A47 Blofield to North Burlingham Dualling

Scheme Number: TR010040

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6.9 Report to Inform Habitats Regulations Assessment

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A47 Blofield to North Burlingham Development Consent Order 202[x]

REPORT TO INFORM HABITATS REGULATIONS ASSESSMENT

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1. Introduction

1.1. Proposed Scheme Background

1.1.1. The A47 from Blofield to North Burlingham dualling is referred to in this report as the 'Proposed Scheme'.

1.1.2. The Proposed Scheme is one of six projects to improve journeys on the 115 mile section of the A47 between Peterborough and Great Yarmouth. Together, the proposals will relieve congestion and improve the reliability of journey times for drivers.

1.1.3. The proposals include converting almost eight miles of single carriageway to dual carriageway and making improvements to junctions across the route. The six schemes are:

- A47 Wansford to Sutton dualling
- A47 Guyhirn junction improvement
- A47 North Tuddenham to Easton dualling
- A47 Blofield to North Burlingham dualling
- A47 / A11 Thickthorn junction improvement
- A47 Great Yarmouth junction improvements

1.1.4. The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east.

1.1.5. The extent of the Proposed Scheme is illustrated in Figure 1.1 Scheme overview **(TR010040/APP/6.3)**. A detailed description of the Proposed Scheme is provided in chapter 2 The Proposed Scheme **(TR010040/APP/6.1)**.

1.1.6. Currently, the existing A47 from Blofield to North Burlingham experiences delays and high levels of congestion during peak hours. The situation is predicted to get worse with proposed growth in residential development.

1.1.7. Key elements of the Proposed Scheme include:

- 2.6km of dual carriageway on the A47
- de-trunking of the existing A47 section between Blofield and North Burlingham
- improvements at Yarmouth Road Junction, including closure of the central reserve, closure of High Noon Lane direct access, merge lane, realignment of Waterlow and local access improvements at the Sparrow Hall properties

- introduction of a compact grade separated junction at B1140 Junction, including the B1140 Overbridge
- a new overbridge at Blofield traversing the proposed A47 dual carriageway, connecting Yarmouth Road with the existing A47
- provision of new drainage systems including an infiltration basin and retention of existing drainage systems where possible
- a retaining wall in the western extents
- introduction of lighting at the Yarmouth Road Junction and new lighting layout at the B1140 Junction
- closure of an existing layby and provision of a new layby
- walking and cycling routes connecting Blofield and North Burlingham via the Blofield Overbridge to the west and the B1140 Overbridge to the east
- provision of North Burlingham Access
- an agricultural access track
- fencing, safety barriers and signage
- environmental mitigation
- diversions of a medium pressure gas main and other utilities

1.1.8. An application for a Development Consent Order for the Proposed Scheme is to be submitted by Highways England under the Planning Act 2008. This report has been prepared in accordance with the Conservation of Habitats and Species Regulations 2017 (as amended) to present information to inform the Habitats Regulations Assessment that will be undertaken by the Secretary of State when determining the DCO application.

1.2. The Habitats Directive

1.2.1. The Directive 92/43/EEC on the Conservation of Natural Habitats and Wild Flora and Fauna ('Habitats Directive') is transposed into English law by The Conservation of Habitats and Species Regulations 2017 (as amended) ('The Habitats Regulations'). The Habitats Regulations set out the process that must be followed where an application for development consent may have effect on a European site of nature conservation importance. The Habitats Regulations apply to European sites protected under the Habitats Directive and Directive 2009/147/EC on the conservation of wild birds (the 'Birds Directive').

1.2.2. Under Regulation 63 of the Habitats Regulations 'any plan or scheme not directly connected with or necessary to the management of the site but likely to have a significant effect thereon, either individually or in combination with other plans or schemes, shall be subject to appropriate assessment of its implications for the site in view of the site's conservation objectives. In the light of the conclusions of the assessment of the implications for the site and subject to the

provisions of paragraph 4, the competent national authorities shall agree to the plan or scheme only after having ascertained that it will not adversely affect the integrity of the site concerned and, if appropriate, after having obtained the opinion of the general public'.

1.2.3. It is UK Government policy that Ramsar sites are afforded the same level of protection as Natura 2000 site and so are referred to alongside SAC and SPA sites within this report as 'international sites'.

