
- DCO Site Boundary

FIRST ISSUE	RF / JG	28/03/19	P01
Revision Details	By / Check	Date	Suffix

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 6.1 AIR QUALITY

Designed	Drawn	Checked	Approved	Date
SW	RF	MM	JG	28/03/19

Internal Project No: 60541541	Suitability:
Scale @ A3: 1:75,000	Zone:

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number — Rev: P02

Filename: P:\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\EIA Scoping Report\Fig 6.1 Air Quality Study Area - A428 Scoping Report 20190327.mxd

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

- DCO Site Boundary
- 1km Scoping Study Area
- 1km Area of Search
- Findspots
- Findspots (Area)
- Monuments (Point)
- Monuments (Area)
- Monuments (Line)
- Buildings
- Conservation Area

FIRST ISSUE	DM / MM	28/03/19	P01
Revision Details	By / Check	Date	Suffix

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 7.1 KNOWN HERITAGE ASSETS SHEET 1 OF 10

Designed	Drawn	Checked	Approved	Date
DM	DM	HM	HM	28/03/19

Internal Project No: 60541541	Suitability:
Scale @ A3: 1:12,500	Zone: M42

Drawing Number				Rev
Highways England Pin	Originator	Volume		
HE551485	-ACM	-EGN-		P01
Location: M42_SW_ZZ_ZZ		-DR-DC-	Type / Role / Number	

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Filename: \\eu.aecomnet.com\euproject\o\UKLDS2-IE\ENVIRONMENT\Practice Areas\Archaeology\Projects\Black Cat Roundabout 60541541\5 Mapping\GIS\02. Maps\FIGURE X Known Heritage Assets.mxd

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

- DCO Site Boundary
- 1km Scoping Study Area
- 1km Area of Search
- Findspots (Area)
- Monuments (Area)
- Listed Buildings
- Buildings
- Buildings (Area)
- Scheduled Monument
- Conservation Area

0 250 500 1,000 1,500 2,000 Metres

FIRST ISSUE	DM / MM	28/03/19	P01	
Revision Details	By / Check	Date	Suffix	

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 7.1 KNOWN HERITAGE ASSETS SHEET 2 OF 10

Designed	Drawn	Checked	Approved	Date
DM	DM	HM	HM	28/03/19

Internal Project No: 60541541	Suitability:
Scale @ A3: 1:12,500	Zone: M42

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number: HE551485 -ACM -EGN- M42_SW_ZZ_ZZ -DR-DC-

Rev: P01

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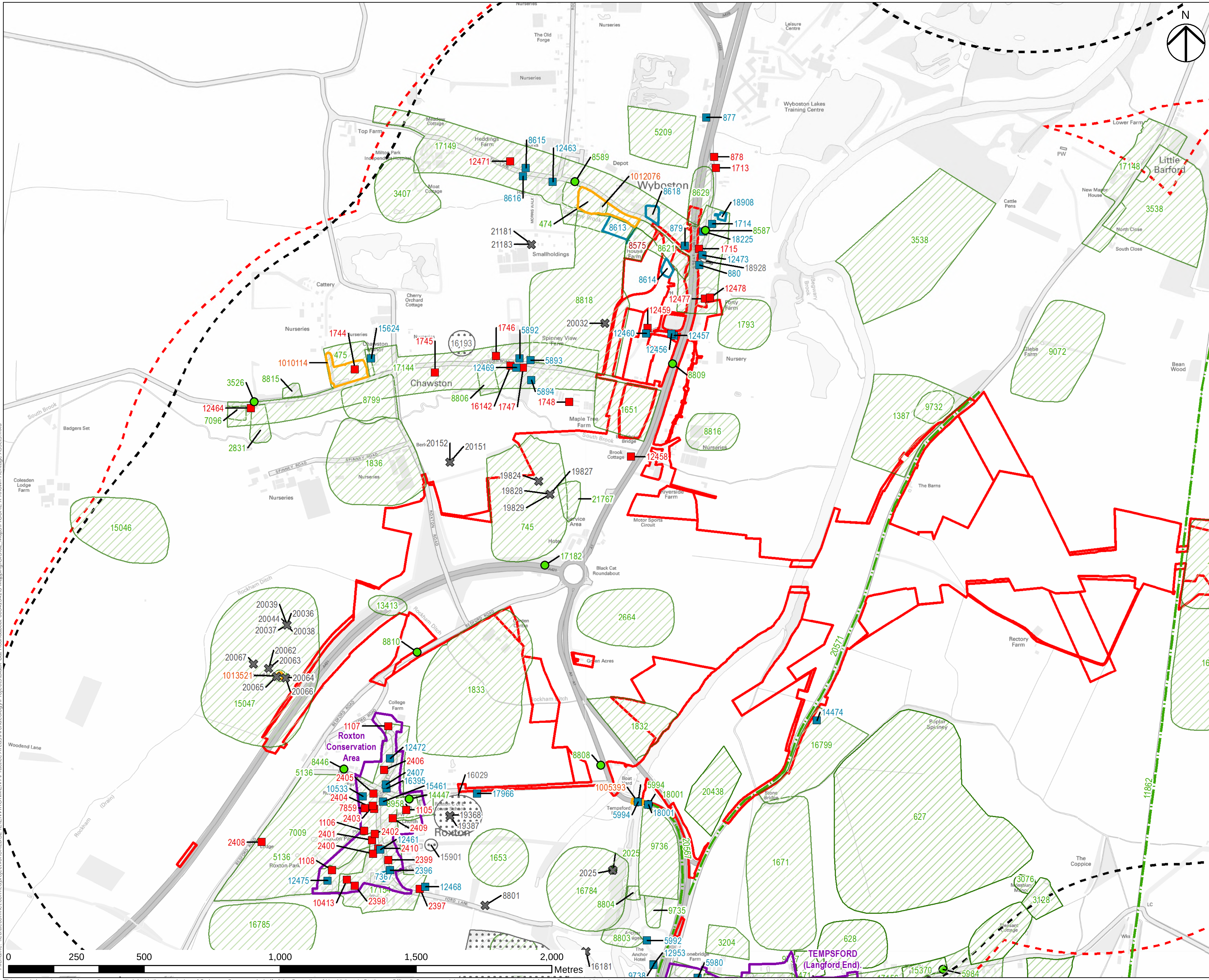

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

- DCO Site Boundary
- 1km Scoping Study Area
- 1km Area of Search
- Findspots
- Findspots (Area)
- Monuments (Point)
- Monuments (Area)
- Monuments (Line)
- Listed Buildings
- Buildings
- Buildings (Area)
- Scheduled Monument
- Conservation Area

Revision Details	By / Check	Date	Suffix
FIRST ISSUE	DM / MM	28/03/19	P01

Purpose of Issue
FOR INFORMATION

Client
Highways England
Woodlands
Manton Lane
Manton Industrial Estate
Bedford
MK41 7LW

highways england

Development Consent Order Number

Project Title
A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title
FIGURE 7.1
KNOWN HERITAGE ASSETS
SHEET 3 OF 10

Designed	Drawn	Checked	Approved	Date
DM	DM	HM	HM	28/03/19

Internal Project No	Suitability
60541541	

Scale @ A3	Zone
1:12,500	M42

Drawing Number
Highways England Pin | Originator | Volume
HE551485 -ACM -EGN-
M42_SW_ZZ_ZZ -DR-DC-
Location | Type | Role | Number

Rev
P01

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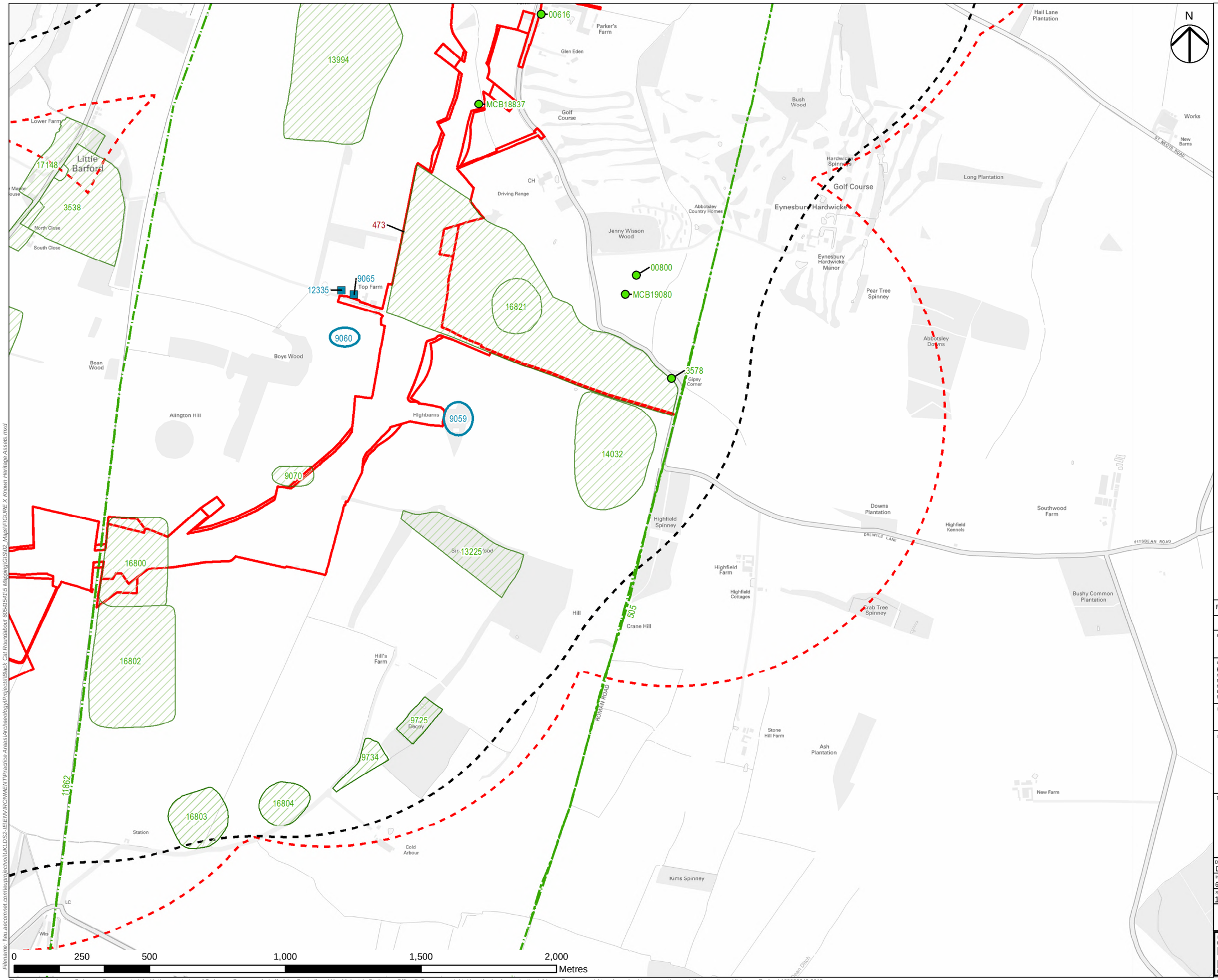

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NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

- DCO Site Boundary
- 1km Scoping Study Area
- 1km Area of Search
- Monuments (Area)
- Monuments (Line)
- Buildings
- Buildings (Area)
- Monuments (Point)

FIRST ISSUE	DM / MM	28/03/19	P01
Revision Details	By / Check	Date	Suffix

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 7.1 KNOWN HERITAGE ASSETS SHEET 4 OF 10

Designed	Drawn	Checked	Approved	Date
DM	DM	HM	HM	28/03/19

Internal Project No: 60541541	Suitability:
Scale @ A3: 1:12,500	Zone: M42

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number

HE551485 -ACM -EGN- M42_SW_ZZ_ZZ -DR-DC-

Rev: P01

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NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

- DCO Site Boundary
- 1km Scoping Study Area
- 1km Area of Search
- Monuments (Area)
- Monuments (Line)
- Monuments (Area)
- Monuments (Point)

FIRST ISSUE	DM / MM	28/03/19	P01
Revision Details	By / Check	Date	Suffix

Purpose of Issue

FOR INFORMATION

Client

Highways England
Woodlands
Manton Lane
Manton Industrial Estate
Bedford
MK41 7LW

Development Consent Order Number

Project Title

A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title

FIGURE 7.1
KNOWN HERITAGE ASSETS
SHEET 5 OF 10

Designed	Drawn	Checked	Approved	Date
DM	DM	HM	HM	28/03/19

Internal Project No	Suitability
60541541	
Scale @ A3	Zone
1:12,500	M42

Drawing Number

Highways England Pin | Originator | Volume | Location | Type | Role | Number | Rev

HE551485 -ACM -EGN- M42_SW_ZZ_ZZ -DR-DC- P01

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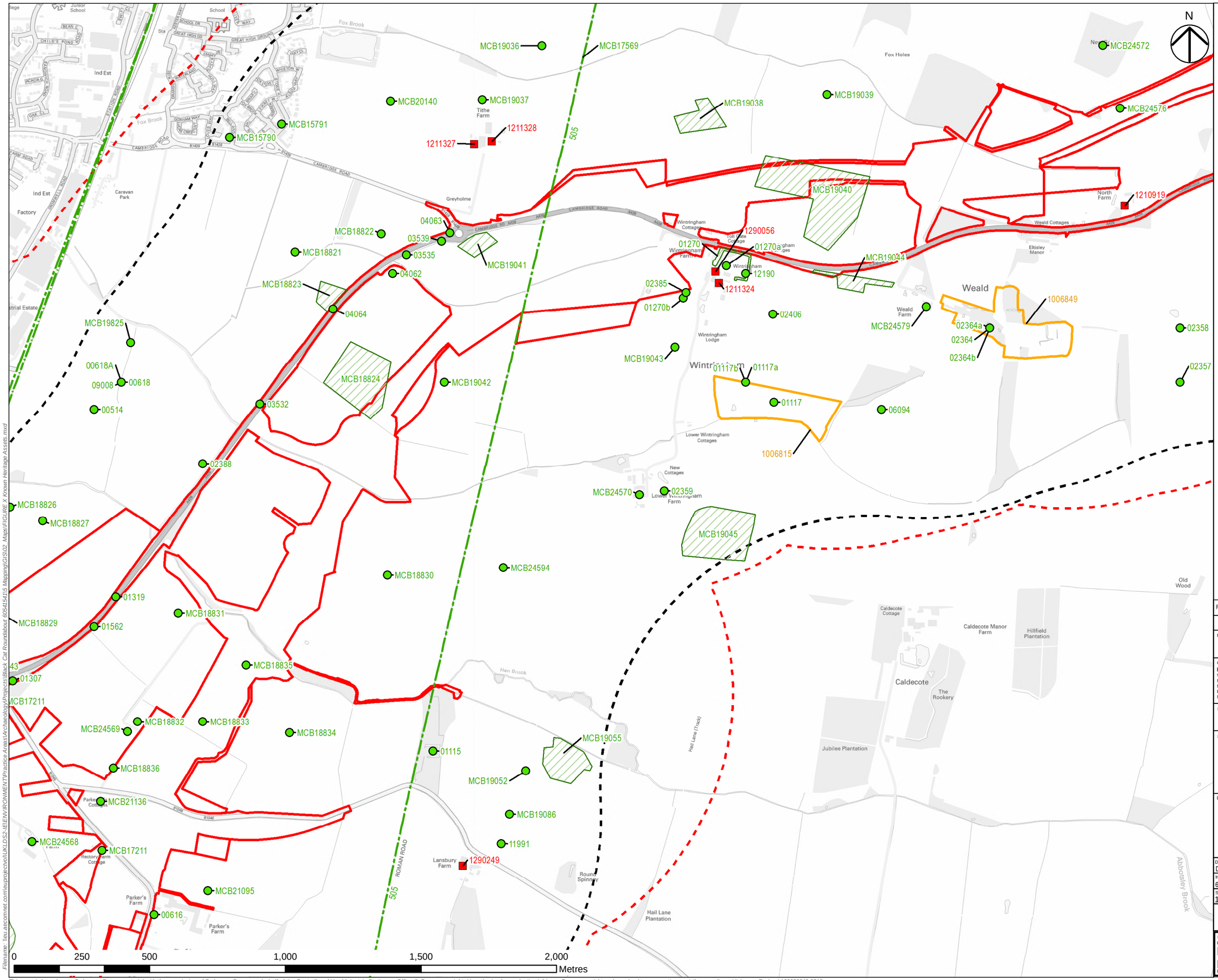


NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

- DCO Site Boundary
- 1km Scoping Study Area
- 1km Area of Search
- Monuments (Area)
- Monuments (Line)
- Monuments (Area)
- Monuments (Point)
- Listed Buildings
- Scheduled Monument

Revision Details	By / Check	Date	Suffix
FIRST ISSUE	DM / MM	28/03/19	P01

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

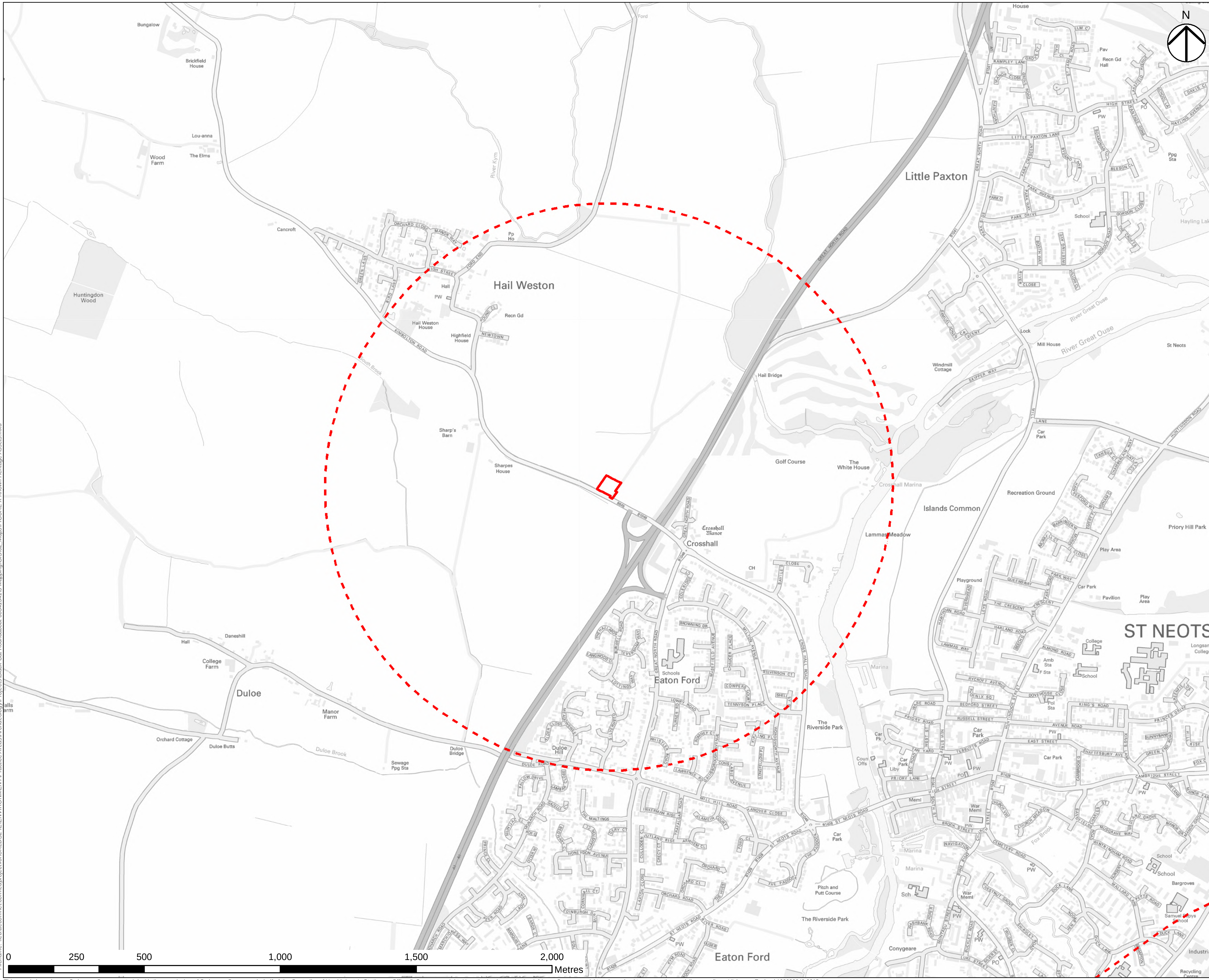
Drawing Title: FIGURE 7.1 KNOWN HERITAGE ASSETS SHEET 6 OF 10

Designed	Drawn	Checked	Approved	Date
DM	DM	HM	HM	28/03/19

Internal Project No	Suitability
60541541	
Scale @ A3: 1:12,500	Zone: M42

Drawing Number: Highways England Pin HE551485 | Originator -ACM | Volume -EGN- | Location M42_SW_ZZ_ZZ | Type -DR- | Role -DC- | Number | Rev P01

Filename: \\eu.aecomnet.com\euproject\n\UKLDS2-\ELENV\RONMENT\Practice Areas\Archaeology\Projects\Black Cat Roundabout 60541541\5 Mapping\GIS\02_Maps\FIGURE X Known Heritage Assets.mxd



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

DCO Site Boundary

1km Scoping Study Area

Revision Details	By / Check	Date	Suffix
FIRST ISSUE	DM / MM	28/03/19	P01

Purpose of Issue

FOR INFORMATION

Client
Highways England
Woodlands
Manton Lane
Manton Industrial Estate
Bedford
MK41 7LW

Development Consent Order Number

Project Title

A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title

FIGURE 7.1
KNOWN HERITAGE ASSETS
SHEET 7 OF 10

Designed	Drawn	Checked	Approved	Date
DM	DM	HM	HM	28/03/19

Internal Project No: 60541541	Suitability
Scale @ A3: 1:12,500	Zone: M42

Drawing Number
Highways England Pin | Originator | Volume
HE551485 -ACM -EGN-
M42_SW_ZZ_ZZ -DR-DC-
Location | Type | Role | Number

Rev: P01

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NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

- DCO Site Boundary
- 1km Scoping Study Area
- 1km Area of Search
- Monuments (Line)
- Monuments (Area)
- Monuments (Point)
- Listed Buildings