1.2.4. Ramsar sites are wetlands identified as being of International importance, under the Ramsar Convention (1975). The criteria for selection are that the site contains representative, rare or unique wetland types and/or supports species and ecological communities of international importance. Any activity that may have significant effects on a Ramsar site requires an Appropriate Assessment. Therefore, they are also considered in this screening assessment. Broadland Ramsar lies within the study area of the proposed scheme.

2. Habitats Regulations Assessment Methodology

2.1.1. The methodology for undertaking this Habitats Regulations Assessment follows guidance from DMRB LA115 (Habitats Regulations Assessment) for the proposed scheme of the A47 Blofield to North Burlingham Dualling.

2.1.2. Stage 1 Screening – determines whether a plan or scheme, either alone or in combination with other plans or schemes, is likely to have a significant effect upon a site within the National Site Network (NSN). If the screening process identifies effects to be significant, potentially significant or uncertain, or if the screening process becomes overly complicated, then the process must proceed to Stage 2. The process should apply the precautionary principle to ascertain if significant effects are likely. For Stage 1, PINS Advice Note 5 (Ref: 5.1.15) is used in conjunction with PINS Advice Note 10.

2.1.3. Stage 2 Appropriate Assessment – considers the impact on the integrity of sites within the NSN of the scheme or plan either alone or in combination with other plans or schemes with respect to the site's structure and function and its conservation objectives. Additionally, where there are adverse impacts, it assesses the potential mitigation for those impacts.

2.1.4. Stage 3 Assessment where no Alternative Solutions exist and where adverse impacts remain – assesses compensatory measures where, in the light of an assessment of imperative reasons of overriding public interest (IROPI), it is deemed that the plan or scheme should proceed.

2.1.5. Each stage determines whether the next stage in the process is required, if for example, it is concluded that at the end of Stage 1 there will be no significant impacts on sites within the NSN, there is no requirement to proceed to Stage 2.

2.1.6. On the 12 April 2018, a precedent was set by a decision made by the Court of Justice of the European Union (CJEU) in the case of People Over Wind and Sweetman v Coillte Teoranta (C-323/17)2. The CJEU issued a judgement which ruled that Article 6(3) of the Habitats Directive must be interpreted as meaning that mitigation measures (referred to in the judgment as measures which are intended to avoid or reduce effects) should be assessed within the framework of AA. As such it is now not permissible to take account of measures intended to avoid or reduce the harmful effects of the plan or project on a European Site at the screening stage. As a consequence, the updated HRA Screening Report and this AIES screening report does not take into account mitigation measures, including aspects such as timing restrictions. A summary of the subsequent Sweetman v. An Bord Pleanála, Case C-258/11 CJEU judgment3 confirms that:

- "1. once you are in appropriate assessment territory, you can only take "measures" (i.e. mitigation) into consideration if you can guarantee beyond all reasonable doubt that the project will not adversely affect the integrity of the protected site (see para 52 of the judgement). The developer could not meet that test in this case because they were relying on mitigation being implemented in the future, the positive effects of which were inherently difficult to forecast with any certainty (this seems to preclude most forms of mitigation from being considered under art. 6(3)); and 2. if you fail to meet the test in 1 above, then any proposed mitigation should be treated as "compensatory measures" under art. 6(4) of the Directive and only once it is shown that:
- a. the project must be carried out for imperative reasons of overriding public interest; and
- b. there are no alternative solutions to the project being put forward.

2.2. Guidance

2.2.1. The screening assessment process which has been used for this assessment is set out in DMRB LA115, with the assessment presented in tabular format in Appendix A.

Determination of connection with site management

2.2.2. The HRA screening assessment report will assess whether the works are connected with or necessary to the management of an NSN site.

2.2.3. Such works should include those that are:

1) for conservation purposes;

2) management which is 'directly connected with or necessary' to the site; and

3) solely conceived for the conservation management of a site and not direct or indirect consequences of other activities.

2.2.4. The Proposed Scheme does not fit any of the above criteria.

Examination of the nature of proposed works

2.2.5. The HRA screening assessment shall include a full description of the proposed works including the programme of works.

2.2.6. The description of the project shall include design measures that are considered integral. Where the project adopts construction good practice or measures required to avoid nuisance or to ensure wider legislative compliance these measures should be reported as part of the project description. The description

of the project shall not include mitigation measures that are introduced to avoid harm to the NSN site or to avoid likely significant effects (LSE).