FIRST ISSUE	DM / MM	28/03/19	P01
Revision Details	By / Check	Date	Suffix

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 7.1 KNOWN HERITAGE ASSETS SHEET 8 OF 10

Designed	Drawn	Checked	Approved	Date
DM	DM	HM	HM	28/03/19

Internal Project No: 60541541	Suitability:
Scale @ A3: 1:12,500	Zone: M42

Drawing Number: Highways England Pin | Originator | Volume
HE551485 -ACM -EGN-
M42_SW_ZZ_ZZ -DR-DC-
Location | Type | Role | Number

Rev: P01

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NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

- DCO Site Boundary
- 1km Scoping Study Area
- 1km Area of Search
- Registered Park and Garden
- Monuments (Area)
- Monuments (Point)
- Listed Buildings
- Scheduled Monument

Revision Details	By Check	Date	Suffix
FIRST ISSUE	DM / MM	28/03/19	P01

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 7.1 KNOWN HERITAGE ASSETS SHEET 9 OF 10

Designed	Drawn	Checked	Approved	Date
DM	DM	HM	HM	28/03/19

Internal Project No	Suitability
60541541	
Scale @ A3: 1:15,000	Zone: M42

Drawing Number: Highways England Pin	Originator	Volume	Rev
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Location		Type | Role | Number	

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NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

- DCO Site Boundary
- 1km Scoping Study Area
- 1km Area of Search
- Monuments (Area)
- Monuments (Point)
- Listed Buildings
- Scheduled Monument

MCB21798
MCB24591
MCB24590
MCB22308
MCB17322
1162760
MCB19627
1019177
01180
12045
1163004
MCB24592
CB15034
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03515
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FIRST ISSUE	DM / MM	28/03/19	P01
Revision Details	By / Check	Date	Suffix

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 7.1 KNOWN HERITAGE ASSETS SHEET 10 OF 10

Designed	Drawn	Checked	Approved	Date
DM	DM	HM	HM	28/03/19

Internal Project No: 60541541	Suitability:
Scale @ A3: 1:15,000	Zone: M42

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number: HE551485 -ACM -EGN- M42_SW_ZZ_ZZ -DR-DC-

Rev: P01

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Grafham Water (SSSI)
Diddington Brook
River Great Ouse
Little Paxton Pits (SSSI)
Midloe Wood
Meagre Wood
Little Paxton Wood
Little Paxton Wood (SSSI)
River Kym
Huntingdon Wood
Willow Pollards West of Sharp's Barn (CWS)
St. Neot's Common (SSSI)
River Great Ouse (CWS)
Gallow Brook
Duloe Brook
Bushmead Wood
Fox Brook
ST NEOTS
Honeydon Brook
Colmworth Brook
Wyboston Pits (CWS)
Begwary Brook
Begwary Brook Pits (CWS & Wildlife Trust Nature Reserve)
Black Cat Roundabout
South Brook
Little Barford (CWS)
Sir Johns Wood (CWS & ancient woodland)
Lady Wood
Rockham Ditch
Palaceyard Wood (CWS & ancient woodland)
Ravensden Brook
Birchfield Farm Meadows (CWS)
Great Barford House Grassland (CWS)
River Great Ouse
Dear Ditch
Latch Pool and Ditch (CWS)
Renhold Brook
River Great Ouse (CWS)
Gadsey Brook
Zwetsloots Pits (CWS)
Willington
Bottom Wood
Lords Wood
Sandy Warren (SSSI)
Sheerhatch Wood
College Wood
Rivers Ivel and Hiz (CWS)
River Ivel
Potton Brook
BIGGLESWADE
Cambridge Road Junction
Caxton Gibbet Junction
Papworth Wood (SSSI)
Papworth Wood
Overhall Grove
Overhall Grove (SSSI)
Elsworth Wood
Elsworth Wood (SSSI)
Elsworth (A428 to Common Farm) (PRV)
Knapwell Wood
Croxton Park (CWS)
Eltisley Wood (CWS & ancient woodland)
Eastern Brook
Hen Brook
Abbotsley Brook
Banham Dean Brook
Little Brook
Haydean
Gascote Dean
Small Brook
Waresley Dean Brook
Gransden Brook
Mandean Brook
Slow Dean
Weaveley Wood
Weaveley and Sand Woods (SSSI)
Sand Wood
Gransden Wood
Waresley Wood (SSSI)
Gamlingay Wood
Waresley Wood
Gamlingay Wood (SSSI)
Woodbury Sinks
White Wood
Foxhole Wood
Millbridge Brook
Hall Green Brook
West Brook
Fen Drayton
Swavesey
Callow Brook
Caldecote Meadows (SSSI)
Hardwick Wood (SSSI)
Hardwick Wood
Home Wood
Bourn Wood
Bourn Brook
New Ditch
Dean Brook
Eversden and Wimpole Woods (SAC)
0 0.5 1 2 3 4 km

INSET MAP: 30KM STUDY AREA FOR BAT SACs
Eversden and Wimpole Woods
30km buffer
Contains OS data © Crown Copyright and database right 2018

Filename: \\cb-man-002\environment\3336 Ecology\Active Projects\A428\GIS\02_Maps\A428_Designated Sites.mxd

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

LEGEND

- The Scheme
- DCO Site Boundary
- 1km Scoping Study Area
- 5km Scoping Study Area
- Special Area of Conservation (SAC)
- Site of Special Scientific Interest (SSSI)
- County Wildlife Site (CWS)
- Protected Road Verge (PRV)
- Wildlife Trust Nature Reserve
- Ancient Woodland
- River
- Other Watercourse

Revision Details	By	Check	Date	Suffix
FIRST ISSUE	BF	MW	25/02/19	P02

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

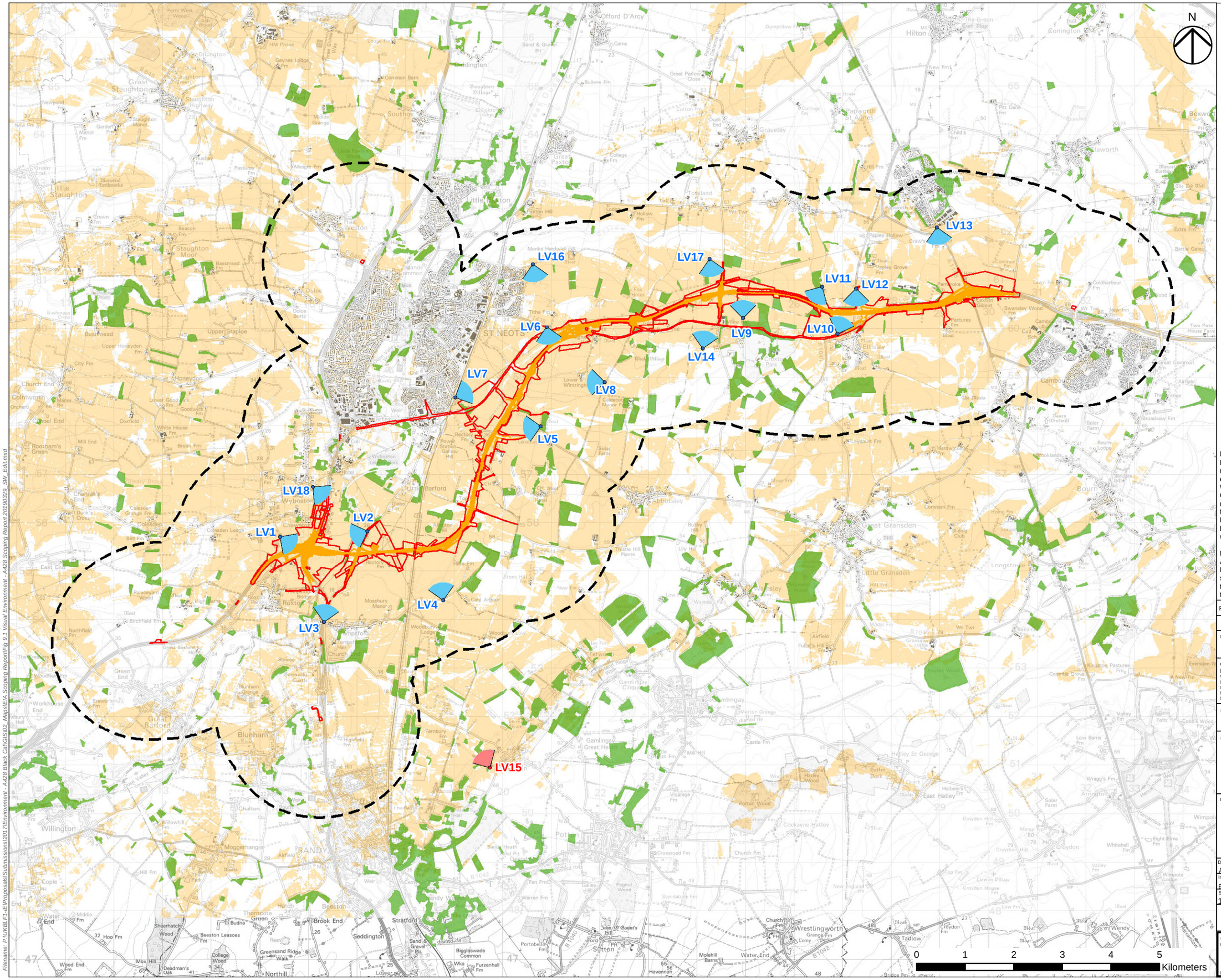
Drawing Title: FIGURE 8.1 BIODIVERSITY

Designed	Drawn	Checked	Approved	Date
GB	BF	MW	MW	27/03/19

Internal Project No	Suitability
60541541	S0
Scale @ A3: 1:85,000	Zone

Drawing Number	Originator	Volume	Rev
Highways England Pin: HE551495	-ACM	-EBD-	P02
XX-DR-GI-00002	Type | Role | Number		

Location



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

LEGEND

- DCO Site Boundary
- The Scheme
- 2km Scoping Study Area
- OS Building Heights
- Woodland (Modelled at 10m - Sourced From National Forest Inventory)

Preliminary Zone of Theoretical Visibility (ZTV)

- Not Visible
- Visible
- Viewpoint from isolated point in wider 5km study area
- Viewpoint Locations

Notes:
Based on 5m resolution Digital Surface Model (DSM), incorporating proposed scheme earthworks.
Woodland areas were derived from Forestry Commission National Forestry Inventory (NFI), modelled at 10m, and buildings were derived from OS MasterMap using the accurate OS Building Height Attribute (BHA) data. For buildings outisde the BHA coverage, heights were modelled at 8m.

Proposed scheme earthworks derived from the AECOM highways 3D model dated 14/02/2019 Proposed carriageway centreline and associated slip roads and overbridges modelled at 4m above the absolute elevation of the carriageway to model the height of HGV traffic on the carriageway.

Revision Details	By / Check	Date	Suffix
REVISION P03	RF / JG	28/03/19	P03

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

Drawing Title: FIGURE 9.1 VISUAL ENVIRONMENT

Designed	Drawn	Checked	Approved	Date
AJ	RF	MM	JG	28/03/19

Internal Project No	Suitability
60541541	
Scale @ A3: 1:70,000	Zone

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number | Rev

Filename: P:\UKBLF1-IE\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\EIA Scoping Report\Fig 9.1 Visual Environment - A428 Scoping Report 20190329_SW_EdIt.mxd

N

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

LEGEND

- DCO Site Boundary
- Administrative Areas
- 2km Detailed Study Area

National Character Areas

- Bedfordshire Greensand Ridge
- Bedfordshire and Cambridgeshire Claylands

Local Landscape Character Areas

- Chalklands
- Sandy
- 1B Riseley Clay Farmland
- 1C Alington Hill Clay Farmland
- 1D Cockayne Hatey Clay Farmland
- 1E Thurleigh Clay Farmland
- 1F Renhold Clay Farmland
- 3 Western Claylands
- 4 Ouse Valley Way
- 4A Great Ouse Clay Valley
- 4B Lower Ivel Clay Valley
- 5 South East Claylands
- 5E East Marston Clay Vale
- 5F Biggin Wood Clay Vale
- 5G Dunton Clay Vale
- 6B Mid Greensand Ridge
- 6C Everton Heasth Greensand Ridge
- 8 Southern Wolds

FIRST ISSUE	SW / JG	28/03/19	P01
Revision Details	By / Check	Date	Suffix

Purpose of Issue

FOR INFORMATION

Client
Highways England
Woodlands
Manton Lane
Manton Industrial Estate
Bedford
MK41 7LW

Development Consent Order Number

Project Title

A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title

FIGURE 9.2

LANDSCAPE CHARACTER

Designed	Drawn	Checked	Approved	Date
SW	SW	MM	JG	28/03/19

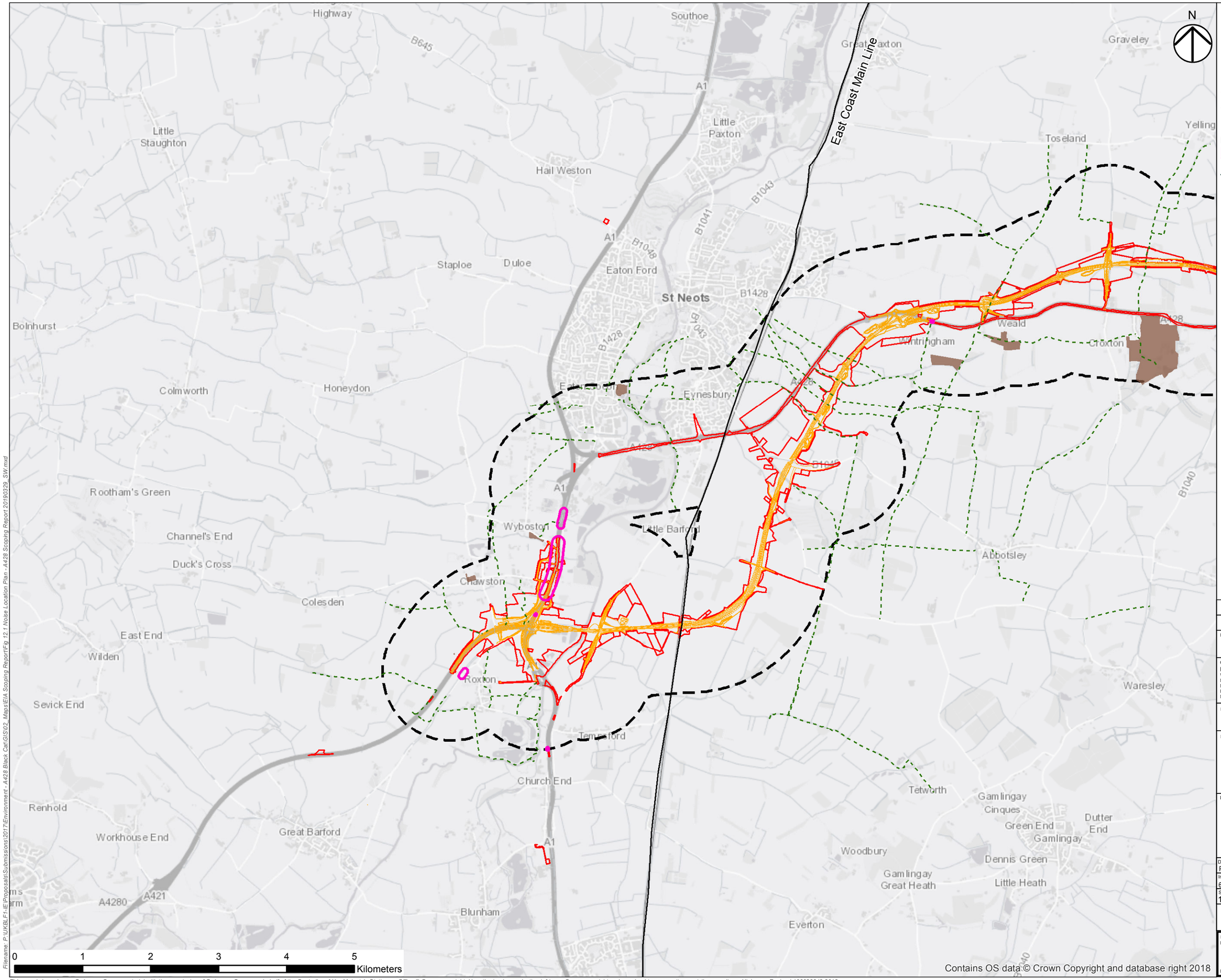
Internal Project No 60541541	Suitability
Scale @ A3 1:70,000	Zone

Drawing Number
Highways England Pin | Originator | Volume | Location | Type | Role | Number

Rev P02

0 1 2 3 4 5 Kilometers

Filename: P:\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\EIA Scoping Report\Fig 9.2 Landscape Character Areas - A428 Black Cat to Caxton Gibbet 20190327 RETROSAVE.mxd



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

- Public Right of Way
- The Scheme
- DCO Site Boundary
- East Coast Main Line
- Scheduled Monument
- 1km Scoping Study Area - Operation
- Noise Important Area
- Air Field Locations

REVISION P02	RF / JG	28/03/19	P02
Revision Details	By / Check	Date	Suffix

Purpose of Issue

FOR INFORMATION

Client

Highways England
Woodlands
Manton Lane
Manton Industrial Estate
Bedford
MK41 7LW

Development Consent Order Number

Project Title

A428 BLACK CAT TO CAXTON GIBBET EIA SCOPING REPORT

Drawing Title

FIGURE 10.1

NOISE AND VIBRATION

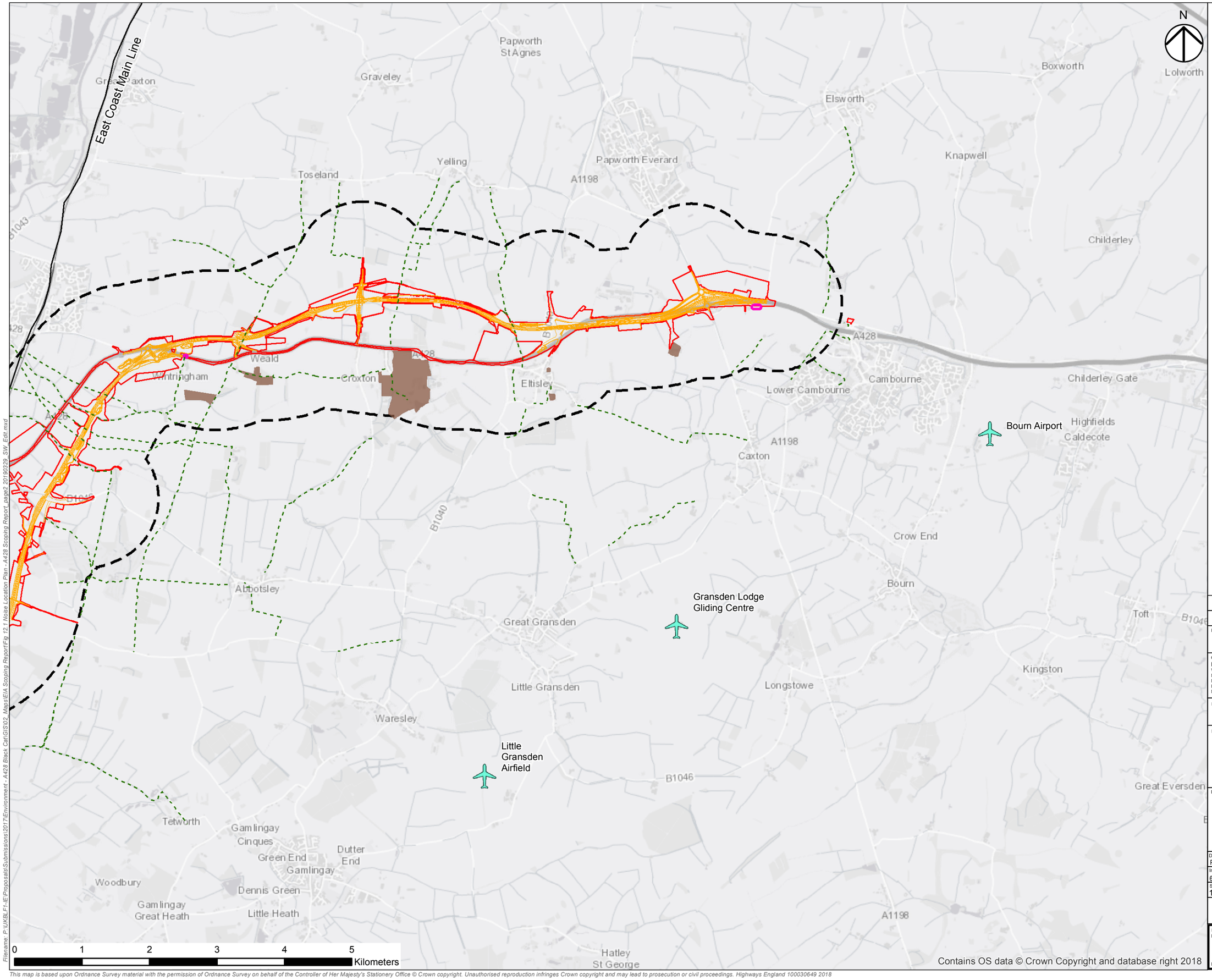
Designed	Drawn	Checked	Approved	Date
PL	RF	MM	JG	28/03/19

Internal Project No: 60541541	Suitability
Scale @ A3: 1:50,000	Zone: A428

Drawing Number
Highways England Pin | Originator | Volume
Location | Type | Role | Number

Rev: P02

Filename: P:\UKBLF1-tE\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\EIA Scoping Report\Fig 12.1 Noise Location Plan - A428 Scoping Report 20190329_SW.mxd



NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

- Public Right of Way
- The Scheme
- DCO Site Boundary
- East Coast Main Line
- Scheduled Monument
- 1km Scoping Study Area - Operation
- Noise Important Area
- Air Field Locations

REVISION P02	RF / JG	28/03/19	P02
Revision Details	By / Check	Date	Suffix

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET EIA SCOPING REPORT

Drawing Title: FIGURE 10.1 NOISE AND VIBRATION

Designed	Drawn	Checked	Approved	Date
PL	RF	MM	JG	28/03/19

Internal Project No: 60541541	Suitability:
Scale @ A3: 1:50,000	Zone: A428

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number

Rev: P02

Filename: P:\UKBLF1-IE\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\EIA Scoping Report\Fig 12.1 Noise Location Plan - A428 Scoping Report_page2 20190329_SW_Edit.mxd

N

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

- DCO Site Boundary
- Regional Trail
- Planning Applications
- Registered Common Land
- 1km Scoping Study Area
- Registered Historic Park & Garden

Public Rights of Way

- Footpath
- Bridleway
- Byway
- Restricted Byway

National Cycle Network

- NCN National Route
- NCN Link Route

SECOND ISSUE	SW / JG	28/03/19	P02
Revision Details	By / Check	Date	Suffix

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 11.1

POPULATION AND HEALTH

Designed	Drawn	Checked	Approved	Date
SW	SW	MM	JG	28/03/19

Internal Project No	Suitability
60541541	SO
Scale @ A3: 1:70,000	Zone

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number

Rev: P02

0 1 2 3 4 5 Kilometers

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

- The Scheme
- DCO Site Boundary

Agricultural Land Classification

- Grade 1
- Grade 2
- Grade 3
- Grade 4
- Non Agricultural
- Urban

N

0 1 2 3 4 5 Kilometers

Revision Details	By / Check	Date	Suffix
FIRST ISSUE	RF / JG	28/03/19	P01

Purpose of Issue

FOR INFORMATION

Client
Highways England
Woodlands
Manton Lane
Manton Industrial Estate
Bedford
MK41 7LW

Development Consent Order Number

Project Title

A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title

FIGURE 11.2
AGRICULTURAL LAND CLASSIFICATION

Designed	Drawn	Checked	Approved	Date
JG	RF	MM	JG	28/03/19

Internal Project No	Suitability
60543032	
Scale @ A3	Zone
1:65,000	M42

Drawing Number
Highways England Pin | Originator | Volume | Location | Type | Role | Number | Rev

Filename: P:\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\EIA Scoping Report\Fig 11.2 Agricultural_Land_Classification_A428_20190328.mxd

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

- Pollution Incident Data
- Groundwater & Surface Water Abstractions
- Active Discharge Consents
- DCO Site Boundary
- The Scheme
- WFD Moderate Ecological Potential
- WFD Good Ecological Potential
- WFD Poor Ecological Status
- Ordinary Watercourse (When not a WFD Reporting Reach)
- Main River (When not a WFD Reporting Reach)
- Ordinary Watercourse
- 2km Scoping Study Area
- 1km Scoping Study Area
- Site of Special Scientific Interest (SSSI)

REVISED STUDY AREA	RF / MM	18/02/19	P02
FIRST ISSUE	GB / DH	17/07/17	P01
Revision Details	By / Check	Date	Suffix

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 12.1 SURFACE WATER ENVIRONMENT

Designed	Drawn	Checked	Approved	Date
	RF	MM	MM	28/03/19

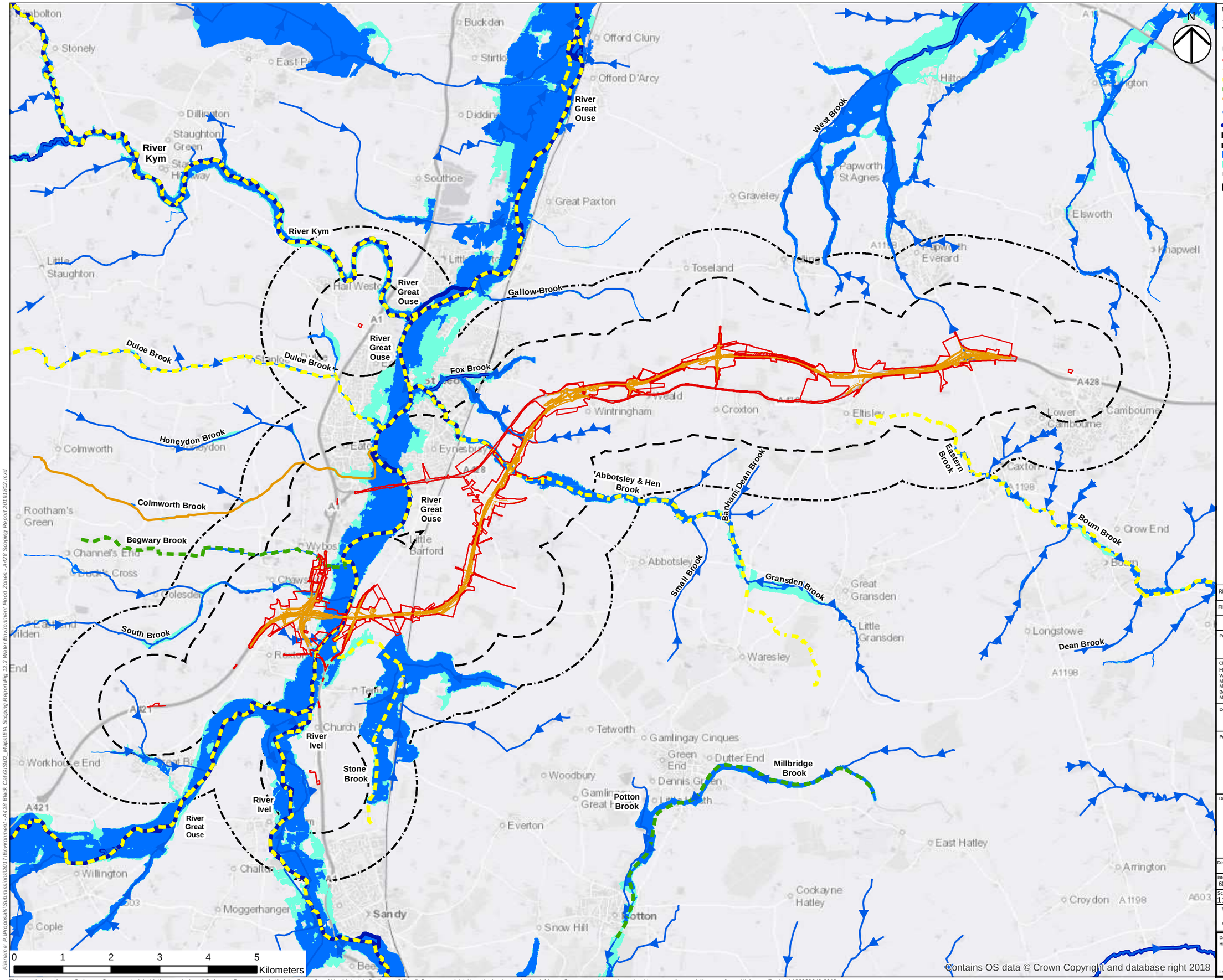
Internal Project No: 60541541	Suitability: SO
Scale @ A3: 1:70,000	Zone:

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number

Rev: P02

0 1 2 3 4 5 Kilometers

Filename: P:\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\EIA Scoping Report\Fig 12.1 Water Environment Location Plan - A428 Scoping Report_20190326.mxd



0 1 2 3 4 5 Kilometers

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

- DCO Site Boundary
- The Scheme
- WFD Moderate Ecological Potential
- WFD Good Ecological Potential
- WFD Poor Ecological Status
- Ordinary Watercourse (When not a WFD Reporting Reach)
- Main River (When not a WFD Reporting Reach)
- 1km Scoping Study Area
- 2km Scoping Study Area
- Flood Zone 3
- Flood Zone 2

Flood Zone 1

All areas not marked as Flood Zone 2 or Flood Zone 3 are within Flood Zone 1.

Revision Details	By / Check	Date	Suffix
REVISED STUDY AREA	RF / JG	27/03/19	P02
FIRST ISSUE	GB / DH	17/07/17	P01

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 12.2 ENVIRONMENT AGENCY FLUVIAL FLOOD ZONES

Designed	Drawn	Checked	Approved	Date
	RF	MM	JG	28/03/19

Internal Project No	Suitability
60541541	SO
Scale @ A3: 1:70,000	Zone

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number

Rev: P02

Filename: P:\Proposals\Submissions\20171\Environment - A428 Black Cat\GIS\02_Maps\EIA Scoping Report\Fig 12.2 Water Environment Flood Zones - A428 Scoping Report 20191802.mxd

Cambridge Road Junction

Caxton Gibbet Junction

Black Cat Roundabout

Weaveley and Sand Woods

0 1 2 3 4 5 Kilometers

NOTES

THIS DRAWING IS TO BE READ IN CONJUNCTION WITH ALL OTHER RELEVANT DOCUMENTATION.

Legend

- 500m Scoping Study Area
- The Scheme
- DCO Site Boundary
- Geological Site of Special Scientific Interest (Geological SSSI)

Woburn Sands Aquifer

- Inferred extents of aquifer within formation

Solid Geology

- Grey Chalk Subgroup - Chalk
- Gault Formation and Upper Greensand Formation (Undifferentiated) - Mudstone, Sandstone and Limestone
- Lower Greensand Group - Sandstone and Mudstone
- West Walton Formation, Ampthill Clay Formation and Kimmeridge Clay Formation (Undifferentiated)
- Kellaways Formation and Oxford Clay Formation (Undifferentiated) - Mudstone, Siltstone and Sandstone

FIRST ISSUE	RF / JG	28/03/19	
Revision Details	By / Check	Date	Suffix

Purpose of Issue: FOR INFORMATION

Client: Highways England, Woodlands, Manton Lane, Manton Industrial Estate, Bedford, MK41 7LW

Development Consent Order Number:

Project Title: A428 BLACK CAT TO CAXTON GIBBET

EIA SCOPING REPORT

Drawing Title: FIGURE 13.2 SOLID GEOLOGY

Designed	Drawn	Checked	Approved	Date
MO	RF	MM	JG	28/03/19

Internal Project No: 60541541	Suitability:
Scale @ A3: 1:60,000	Zone:

Drawing Number: Highways England Pin | Originator | Volume | Location | Type | Role | Number

Rev: P03

Filename: P:\Proposals\Submissions\2017\Environment - A428 Black Cat\GIS\02_Maps\EIA Scoping Report\Fig 10.2 Solid Geology - A428 Scoping Report_20190214.mxd

Appendix 5.1: Major Accidents and Disasters Screening Matrix

Background

Regulation 5(4) of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) [REF 1] stipulates that the "*expected significant effects arising from the vulnerability of a proposed development to major accidents or disasters that are relevant to that development*" are to be identified and assessed as part of an Environmental Impact Assessment (EIA).

This requirement derives from EU Directive 2011/92/EU [REF 2], as amended by EU Directive 2014/52/EU [REF 3]. This legislation emphasises the need to consider the vulnerability of projects, in terms of their exposure and resilience, to major accidents and/or disasters (such as flooding, earthquakes and sea level rises), the risk of those accidents and/or disasters occurring, and the implications for the likelihood of significant adverse environmental effects.

The identification of likely significant effects associated with major accidents and disasters (collectively termed 'major events') enables projects to be developed in a manner that provides protection of the environment, for example by making allowances in the design of developments to build resilience to the effects of a flood event arising from future climate change.

Accordingly, a preliminary screening of major events has been undertaken as part of the process of EIA scoping (see Chapter 5 of the Scoping Report), the purpose being to identify whether such events require consideration within the individual assessments that are to be progressed within the EIA of the Scheme, and to inform the ongoing design-development of the Scheme.

Approach

The preliminary screening of major events has involved a four stage approach. A summary of the key activities undertaken within each stage, and the findings and outcomes of the preliminary screening process, are described in the following sections.

Stage 1: Long list of major events

The preliminary screening exercise commenced with the identification of major events, using the following information sources to develop a long list for further consideration:

- the UK Government's Risk Register of Civil Emergencies [REF 4]; and
- professional judgement based on the form, nature and location of the Scheme.

Each identified major event was then categorised within the following broad types of disaster and accident.

- Geological and ground-related disasters.
- Hydrological disasters.
- Meteorological disasters.
- Space disasters.
- Transport accidents and disasters.
- Engineering accidents and failures.
- Industrial accidents.
- Terrorism, crime, war and civil unrest.
- Disease.

Stage 2: Screening of the long list of major events

Events that would not realistically occur due to their type or applicability to the Scheme, the characteristics of the Scheme, and/or the geographic location of the Scheme were screened out and discounted from further consideration during Stage 2. Examples included avalanches and famine which are major events, but which do not occur within the UK due to our climate and economic status.

The screening exercise then identified that a number of major events are already covered by legislative provisions and design requirements which offer legal protection and provide minimum design standards and operational requirements. Such examples include:

- Health and Safety at work etc. Act 1974 [REF 5];
- The Workplace (Health, Safety and Welfare) Regulations 1992 [REF 6];
- The Management of Health and Safety at Work Regulations 1999 [REF 7];
- Construction (Design and Management) Regulations 2015 [REF 8];
- Design Manual for Roads and Bridges (1993-2018) [REF 9]; and
- Interim Advice Note 191/16 Safety Governance for Highways England [REF 10].

The screening exercise concluded that it would be reasonable and proportionate to scope out construction workers, and similar operatives undertaking future maintenance activities on the Scheme, as specific types of receptor in the assessment. This was on the grounds that their health and wellbeing in the workplace would be safeguarded through existing legal protection, which would minimise the risk from major events to an acceptable level.

Stage 3: Scoping of major events within the long list

The identification of the need for assessment was facilitated by categorising the identified major events into two types during Stage 3:

- **Type 1** – events that could realistically occur, but for which the Scheme and its associated environmental resources and receptors are no more vulnerable than any other type of project or development; and
- **Type 2** – events that could occur, and to which the Scheme is particularly vulnerable, or which the construction, operation and/or maintenance of the Scheme has a particular capacity to exacerbate.

Factors considered in the scoping of major events included:

- the likelihood of major events occurring and their potential to interact with relevant environmental resources and receptors;
- the extent to which major events could alter the significance of effects associated with the topic assessments identified within the EIA Scoping Report for progression as part of the EIA of the Scheme;
- whether such events would be appropriately mitigated and/or managed such that the consequential effects would not be significant, and could therefore be scoped out of further consideration; and
- whether further mitigation would likely be required to reduce their likelihood/risk and/or improve the resilience of the Scheme to major events.

Stage 4: Assessment of shortlisted major events

The identification, screening and subsequent scoping of major events concluded a low likelihood of the identified major events to be assessed in Stage 4 i.e. as part of the EIA of the Scheme.

Outcomes

The outcomes of each stage of the major events screening exercise are tabulated below.

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
Geological and Ground Related Disasters						
Avalanches	No - avalanches are not considered relevant given the geographical location of the Scheme.	N/A	N/A	N/A	N/A	N/A
Landslides	Yes	2	Water resources and ecological receptors Properties People, drivers and workers	This type of event has been considered by the geotechnical and highway engineering teams as a fundamental part of the Scheme's design-development. In designing the Scheme to applicable standards, environmental resources and receptors would not be put at a greater risk as a consequence of the Scheme.	No	Geology and soils
Earthquakes	No - the Scheme would not be located in a geologically active area, and as such the risk of earthquake events is not considered a risk to the Scheme.	N/A	N/A	N/A	N/A	N/A
Sinkholes	Yes	2	Water resources and ecological receptors Properties	This type of event has been considered by the geotechnical and highway engineering teams as a fundamental part of the Scheme's design-development.	No	Geology and soils

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
			People, drivers and workers	The nature of the underlying geology beneath the Scheme is such that sinkholes are considered unlikely to occur.		
Ground stability	Yes	2	Aquatic environment and ecological receptors Properties People, drivers and workers	This type of event has been considered by the geotechnical and highway engineering teams as a fundamental part of the Scheme's design-development. In designing the Scheme to applicable standards, environmental resources and receptors would not be put at a greater risk as a consequence of the Scheme.	No	Geology and soils
Volcanic eruptions	No - the Scheme is not located in a volcanically active area, and it is considered highly unlikely that an ash cloud could significantly impact on any aspect of the Scheme.	N/A	N/A	N/A	N/A	N/A
Landfill accidents	Yes	2	Water resources Aquatic environment and ecological receptors Properties	A number of historic landfill sites are recorded in proximity to the Scheme, concentrated around the Wyboston and Wyboston Leisure Park areas. These were used for a range of wastes	No	Geology and soils

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
			People, drivers and workers	including commercial, industrial, inert, household and special wastes. One active landfill site is recorded to the north of Eltisley. Potential exists for landfill sites in close proximity to contain materials that could be damaging to human and ecological receptors. Standard mitigation measures would be implemented by the contractor during construction of the Scheme, to avoid and/or minimise the risk of any disturbance and the opening of possible pollutant pathways.		
Hydrological Disasters						
Flooding	Yes	2	Aquatic environment and ecological receptors Properties People, drivers and workers	Detailed flood modelling is being undertaken as part of the Environmental Impact Assessment to identify, model and evaluate flood risk associated with the Scheme. This modelling is considering both the vulnerability of the Scheme to	No	The project Road drainage and the water environment

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
				flooding, and the potential for the Scheme to exacerbate flooding. Appropriate measures are being incorporated into the Scheme design to capture, control, manage, treat and discharge surface water. Allowances are also being made in the Scheme design to allow for the effects of future climate change. Collectively, these measures would appropriately manage potential flood risk associated with the Scheme.		
Limnic eruptions	No – the Scheme is not located in proximity to any natural deep water lakes.	N/A	N/A	N/A	N/A	N/A
Groundwater contamination events within Source Protection Zones	No – the Scheme is not located in, or in proximity to, any Source Protection Zones.	N/A	N/A	N/A	N/A	N/A
Tsunami or storm surge	No – the Scheme is geographically located at	N/A	N/A	N/A	N/A	N/A

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
	distance from the UK's coastline (approx. 70km south-west of The Wash)					
Meteorological Disasters						
Blizzards	Yes	1	People, drivers and workers	This type of event could cause road users to be trapped on the highway; however, the risk is no different to any other highway or road users travelling on the UK's road network. Specific measures are therefore not considered to be required as part of the Scheme.	No	N/A
Cyclonic storms	Yes	1	People, drivers and workers	This type of event could result in damage to highway infrastructure and could affect journeys made by road users; however, the risk is no different to any other highway or road users travelling on the UK's road network. Specific measures are therefore not considered to be required as part of the Scheme.	No	N/A
Droughts	Yes	1	Aquatic environment and ecological receptors People, drivers and workers	This type of event could result in the drying out of features forming part of the Scheme design, and/or result in dust affecting road users and highway	No	N/A

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
				operatives; however, the risk is no different to any other highway or road users travelling on the UK's road network. Specific measures are therefore not considered to be required as part of the Scheme.		
Thunder-storms	Yes	1	People, drivers and workers	This type of event could result in lightning strikes to elevated structures (such as bridges) introduced as part of the Scheme; however, the risk is no different to any other highway or road users travelling on the UK's road network. Specific measures are therefore not considered to be required as part of the Scheme.	No	N/A
Hailstorms	Yes	1	People, drivers and workers	This type of event could result in difficult driving conditions for road users; however, the risk is no different to any other highway or road users travelling on the UK's road network. Specific measures are therefore not considered to be required as part of the Scheme.	No	N/A
Heat waves	Yes	1	Aquatic environment	This type of event could give rise	No	N/A

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
			and ecological receptors People, drivers and workers	to changes in climatic conditions, with road infrastructure exposed to greater heat intensity and exposure to sunlight; however, the risk is no different to any other highway or road users travelling on the UK's road network. Specific measures are therefore not considered to be required as part of the Scheme.		
Tornadoes	No – these events are uncommon in the UK, and on the rare occasions where these conditions do emerge they are typically of a force that is much less destructive in comparison to those found in other parts of the world.	N/A	N/A	N/A	N/A	N/A
Wildfires	Yes	1	Aquatic environment and ecological receptors Properties People, drivers and workers	Parts of the Scheme would be located in, and be surrounded by, areas of grassland that could be at risk of wildfire events during hot and dry periods; however, the risk is no different to any other highway or road users travelling on the UK's road network. Specific measures are therefore	No	N/A

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
				not considered to be required as part of the Scheme.		
Air quality events	Yes	2	Ecological receptors People, drivers and workers	Emissions associated with vehicles travelling on new and improved sections of highway proposed as part of the Scheme may contribute to events associated with poor air quality. The potential for significant effects arising from this type of event will be considered in detail as part of the Environmental Impact Assessment, and accordingly there is not considered a requirement to evaluate this further.	No	Air quality
Space Disasters						
Impact events and airburst	No - the risk associated with this type of event occurring is very low.	N/A	N/A	N/A	N/A	N/A
Solar flare	Yes	1	Road users	Solar flare events are known to interrupt radio and other electronic communications; however, no such systems would be implemented as part of the Scheme. Specific measures are therefore not considered to be required as	No	N/A

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
				part of the Scheme.		
Transport Accidents and Disasters						
Road accidents	Yes	2	Aquatic environment and ecological receptors People, drivers and workers	The Scheme is being designed to achieve a reduction in existing accident rates on the road network, and to manage any accidental spillages through the incorporation of modern drainage and treatment systems. The environmental risks posed by spillages of hazardous loads as a result of road accidents will be considered within the Environmental Impact Assessment.	No	Road drainage and the water environment
Rail accidents	Yes	2	Aquatic environment and ecological receptors People, drivers and workers	The Scheme would cross a section of the East Coast Main Line to the south of the settlement of Little Barford. The presence of the railway would be taken account of during the definition of construction working methods and timing/phasing of activities, to be employed by the contractor.	No	The project
Aircraft disasters	No – the Scheme is located at distance from the nearest international	N/A	N/A	N/A	N/A	N/A

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
	airport (Luton – approx. 34km south) and domestic airport (Cambridge – approx. 18km east).					
Maritime disasters	No – the Scheme is located on land, and would be located at distance from coastal areas (approx. 70km south-west of The Wash).	N/A	N/A	N/A	N/A	N/A
Engineering Accidents and Failures						
Bridge failure	Yes	1	Aquatic environment and ecological receptors People, drivers and workers	Bridge works are proposed as part of the Scheme. These structures are being designed to meet modern safety standards, reducing their likelihood of future failure. The risk associated with the Scheme of this event is considered no greater than other roads that include structures designed to comparable standards.	No	The project
Property or bridge demolition accidents	Yes	2	People, drivers and workers	The Scheme would require the demolition of two residential properties (Brook Cottages – Grade II Listed). A group of commercial buildings	No	The project Population and health

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
				(including a hotel and petrol station) would require demolition as part of the Scheme, located on the A1 at Black Cat Junction. A car wash facility near Caxton Gibbet will be removed to facilitate progression of the Scheme. The requirement for the demolition of agricultural buildings and structures will be evaluated as part of the design-development of the Scheme. The risks of accidents occurring during demolition works would be taken into account by the contractor, and considered as part of their detailed methodology and risk assessments carried out in advance of these works. Surveys would be undertaken prior to the demolition of properties and structures to confirm whether any potential harmful substances (e.g. asbestos) are present, and to determine the risk to people.		