Identification of potential effects on NSN sites

2.2.7. The HRA screening assessment shall include all NSN sites that meet any of the following screening criteria:

1) is within 2km of an NSN site or functionally linked land[1];

2) is within 30km of a SACs, where bats are noted as one of the qualifying interests;

3) crosses or lies adjacent to, upstream of, or downstream of, a watercourse which is designated in part or wholly as a NSN site;

4) has a potential hydrological or hydrogeological linkage to a NSN site containing a groundwater dependent terrestrial ecosystem (GWDTE) which triggers the assessment of NSN sites in accordance with LA 113[2];

5) has an affected road network (ARN) which triggers the criteria for the assessment of NSN sites HA 207 07[3].

2.2.8. For the purposes of HRA, where the established risk to GWDTE is assessed to be above negligible, further assessment in accordance with LA 113 may be required.

2.2.9. Additional NSN sites should be subject to screening where the existence of ecological connectivity between the project and NSN sites is identified beyond the screening criteria above.

Reporting the outcomes of screening

2.2.10. The screening stage of HRA shall be reported within an HRA screening report which will include completed screening matrices for all NSN sites which meet the screening criteria.

2.2.11. Screening matrices shall set out the conclusion that either:

- there is an absence of LSE; or

[1] Effect pathways on qualifying interests that are mobile species can extend to land occupied outside of the designated site boundary this is defined as functionally linked land

[2] Highways England. LA 113, 'Road drainage and the water environment'

[3] Highways England. HA 207, 'Air Quality', 07

- there are LSE.

2.2.12. Where the screening assessment concludes that significant effects are likely (alone or in combination) or that sufficient uncertainty remains then further HRA shall be undertaken and reported in the form of a Statement to Inform Appropriate Assessment (SIAA).

2.2.13. This assessment has been completed using the following guidance:

- DMRB LA115 'Habitats Regulations assessment' Revision 1 (formerly DMRB Volume 11, section 4, part 1 HD44/09 Assessment of Implications (of Highways and/or Roads Schemes) on European Sites (including Appropriate Assessment))
- The UK Government's guidance on the use of the Habitats Regulations Assessment
- The Habitats Regulations Assessment Handbook (Ref 5.1.5)
- The European Commission Managing Natura 2000 sites (the Provisions of Article 6 of the Habitats Directive 92/43/EEC (Ref 5.1.3)).

2.2.14. In addition, Appendix C incorporates guidance set out in Planning Inspectorate (PINS) Advice Note Ten November 2017 Version 8 (Ref: 5.1.13) and includes the Stage 1 screening matrices which sets out the findings of the DMRB process into the PINS format.

2.2.15. The Planning Inspectorate has issued guidance to applicants for Development Consent Orders in Planning Inspectorate (PINS) Advice Note Ten: Habitats Regulations Assessment (Ref 5.1.13) relevant to nationally significant infrastructure projects. Advice Note Ten states that when preparing applications for Nationally Significant Infrastructure Projects (NSIPs) under the Planning Act 2008 (as amended), the potential effects upon protected habitats must be considered.

2.2.16. If an NSIP, when taken alone or with existing and known future projects, is likely to affect an internationally designated site within the National Site Network (NSN), which includes site such as Special Areas of Conservation, Special Protected Areas and Ramsar sites, the applicant must provide a report with the application showing the sites that may be affected together with sufficient information to enable the competent authority to make an appropriate assessment, if required.

2.2.17. As required in PINS Advice note ten, this report comprises a Stage 1 screening assessment to ascertain whether the Proposed Scheme is likely to have a significant effect on qualifying features of any NSN site either alone or in-combination with other plans and projects. If Stage 1 identifies significant effects that cannot be excluded on the basis of objective information, then a plan or

scheme should be considered to have a likely significant effect and taken through to Stage 2 Appropriate Assessment (AA).

2.2.18. As explained in the PINS Advice Note 10 Habitats Regulations Assessment, a set of matrices has been developed to assist the Secretary of State, as the Competent Authority in fulfilling the requirements of the Habitats Directive and the Habitats Regulations in the context of the 2008 Act process. The matrices are intended to clearly present the outcomes at each stage of the process in a standardised tabular form for the benefit of all those involved in the application and examination. The matrices in Appendix C of this report contain the combined outcomes of the process for both the Proposed Scheme and other projects within the Zone of Influence anticipated to result in significant effects that would require additional mitigation in response to cumulative effects.

2.2.19. The matrices comprise:

- Screening Matrices (HRA Stage 1: Screening) - which summarise the screening exercise for Likely Significant Effects of the Scheme on the European Sites and qualifying features considered.

2.3. Assumptions

2.3.1. Standard construction best practice has been developed which is industry standard for environmental protection. During road construction there will be adherence to best practice measures to prevent water pollution and to control sediment generation and runoff. These measures will ensure temporary impacts on water quality from pollution are minimised. In addition, standard construction best practice measures have been adopted to ensure any particularly noisy works can be undertaken to avoid the breeding season for all species of birds. This is because all nesting birds are protected from disturbance under the Wildlife and Countryside act 1981 (as amended).

2.3.2. Construction is likely to commence in the summer months of 2022 and occur for the duration of 22 months.

3. Stage 1 screening results

3.1. Background

3.1.1. In May 1992 European Union member states adopted legislation designed to protect the most seriously threatened habitats and species across Europe. This legislation is called the Habitats Directive and complements the Birds Directive adopted in 1979. These directives implemented the creation of a network of protected sites called Natura 2000, hereafter referred to as the NSN. The Birds Directive requires the establishment of Special Protection Areas (SPAs) for rare and vulnerable bird species listed under Annex I of the Directive. The Habitats Directive similarly requires Special Areas of Conservation (SACs) to be designated for habitats (listed in Annex I of the Directive) and species (listed in Annex II). Sites that are approved by the Government and are in the process of being classified – known as candidate Special Areas of Conservation (cSAC) and potential Special Protection Areas (pSPA) are afforded the same level of protection. Together, SPAs, pSPAs, SACs and cSACs make up the NSN and, under UK law, are protected by the Conservation of Habitats and Species Regulations (2017).

3.1.2. In the UK it is government policy that wetlands of international importance - Ramsar sites - are also considered in the Habitats Regulations assessment process.

3.2. Stage 1 screening: alone

Study area

3.2.1. Most of the Proposed Scheme is either online or south of the existing A47, and is shown in more detail on Figure 1.

3.2.2. A study area of 2km from the boundary of the Proposed Scheme was used to identify international sites likely to be affected, and a study area of 30km from the Proposed Scheme was used to identify international sites designated for bats. These search areas for designated sites are defined as 2km from the Proposed Scheme in the DMRB LA115 (Habitats Regulations Assessment(formerly HG 44/09)) as stated: '*The screening stage of HRA shall be completed for all European sites where a route corridor or project meets any of the following screening criteria:*

- *Is within 2km of a European site or functionally linked land.*
- *Is within 30km of a SACs, where bats are noted as one of the qualifying interests.*
- *Crosses or lies adjacent to, upstream of, or downstream of, a watercourse which is designated in part or wholly as a European site.*

- *Has a potential hydrological or hydrogeological linkage to a European site containing a groundwater.*
- *Dependent terrestrial ecosystem (GWDTE) which triggers the assessment of European sites in accordance with LA 113.*
- *Has an affected road network (ARN) which triggers the criteria for assessment of European sites LA 105.'*

3.2.3. A desk top study was undertaken using MAGIC (Ref 5.1.6) maps to identify any sites within the NSN that potentially may be affected, according to the guidance in section 1.5.4. From this it was determined that there is potential for effects on the following sites:

- The Broads SAC
- Broadland SPA
- Broadland Ramsar site
- Paston Great Barn SAC
- Breydon Water SPA
- Breydon Water Ramsar site.

3.2.4. The locations of these sites relative to the Proposed Scheme is shown in Appendix D. While none of these sites lie within the boundary of the Proposed Scheme, there is potential for effect pathways to exist between the Proposed Scheme and the Broads SAC through changes in drainage affecting watercourses that flow into the River Yare.

3.2.5. The Broadland SPA and Ramsar site is a diffuse site and covers a wide area to the south and north of the A47, suggesting that there may be indirect effects on the qualifying bird species as they are likely to move through or utilise the lands around the A47.