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
Tunnel failure/fire	No – no tunnel structures are proposed as part of the Scheme.	N/A	N/A	N/A	N/A	N/A
Dam failure	No – no dams are located within proximity of the Scheme.	N/A	N/A	N/A	N/A	N/A
Flood defence failure	Yes	2	People, drivers and workers	The Scheme would cross areas of floodplain associated with the River Great Ouse (east of the A421/A1 junction) and Hen Brook (south-east of St. Neots). The area does not benefit from flood defences or provides flood storage areas. The design of the Scheme is being developed to include allowances for future climate change that could result in flooding. The potential risk of breech events will be considered in the Environmental Impact Assessment as part of the road drainage and the water environment assessment.	No	The project Road drainage and the water environment
Mast and tower collapse	No – no masts or towers are proposed as part of the Scheme, and no such infrastructure currently exists within a ‘topple’	N/A	N/A	N/A	N/A	N/A

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
	distance from the Scheme.					
Building failure or fire	Yes	1	People, drivers and workers	Buildings in proximity to the Scheme comprise residential and commercial properties, a number of which require demolition to facilitate progression of the Scheme. The risk of building fires affecting the Scheme is no greater than the risks associated with other roads on the UK's highway network.	No	Site and surroundings The project
Utilities failure	Yes	2	People, drivers and workers	Underground and above-ground utilities coincide with the Scheme, the responsibilities of which lie with the relevant local operator or company should this infrastructure fail. The requirement for utility diversion works is being considered as part of the design-development of the Scheme, and such works will be considered within the Environmental Impact Assessment. The potential risk of construction-related incidents when undertaking diversion works as	No	EIA methodology and consultation

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
				part of the Scheme would be covered by existing legislation.		
Industrial Accidents						
Defence industry and Unexploded Ordnance risk	Yes	2	Aquatic environment and ecological receptors People, drivers and workers	Potential exists for encountering unexploded ordnance during construction of the Scheme. Measures would be undertaken by the contractor during construction of the Scheme to brief operatives and raise awareness of this issue, and to define appropriate response strategies should this be discovered during the works. There would be a limited risk of unexploded ordnance affecting the Scheme, once operational.	No	The project
Energy industry (fossil fuel)	Yes	2	People, drivers and workers	The risk of ground contamination resulting from Scheme progression is being assessed as part of the geotechnical investigations, geological and hydrological studies undertaken to inform the design-development and Environmental Impact Assessment processes.	No	Geology and soils Road drainage and the water environment

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
Nuclear power	No – all such active plants are located at considerable distance from the Scheme.	N/A	N/A	N/A	N/A	N/A
Oil and gas refinery / storage	No – no such facilities are located in proximity to the Scheme.	N/A	N/A	N/A	N/A	N/A
Food industry	No – no such facilities are located in proximity to the Scheme.	N/A	N/A	N/A	N/A	N/A
Chemical industry	No – no such facilities are located in proximity to the Scheme.	N/A	N/A	N/A	N/A	N/A
Manufacturing industry	No – no such facilities are located in proximity to the Scheme.	N/A	N/A	N/A	N/A	N/A
Mining industry	Yes	2	People, drivers and workers	Quarrying operations for sand and gravel are currently active on land at Black Cat Junction on the A1 (Breedon Black Cat Quarry). Geotechnical investigations being undertaken as part of the design-development and Environmental Impact Assessment processes, which will consider any historic mining activity on land associated with the Scheme.	No	The project Geology and soils

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
Terrorism, Crime, War and Civil Unrest						
Bomb / vehicle attack on people	No – the Scheme is unlikely to be a target for this type of event due to the low number of exposed targets.	N/A	N/A	N/A	N/A	N/A
Bomb / vehicle attack on infrastructure	No – the Scheme is unlikely to be a target for this type of event due to the low number of exposed targets.	N/A	N/A	N/A	N/A	N/A
Mass shooting	No – the Scheme is unlikely to be a target for this type of event due to the low number of exposed targets.	N/A	N/A	N/A	N/A	N/A
Chemical / gas attack	No – the Scheme is unlikely to be a target for this type of incident due to the low number of exposed targets.	N/A	N/A	N/A	N/A	N/A
Rioting	No – the nature of the Scheme is such that it is not considered to be a target for this type of event.	N/A	N/A	N/A	N/A	N/A
Cyber attack	Yes	1	People, drivers and workers	The increasing reliance on roadside technology could render the Scheme more vulnerable to a	No	The project

Stage 1: Long List	Stage 2: Screening	Stage 3: Scoping			Stage 4: Assessment	Relevant EIA Topic(s)
Event	**Relevant to Scheme?**	**Type 1 or 2?**	**Relevant Receptors**	**Mitigation and/or Management Action**	**Requires Assessment?**	
				cyber-attack; however, it is not considered to be more vulnerable to attack than similar infrastructure installed and running elsewhere on the UK's highway network. Highways England is accountable to the Secretary of State for Transport for ensuring the resilience of their strategic road network to national security risks, including from terrorism, cyber-attack, natural hazards and other risks.		
Disease						
Spread of human, animal and plant diseases	Yes	1	Aquatic and ecological receptors People, drivers and workers	The spread of disease as a consequence of the Scheme is not considered to be any greater than that associated with other highway schemes. Standard control measures would be implemented by the contractor during construction to handle and dispose of any diseased plants and/or injurious weeds, and prevent their spread.	No	The project Biodiversity

Number	Reference
REF 1	The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. HMSO (2017). http://www.legislation.gov.uk/uksi/2017/572/contents/made
REF 2	Directive 2011/92/EU of the European Parliament and of the Council of 13 December 2011on the assessment of the effects of certain public and private projects on the environment (codification). Official Journal of the European Union (2011). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32011L0092
REF 3	Directive 2014/52/EU of the European Parliament and of the Council of 16 April 2014 amending Directive 2011/92/EU on the assessment of the effects of certain public and private projects on the environment. Official Journal of the European Union (2014). https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32014L0052
REF 4	National Risk Register of Civil Emergencies, 2017 Edition. Cabinet Office (2017). https://www.gov.uk/government/publications/national-risk-register-of-civil-emergencies-2017-edition
REF 5	Health and Safety at work etc. Act 1974. HMSO (1974). https://www.legislation.gov.uk/ukpga/1974/37
REF 6	The Workplace (Health, Safety and Welfare) Regulations 1992. HMSO (1992). http://www.legislation.gov.uk/uksi/1992/3004/contents/made
REF 7	The Management of Health and Safety at Work Regulations 1999. HMSO (1999). http://www.legislation.gov.uk/uksi/1999/3242/contents/made
REF 8	Construction (Design and Management) Regulations 2015. HMSO (2015). http://www.legislation.gov.uk/uksi/2015/51/contents/made
REF 9	Design Manual for Roads and Bridges, Volume 11. Highways England (1993 to date). http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/index.htm
REF 10	Interim Advice Note 191/16: Safety Governance for Highways England. Highways England (2016). http://www.standardsforhighways.co.uk/ha/standards/ians/

Appendix 5.2: Transboundary Effects Screening Matrix

Background

Regulation 32 of The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (as amended) [REF 1] requires the consideration of any likely significant effects on the environment of another European Economic Area Member States (EEA States).

Effects on other EEA States are referred to as transboundary effects.

To inform the process of scoping, a preliminary screening exercise has been undertaken to identify the potential for the Scheme to result in transboundary effects. This has been undertaken using guidance provided in the Planning Inspectorate's Advice Note 12: Transboundary Impacts [REF 2].

The following matrix presents the consideration of transboundary effects for the Scheme, and provides the evidence on which a decision has been based to scope such effects out of the Environmental Impact Assessment (see Chapter 5 of the Scoping Report).

Criteria and Relevant Considerations	Commentary with Regard to the Scheme
Characteristics of the development • size of the development • use of natural resources • production of waste • pollution and nuisance • risk of accidents • use of technologies	The Scheme comprises the following main components: • A new offline dual two lane carriageway between Black Cat and Caxton Gibbet, designed to allow it to become an expressway in the future. • A grade-separated interchange at Black Cat. • Grade-separated junctions at Cambridge Road and Caxton Gibbet. • A single-span bridge over the East Coast Main Line railway. • An overbridge on the B1046 to cross the new dual carriageway. • Local road diversions. • Local junction and access modifications. • New and improved drainage infrastructure. • Vehicle recovery areas. The Scheme will be progressed within the administrative boundaries of: Bedford Borough Council; Central Bedfordshire Council; Huntingdonshire District Council, and South Cambridgeshire District Council. A review of the characteristics of the Scheme has concluded that: • some of the resources required to construct the Scheme are likely to be obtained from the global market e.g. steel; however it is envisaged that such materials would be able to be obtained locally within the UK; • no waste, nuisances or accidents are likely that would extend beyond the border of the UK as a result of construction or operation of the Scheme; and • no novel technologies are proposed that would introduce potential for transboundary effects to occur on other EEA States.
Geographical area What is the extent of the area of a likely impact under the jurisdiction of another EEA state?	A review of the geographical area of impact associated with the Scheme has concluded that any environmental effects associated with its construction and operation are unlikely to extend beyond the jurisdiction of the UK, with the exception of potential release of greenhouse gas emissions from vehicles (traffic) in relation to their contribution to climate change.

Criteria and Relevant Considerations	Commentary with Regard to the Scheme
Location of development What is the existing use? What is the distance to another EEA state?	A review of the location within which the Scheme would be constructed and would operate has concluded that existing land uses are mixed but predominantly agricultural. Some of the areas of land that would be permanently taken by the Scheme are currently occupied by existing highway network. The location of the Scheme is situated approximately 190km from France and 410km from the Republic of Ireland. The study areas proposed within each individual assessment have been reviewed, and it has been concluded that none of their boundaries would extend into these EEA states.
Cumulative impacts Are other major developments close by?	A number of developments which could interact cumulatively with the Scheme have been identified and are presented in Chapter 16 of the Scoping Report. The form and nature of several of these developments are such that they are likely to result in the attraction or reassignment of traffic on the highway network which, in combination with the Scheme, could give rise to cumulative increases in greenhouse gas emissions.
Carrier By what means could impacts be spread?	Environmental effects would derive from the physical introduction of new highway infrastructure into the receiving environment, and from vehicles (traffic) travelling on the highway network. Potential effects associated with noise, biodiversity, landscape, flood risk and land use (land take) would be relative to the Scheme, and would be focused within the adopted assessment study areas identified for these topics. Emissions to air (specifically greenhouse gases) derived from vehicles travelling on new and improved sections of the highway network would be spread and dispersed by normal atmospheric processes and conditions. Such emissions have the potential to combine with greenhouse gas emissions associated with other developments within EEA states, and with the cumulative developments identified above.

Criteria and Relevant Considerations	Commentary with Regard to the Scheme
Environmental importance Are particular environmental values likely to be affected? • Capacity of the natural environment • Wetlands, coastal zones, mountain and forest areas, nature reserves and parks, Natura 2000 sites, areas where environmental quality standards already exceeded, densely populated areas, landscapes of historical, cultural or archaeological significance	<u>Nature Conservation</u> A review of the geographic location of the Scheme against statutory nature conservation designations confirmed that: • there are two international nature conservation sites within 10km of the Scheme: Portholme Special Area of Conservation (SAC), located approximately 8.9km from the DCO site boundary, and Eversden and Wimpole Woods SAC, located approximately 7.4km from the DCO site boundary; • there are two Sites of Special Scientific Interest (SSSI) of national importance within 1km of the DCO site boundary: St Neots Common SSSI, located 0.9km from the DCO site boundary to the north of Wyboston interchange; and Elsworth Wood SSSI, located 0.85km from the DCO site boundary to the north of Caxton Gibbet junction; and • there are no National Nature Reserves or Local Nature Reserves within 1km of the DCO site boundary. Due to the intervening distance between the Scheme and the identified SACs, construction and operation of the Scheme is unlikely to result in significant adverse effects on these European (Natura 2000) sites. <u>Air Quality</u> One Air Quality Management Area (AQMA) has been designated by Huntingdonshire District Council on St Neots' High Street, approximately 1.6km from the DCO site boundary (approximately 5.4km north of Black Cat junction). A second AQMA has been designated by Central Bedfordshire Council along a section of the A1 immediately west of Sandy, approximately 1.6km from the DCO site boundary (approximately 5km south of Black Cat junction). . <u>Landscape</u> There is one Registered Historic Park and Garden (Croxton Park) within 1km of the DCO site boundary, located to the south of the A428 at Croxton Park. <u>Cultural Heritage</u> There are no World Heritage Sites within 5km of the DCO site boundary. There are 14 Scheduled Monuments within 1km of the DCO site boundary. One Registered Park and Garden is present within 1km of the DCO site boundary (Croxton Park – Grade II* listed).

Criteria and Relevant Considerations	Commentary with Regard to the Scheme
Extent What is the likely extent of the impact?	The only potential transboundary environmental impact is from greenhouse gas emissions, which could contribute to climatic changes on a global scale. Based on a review of the characteristics of the Scheme, it has been concluded that such changes to the existing strategic highway network are unlikely to result in a significant contribution to global climate change.
Magnitude What will the likely magnitude of the change in relevant variables relative to the status quo, taking into account the sensitivity of the variable?	Provisional totals of UK greenhouse gas emissions are estimated to be 455.9 million tonnes carbon dioxide equivalent (MtCO2e) for the year 2017, whilst greenhouse gas emissions from UK transport were estimated to be approximately 124.4MtCO2e (Department for Business, Energy & Industrial Strategy (29 March 2018) [REF 3]. A review of the Scheme has concluded that there would likely be a negligible contribution to the UK's overall greenhouse gas emissions associated with changes of the type proposed, and accordingly negligible potential to contribute to global climate change when considered against emissions from other EEA States in a transboundary context (and with other identified cumulative developments).
Probability What is the degree of probability of the impact? Is the impact likely to occur as a consequence of normal conditions or exceptional situations, such as accidents?	By virtue of its form and scale, the Scheme would result in greenhouse gas emissions. Greenhouse gases would principally derive from vehicle exhaust emissions during operation of the Scheme, with reduced emissions from plant, machinery and other vehicles during its construction. Both increases and decreases in air quality (and greenhouse gas emissions) are likely to occur at different locations as a result of the Scheme implementation.
Duration Is the impact likely to be temporary, short-term or long-term? Is the impact likely to relate to the construction, operation or decommissioning phase of the activity?	Greenhouse gas emissions are likely to occur over a long period of time, and would be predominantly associated with the operational stage of the Scheme where traffic would travel continuously on both new and improved sections of the highway network. Notwithstanding this, it is expected that improvements in the levels of greenhouse gas emissions from individual vehicles will be achieved in the medium to long term through technological advancements, and the UK's drive to decrease its dependency on carbon-based fuels such as diesel.
Frequency What is likely to be the temporal pattern of the impact?	The temporal pattern of greenhouse gas emissions is likely to be relatively constant, due to the Scheme forming part of the existing highway network and being in constant use.
Reversibility Is the impact likely to be reversible or irreversible?	The impact of greenhouse gas emissions is considered irreversible, as the highways improvements are unlikely to be decommissioned within human lifetimes.

Number	Reference
REF 1	The Infrastructure Planning (Environmental Impact Assessment) Regulations 2017. HMSO (2017). http://www.legislation.gov.uk/uksi/2017/572/contents/made
REF 2	Advice Note Twelve – Transboundary Impacts and Process. The Planning Inspectorate (2018). https://infrastructure.planninginspectorate.gov.uk/wp-content/uploads/2013/04/Advice-note-12v2.pdf
REF 3	2017 UK Greenhouse Gas Emissions, Provisional Figures – Statistical Release: National Statistics. Departments for Business, Energy & Industrial Strategy (2018). https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/695930/2017_Provisional_Emissions_statistics_2.pdf

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Appendix 7.1: Known Heritage Assets

The following table lists all known identified heritage assets considered as part of the scoping exercise (the first number in the reference column is that used on the accompanying figures in Chapter 19).

Reference	Grid Reference	Period	Description
1013521; MBD1494	TL 14875 55013	Bronze Age	Bowl barrow known as the "Round Hill", 440m WNW of College Farm. It is circular in plan, measuring about 21m in diameter, and survives to a height of approximately 1.7m, with steep sloping sides descending from a level area on the summit which measures 10m across. The barrow, which is apparently unexcavated, is thought to be an outlying example associated with a pattern of Bronze Age barrows located along the gravel terraces flanking the River Great Ouse. Scheduled monument.
1005393; 5994	TL 16189 54551	Post-Medieval	Tempsford Bridge, built 1814-20 built of dressed sandstone, with cutwaters and arches made of Bramley fall stone. Measures approximately 50m long and 10m wide. Scheduled monument and Grade II listed.
1010114; MBD475	TL 15121 56125	Medieval	Chawston Manor moated site and associated fishpond. The monument includes the remains of a medieval moated enclosure, and an associated fishpond and supply channel forming the south and west sides of a subsidiary enclosure. The principal moated enclosure in the eastern part of the monument is rectangular measuring some 56m north to south by 75m east to west, inclusive of the 8m wide dry surrounding moat. Scheduled monument.
1012076; MBD474	TL 16084 56730	Medieval	Moated enclosure and associated building platforms The Lane, Wyboston. The moated enclosure is `D' shaped in plan and measures some 85m along the straight southern edge of the moat. The surrounding moat is 8m wide and about 1.2m deep and is dry except for part of the east arm. Prominent external banks, surviving up to 1m high, flank the west and east sides. Scheduled monument.
1108; 1114917	TL 1506 5430	Post-Medieval	Roxton House, a small country house dated to the late 18th century with 19th century additions and constructed of red brick with a stone coped slate roof in neo classical style. Grade II listed.
10413; 1146329	TL 1512 5426	Post-Medieval	A 17th century timber framed barn to the south east of Roxton House. Mainly weather boarded with some rough cast and brick infill. Grade II listed.
2397; 1321209	TL 1539 5423	Post-Medieval	Poplar Farm a 17th century farmhouse with 19th century alterations. Built in an L-shaped plan of colour washed rough cast over a timber frame with one storey and attics. Grade II listed.
2399; 1114926	TL 1527 5433	Post-Medieval	51 High Street, a 17th century house, colour washed rough cast over timber frame. Grade II listed.
2410; 1311825	TL 1523 5437	Post-Medieval	60 High Street, a 17th century cottage, timber framed with colour washed plaster infill and a thatched roof. Grade II listed.

Reference	Grid Reference	Period	Description
2401; 1146386	TL 1521 5440	Post-Medieval	50 & 56 High Street, 17th century cottages with early 19th century alterations, colour washed rough cast over timber frame. Grade II listed.
2402; 1114925	TL 1522 5443	Post-Medieval	46 & 48 High Street, a pair of 18th century thatched cottages, colour washed rough cast over timber frame. Grade II listed.
1106; 1146376	TL 1518 5444	Post-Medieval	Congregational Chapel built in 1808 in thatched cottage style. Built in T-plan, one storey, of colour washed rough cast. Grade II* listed.
2409; 1321211	TL 1529 5449	Post-Medieval	Church Farmhouse, High Street. C.1600 and refaced in the 19th century. Timber framed, L-plan and two storeys with attics. Grade II listed.
1105; 1114927	TL 1534 5452	Medieval	St Mary's Church, a 14th- 15th century building with some 19th century reworking. Built of brown cobblestones with ashlar dressings and slated roofs. Grade II* listed.
2404; 1146343	TL 1522 5452	Post-Medieval	38 High Street, a c.1700 cottage. Colour washed rough cast over timber frame with a thatched roof. Consisting of one storey with attics. Grade II listed.
2403; 1321210	TL 1521 5453	Post-Medieval	28,30,32,34 High Street, a group of thatched cottages built c.1700. Colour-washed rough cast over timber frame. Grade II listed.
7859; 1114924	TL 1518 5452	Post-Medieval	36 High Street, an 18th century, colour washed rough cast over timber frame, with a thatched roof. Grade II listed.
2405; 1311841	TL 1522 5458	Post-Medieval	22 High Street, (The Cedars), a 17th century timber framed house with 19th century alterations. Grade II listed.
2406; 1114923	TL 1525 5466	Post-Medieval	14 High Street, an 18th century thatched cottage with later extensions. Possibly originally divided into two. Grade II listed.
1107; 1311876	TL 152 548	Post-Medieval	College farmhouse, a 16th-17th century timber framed farmhouse in Roxton. Grade II listed.
1744; 1114919	TL 151 561	Post-Medieval	Chawston Manor, a 17th century manor house on moated site. A two storey, L-plan building. Grade II listed.
1745; 1138337	TL 1544 5612	Post-Medieval	Claygates (formerly College Farm), a 17th century timber framed and thatched cottage with 20th century additions. Grade II listed.
1746; 1321207	TL 1567 5619	Post-Medieval	Laburnum Cottage, Chawston. A timber framed and thatched cottage built c.1700 with 20th century alterations. Grade II listed.
1747; 1311859	TL 1576 5614	Post-Medieval	Holly Cottage, Chawston an early 19th century thatched cottage. Grade II listed.

Reference	Grid Reference	Period	Description
16142; 1245334	TL 1572 5615	Post-Medieval	Chawston Lodge, The Lane, Wyboston. A timber framed core house, c.1600 with 19th and 20th century alterations and additions. Grade II listed.
1748; 1114920	TL 159 560	Post-Medieval	Bridge Farmhouse, a 17th century, colour wash tough cast over timber frame. Old clay tile roof. T-plan, 2 storeys to main block, 2 storeys and attics to cross-wing. Grade II listed.
12458; 1311862	TL 161 558	Post-Medieval	Brook Cottages, Great North Road. A pair of 18th century, timber-framed thatched cottages. Grade II listed.
12459; 1321208	TL 162 562	Post-Medieval	Scuttle Cottage, Circa 1700. Timber framed, with some colour washed brick infill and some colour washed plaster incised to imitate ashlar. Thatched roof. 3-bay plan, one storey and attics. S elevation: ground floor has 2 2-light casements, one 2-lignt horizontal sash, attic has one dormer with 2-light horizontal sash, all with glazing bars. C20 door and porch in line with red brick double ridge stack. C20 one storey additions to W and N. Grade II listed.
12477; 1146418	TL 16438 56397	Post-Medieval	Farmhouse. Circa 1800, probably encasing earlier building, reworked C19, with later C19 block added to road elevation. Red brick, probably encasing timber frame, old clay tile roof. Grade II listed.
1715; 1146425	TL 16414 56586	Post-Medieval	31 Great North Road, Wyboston. A late 17th century house. Colour washed rough cast. C20 tile roof, 3-room plan, two storeys. Grade II listed.
1713; 1114928	TL 16480 56878	Post-Medieval	64 Great North Road, Wyboston. House, formerly the Queen's Head public house. 17th century, refronted C18. Colour washed brick over timber frame, old clay tile roof. 3-room plan, 2 storeys. Grade II listed.
12464; 1114918	TL 14767 55997	Post-Medieval	Aubretia Cottage, Chawston. Circa 1700. Timber framed, with weather boarding to ground floor and colour washed rough cast above. Thatched roof. 2-room plan, one storey and attics. Grade II listed.
2408; 1321206	TL 14808 54399	Post-Medieval	Roxton House Lodge, an early C19 cottage. Main block of colour washed rough cast. S block of colour washed brick. Thatched roof. Single storeyed, octagonal plan with rectangular block to S, in cottage orne style. Grade II listed.
12471; 1114930	TL 15720 56904	Post-Medieval	Heddings Farmhouse, The Lane, Wyboston. Circa 1700 Farmhouse, refaced early C19. Pebble-dashed exterior, old clay tile roof. 3-room plan, 2 storeys. Grade II listed.
12478; 1321213	TL 16458 56405	Post-Medieval	Dovecote at Forty Farm, Great North Road, Wyboston. 17th century, timber framed with red brick infill, now colour washed. Corrugated iron roof, lower part hipped, upper gablets weather boarded. Small, square plan. Grade II listed.

Reference	Grid Reference	Period	Description
878; 1114929	TL 16475 56920	Post-Medieval	66 & 68 great North Road, Wyboston. House. C17. Colour washed rough cast over timber frame, ground floor of N wing of colour washed brick. Old clay tile roof. L-plan, one storey and attics. Grade II listed.
2398; 1114922	TL 1515 5424	Post-Medieval	2, 4 & 6 Ford Lane, a former farmhouse, now divided into separate dwellings. Built c.1600 with 18th century additions, timber framed two storeys. Grade II listed.
2400; 1321212	TL 15217 54360	Post-Medieval	58 High Street, 18th century Cottage. Colour washed plaster over timber frame, with colour washed brick plinth. Half-hipped thatched roof. 2-room plan, one storey and attics. Grade II listed.
1114877	TL 12218 53930	Post-Medieval	Birchfield Farmhouse. A 17th century farmhouse, consisting of two storeys in an L-shaped plan, of colour washed rough cast over timber frame. Grade II listed.
1137788	TL 13746 53317	Post-Medieval	Barford House, a small country house dated 1843 and remodelled and extended in c.1856. It is built of yellow brick with stone dressings in Italianate style, in an irregular plan with two storeys, and dominated by a four storey square tower. Grade II listed.
1114885	TL 13761 53336	Post-Medieval	Game Larder at Barford House dated to the mid-late 19th century. It is a one storey structure of octagonal plan with a projecting gabled porch to the west elevation. It is built of wood cladding with a thatched roof. Grade II listed.
1321232	TL 13752 53326	Post-Medieval	A screen wall adjoining Barford House to outbuildings to the north. Built of yellow brick with five projecting brick piers imitating banded rustication, and surmounted by stone urns. There is also a cambered arched gateway with vermiculated stone keystone. Grade II listed.
1137796	TL 13753 53353	Post-Medieval	A mid-late 19th century barn at Barford House with wood cladding and a thatched roof. It consists of a low rectangular block with projecting gabled entrance to the south elevation. Grade II listed.
1321231	TL 13761 53096	Post-Medieval	Gate piers and gate to Barford House, dated to the mid-late 19th century. It consists of ashlar piers, square, approximately six feet tall with Ionic base and cornice. The gate is built of wood and wrought iron with a pierced arcading design. Grade II listed.
1137728	TL 13816 53120	Post-Medieval	Lowlands, an early 19th century house with later 19th century alterations, consisting of two storeys and five bays, of yellow brick and colour washed front elevation. Grade II listed.
1137550	TL 12339 52684	Post-Medieval	Greenlands, an 18th century house, consisting of two storeys in an L-plan. Colour washed and rough cast. Grade II listed.

Reference	Grid Reference	Period	Description
1010864	TL 12105 54061	Medieval	Birchfield Farm moated site and associated fishponds and leats. It includes the remains of a medieval moated enclosure, measuring 100m by 85m inclusive of the 14m wide surrounding moat. A platform at the south side of the island is thought to represent the site of the original 12th century manorial building. Scheduled monument.
1010948	TL 13050 54449	Medieval	Palaceyard Wood medieval moated enclosure and associated enclosures, woodland bank and cultivation earthworks. The moated site is roughly circular in shape, measuring about 70m in diameter including the surrounding water-filled moat which is between 6m and 12m wide. Scheduled monument.
1004504; 1113881	TL 15539 51886	Post-Medieval	Blunham Bridge, two adjoining bridges spanning the River Ivel. The west bridge is 17th-18th century with 19th century additions, consisting of coursed ironstone and lime stone with five arches. The east bridge is a single span late 19th century bridge, with iron girders mounted on coursed stone. Scheduled monument, Grade II listed.
1013419	TL 16045 52935	Medieval	Gannocks Castle moated site. The moat is rectangular in form measuring 65m by 55m including the 10m wide surrounding moat. The moat is approximately 2.5m deep and water-filled along its northern arm. A mound at the north-eastern edge may be the site of a defensive structure. The site is thought to be built on the same spot as an earlier Danish fortress referred to in Anglo-Saxon chronicle as constructed in AD921. Scheduled monument,
1137920	TL 16325 51237	Post-Medieval	Dick Turpin Public House, a 17th century, two storey timber-framed building, and refaced in colour washed brick in the 19th century. Grade II listed.
1312362	TL 15271 51894	Post-Medieval	A 17th century house, of timber frame construction with colour washed rough cast exterior and a thatched roof. It consists of one storey and attics and two room plan. Grade II listed.
1113874	TL 15253 51957	Post-Medieval	An early 19th century house, originally a pair. It is of timber frame construction with brick infill, now with colour washed roughcast render leaving timber framing partly exposed. The building consists of two storeys with a four room plan. Grade II listed.
1321755	TL 15155 52111	Post-Medieval	A 17th century house, with colour washed roughcast over timber frame construction and a thatched roof. The building consists of one storey with attics and a three room plan. Grade II listed.

Reference	Grid Reference	Period	Description
1321634	TL 16243 52943	Post-Medieval	Church Farmhouse, 16th century with 17th -19th century reworking. A substantial timber framed structure, the front brick faced, and almost the whole under colour washed render, in H-plan. The cross-wings of two storeys and the central block of one storey and attics but apparently originally an open hall. Grade II listed.
1114093	TL 16245 52912	Post-Medieval	Brewhouse and outbuilding at Church Farm. Timber framed with some weatherboarding and colour washed brick infill and built in L-plan. Grade II listed.
1321635	TL 16258 52960	Post-Medieval	A late 17th – early 18th century house, formerly Gannock Farm. It is a single storey, timber framed structure with colour washed plaster infill and a thatched roof. Grade II listed.
1114094	TL 16236 52992	Post-Medieval	Two houses of late 17th century- early 18th century origins, and extended in the 19th century. The buildings are two storeys, L-plan with colour washed rough cast render over a timber-frame core and a slate roof. Grade II listed.
1114110	TL 16234 52985	Modern	A K6 telephone kiosk, designed 1935 and built of cast iron consisting of a square kiosk with domed roof. Grade II listed.
1138206	TL 16216 52990	Post-Medieval	A 17th century house, thought to have been an Inn, with later reworking, The building is two storeys in a T-plan; the right wing has substantial timber framing exposed with colour washed brick infilling while elsewhere the building is encased in colour washed brick. Grade II listed.
1311945	TL 16238 53027	Post-Medieval	A pair of 18th century cottages. They are single storey with colour washed rough cast render over timber frame with a thatched roof. Grade II listed.
1114095	TL 16254 53071	Post-Medieval	The Wheatsheaf, an 18th-19th century public house. The building is two storeys with attics with colour washed rough cast render, apparently containing some timber framing, and clay tile roofs. Grade II listed.
1114096	TL 16192 53032	Medieval	Church of St Peter dated to the 14th and 15th centuries, and repaired in 1621 and 1874. Constructed of coursed iron stone, cobbles and clunch with ashlar dressings. It consists of a chancel, nave, north and south aisles, north and south porches, and west tower. Grade II* listed.
1311917	TL 16201 53072	Medieval/ Post-Medieval	Remains of a cross, approximately 25m north of the Church of St Peter. The remains comprise the base and the bottom section of octagonal shaft. Reset on 19th century square stone base. Grade II listed,

Reference	Grid Reference	Period	Description
1114098	TL 16153 53022	Post-Medieval	The Old Rectory, a 16th century house, substantially extended in the late 19th century. The original structure has substantial timber frame exposed to the rear elevation and with colour washed infill. The original structure is two storeys and of two room plan. Grade II listed.
1138245	TL 16030 53055	Post-Medieval	An 18th century, single storey house of colour washed rough cast over timber frame with thatched roof. Grade II listed.
1114097	TL 16196 53249	Post-Medieval	Cottage Farmhouse, an 18th-19th century house consisting of two storeys and of yellow brick, partly colour washed with hipped clay tile roof. Grade II listed.
1138237	TL 16119 53313	Post-Medieval	Ouse Farmhouse, an 18th century house, extended in the 19th century. It consists of two storeys with attics, mainly of colour washed brick, and the rear elevation has colour washed rough cast render, apparently covering timber framing. Grade II listed.
7367	TL 1525 5427	Post-Medieval	Bakehouse & 3 dwellings (site of). The buildings stood from 1813 until 1862 when they were demolished.
8614	TL 1629 5650	Post-Medieval	Buildings (site of) E of Dovehouse Farm recorded as Farm Homestead and Close on enclosure map, 1799. Site now part of arable land.
8613	TL 1612 5666	Post-Medieval	Four buildings W of Dovehouse Farm shown on the 1799 map. Site now part of arable land.
8618	TL 1624 5671	Post-Medieval	Buildings (site of) opposite Dovehouse Farm. Farm homestead and close shown on 1799 enclosure map. Site now part of arable land.
MBB18908	TL 1650 5670	Medieval	Barn adjacent to 44 Great North Road, Wyboston, a large timber framed barn with weatherboarding and pantiles.
5992; 1114092	TL 1622 5404	Post-Medieval	A 17th – 18th century house, formerly the Anchor Inn before the modern inn was built. A two storey, timber frame building, cased in colour washed brick. Listed Building Grade II
12953	TL 1625 5395	Post-Medieval	The Anchor public house first mentioned in 1794 and rebuilt in 1831. It is a large two bay construction with a central entrance way porch.
18001	TL 1623 5454	Modern	The site of WWII anti-tank traps of the angle iron type. Concrete blocks with a socket were discovered extending across the road when the bridge was repaired in 1994.
14474	TL 1685 5485	Post-Medieval	161 Station Road, a brick, 2 bay plan house, deemed to be of local interest.
5980; 1114099	TL 1641 5390	Post-Medieval	Stonebridge Farmhouse, Station Road, a two storey, 18th century neo-classical style house with 19th century reworking and 20th century alterations. Red brick with stucco to the front and west elevations. Grade II listed

Reference	Grid Reference	Period	Description
9738	TL 1625 5395	Post-Medieval	The site of Tempsford Pound, shown on the 1825 map. The site is now occupied by the present Anchor Inn.
17966	TL 1560 5458	Modern	The site of a WWII pillbox on School Lane in Roxton.
12475	TL 1505 5426	Post-Medieval	A range of 19th century outbuildings to rear of Roxton House. Whitewashed brick construction with a gabled tiled roof.
12468	TL 1540 5423	Post-Medieval	A range of 19th century barns, Poplar Farm. Weather boarded with gabled slate roofs.
2396	TL 1528 5430	Post-Medieval	Site of 57 High Street, a 17th century, timber framed house with a thatched roof. Now demolished.
12461	TL 1524 5437	Post-Medieval	The Chequers Inn Public house, High St. A 19th century, two storey public house of brick construction with a gabled slate roof.
10533	TL 1518 5457	Post-Medieval	The site of demolished 19th century timber framed barns, Park Rd.
16395	TL 152 545	Post-Medieval	The Royal Oak Pub, High Street. A 19th century brick building, with a two bay elevation with a porch, and tile roof.
12472	TL 1528 5471	Post-Medieval	8 High Street, an 18th century cottage of painted brick with a thatched roof.
15624	TL 1521 5618	Post-Medieval	Chawston Manor Farm buildings, built of brick in the 19th century. The buildings are arranged around a central yard, typical of Model Farms.
5892	TL 1575 5618	Post-Medieval	Site of Chawston House, a two storey building built in 1718 of whitewashed brick and a red tile roof. It was demolished in 1965.
5893	TL 1579 5617	Post-Medieval	Stables belonging to Chawston House, demolished in 1965.
12469	TL 1574 5614	Post-Medieval	An 18th century cottage west of Holly Cottage, Chawston. Rendered and timber-framed with a gabled cross slate roof.
5894	TL 158 561	Post-Medieval	Colesden Grange Farmhouse, a 19th century farmhouse, made of brick with tiled roof. Formerly grade II listed but removed from list in 1983.
12457	TL 163 562	Post-Medieval	18th century 1 storey + attic cottage. Gabled thatched roof. Thatched gabled porch. Gabled tile roof to 1 storey extension. Dormers to attic. Central brick chimney stack. Of rendered brick construction.
12456	TL 163 562	Post-Medieval	1 storey rendered brick cottage of 18th century origins. Gabled thatched roof with central and Gable end chimney stacks.

Reference	Grid Reference	Period	Description
12460	TL 162 562	Post-Medieval	18th century cottage, L shaped in plan, 2 storey cottage with wing of 1 storey + attic. 18th century in origin with 20th century additions. Partly rendered brick partly timber framed construction. Gabled thatched roofs. 1 storey lean-to addition with tile roof. Centrally located chimney stacks. With dormer windows to attic level.
879	TL 1636 5659	Post-Medieval	4 The Lane, Wyboston, a two storey, timber framed building. Construction date unknown.
1714	TL 1646 5667	Post-Medieval	Old Post Office, 40 Great North Road Wyboston. A 17th century house, formerly the village post office. Two storey, built of colour washed brick with a tiled roof.
18225	TL 1643 5664	Post-Medieval	A 19th century former Methodist Chapel located on the Great North Road. A large brick built structure with a slate gabled roof.
12473	TL 1643 5656	Post-Medieval	20 Great North Road, Wyboston. An 18th century rendered cottage with a gabled tile roof, consisting of one storey and an attic.
877	TL 1644 5706	Post-Medieval	Timber-framed cottage, Great North Road possibly built in the 18th century.
12463	TL 158 568	Post-Medieval	83 The Lane, Rookery Farmhouse Wyboston. An 18th century farmhouse with two storeys and an attic partly rendered brick and part plain brick construction.
8616	TL 1577 5685	Post-Medieval	The site of demolished 19th century buildings, Wyboston. Shown on the 1799 enclosure map but demolished by 1978 when the site was visited.
8615	TL 1578 5688	Post-Medieval	The site of three demolished post-medieval buildings, east of Heddings Farm. Described on the enclosure map and award c.1800.
15461	TL 1525 5455	Post-Medieval	Parish Hall, 37 High Street. A timber framed building clad in weatherboarding with a pantile roof.
880	TL 164 565	Post-Medieval	Timber framed cottage, Wyboston. Now demolished.
2407	TL 1526 5461	Post-Medieval	31 High Street, a 17th century timber framed cottage with later alterations. Demolished in 1982.
DBD3406	TL 1636 5343	-	Tempsford (Church End) Conservation Area.
DBD3415	TL 1522 5446	-	Roxton Conservation Area
DBD6476	TL 1664 5386	-	Tempsford (Langford End) Conservation Area
14844 – MBD15020	TL 157 538	Bronze Age	Bronze Age flint scatter, found during excavation at Redlands Gravel Pit, 1995. The site is located adjacent to a Bronze Age cemetery site. The flints are thought to probably be associated with the ring ditches previously excavated in 1972.

Reference	Grid Reference	Period	Description
16029 – MBD15983	TL 1 5	Early Medieval; Medieval; Post-Medieval	Anglo-Saxon strap ends, one made of silver and the other of Bronze, a brooch, as well as a bronze medieval seal die and a post-medieval purse were recorded in Roxton.
15901 – MBD15855	TL 154 543	Palaeolithic	A Palaeolithic flint core was found at Roxton
16193 – MBD16147	TL 155 562	Roman; Medieval; Post-Medieval	Remains including a Roman strap end, a late medieval belt tag and a knob from a 16th – 17th century buckle were found near Chawston in Roxton.
MBB18928	TL 1644 5653	Unknown	Human remains of at least two skeletons, an adult and a child, were discovered at 18A Great North Road.
16181 – MBD16135	TL 160 540	Roman; Early Medieval; Post-Medieval	A Roman bow brooch, five Anglo-Saxon long brooches and a fragment of a post-medieval pewter plate were identified during metal detecting near the Anchor Public House in Roxton.
2025 – MBD2025	TL 161 543	Iron Age; Roman; Early Medieval; Medieval	A group of finds were retrieved from the River Ivel in dredging operations, prior to 1939. Finds included Roman, Anglo-Saxon and medieval pottery, animal bone and red deer antler, a triangular clay loom weight and an iron ring thought to be an Iron Age currency ring.
8801 – MBD8801	TL 1563 5417	Palaeolithic	Palaeolithic hand axe found by field walking.
7001	TL 166 534	Post-Medieval	Tempsford Hall Park, the site of an 18th- 19th century landscape park. Tempsford Hall was built some time prior to 1787. Much of the park is under ridge and furrow and there is a derelict ornamental cottage in the grounds and a pair of fallen cast iron gate posts.
9726	TL 164 537	Early Medieval-Medieval	Moat and Medieval Settlement, North West corner of Tempsford Park. A square moat, largely backfilled. A structured settlement comprising a series of rectilinear plots that underwent later development, thought to be late Saxon – Medieval. This was followed by the construction of a substantial manor house within a moated enclosure.
8804	TL 1617 5421	Post-Medieval	Tempsford Staunch, the site of a former staunch over Tempsford ford, before the construction of a bridge. Yellow brickwork complete with cemented over islands.
8803	TL 1613 5405	Medieval - Post-Medieval	Site of a medieval- post-medieval ford across the Ouse is shown on Ogilbys road map of 1675.

Reference	Grid Reference	Period	Description
9736	TL 162 543	Post-Medieval	Place name evidence for gravel extraction pit recorded by 1825 map and 1829 estate book. Recorded as Gravel pit field.
17156 – MBD17109	TL 169 538	Medieval	Langford End Medieval settlement, a linear settlement set along both sides of Station Road. The village has not expanded much outside of the medieval limits.
1671	TL 167 542	Roman	Cropmarks and Roman finds, S of Tempsford Sewage Works comprising a north-south running trackway, bordered by rectilinear and sub-rectangular enclosures. Occupation evidence includes beam slots, post holes and pits as well as Roman pottery observed in the topsoil.
9732	TL 172 560	Post-Medieval	Osier ground shown on the 1829 map in the corner of a field called Friar Pits.
1387	TL 171 559	Prehistoric	A small ring ditch and linear features recorded from aerial photographs. After topsoil stripping for a pipeline in 1993, a total of 59 flint objects were recovered from the area but no features were recorded. Most of the flints were flakes and are interpreted as indicating extraction and initial working rather than occupation; they ranged in date from the early Neolithic to the mid Bronze Age.
16799	TL 168 547	Roman	A small rectangular enclosure, on the E slope of S-facing spur is thought to be associated with a Roman villa and its industrial area, the latter of which was excavated in 1994. The main settlement is thought to be located around the site of the cropmark.
8802	TL 1573 5398	Unknown	Cropmarks visible on aerial photography but the site has since destroyed by quarrying.
16784	TL 160 542	Medieval	Trackway, North of Ford Lane of medieval date, consisting of a double linear cropmark running east-west. A possible pre-cursor to the modern route from Roxton village to the footbridge over the River Ouse.
1653	TL 156 543	Prehistoric	Cropmarks, East of Roxton village, comprising linear features.
1832	TL 161 548	Prehistoric	Cropmarks indicating a block of sub-rectangular enclosures thought to be prehistoric, visible on aerial photographs.
1833	TL 155 549	Prehistoric?	An area of sub-rectangular enclosures and other linear features, probably prehistoric in origin. Archaeological trenching in the area uncovered very few features, none of which were datable.

Reference	Grid Reference	Period	Description
13413	TL 152 552	Early Medieval	A site containing evidence for Saxon occupation, primarily due to one probable structure, found while trial trenching. It contained 3 roughly parallel gullies and 11 pits or postholes, 4 of which may make a rectangular structure. One of the larger pits may have been the southern end of a Grubenhaus, this is due to its large width and shallow depth, as well as containing a posthole.
15047	TL 148 550	Prehistoric	Cropmarks around Round Hill, consisting of an agglomeration of irregular enclosures with some outlying sub-rectangular and rectilinear features. Nearby excavations also revealed a small Roman enclosure system.
7009	TL 149 543	Post-Medieval	Roxton Park, a 19th century landscape park. The park comprises pasture with many trees and a lodge.
16785 – MBD16740	TL 148 540	Prehistoric	Faint cropmarks, South of Roxton Park of a possible group of rectilinear enclosures.
8958	TL 1534 5453	Post-Medieval	St Mary's Churchyard, a post-medieval parish churchyard.
17154 – MBD17107	TL 152 544	Medieval	The historic core of the medieval settlement of Roxton.
15046 – MBD15117	TL 142 555	Prehistoric	Cropmarks, East of Colesden Hill Farm, consisting of an agglomeration of irregular enclosures, with outlying enclosures to the north and south.
7096	TL 1471 5598	Post-Medieval	The site of a demolished post-medieval farm house. The site comprised a dump of building material and pottery with a date range from the 15th to 19th century.
2831	TL 1480 5593	Medieval	Suggestions of a moated site, although uncertain as no moat is shown on the 1813 enclosure map and the alignment of the stream shown on the map suggests canalisation.
1836	TL 152 557	Prehistoric	A number of irregular linear features, thought to be prehistoric, and part of a possible ring ditch, recorded as cropmarks from aerial photographs.
8799	TL 1521 5602	Post-Medieval	Pound Close, Chawston. The Roxton enclosure award mentions a common pound at Chawston, dating 18th/19th century. Now demolished.
8806	TL 1563 5610	Modern	Gravel Pit, Chawston. The site of a disused 20th century gravel extraction pit, shown on the 1960 OS map.
17144 - MBD17097	TL 154 561	Medieval	The historic centre of the linear medieval settlement of Chawston.