3.2.6. Paston Great Barn, designated for a substantial maternity roost of barbastelle (*Barbastella barbastellus*) bats in a building, is distant from the Proposed Scheme but falls within the 30km search radius for bat sites, approximately 24.6km away from the Proposed Scheme. Results from the surveys in 2020 included records of barbastelle bats. Therefore, Paston Great Barn SAC must be considered in the HRA screening process to ascertain whether the Propsoed Scheme will have Likely Significant Effects on barbastelle bats from this international site.

3.2.7. Further information on all the sites included in this HRA screening is given in the following sections. Baseline information on the sites was derived from Joint Nature Conservation Committee (Ref 5.1.7) and Natural England websites (Ref 5.1.8) as well as from Birdlife International (Ref 5.1.9) and British Trust for Ornithology (Ref 5.1.10). This updated report also utilises the results from the

ecological surveys undertaken during 2016, 2017, 2018, 2019 and 2020. This includes wintering bird surveys and aquatic invertebrate surveys.

The Broads SAC

Site description

3.2.8. The Broads SAC is a diffuse site, covering an area of 5885ha and made up of a number of component Sites of Special Scientific Interest (SSSI). The SAC contains several examples of naturally nutrient-rich lakes, and although they are artificial having been created by past peat digging, the lakes and ditches support relict vegetation of the original fenland flora and collectively this site contains one of the richest assemblages of rare and local aquatic species in the UK. The ditches are a stronghold for the lesser whirlpool ramshorn snail and Desmoulin's whorl snail.

3.2.9. The site is also the richest area for stoneworts in Britain, with examples of *Chara* vegetation found within the fen and marsh ditch systems. The complex of sites contains large blocks of alder woodland and within the site occur complete successional sequences from open water to reedswamp to alder woodland on fen peat. The site also contains calcareous fens and transition mires.

Baseline conditions

3.2.10. The Broads SAC comprises a large number of SSSIs, some of which are in favourable condition for the qualifying features, with some features classified as unfavourable but recovering. Of the component SSSIs that make up the SAC, the closest ones to the Proposed Scheme are Cantley Marshes SSSI (approximately 4.5km south west of the Proposed Scheme), Yare Broads and Marshes SSSI (approximately 2.5km south west of the Proposed Scheme), and Decoy Carr, Acle SSSI (approximately 2.07km south west of the Proposed Scheme). According to the latest condition monitoring for these sites, Cantley Marshes is 100% favourable, Yare Broads and Marshes is 39.22% favourable, 11.3% unfavourable recovering, 47.27% unfavourable no change and 2.2% unfavourable declining, while Decoy Carr is 70.21% favourable and 29.79% unfavourable recovering (Ref 5.1.11).

3.2.11. Desmoulin's whorl snail is restricted to calcareous wetlands, usually bordering lakes or rivers, or in fens. It normally lives on reed-grasses and sedges, such as reed sweet grass *Glyceria maxima* and tussocks of greater pond sedge *Carex riparia* and lesser pond sedge *C.acutiformis*, where it feeds on the microflora and in autumn it may ascend taller reeds and scrub. It is highly dependent on the maintenance of existing local hydrological conditions.

3.2.12. The lesser whirlpool ramshorn snail is a small aquatic snail which occurs in unpolluted, calcaerous waters in marsh drains with dense aquatic flora and

favours ditches with a diverse flora but little emergent vegetation. It often floats on the surface amongst duckweed. Ditches that are either completely cleared of vegetation or choked with weed and silt are unsuitable. This species is known to be present in the vicinity of the A47 east of Acle, along Acle Straight.

3.2.13. Fen orchid is a small green flowered orchid of fens and dune systems. In the fens the cessation of peat cutting is probably the most important contributory factor leading to its decline as here, the orchid is confined to tall herb fens that have experienced disturbance through peat cutting.