Reference	Grid Reference	Period	Description
745	TL 157 556	Iron Age/ Roman	A linear block of linked sub-rectangular enclosures visible on aerial photographs, one or more contained circular structures possibly of some status. Archaeological investigations just to the south of the cropmarks uncovered peripheral features relating to late Iron Age or Roman occupation.
1651	TL 161 559	Prehistoric	Linear irregular cropmarks; part of a possible sub-rectangular enclosure
8816	TL 164 559	Post-Medieval	Gravel pit shown on 1st edition OS 1" map (1834) Not shown on maps of 1817 or 1882.
1793	TL 165 563	Prehistoric	Cropmarks representing two probable ring ditches, one containing a rectangular feature, were recorded on aerial photographs taken in 1959. Subsequent photographs taken in 1968 showed that the area had been quarried away. The ring ditches were probably the remains of late Neolithic or Bronze Age barrows.
8629	TL 1642 5678	Post-Medieval	Gravel Pit Close marked on enclosure map, 1799. Place-name evidence for presence of post-medieval gravel extraction pit.
17149-MBD17102	TL 159 567	Medieval	The medieval roadside settlement of Wyboston, located along the Great North Road and The Lane.
3407	TL 153 567	Medieval	Moat site, Manor Farm, Wyboston. A rectangular moated site shown on the 1799 Enclosure Map, but now ploughed out. At the time of the map it partially enclosed buildings, which were still extant in 1856, but were subsequently demolished.
5136	TL 149 544	Medieval	Earthworks within Roxton Park include ridge and furrow, a pre-enclosure roadway and park boundary.
5209	TL 1627 5699	Medieval	Ridge and furrow, Eaton Socon historic parish recorded on aerial photography.
MBD21767	TL 1594 5566	Medieval	Ridge and furrow adjacent to Black Cat Roundabout. Evidence comprises northwest-southeast aligned, weakly positive parallel linear trends.
9735	TL 1624 5414	Post-Medieval	Osier ground, the site of a former post-medieval osier bed. Shown on the map of 1825, now pasture fields.
3204	TL 1667 5348	Medieval	Ridge and furrow, Tempsford parish. Recorded on aerial photography although much has been ploughed flat since.
8621	TL 1626 5660	Medieval-Post-Medieval	Wyboston Green, the site of a former medieval village green, enclosed c.1799. The Green was divided into six allotments, and by 1977 the eastern end had been developed and the remainder now pasture.

Reference	Grid Reference	Period	Description
8815	TL 1491 5606	Post-Medieval - Modern	A 19th-20th century gravel extraction pit, now disused. Recorded on the 1813 enclosure map, and shown as 'Old Gravel pit' on 1884 map.
8818 – MBD17147	TL 1599 5639	Bronze Age	Cropmarks, North of Chawston comprising ring ditch, linear features and possible small rectangular enclosure.
2664	TL 161 552	Iron Age/ Roman	Cropmarks of a probable group of sub-rectangular enclosures. Ditches and pits of late Iron Age/Early Roman and later Roman date were found during investigation, along with two pits containing cremation burials dated to the Roman period
8808	TL 160 546	Post-Medieval	Limestone milestone set in verge. Roadside face has inscription; "52 miles from London - Roxton, opposite face has some legend.
8810	TL 153 551	Post-Medieval	Former site of destroyed Post medieval milepost, "Bedford 3, St. Neots 4, shown on map of 1884
14447	TL 1535 5456	Post-Medieval	Tombstone, Roxton Churchyard dated to 1866, above which is a moulded horseshoe with the name inscribed on and a scroll in the middle. The bottom of the gravestone contains a poem, which is damaged and part missing.
8446	TL 151 546	Modern	20th century cast iron, standard Lion's head standpipe.
3526	TL 1478 5602	Modern	An iron standpipe with a Lionhead spout probably set up in the 1930s.
17182 – MBD17135	TL 158 554	Post-Medieval	The foundations of a 17th – 18th century wall, recovered during trenching for a gas pipeline. Thought to be for agricultural use.
8809	TL 163 561	Post-Medieval	Milestone, defaced shown on map of 1884. Milestone London 53 shown on 1902 map. Site visit c.1978; Presumably removed during road improvements, site now part of dual carriageway.
8587	TL 1644 5665	Modern	A 20th century Lionhead Standpipe with pail rest, Great North Rd Wyboston.
8589	TL 1596 5683	Modern	A 20th century standard cast iron Lionhead standpipe.
MBB19368	TL 15 54	Unknown	A bead of light blue opaque glass of uncertain date.
MBB19387	TL 15 54	Medieval	A medieval strap fitting, made of gilt copper alloy. Its precise purpose is uncertain.
MBB19824	TL 15 55	Roman	A copper alloy Roman strap fitting, likely of 2nd- 3rd century date.
MBB19827	TL 15 55	Roman	An incomplete copper alloy barbarous radiate Roman coin, c. AD275-285.
MBB19828	TL 15 55	Roman	A copper alloy Roman coin, a nummus of Constans (AD333-350).
MBB19829	TL 15 55	Roman	A copper alloy barbarous radiate of c. AD275-285.

Reference	Grid Reference	Period	Description
MBB20032	TL 16 56	Post-Medieval	A 17th century coin, a half groat of the Commonwealth period, 1649-1660.
MBB20036	TL 14 55	Post-Medieval	A 16th-17th century copper alloy decorative mount.
MBB20037	TL 14 55	Post-Medieval	A 16th-17th century copper alloy, double-oval buckle.
MBB20038	TL 14 55	Post-Medieval	An early post-medieval copper alloy hooking tag.
MBB20039	TL 14 55	Post-Medieval	An early post-medieval copper alloy sword or dagger scabbard chape.
MBB20040	TL 14 55	Medieval	A copper alloy medieval harness fitting.
MBB20044	TL 14 55	Roman	A copper alloy Roman coin, thought to be a 2nd century Sestertius.
MBB20062	TL 14 55	Roman	An incomplete copper alloy radiate or nummus of c. AD260-402.
MBB20063	TL 14 55	Roman	A copper alloy nummus, minted AD324-330.
MBB20064	TL 14 55	Roman	A copper alloy nummus, minted AD 388-395.
MBB20065	TL 14 55	Roman	A copper alloy radiate or nummus of c. AD260-402.
MBB20066	TL 14 55	Roman	A copper alloy barbarous radiate or nummus of AD275-402.
MBB20067	TL 14 55	Roman	A copper alloy nummus of the House of Valentinian, minted AD364-378.
MBB20151	TL 15 55	Post-Medieval	A post-medieval Nuremberg Rose/Orb jetton of Hans Krauwinckel II. Copper alloy, probably struck 1586-1635.
MBB20152	TL 15 55	Iron Age	A gold quarter stater of Tasciovanus c. 20BC-AD10.
MBB21181	TL 15 56	Early Medieval	A cast lead object of uncertain date and function, but may be an early medieval gaming piece.
MBB21183	TL 15 56	Medieval –Post-Medieval	A fragment of late medieval – early post-medieval copper alloy spoon bowl.
8575	TL 161 565	Post-Medieval	Dovehouse Close marked on the 1799 map. Place name evidence for the presence of a post-medieval dovecote.
627	TL 172 545	Prehistoric; Modern	Cropmarks of a rectilinear enclosure and a small curvilinear enclosure to the north of Tingey Farm, Langford End. Cropmarks to the east are thought to represent a series of Second World War bomb craters.
628	TL 169 540	Prehistoric/ Roman	Cropmarks of a trackway running east to west bordered by rectilinear enclosures at Lambcourt End Farm. An excavation in the north of the enclosures in 2012 revealed a ditch dating from the 2nd century AD.

Reference	Grid Reference	Period	Description
3008	TL 1667 5388	Post-Medieval	A small, brick-built, 19th century Wesleyan Association chapel, located within the Tempsford (Langford End) Conservation Area.
5981; 1114100	TL 1677 5385	Post-Medieval	The Old Bakery, 63 Station Road. A 17th century house with later alterations, formerly a bakery. Colour washed roughcast over timber frame, Grade II listed.
5982; 1114101	TL 1679 5385	Post-Medieval	Clematis Cottage, 65 Station Road. An 18th century colour washed rough cast over timber frame house with 19th century additions. Grade II listed.
5983; 1138262	TL 1698 5388	Post-Medieval	Lambcourt Farmhouse, 95 Station Road. A 17th century house with 20th century alterations and additions. Colour washed roughcast render over timber frame. Grade II listed.
5984; 1321636	TL 1731 5393	Post-Medieval	139 Station Road, a 17th century house with later additions. Colour washed roughcast over timber frame, with a thatched roof. Grade II listed.
5985; 1114102	TL 1698 5384	Post-Medieval	88 Station Road, a 16th century timber frame house with colour washed plaster infill, as well as 20th century alterations. It contains two storeys and three-room plan. Grade II listed.
5986	TL 1716 5386	Post-Medieval	52 Langford End, a former timber frame cottage. Consisted of one storey and attic, one dormer and some exposed timber framing. Now demolished.
5987; 1114103	TL 1723 5387	Post-Medieval	Biggin Farmhouse, 126 Station Road. A 17th/18th century house with 19th century extension. Two storey building, timber framed with colour washed roughcast render and partly rebuilt in brick. Grade II listed.
5988; 1138264	TL 1726 5389	Post-Medieval	A 17th century dovecote at Biggin Farm, 126 Station Road. Timber framed with red brick infill. Grade II listed.
9737	TL 1682 5394	Medieval/ Post-Medieval	Dove House Close, place name evidence for the presence of a medieval/ post-medieval dovecote, recorded on 1825 map and in the 1829 survey book.
9874	TL 1708 5378	Post-Medieval	Pound Close, place-name evidence for a site of a demolished 19th century pound. Recorded as ‘First Meadow’ in the enclosure award of 1778, and ‘Pound Close’ on the map of 1829.
14470; 1138250	TL 1685 5383	Post-Medieval	62 Station Road, an 18th century timber frame house with colour washed roughcast render. Grade II listed.
15370	TL 172 539	Medieval	Earthworks, Tingey’s Farm, Station road of a possible shrunken medieval settlement.
19765	TL 1638 5372	Iron Age	Ditches, beam slots, post settings and post holes dated as Iron Age and likely to represent division and use of land adjacent to a structure. Located at the north-west corner of Tempsford Park.

Reference	Grid Reference	Period	Description
19766	TL 1632 5376	Early Medieval	Saxon activity including ditches, post holes, pottery and inhumations revealed through a series of archaeological works in Tempsford Park.
20438	TL 1646 5458	Bronze Age	Cropmarks of a ring ditch, possibly a ploughed out Bronze Age round barrow and a probable north-south trackway.
20526	TL 1645 5389	Post-Medieval	Farm buildings at Stonebridge Farm, consisting of two threshing barns, a storage shed, four shelter sheds/stores for animals and a probable stable.
20567	TL 1742 4988	Post-Medieval	The route of a former turnpike road from Biggleswade to Alconbury Hill, whose alignment is now mostly followed by the A1.
20571	TL 1691 5513	Post-Medieval	A part of the former turnpike road, which ran from Tempsford Bridge to Godmanchester.
7180	TL 1622 5363	Post-Medieval	Tempsford Primary School constructed c.1870.
14471; 1311931	TL 1686 5386	Post-Medieval	81 Station Road, Langford End. A timber frame house with 16th century origins but extended in the 18th century and refaced in the 19th century. Grade II listed.
15795	TL 1655 5380	Post-Medieval	Demolished outbuildings to the rear of 42 and 44 Station Road. The site has since been redeveloped.
19769	TL 1633 5368	Roman	Linear ditches and curvilinear ditch dated as Roman found during archaeological investigations at the north-west corner of Tempsford Park.
3076	TL 1761 5424	Post-Medieval	The site of a gravel pit shown on the 1901 Ordnance Survey map at Mossbury Manor.
3128	TL 1767 5419	Medieval	The site of a probable moat at Mossbury Manor. The moat has been altered by ploughing and later building and is still visible to the south of the manor, while the south-east and north-east sides are now deep drainage ditches.
16802	TL 183 550	Prehistoric	Cropmarks, E of Rectory Farm. A scatter of small curvilinear enclosures with a large sub-rectangular one to the south.
9072	TL 177 562	Roman	A mixture of rectilinear and polygonal enclosures. Area cut by pipeline. The site was first located after topsoiling as a single ditch with Roman pottery being found in the topsoil up to 40m north of the ditch. A small amount of pottery and bone was found in another ditch. All ditches were aligned E-W. The site is located on a gravel terrace.
17148	TL 180 568	Medieval	Little Barford Medieval Village. The current village is still contained within the area of the medieval settlement.
3538	TL 1756 5664	Medieval	Area of ridge and furrow, Little Barford parish, recorded from aerial photography.

Reference	Grid Reference	Period	Description
9059	TL 1951 5595	Post-Medieval	High Barns, farmstead shown on the 1840 tithe map. The building has since been demolished and the site covered with shrubs.
9060	TL 1909 5625	Post-Medieval	Sheepfold in Bunker's Hill, located in field south of Top Farm depicted on the OS map. Now demolished, and land used for arable production.
9065	TL 1913 5641	Post-Medieval	An 18th century timber-framed barn, Top Farm. Now demolished.
12335	TL 190 564	Post-Medieval	The site of a range of stone, brick and weather boarded barns with gabled corrugated iron roofs at Top Farm. Now demolished.
16800	TL 183 554	Prehistoric	Cropmarks, South of Alington Hill consisting of rectilinear enclosures that abut a former stream course.
13225	TL 195 554	Unknown	Sir John's Wood, an ancient woodland of local interest.
9070	TL 189 557	Post-Medieval	The site of a demolished 19th century kiln building, shown on the map of 1826.
14032	TL 200 558	Prehistoric	Cropmarks, east of High Barns, representing a number of enclosures of different shapes and sizes.
16821	TL 197 563	Prehistoric	Cropmarks, east of Top Farm, consisting of a conjoined group of small sub-rectangular enclosure cropmarks.
13994	TL 190 572	Prehistoric	Cropmarks, north of Top Farm, comprising an extensive area of mainly rectilinear enclosures either side of a former watercourse.
3578	TL 203 561	Modern	Gipsy Corner, a 19th century field name, with circular cropmarks from Second World War structures have been reported on the site.
473	TL 1969 5638	Post-Medieval	Giants Parlour, a field name shown on the 1840 Tithe Map. Thought to relate to a local myth of a giant stood on earthworks of the site of a Roman fort.
9725	TL 193 548	Post-Medieval	A duck decoy pond constructed in the early 18th century located on the Tempsford Estate. Identified as earthworks.
9734	TL 1915 5467	Medieval	Cran Green, possible site of medieval manor house/ settlement. Referred to on the 1825 estate map and 1829 survey book.
16803	TL 185 544	Prehistoric	Cropmark of a sub-rectangular enclosure , west of Cold Arbour.
16804	TL 188 545	Prehistoric	Cropmark of a sub-rectangular enclosure, north-west of Cold Arbour.

Reference	Grid Reference	Period	Description
505; MCB17569	TL 2084 4614	Roman	Sandy to Godmanchester Roman road. A section cut across the road at Sandy in 1954 revealed it to have been 17ft wide, surfaced with rammed gravel. Pottery finds beneath the road suggests a 1st century construction date.
MCB19080	TL 2013 5641	Unknown	Cropmark enclosure complex, Eynesbury Hardwick, consisting of several enclosures of rectangular forms plus adjacent ditches and pits. Mapped from Bedfordshire 1996 aerial photography.
00800; MCB1023	TL 2017 5648	Roman	Roman coin, Eynesbury Hardwicke, a brass of Maxentius or Urbs Roma. Found in the 1930s.
MCB18837	TL 1959 5711	Medieval	Ridge and furrow (levelled), Eynesbury Hardwicke. Mapped from Bedfordshire 1996 aerial photography.
00618; MCB801	TL 197 594	Roman	Roman pit and 3ft wide metalled path, St. Neots. A coin of Claudius was found in spoil.
00618A; MCB802	TL 197 594	Post-Medieval	Three C15th and C16th silver French coins, St. Neots found in spoil.
MCB19825	TL 1973 5954	Iron Age- Roman	Large Iron Age-Roman settlement at Wintringham Park, St Neots. The site measures approximately 162 hectares, and consists of evidence of enclosures and structures. The earliest evidence is of Iron Age roundhouses, as well as enclosures and a crouched inhumation. In the south of the site is a further late Iron Age enclosure complex with a rectilinear building, roundhouse as well as finds of pottery, animal bones and daub.
05690; MCB6927	TL 188 580	Unknown	Gallow Hill, a sub-rectangular enclosure and other ditches.
00514; MCB670	TL 196 593	Mesolithic	Flint implements, St. Neots comprising 16 cores, 29 blades and flakes, five scrapers and three other implements.
00616; MCB799	TL 1982 5744	Roman	Roman coins found at Parkers Farm, one of Constantinus II or Constans, one dated to the 3rd century and the other indecipherable.
MCB21095	TL 2001 5752	Unknown	Enclosure features and possible holloway, Parkers Farmhouse
11991; MCB14116	TL 211 577	Medieval	Medieval pottery and a thimble discovered over a ‘cobbled area’ on Lansbury Farm. Aerial photography showed a rectilinear pattern of cropmarks, diagonal to road and ploughlines.
MCB18836	TL 1967 5798	Unknown	Ditches, Eynesbury Hardwicke forming possible enclosure plus adjacent ditches. Mapped from Bedfordshire 1996 aerial photography.

Reference	Grid Reference	Period	Description
MCB19052	TL 2119 5797	Medieval	Levelled ridge and furrow, Eynesbury Hardwicke mapped from 1996 aerial photography.
MCB19086	TL 2113 5781	Medieval	Medieval settlement, Lansbury Farm. Consisting ditched features that may form a series of fields or small enclosed areas with a possible settlement area near the east end.
MCB21136	TL 1962 5785	Unknown	Enclosures, adjacent to Rectory Farm Cottages, Abbotsley recorded from 2013 aerial photography.
MCB24568	TL 1937 5770	Post-medieval	Rectory Farm, Abbotsley illustrated om 1st edition OS map. Buildings remain extant.
01307; MCB1680	TL 193 583	Prehistoric	Flint core, Eynesbury Hardwicke found on surface scraped for carriageway.
03543; MCB4355	TL 192 583	Prehistoric	Two flint scrapers were found in a drainage ditch, Eynesbury Hardwicke.
MCB17211; ECB2121	TL 1943 5795	Medieval; Unknown	Undated and medieval features, Potton Lane, Eynesbury Hardwicke, found during a watching brief and evaluation. Feature consisted of three undated gullies and the furrows of a medieval ridge and furrow field system. Also finds of a single prehistoric flake and a small quantity of medieval pottery.
MCB18834	TL 2032 5811	Unknown	Ditches, Eynesbury Hardwicke forming a possible enclosure plus pits. Mapped from Bedfordshire 1996 aerial photography.
MCB18833	TL 2000 5815	Unknown	Ditches, Eynesbury Hardwicke forming a possible enclosure. Mapped from Bedfordshire 1996 aerial photography.
MCB18832	TL 1976 5815	Unknown	Pits, Eynesbury Hardwicke mapped from Bedfordshire 1996 aerial photography.
MCB18835	TL 2016 5836	Medieval	Ridge and furrow (levelled), Eynesbury Hardwicke. Mapped from Bedfordshire 1996 aerial photography.
01115; MCB1417	TL 2084 5804	Medieval	Homestead moat, Eynesbury Hardwicke, which may represent the site of the manor of Launcelynsbury.
MCB23451	TL 1908 5835	Medieval	Possible archaeological features, St Neots Road, St Neots including traces of ridge and furrow and former field boundaries. An undated pit and ditch were also identified through evaluation. Pottery sherds were recorded including a late medieval sherd from the furrows and post-medieval sherds, fragments of brick and peg-tile.
MCB24569	TL 1972 5811	Post-medieval	Eynesbury Fields Farm illustrated on the 1st edition OS map. No longer extant.
01319; MCB1697	TL 1968 5861	Prehistoric	A flint blade, Eynesbury Hardwicke found in a drainage ditch.

Reference	Grid Reference	Period	Description
01562; MCB2007	TL 196 585	Prehistoric	Flint implements, Eynesbury Hardwicke comprising three flakes and a scraper found in a drainage ditch.
MCB18829	TL 1924 5856	Unknown	Enclosure, Eynesbury Hardwicke. Rectangular enclosure with adjacent ditches forming another enclosure/ field division. Mapped from Bedfordshire 1996 aerial photography.
MCB18830	TL 2068 5869	Unknown	Circular enclosure and adjacent ditches plus pits, mapped from Bedfordshire 1996 aerial photography.
MCB18828	TL 1910 5862	Unknown	Enclosure group, Eynesbury Hardwicke. Several enclosures of rectangular forms plus adjacent ditches and pits, mapped from Bedfordshire 1996 AP
MCB18831	TL 1991 5855	Unknown	Possible parallel ditches, Eynesbury Hardwicke mapped from Bedfordshire 1996 aerial photography.
MCB21094	TL 1893 5829	Unknown	Cropmark features north of A428, Eynesbury consisting of a series of linear features noted by aerial photography.
MCB24594	TL 2110 5871	Unknown	Rectilinear Enclosure, Abbotsley visible on aerial photography. The enclosure appears to have sub divisions within it, measures roughly 68m x 55m.
MCB18826	TL 1929 5894	Unknown	Ditches, Eynesbury Hardwicke forming a possible enclosure plus adjacent features. Mapped from Bedfordshire 1996 AP
MCB18827	TL 1941 5889	Medieval	Ridge and furrow, Eynesbury Hardwicke (levelled), mapped from Bedfordshire 1996 AP
09008; MCB10797	TL 197 594	Roman	Roman coin, St. Neots, a second brass of Claudius.
MCB20853; 11862	TL 2177 6701	Post-medieval	Great Northern Railway originally proposed in 1827. The London to Peterborough section opened in 1850. The service is currently known as the East Coast Mainline.
MCB19055	TL 2134 5800	Unknown	Enclosure complex, Eynesbury Hardwicke, comprising a series of abutting rectangular enclosures with internal and external ditches and pits, mapped from aerial photography. Possibly more than one phase, from superimposed ditches.
09972; MCB11831	TL 192 585	Unknown	Rectilinear enclosures, Eynesbury Hardwicke recorded on aerial photography as two enclosures with attached linear features.
1290249; DCB3188; MCB23435	TL 20959 57620	Post-Medieval	Lansbury Farmhouse, c.1800 farmhouse. Gault brick with hipped, slate roof and boarded eaves. Two storeys. Grade II listed.

Reference	Grid Reference	Period	Description
1331024	TL 17416 61201	Post-Medieval	A 17th century timber frame house, refronted in the early 18th century with later alterations. The building is two storeys with attics, tiled roof with gable coping and stacks and an architraved doorway. Grade II* listed.
1330437	TL 16520 62079	Medieval	Church of St Nicholas, dated to the 13th century with a 14th century timber-framed tower, restored in the 19th century. It is built of pebble-rubble and some stone with limestone and clunch dressing. Grade II* listed.
1309874	TL 17331 60802	Post-Medieval	An early-mid 19th century farmhouse, consisting of two storeys of gault brick. It is double fronted with three windows and a rounded arch doorway with wooden doorcase with pilasters carrying cornice. Grade II listed.
1454154	TL 16454 61869	Post-Medieval	Milestone 57 on the B465 is dated to 1754-58. It is tall, stone, roughly hewn and with a rounded top with a broken top-left corner. Grade II listed.
1130274	TL 16589 62222	Post-Medieval	Manor Farmhouse, a 17th century timber framed and plastered farmhouse, consisting of two storeys in a hall and crosswing plan. It also has an early 19th century, single storey painted brick bakehouse to the east. Grade II listed.
1162365	TL 16651 62270	Post-Medieval	A 17th century timber frame and plastered farmhouse, with two later, possible 18th century, extensions to the west of the original hall and cross wing. Grade II listed.
MCB19042	TL 2089 5940	Unknown	Ditches forming a possible curvilinear enclosure, Abbotsley. Mapped from Bedfordshire 1996 aerial photography.
01270b; MCB1642	TL 2177 5971	Medieval	Moat and Medieval chapel site, Wintringham. Traces of a moated enclosure are seen to the west of the house, rectangular shaped. No trace of chapel found during trenching.
02359; MCB2973	TL 217 590	Post-Medieval	Wind pump, Wintringham, recorded on OS mapping.
02385; MCB3006	TL 2178 5973	Post-Medieval	Possible Tanning vat, Wintringham. A rectangular structure of rubble faced on the inside with red tiles measuring 10ft by 8ft.
03535; MCB4342	TL 2075 5987	Prehistoric	Flint flake, St. Neots Rural found in a drainage ditch.
03539; MCB4349	TL 2088 5992	Prehistoric	Prehistoric flint flake, St. Neots found broken in a drainage ditch.
04062; MCB4930	TL 2070 5980	Unknown	V-shaped undated ditches, St. Neots bypass were observed in section 1m wide and 40cm deep below top of subsoil.

Reference	Grid Reference	Period	Description
04063; MCB4931	TL 2091 5995	Unknown	Pit, St. Neots Bypass observed in section, 1.4m long and 0.4m deep below ploughsoil.
04064; MCB4932	TL 2048 5967	Unknown	Pit, St. Neots Bypass observed in section measuring 6m long and 0.5m deep.
MCB19043	TL 2174 5953	Unknown	Possible ditch, Abbotsley. Mapped from Bedfordshire 1996 aerial photography.
MCB18821	TL 2034 5988	Medieval	Ridge and furrow, St Neots, mapped from Bedfordshire 1996 aerial photography.
MCB18822	TL 2065 5994	Unknown	Pit, St Neots Rural, mapped from Bedfordshire 1996 aerial photography.
02388; MCB3010	TL 200 591	Roman	Roman metalled surface and pottery revealed during a small excavation at Eynesbury Hardwicke.
MCB24570	TL 2160 5898	Post-medieval	Lower Wintringham Farm illustrated on 1st edition OS map. Farm remains in use although unclear how many original buildings are extant.
03532; MCB4339	TL 2021 5932	Prehistoric	Flint scraper, St. Neots found in a drainage ditch.
MCB18824	TL 2056 5940	Unknown	Ditches, Abbotsley forming a possible enclosure. Mapped from Bedfordshire 1996 aerial photography.
MCB19045	TL 2190 5884	Unknown	Enclosure group, predominately rectilinear, within of forming a broad ditched enclosure which also has external features, Abbotsley. Mapped from Bedfordshire 1996 aerial photography.
MCB19041	TL 2101 5990	Unknown	Ditches that may be part of an irregular enclosure and adjacent features and possible pits nearby, Abbotsley. Mapped from Bedfordshire 1996 aerial photography.
MCB18823	TL 2047 5971	Unknown	Ditches, St Neots forming a possible enclosure/ field division. Mapped from Bedfordshire 1996 aerial photography.
1006849; DCB103; 02364	TL 22941 59650	Medieval	Deserted village (site of) at Weald. The manor site is clearly visible to the north east of the scheduled area and the church stood in the chapel yard. The site was deserted in the last 200 years. Scheduled monument
1006815; DCB108; 01117	TL 22123 59325	Medieval	Deserted village at Wintringham. Earthworks comprising a rectangular pattern of sunken roads and rectangular house platforms typical of deserted medieval villages. Scheduled monument.

Reference	Grid Reference	Period	Description
1210919; DCB2892 MCB24577	TL 23397 60050	Post-Medieval	North Farmhouse about 1/4 Mile North East of Weald House. C18 L-plan farmhouse. Local brick, originally painted or plaster rendered. Thatched, hipped roof with end stacks. Two storeys. Grade II listed.
1211324; DCB2933	TL 21902 59766	Post-Medieval	Barn about 100 yards South of Wintringham Hall, C17 aisled barn of nine bays. Timber framed on brick sill. Modern roof. Grade II listed.
1211327; DCB2935; MCB19834;	TL 21034 60270	Post-Medieval	Farm buildings at Tithe Farm, Mid C19 model farm buildings on L-plan. Gault brick and hipped, slate roofs with dentil cornice. East range: cartshed of eight bays with grainstore above. South range: stable incorporating granary. Five horizontal sliding sashes and two doorways to stables. Grade II listed.
1211328; DCB2936;	TL 21065 60288	Post-Medieval	Tithe Farmhouse about 1 Mile East of Railway Bridge, Farmhouse dated 1773 on bell shaped rainwater head to east gable end. Gault brick. Double pile plan with two linked mansard roofs. Tiled. Two storeys and attics. Grade II listed.
1290056; DCB3165;	TL 21889 59808	Post-Medieval	Granary South West of Wintringham Hall, c.1830 granary with three cart bays at ground floor. Gault brick. Hipped, slate roof with louvred ventilation opening at apex. Grade II listed.
MCB23486	TL 2364 6138	Unknown	Rectilinear enclosures, 1km south of Wayside Farm, Toseland, shown as cropmarks of linear features on 2009 aerial photographs.
MCB1421; 01117a	TL 220 594	Medieval	Wintringham Medieval Great Hall
01117b ; MCB1422	TL 220 594	Roman	Twelve sherds of Roman pottery were found, Wintringham
12190; MCB14315	TL 220 598	Post-Medieval	Wintringham Hall Park, consisting of mostly lawns and trees.
01270a; MCB1641	TL 219 598	Post-Medieval	Wintringham Hall, a late 19th century brick building surrounded by a rectangular moat, thought to have replaced a previous Elizabethan manor on the site.
02406; MCB3033	TL 2210 5965	Modern	The site of a Second World War searchlight, Wintringham, recorded as a circular cropmark on aerial photography.
06094; MCB7417	TL 225 593	Medieval	Ridge and furrow, Eynesbury Hardwicke indicating medieval agricultural activity.

Reference	Grid Reference	Period	Description
MCB15790; ECB1482	TL 20098 60302	Iron Age	Middle Iron Age settlement activity, E of St. Neots, consisting of shallow ditches and pits containing occupational debris, recorded through trial trenching.
MCB15791	TL 2029 6035	Iron Age	Iron Age coin, E of St. Neots, revealed during trial trenching. A coin of Cunobelin was found in the South-west corner of the site.
MCB19036	TL 2125 6064	Unknown	A series of adjacent or linked enclosures of mainly sub-square forms. Mapped from Bedfordshire 1996 aerial photography.
MCB19039	TL 2230 6046	Unknown	Possible enclosure, Abbotsley. Enclosure-like form but possibly a mixture of natural and agricultural marks. Mapped from Bedfordshire 1996 aerial photography.
MCB19037	TL 2103 6044	Medieval	Ridge and furrow (levelled), St Neots. Mapped from Bedfordshire 1996 aerial photography.
MCB20140; ECB3667	TL 2069 6043	Roman/ Medieval	Field walking finds at Love's Farm, St Neots, consisting of occasional pot sherds of roman and medieval date. The Roman pottery was broadly dateable to the 1st and 2nd centuries. Also found were a possible Roman pot mend, a fragment of an intaglio ring and a single Roman coin.
MCB19035	TL 2130 6082	Unknown	Rectilinear Enclosure with internal and external ditches and pits, St Neots. Mapped from Bedfordshire 1996 aerial photography.
02472; MCB3102	TL 221 611	Roman	Roman earthworks, Monks Hardwick Farm situated on an elevated position some 400 yards north of Fox Brook. Possibly representing a temporary camp, with earthworks recorded in the 19th century supposedly showing fortifications. Not visible on aerial photography, and no trace of earthworks seen from ground.
MCB24564	TL 2257 6127	Post-Medieval	High Barn, Abbotsley illustrated on the 1st edition Huntingdonshire OS map, 1885. The buildings are still extant.
02357; MCB2971	TL 236 594	Roman	Roman cemetery site, Eynesbury Hardwicke reported by G T Rudd.
02358; MCB2972	TL 236 596	Roman	Roman finds, Eynesbury Hardwicke consisting of coins and pottery sherds as well as a carved stone block.
02364a; MCB2979; ECB355	TL 229 596	Early Medieval	Saxon finds, Weald DMV consisting of pottery was found during excavations north west of Chapel yard. Late Anglo-Saxon structures of a domestic nature were found during excavation in 1942 below the church.

Reference	Grid Reference	Period	Description
02346b; MCB2980	TL 229 596	Post-Medieval	Post-medieval architectural remains at the site of the deserted village at Weald. Brick foundations of a house look 17th century but there are little or no remains of other buildings shown. One cottage along the road recorded on the 1902 map, thought to be deserted during the 19th century.
MCB24572	TL 2331 6064	Medieval	An area of ridge and Furrow, Abbotsley visible on LiDAR imagery, 2015. The features appear to be heavily grown over in an area known as New Gorse. Further ridge and furrow is also recorded as cropmarks directly to the south on aerial photography, 2009.
MCB24573	TL 2327 6083	Unknown	Linear cropmarks forming several rectilinear enclosures, Abbotsley visible on aerial photography, 2009. The cropmarks are situated in a line on a broadly NE-SW alignment. The cropmarks cover and area measuring c.190m east-west.
MCB24574	TL 2299 6087	Unknown	Cropmarks of a rectilinear enclosure, Abbotsley are visible on aerial photography, 2009. The enclosure measures roughly 50m by 65m and a second enclosure is possibly visible to the south.
MCB24576	TL 2337 6040	Unknown	Linear features, Abbotsley are visible as cropmarks on aerial photography, 2009. The cropmarks may form several enclosures although it is difficult to determine their exact relationship.
MCB24579	TL 2266 5967	Post-Medieval	Weald Farm, Weald illustrated on 1st edition Huntingdonshire OS map, 1885. The buildings appear to still be extant.
01270; MCB1640	TL 218 598	Medieval	Moated site at Wintringham Hall. The moat is sharply defined and wet on the north and east but deteriorated on the west side. Much of the south arm has been obliterated by farm buildings.
MCB19040	TL 2224 6006	Unknown	Ditched features that include rectangular forms, irregular shapes and a possible ditch running to a pond, Abbotsley. Mapped from Bedfordshire 1996 aerial photography.
MCB19044	TL 2239 5977	Post-Medieval	Metalled track, presumably once linking the road to its north with a building and possible ditches, Abbotsley. The possible ditches on its south side mapped from Bedfordshire 1996 aerial photography.
MCB19038	TL 2183 6038	Unknown	Ditches, Abbotsley possibly parts of enclosure group recorded through aerial photography.
MCB19032	TL 2226 6120	Unknown	A series of mainly straight ditches, Abbotsley. Possibly part of a field system, mapped from 1996 aerial photography.

Reference	Grid Reference	Period	Description
MCB24578	TL 2389 5999	Unknown	Series of features visible as cropmarks east of North Farm, Abbotsley and Croxton, on aerial photographs 2009. Consists of two sets of linears that run parallel and form two roughly rectangular shapes, one wholly within the other. There are also two oval shaped features also visible.
MCB24562	TL 2401 6085	Post-Medieval	Site of Barn Farm, Toseland, illustrated on the 1st edition Huntingdonshire OS map, 1885. The building is no longer extant.
02431; MCB3060	TL 239 596	Medieval	Weald medieval church (site of), Croxton, evident through earthworks, the churchyard can still be traced.
1019176; DCB273; MCB1482; 01143	TL 27285 59713	Medieval	Moated site at Pond Farm, a roughly rectangular island which measures 50m north-south by up to 46m east-west and which is raised by approximately 1.5m above the surrounding ground surface. This is defined on three sides by a water-filled moat, measuring up to 8m wide and at least 2m in depth. A shallow linear depression indicates the position of the west arm of the moat which was partly infilled in the late 19th century and now survives as a buried feature. Scheduled monument.
1019638; DCB274; 01142a	TL 2732 5931	Medieval	Moated site at Manor Farm. It is located 600m to the south east of the parish of Eltisley. It consists of a roughly rectangular island, measuring up to 74m north-south by 64m east-west. There is a water-filled moat measuring an average 12m in width. Manor Farm House is located on a building platform on the southern side of the island. Scheduled monument.
1006783; DCB243; 02334	TL 25149 59537	Medieval	Croxton deserted medieval village and 16th-17th century garden remains. The post-medieval remains consist of a circular enclosure and a pond. Scheduled monument.
1163501; DCB5025; 01143a	TL 27273 59714	Post-Medieval	Pond Farmhouse, late C15 or early C16 with C19 and C20 alterations. Timber-frame exposed and plastered or covered at first floor by asbestos sheeting; painted brick. Low pitched hipped early C19 slate roofs. Two storeys with main north-south range and crosswing to north. Grade II listed.
1127171; DCB4404; 02329	TL 24829 59990	Post-Medieval	The Downs, an early to mid C19 Villa. Gault brick, low pitched hipped slate roof. Two storeys with lower, rear service wing. Grade II listed.
1127175; DCB4405	TL 24934 59697	Post-Medieval	Gatehouse Lodge, A C17 2 storey cottage with C19 lean-to to left hand. Timber-framed and plastered. Plain tile roof. Tall square red brick ridge stack. Grade II listed.

Reference	Grid Reference	Period	Description
1127177; DCB4406	TL 27234 59562	Post-Medieval	Village Pump to North of Number 18, C19. Long case of wood with cast iron cistern and spout and lever. Grade II listed.
1127178; DCB4407	TL 27618 59269	Post-Medieval	122 & 124 Caxton End. Cottage. Early C19. Gault brick, timber-framed and plastered, slate roof. Central ridge stack. Two storeys. Grade II listed.
1127181; DCB4409	TL 27097 59778	Post-Medieval	Kent Cottage, early C19. Painted brick; long straw thatch roof, end stacks. Two storeys. Symmetrical façade. Grade II listed.
1127205; DCB4420	TL 24674 59464	Post-Medieval	Westbury Farmhouse, early C16 open hall with later C17 or C18 axial additions, early C19 brick casing and double pile wing to west. Timber-framed and plastered, soft red brick and C19 gault brick. Plain tile hipped roofs, side stack to west and rear stack. Grade II listed.
1163272; DCB4995	TL 24851 59808	Post-Medieval	The House on the Hill, Pair of late C17 or early C18 cottages with C19 brick casing. Long straw thatched roof. Two local red brick ridge stacks. One storey and attics. Grade II listed.
1163308; DCB4999	TL 24888 59815	Post-Medieval	Chefs' Cottage, C17. Timber-framed and plastered. Hipped long straw thatched roof. Central gault brick ridge stack. One storey and attic. Grade II listed.
1163469; DCB5022 02344	TL 26966 59652	Post-Medieval	The Old House, exposed timber-frame with plain tile roofs and plastered plinth. Two storeys and attics; dated 1612 on the door lintel. Grade II listed.
1163520; DCB5026	TL 27129 59788	Post-Medieval	South View, Cottage. C17 with C19 alterations. Timber-framed and plastered. Corrugated iron roof; red brick ridge stack. One storey and attic. Grade II listed.
1163524; DCB5027	TL 26947 59726	Post-Medieval	52, The Green, C17 cottage. Timber-framed and plastered. Long straw thatched roof with central red brick ridge stack. One storey and attic. Grade II listed.
1223662; DCB5224	TL 27191 59750	Modern	K6 Telephone Kiosk, designed 1935. Cast iron. Square kiosk with domed roof. Unperforated crowns to top panels and margin glazing to windows and door. Grade II listed.

Reference	Grid Reference	Period	Description
1309206; DCB5347; 01142b	TL 27339 59301	Medieval/ Post-Medieval	Manor Farmhouse, built in the late C15 with C17 insertions and C18 and C19 alterations and additions. Timber-frame cased in late C19 red brick. Plain tile roofs. Grade II listed.
1331393; DCB5655	TL 24889 59800	Post-Medieval	Myrune Cottage, C17. Timber-framed and plastered. Half hipped long straw thatched roof, with original red brick stack with grouped shafts set diagonally. One storey and attic, three unit plan. Grade II listed.
1331396; DCB5656; 02297	TL 27103 59618	Medieval/ Post-Medieval	Green Farmhouse, House formerly a farmhouse. Possibly late C15 or early C16 (qv Manor Farmhouse and No. 18 The Green), remodelled and partly rebuilt C17 with later alterations. Timber-frame exposed and plastered with plain tile roofs. Ridge stack with grouped diagonal shafts; two side stacks to left hand. Two storeys and attics, hall with crosswings to east and west. Grade II listed.
1127172; DCB5690	TL 24854 59838	Post-Medieval	Rose Cottage, Late C17 or early C18. Timber-framed and plastered with long straw thatched roof. Stack behind ridge with upper courses rebuilt. One storey and attic, three unit plan. Grade II listed.
02328; DCB5691; 1127173	TL 24894 59698	Medieval/ Post-Medieval	The Manor House, late C15 or early C16. Timber-frame exposed and plastered with C17 red brick plinth and walls. C19 brick casing to rear. Plain tile roofs with pantiles to rear elevations. One storey and attic hall range with jettied cross wings of two storeys. Grade II listed.
1163289; DCB584	TL 24872 59719	Post-Medieval	Forge Cottage and Ivy Cottage, a pair of C18 cottages subdivided into four small dwellings early C19. Timber-frame on soft red brick plinth with front walls cased with weatherboarding and pebble dashed; plastered gables. Grade II listed.
1331398; DCB5996	TL 27089 59444	Medieval/ Post-Medieval	Late C15 or early C16 with later alterations. Timber-framed with roughcast render and long straw thatched roofs. Ridge stack and end stack to right hand. One storey and attic, L-plan with hall range to right hand originally single storeyed. Grade II listed.
1127174; DCB6008	TL 24880 59839	Post-Medieval	Village Pump outside Chefs' Cottage, C19. Cast iron stand with spout and lever. Grade II listed.
1127176; DCB6009	TL 27233 59539	Post-Medieval	Pump Cottage, Late C16 or early C17. Timber-framed and cased with painted brick. Long straw thatched roof. One storey and attic, three unit plan. Grade II listed.

Reference	Grid Reference	Period	Description
1331370; DCB6322	TL 24673 59490	Post-Medieval	Barn to North of Westbury Farmhouse, C16. Timber-framed and weather boarded with asbestos covering to modern roof. Grade II listed.
1331370; DCB6323; MCB18052	TL 24410 60080	Post-Medieval	Mile Post, to North West of Spread Eagle Public House, C19. Cast iron, triangular with chamfered top. Painted white, with black painted letters in relief. ‘Camb. 14, St Neots 4, Oxford 75’ Grade II listed.
1163314; DCB6491	TL 24896 59779	Post-Medieval	Lindsey Cottage Immediately South of Myrune Cottage, Late C17, timber-framed and cased in early C19 brick. Long straw hipped thatched roof. Local red brick ridge stack. One storey and attic, three unit plan. Grade II listed.
1318237; DCB6589; MCB2904	TL 27620 59243	Post-Medieval	Jesus College Farmhouse, a house formerly a farmhouse. Early C17 originally extended further to east of existing building. C20 extension to west. Timber-framed and plastered, hipped plain tile roof. Grade II listed.
1331392; DCB6650	TL 24871 59760	Post-Medieval	Orchard Cottage and Two Cottages to North. Row of three cottages, now a single dwelling. C17 with timber-frame cased in C19 brick and cottage to south possibly rebuilt. Timber-frame partly plastered in north gable, C19 brick. Grade II listed.
1331394; DCB6651; MCB18069	TL 27411 60086	Post-Medieval	Mile Post, C19. Cast iron with three angled faces. Painted white with black painted raised inscription 'Oxford 75, St Neots 6, Cambridge 12, Eltisley'. Grade II listed.
1331395; DCB6652	TL 27378 59489	Post-Medieval	Pear Tree House, Early C19. Timber-framed with pebble-dashed render, red brick gables extended to right hand with gault brick by one bay. Pantile roof. Two storeys. Grade II listed.
1127180; DCB6665	TL 26905 59693	Post-Medieval	Lych Gate to North East of Parish Church, commemorating 1914-18 war. Limestone walls with two inset plaques inscribed with war dead. Oak frame inscribed 'Death Swallowed Up in Victory'; plain tile gable roof. The lych gate marks a C20 extension to the churchyard. Grade II listed.
1163346; DCB6817	TL 27206 59560	Post-Medieval	12 Caxton End, a late C16 or early C17 Cottage with C20 alterations. Timber-framed with roughcast render. Long straw thatched roofs. Ridge stack. One storey and attic with roof perhaps raised to right hand unit of original three unit plan. Grade II listed.