3.2.14. The full Stage 1 screening assessment for the Broads SAC is found in Appendix A in Table A.1

Broadland SPA

Site description

3.2.15. Broadland is a low-lying wetland complex straddling the boundaries between east Norfolk and northern Suffolk in eastern England. The Broads are a series of flooded medieval peat cuttings and they lie within the floodplains of five principal river systems, known as Broadland. The area includes the river valley systems of the Bure, Yare and Waveney and their principal tributaries. The open landscape comprises a complex and interlinked mosaic for wetland habitats including open water, reedbeds, carr woodland, grazing marsh and fen meadow. The differing types of management of the vegetation for reed, sedge and marsh hay, coupled with variations in hydrology and substrate support a diverse range of plant communities. The area is of international importance for a variety of wintering and breeding raptors and waterbirds associated with lowland marshes. The estuary at the mouth of Broadland is Breydon Water SPA, and the two sites adjoin each other at Halvergate Marshes. Breeding and wintering raptors, and wintering waterbirds spend time on feeding areas outside the SPA boundary. The site is diffuse and comprises an area of 5508ha.

Baseline conditions

3.2.16. Broadland SPA is made up of a number of SSSIs, many of which overlap with the Broads SAC.

3.2.17. The fens habitat provides foraging and nesting sites for bittern and marsh harrier. They are also an important habitat for the overwintering bird species for foraging.

3.2.18. Populations of overwintering ruff generally occupy muddy margins of brackish, saline and alkaline lakes, ponds, pools, rivers, marshes and floodplains, as well as freshly mown or grazed short sward grasslands. Prey species includes

insects, small crustaceans, spiders, worms and seeds of cereals, grasses and aquatic plants.

3.2.19. Marsh harriers prefer habitats of dense marsh vegetation, in fresh or brackish water. It is a generalist predator feeding on small birds and mammals such as voles, rabbits and rats. They require extensive wetlands in its breeding range.

3.2.20. Hen harriers occur in a wide variety of habitats preferring fields, meadows, river valleys, reedbeds and open areas in the vicinity of water. They feed on small birds and mammals such as voles and rabbits, like the marsh harrier.

3.2.21. During the non-breeding season, wigeon prefer coastal salt marshes, freshwater, brackish and saline lagoons, flooded grasslands and estuaries. Its diet is vegetarian and consumes the leaves, seeds, stems and root bulbs of pond weeds, fine grasses from agricultural land, horsetails and algae.

3.2.22. Shoveler inhabits permanent shallow, freshwater wetlands, preferring sites surrounded by dense stands of reeds or other emergent vegetation. Its diet consists of small aquatic invertebrates, beetles, bugs, flies and the seeds and vegetative parts of aquatic plants. It is threatened by habitat loss and predation by mink.

3.2.23. Gadwall inhabits highly productive and eutrophic freshwater marsh or lake habitats in open lowland grassland. The diet is primarily herbivorous and consists of the seeds, leaves, roots and stems of aquatic plants as well as grasses and stoneworts.

3.2.24. During the breeding season, great bittern prefers quiet lowland marshes around lakes and rivers with extensive dense young reedbeds of *Phragmites* spp., that are flooded but fairly shallow with little fluctuation in water level. It has a varied diet and will feed on fish, amphibians as well as terrestrial invertebrates, birds and small mammals.

3.2.25. Overwintering populations of Bewick's swan (mid October to March) will gather in large flocks, feeding on lakes, reservoirs, estuaries and freshwater marshes with adjacent grasslands or arable fields. The species is mainly herbivorous feeding on the seeds, leaves, rhizomes and stems of aquatic plants. During the winter they will supplement their diet with agricultural grain and vegetables. The species is vulnerable to disturbance during foraging.

3.2.26. During winter whooper swan will gather in flocks of up to 300-400 individuals. It roosts on areas of open water adjacent to its feeding areas. Like Bewick's swan, they will use agricultural areas to supplement their diet. They are predominantly herbivorous, eating aquatic plants, grasses, sedges and horsetails. They are vulnerable to habitat loss and degradation as well as vegetation cutting for winter livestock feed and the development of roads.

3.2.27. The full Stage 1 screening assessment for the Broadland SPA is found in Appendix A in Table A.2.

Broadland Ramsar

Site description

3.2.28. The Ramsar designation is coincident with the boundary of the SPA and also overlaps in part with the Broads SAC.

Baseline conditions

3.2.29. The populations of pink-footed goose overwinter on areas of saltmarsh, estuaries and flat agricultural land. Its diet is herbivorous feeding on grass, grain and vegetables on agricultural land. In the UK studies have found that the species prefers to forage on grasslands less than 10km from their roost sites (roosting on water), with an optimum distance of 2-5km (Ref 5.1.12). The species is vulnerable to disturbance during foraging.