Reference	Grid Reference	Period	Description
1163409; DCB6819	TL 27456 59460	Post-Medieval	Mistletoe House, a cottage and shop extension. Dated EN 1826 on ridge stack. Timber-frame cased in gault brick with corrugated iron roofs. Two storeys with single storey shop to north-east. Grade II listed.
1163534; DCB6820; MCB18059	TL 27207 60052	Post-Medieval	Milestone, C19 or earlier. Limestone block with pyramidal cap. Inscriptions incised and painted black 'Eltisley, St Ives 8, Potton 8'. Grade II listed.
1309225; DCB6915	TL 25311 59712	Post-Medieval	Well Head to North of Croxton Park, C19. Timber-framed and weather boarded with hipped long straw thatched roof with central projecting structure. Entrance facing south. Grade II listed.
1309327; DCB6920	TL 24653 59503	Post-Medieval	Barn to North West of Westbury Farmhouse, C16. Timber-framed and weather boarded on ironstone and brick foundations. Corrugated iron covering to modern roof. Grade II listed.
1331397; DCB7000; 02316	TL 27145 59796	Medieval/ Post-Medieval	The Old Post House, Late C15 with early C17 and C19 and C20 additions and alterations. Timber-framed with C20 pargetted cement render, plain tile roofs hipped to left hand with gablet. Single storeyed open hall and service bay to right hand with jettied crosswing to left hand. Grade II listed.
1127179; MCB339; DCB4408; 00252	TL 2684 5966	Medieval	Saint Pandionia and Saint John the Baptist's Church, Eltisley. The earliest parts of the church are the nave and aisles which were built c.1200, with the clerestorey remodelled and the tower added in the later medieval period. Rebuilding work took place in the 19th century including of the chancel and much of the north chapel and general restoration between 1875-1879. Grade II* listed.
1127206; MCB12357; DCB6343; 10406	TL 2473 5948	Post-Medieval	Dovecote, Westbury Farm, Croxton, a late 17th – early 18th century, a rebuilding of a former timber framed dovecote. Red brick walls with plain tiled pyramidal roof. One storey, square planned with about 300 blocked nesting boxes constructed in brick. Grade II listed.
12280; MCB14404	TL 2519 5944	Post-Medieval	Croxton Park, an early 16th century deer park which incorporates earthwork remains of 16th century garden features, as well as a mid-18th century house and walled garden set within the park. The area was enlarged and landscaped in the early 19th century. Grade II* registered park and garden.
MCB24582	TL 2668 6134	Unknown	Ridge and furrow and curvilinear features at Fair View Farm, Yelling

Reference	Grid Reference	Period	Description
10020; MCB11884	TL 2700 5940	Medieval	Medieval earthworks, Eltisley, comprising series of banks, ditches, ponds and potential house plots.
02317; MCB2928	TL 2722 5982	Post-Medieval	Leeds Arms, Eltisley, a late 18th century public house. Two storey with attics, made of redbrick with tiled roofs.
02318; MCB2929	TL 271 594	Post-Medieval	Post-medieval barn, Eltisley, framed and boarded, with a suggested C16 origin.
02343; MCB2954	TL 261 594	Post-Medieval	Eltisley windmill
02351; MCB2962	TL 271 595	Medieval	Earthworks, Eltisley
02352; MCB2963	TL 272 595	Medieval	Medieval pottery finds, Eltisley. A twisted pottery handle, grey in colour. Well-fired, fine fabric.
02380; MCB2999	TL 2687 5963	Early Medieval/ Medieval	Eltisley Abbey, St. Pandionia's Well (site of). The traditional site of a 9th century Benedictine nunnery, with possibly post-medieval moat and water garden.
02380a; MCB3000	TL 2687 5963	Post-Medieval	Post Medieval house and moat, The Old House, Eltisley, dated 1612 are thought to be a water garden connected to the house.
02403; MCB3030	TL 266 595	Iron Age	Three parallel rows of pits, Eltisley presumed to be Iron Age in date.
02411; MCB3038	TL 2740 5928	Unknown	Earthwork bank, Eltisley following a hedge line marked on the OS map to the south of the moated site at Manor Farm. The bank is rounded and measures 10-15ft wide and 1 ½ ft high, with an outer ditch which crosses a series of ridge and furrow.
MCB22620	TL 2635 5984	Post-Medieval	Rectory, Eltisley, recorded on the 1st edition OS map. The building is still extant.
MCB22621	TL 2725 5954	Post-Medieval	Blacksmiths workshop, Eltisley illustrated on the 1st edition OS map.
MCB22622	TL 2632 5934	Medieval	Ridge and furrow, Croxton, area levelled. Visible on aerial photography 2013.
MCB23573	TL 2717 6117	Unknown	Cropmarks of at least four rectilinear enclosures, Eltisley visible on aerial photography.
MCB24563	TL 2520 6097	Post-medieval	High Hayden, Yelling, the site of a house or farm illustrated on the 1st edition OS map. No longer extant.
MCB24566	TL 2562 5988	Post-medieval	School, Croxton built in 1869. No longer in use.

Reference	Grid Reference	Period	Description
MCB24583; ECB4675	TL 2673 6084	Unknown	Curvilinear and linear features at Fair View Farm, Yelling recorded through geophysical survey thought to represent an enclosure, ditches, paths or tracks. A east-west track is shown on historic mapping so features may relate to this.
MCB24584	TL 2629 6005	Unknown	Possible enclosure, Croxton visible as cropmarks. The linear features form at least three separate sides of the possible enclosure, measuring roughly 40m x 46m.
MCB24585	TL 2722 6057	Unknown	Enclosure Complex, Eltisley shown on aerial photography. At least four separate enclosures with several linear features cutting them, suggesting multiple phases of activity. Three circular features are also visible.
MCB24586	TL 2718 6038	Unknown	A single enclosure, Eltisley is visible as cropmarks. Measures roughly 37m x 26m and is likely related to the enclosure complex visible to the north.
MCB24587	TL 2734 6022	Unknown	A Single enclosure, Eltisley visible as cropmarks. Measures roughly 65m x 55m.
CB15602; MCB15602; ECB1261	TL 27241 59516	Roman; Medieval	Evaluation at Newton County Primary School, Eltisley, 2003 revealed a ditch and pit containing a fragment of human hip bone. Both of these features were cut by a large medieval pit, dated c. AD1200-1300. The feature is thought may represent back plots to houses fronting the roadway.
MCB16718	TL 2740 5943	Neolithic	An early Neolithic unpolished axe find, Caxton End, Eltisley.
MCB17175	TL 2704 5965	Post-Medieval	Primitive Methodist chapel, Eltisley. It was built facing the Green in 1846, and rebuilt in brick in 1879.
MCB17254	TL 2680 5962	Medieval	Ridge and furrow, Church End, Eltisley revealed during magnetic survey.
MCB18912	TL 2600 5970	Post-Medieval	Ditched boundaries and possible quarries or ponds, Croxton. Mapped from Bedfordshire 1996 aerial photography.
02387; MCB3009	TL 253 597	Bronze Age	A Middle Bronze Age rapier, found in Croxton Park. The blade has a broad, flat mid-rib and two notches in the butt, which provide the only means of securing the blade to the grip.
MCB19662	TL 2683 5960	Post-Medieval	Ditches and mounds as part of garden at Old House, Eltisley.
MCB19980; ECB3672	TL 2732 5932	Medieval - Modern	Roman and Medieval to Modern features at Manor Farm, Eltisley. Trial trenching revealed a mound/ platform that probably supported a larger building to the east of the present building. There also appeared to have been a trackway to the north of the moat.
MCB21441	TL 2691 5972	Post-Medieval	Corn Mill, Church End, Eltisley recorded on the 1st edition OS map, comprising a detached house and square courtyard.
MCB21442	TL 2740 5947	Post-Medieval	Wesleyan Methodist Chapel, Eltisley recorded on the 19th century OS maps.

Reference	Grid Reference	Period	Description
MCB18907	TL 2519 6162	Unknown	Enclosure group, Yelling. D-shaped enclosure plus adjacent enclosures and fields mapped from Bedfordshire 1996 aerial photograph transcription.
02517; MCB3165	TL 246 601	Medieval	Ridge and furrow, Croxton measuring 140 yards long. This area was formerly all old enclosures but this is all that now remains.
02451; MCB3080	TL 2450 6009	Post-Medieval	White Hall, Croxton, a complex of buildings visible on the 1st edition OS map. The building survives as a red brick L-shaped building with later additions. The front façade is symmetrical with two bay windows and a central entranceway with a porch. The rest of the complex has been destroyed.
MCB24565	TL 2439 5959	Post-Medieval	Croxton Kennels, Croxton, illustrated on the 1st edition Huntingdonshire OS map 1885. The buildings remain extant and are now used as a private residence.
MCB24581	TL 2464 5986	Medieval/ Post-Medieval	An area of ridge and furrow, Croxton, visible as extant earthworks on aerial photographs, 2009, which follow several different alignments.
09592; MCB11414	TL 2455 5935	Roman	Roman knife handle, Croxton found in spoil from a field ditch in 1960. The handle is made of bronze, ornamented with the grey hound-and-hare motif and slotted to receive the hinged iron blade, as in a mod pen-knife. Part of the blade can in fact still be seen in the slot.
MCB18909	TL 2599 6128	Medieval	Rectangular enclosures and medieval ridge and furrow, Yelling. Mapped from Bedfordshire 1996 aerial photography.
02349; MCB2960	TL 2723 5894	Medieval	Deer park, documented in Eltisley parish, its position is indicated by a large area of woodland. The massive bank of the park pale can be seen defining exactly the suggested boundaries of the park.
01137; MCB1474	TL 2470 5947	Medieval	Moated site, Westbury Farm, Croxton. A stretch of wet ditch measuring 408ft long, 30-40ft wide and 3ft deep may be the surviving north side of a large rectangular moat around Westbury Farm. The west side is masked by a depression and there are no signs of the south or east sides.
02463; MCB3091	TL 278 604	Post-Medieval	The site of a post-medieval windmill marked as ‘Mill Hill’ and surrounded by a wet moat on early 19th century OS maps. Only a pile of rubble is still visible.
MCB23487	TL 2762 5945	Medieval-Post-Medieval	Earthwork remains of ridge and furrow, north of Jesus College Farm, Eltisley in an east-west alignment. Visible on 2009 aerial photography.
MCB23488	TL 2781 5920	Medieval-Post-Medieval	Earthwork remains of ridge and furrow, south of Jesus College Farm, Eltisley in an east-west alignment. Visible on 2009 aerial photography.

Reference	Grid Reference	Period	Description
MCB23489	TL 2758 5912	Medieval-Post-Medieval	Earthwork remains of ridge and furrow, south of Jesus College Farm, Eltisley in an east-west alignment. Visible on 2009 aerial photography.
MCB24539	TL 2761 6133	Post-Medieval	Papley Grove, Eltisley recorded on the 1st edition OS map. Parts of the original house appear to still be extant, although significant extension work has been added.
MCB24588	TL 2780 6052	Unknown	Oval Enclosure, Eltisley visible as cropmarks. Measures roughly 40m x 27m.
MCB24589	TL 2757 6119	Unknown	Enclosures south of Papley Grove, Eltisley visible as cropmarks. Situated directly south of Papley Grove, with at least three separate enclosures visible.
02541; MCB3190	TL 2785 6039	Post-Medieval	Probable windmill mound, Papworth Everard, consisting of a ditched mound. No surface finds have been made and the mound has been levelled.
05753; MCB14776	TL 27723 60569	Medieval	Extensive ridge and furrow, Eltisley indicative of medieval agricultural activity in this area.
MCB17255	TL 2774 5937	Roman	A complex of ditch and pit anomalies which is thought may represent a possible small Roman settlement, Caxton End, Eltisley
MCB23574	TL 2759 6159	Medieval/ Post-Medieval	An area of ridge and furrow, Eltisley, located 130m north of Papley Grove Farm. It is visible on 2009 aerial photographs and 2016 LiDAR.
01049A; MCB1326	TL 276 614	Medieval	Papley Grove deserted medieval settlement, deserted by 1100 although the manor house continued to be occupied well into the 13th century.
01049; MCB1325	TL 276 613	Medieval	Moated site at Papley Grove, Eltisley the site of manor house. The enclosed island measures 130ft north, 110ft east, 115ft south and 110ft west. The ditch is between 15-20ft wide and 2ft deep, with the south side extended into a pond.
01179; MCB1522	TL 2772 5931	Medieval	Moated site, NE of Jesus Farm, Eltisley. The moat is trapezoidal, measuring 85ft NE by 135ft E by 135ft S by 170ft NW and is surrounded by a 25ft-35ft wide ditch. Medieval pottery dated to the 11th and 12th centuries has also been recorded on the site.
02350; MCB2961	TL 279 594	Medieval	Ridge and furrow, Eltisley

Reference	Grid Reference	Period	Description
1019177; 12045; DCB275; 01180; MCB14170	TL 29147 59911	Medieval	Moated site at Pastures Farm, roughly square shaped island which measures up to 150m wide. This is contained by a seasonally water-filled moat which is up to 9m wide and 1.5m deep. Near the western corner the moat has been enlarged to form a sub-circular pond, with a diameter of approximately 22m. Part of the moat immediately to the north east of this pond has been filled in and now survives as a buried feature. The moated site, which is also known as Caxton Pastures, may be the site of the manor of Brockholt which is known to have been separated from the main manor of Caxton from 1154 until 1400. Scheduled monument.
1331369; DCB5644; MCB18049	TL 30521 60665	Post-Medieval	Mile Post near Junction with Elsworth Road. C19, Cast iron with three angled faces. Painted white with black painted raised inscription. 'Oxford 77, St Neots 8, Cambridge 10'. Grade II listed.
1162760; DCB6155; MCB18044	TL 28902 60528	Post-Medieval	Mile Post South of Pembroke Farm and West of Caxton Gibbet Inn. C19, Cast iron with three angled faces. Painted white, with black painted raised inscription. 'Oxford 76, St Neots 7, Cambridge 11.' Grade II listed.
1163004; DCB6487; 01180B	TL 29162 59995	Post-Medieval	Dovecote to North East of Caxton Pastures Farmhouse. Late C18, altered to small dwelling in C19. Red brick with plain tile hipped roof with gablets. Two storeys, square plan with outshut. Grade II listed.
1127202; DCB6669; MCB18047	TL 29781 60240	Post-Medieval	Milestone to South of Caxton Gibbet Inn. C19 or earlier. Stone block painted white with black painted incised lettering. 'London 51, Huntingdon 8, Royston 13'. Grade II listed.
1127144	TL 32406 60256	Post-Medieval	New Inn Farm, a late 18th-early 19th century farmhouse, consisting of two storeys with a cellar in a U-plan, built of red brick with a hipped slate roof. Grade II listed.
1331400	TL 32425 60291	Post-Medieval	Farm buildings forming an L-plan including two barns linked by rebuilt lower range to the north and a stable range to the south. Built of red brick with slate and pantile roofs. Grade II listed.
02470; MCB3100	TL 29673 60590	Medieval	Caxton Gibbet, which stood on Caxton Common, a piece of land around the crossing of the two main roads, and the gibbet timbers are in fairly good condition. It is suggested that the gibbet may have been a Royal Gallows and was in use until the last hanging in 1753. A possible row of burials, found by dowsing in 1986, but no confirmation.

Reference	Grid Reference	Period	Description
CB15017; MCB15017	TL 30656 60703	Medieval	Ridge and furrow, Cambourne Elsworth Turn revealed during excavation.
MCB19660; ECB3602	TL 3094 6002	Iron Age- Roman	Iron Age and Roman remains at Cambourne Secondary School. Archaeological features mostly associated with land division and possibly drainage were uncovered during evaluation. Early Roman pottery was recovered from boundary and enclosure ditches, mostly locally produced domestic course wares.
MCB20864	TL 3145 6094	Post-Medieval	Former site of Rectory Farm, Elsworth. A complex of farm buildings set around a farm yard, now completely demolished.
MCB24004	TL 3064 6002	Iron Age	Pit or water hole at Land West of Cambourne, Caxton with a large amorphous feature measuring approximately 6m wide and over 1.1m deep.
CB15131; MCB15131	TL 30374 60376	Modern	RAF Caxton Gibbet, a WWII military airfield used for training. Also an associated picket post and pillbox.
MCB24005	TL 3107 6016	Unknown	Cropmark features at Land West of Cambourne, Caxton representing small and large pits, some fragmentary ditches and a former plough headland.
MCB22308	Tl 2888 6085	Post-Medieval	Pembroke College Farm, Eltisley recorded on the 1st edition OS map and still in use. Consisted of three detached buildings in a U-shaped courtyard.
MCB19981	TL 2998 6048	Iron Age- Roman	Middle Iron Age to Early Roman remains at Land West of Cambourne, Caxton. Curvilinear ditch with mid Iron Age pottery, also a cremation with grave goods dated AD30-60. Grace goods include two butt beakers, two channel rim jars, one everted rim jar and a closed vessel.
MCB24003	TL 2989 6018	Iron Age- Roman	Ring ditch and enclosure at Land West of Cambourne, Caxton. Measuring 0.47m wide by 0.34m deep and no finds recorded. The sub-square enclosure revealed 12 sherds of late iron age- Roman pottery. A further ditch found mid iron age pottery, fired clay, and animal bone.
MCB24590	TL 2870 6122	Unknown	Possible double ditched enclosure, Eltisley. The circumference of the feature measures at roughly 80m.
MCB24592	TL 2917 5958	Unknown	Oval Enclosure, Caxton visible as cropmarks. Measures approximately 40m by 35m.
00278; MCB372	TL 308 616	Medieval	Ridge and furrow, Elsworth running east-west on either side of a north-south hollow way which measured 40ft wide by 2ft deep. Traces of curving ridge and furrow can be seen on air photographs over much of the parish, all belonging to the former open fields.

Reference	Grid Reference	Period	Description
03429; MCB4233	TL 3076 6135	Medieval	Medieval earthworks, Elsworth with medieval potsherd recovered from the site.
02494; MCB3137	TL 294 609	Neolithic	Neolithic find spot, north west of Caxton Gibbett, consisting of a brownish-grey patinated, polished celt (axe).
03502; MCB4305	TL 3029 6118	Post-Medieval	Common Farm, Elsworth, a c.1800 farmhouse, consisting of two storeys with attics, partly white brick and partly framed and plastered with tiled roofs. Still extant.
MCB4320	TL 303 608	Roman; Medieval	Linear cropmarks, Elsworth, which during evaluation revealed a series of ditches, one of which contained a sherd of 1st-3rd century Roman pottery. The ditches are thought to be part of an extensive field system, and they are overlain with medieval furrows.
01087; MCB14724	TL 30510 60230	Medieval	Swansley Wood Farm, a moated site of the manor house of Swansley which belonged to St Neots Priory from the 11th century to the 16th century. On a rectangular area measuring 85ftx70ft surrounded by a moat 15ft wide and 6ft deep, with a causeway across on the SW side. The area is now occupied by two modern cottages and their gardens.
MCB16333	TL 29880 60700	Medieval	Ridge and furrow, Elsworth identified through a series of NW-SE aligned ditch type anomalies.
MCB17322	TL 285 606	Post-Medieval	Hare Park, Eltisley, a possible rabbit warren shown on the tithe map 1841, no evidence of which survives.
MCB19627	TL 2895 6039	Unknown	Group of rectilinear enclosure cropmarks identified on the Cambridgeshire County Council, Huntingdon aerial photography data set, directly south of the A428 near Caxton.
MCB20881	TL 2969 6063	Post-Medieval	Former site of Gibbot Inn, off Ermine Street, Elsworth, illustrated on the 1st edition OS map. Now demolished.
CB15034; MCB15034	TL 22859 70634	Roman	Ermine Street Roman Road visible as a gravel track without agger. Fragmentary remains of a possible roman road and flanking ditch recorded during excavation.
MCB19542	TL 3085 5974	Iron Age/ Roman	Middle Iron Age to Roman settlement area at Land West of Cambourne, Caxton consisting of a cropmark complex.
MCB22309	TL 3112 6074	Iron Age/ Roman	Probable Iron Age to Roman settlement, field adjacent to the Bungalow, Elsworth visible as cropmarks, a series of ditches to the western end indicate a possible trackway and several rectilinear fields with the main cluster of activity is located at the eastern end.

Reference	Grid Reference	Period	Description
MCB22310	TL 3105 6114	Iron Age/ Roman	Possible Iron Age to Roman enclosures, Elsworth visible as cropmarks from aerial photography suggestive of settlement activity. Consists of a D shaped enclosure measuring 50mx 53m, a small U shaped feature, 9m x 7.5m and a second D shaped enclosure, 48m x 40m. Two entry points were noted to the D shaped enclosures.
MCB19541	TL 3028 5956	Iron Age/ Roman	Middle Iron Age to Roman activity at Land West of Cambourne, Caxton. Small curvilinear and rectilinear enclosures in the southern part of the site, revealing 1st and 2nd date with Roman pottery. A number of ditches with Iron Age pottery were also recorded, including a large enclosure ditch hand internal post holes with mid iron age pottery.
MCB15957	TL 30574 59712	Medieval	Features including headlands and traces of a now-levelled ridge and furrow, at Swansley Wood identified during aerial photography.
MCB21798	TL 2903 6177	Post-Medieval	Crows Nest Farm, Pawpworth Everard, an 18th century house recorded on the first edition OS map, 1885. It comprises a U-shaped courtyard complex and is still in use.
MCB24591	TL 2842 6146	Unknown	Cropmarks, Eltisley consisting of several linear cropmarks visible on aerial photography.
11873; MCB13973	TL 2960 6060	Bronze Age	Two early Bronze Age flints, Swansley Wood, found during field walking.
11874; MCB13974	TL 305 598	Bronze Age	Bronze Age flint scatter, Swansley Wood comprising mainly of waste flakes was found during field walking.
01180; MCB1524	TL 291 600	Post-Medieval	Pastures Farm, an 18th century, T-shaped house of two storeys with attics and cellar. Partly brick built and partly framed. Located within the moated site.