3.2.30. During winter greylag geese inhabit lowland farmland in open country, swamps, lakes, reservoirs and estuaries. Its diet consists of grass, herbaceous marsh vegetation, aquatic plants and agricultural grain and potatoes. It is vulnerable to disturbance during foraging.

3.2.31. The full Stage 1 screening assessment for the Broadland Ramsar is found in Appendix A in Table A.3.

Paston Great Barn SAC

Site description

3.2.32. Paston Great Barn SAC is approximately 0.95ha in size and is the only known example of a maternity roost of barbastelle bats *Barbastella barbastellus* in a building. The site is also designated as a Site of Special Scientific Interest (SSSI).

3.2.33. The Barn is a 16th century thatched barn with associated outbuildings. A maternity colony of barbastelles utilises a range of cracks and crevices in the roof timbers for roosting.

Baseline conditions

3.2.34. This area is considered to be one of the best in the United Kingdom for the barbastelle bat. In 2015, the minimum and maximum numbers of individual barbastelle bats recorded to roost in this building were 11 and 50 (respectively).

3.2.35. The building of Paston Great Barn is located approximately 24.5km north of the Proposed Scheme.

3.2.36. The full Stage 1 screening assessment for Paston Great Barn SAC is found in Appendix A in Table A.4.

Breydon Water SPA

Site Description

3.2.37. Breydon Water is approximately 492.66ha and is located at the extreme east of England on the coast of Norfolk. The site is an inland tidal estuary at the mouth of the River Yare and its confluence with the Rivers Bure and Waveney. It has extensive areas of mudflats that are exposed at low tide and these form the only tidal flats on the east coast of Norfolk. There are also extensive areas of floodplain grassland adjacent to the intertidal areas. Breydon Water is internationally important for wintering waterbirds, some of which feed in the Broadland SPA that adjoins this site at Halvergate Marshes.

Baseline conditions

3.2.38. The terns breed on the saltmarsh and breeding platforms in the north eastern part of the estuary. They feed in the shallow coastal water and river channel as well as utilising the ditches in the surrounding agricultural land.

3.2.39. Bewick's swan will forage on the mudflats and occasionally use the estuary as a roost site.

3.2.40. Golden plover roost on the mudflats and may feed here during harsh weather. Over winter they area generally found on lowland fields and pastures. Their diet consists of worms, berries, insects and seeds.

3.2.41. During winter avocet spend a high proportion of time feeding on the mudflats and roosting on the saltmarshes of Breydon Water (Ref 5.1.12). Their diet consists of small crustaceans, marine worms and molluscs.

3.2.42. Ruff is predominantly found around flooded marshes and spends less time on the estuary. In winter they are found on marshes, shallow pools, estuaries and ploughed and stubble fields. Their diet consists of insects, small crustaceans, spiders, cereals, sedges, grasses and aquatic plants.

3.2.43. While lapwing roost on the saltmarshes and feed on the mudflats of the estuary during harsh weather, they spend much of their time feeding and roosting on the adjacent grazing marsh. In winter they form large flocks in farmland and grazing marshes. Their diet consists of worms and insects.

3.2.44. The bird species will feed and roost on the grazing marshes, ditches and flooded borrow pits of Breydon Water SSSI and Halvergate Marshes SSSI. The aquatic vegetation of the ditches, borrow pits and flooded grassland provide an

important food source for populations of wintering Bewick's swan and for the breeding populations of terns.

3.2.45. Information on wintering bird numbers at the site were gained from BTO wetland bird surveys WeBS for 2014/15. Peak counts for the qualifying species are given below:

- Bewick's swan – 120 individuals
- Golden plover – 16,230 individuals
- Pied avocet – 1,327 individuals
- Ruff – 17 individuals
- Lapwing – 12,100 individuals.

3.2.46. The full Stage 1 screening assessment for Breydon Water SPA is found in Appendix A in Table A.5.

Breydon Water Ramsar

Site Description

3.2.47. The Ramsar site has a similar boundary to the Breydon Water SPA site.

Baseline conditions

3.2.48. Over winter black-tailed godwit are mainly found on estuaries, coastal mudflats and lagoons and inland marshes. Their diet consists of insects, annelids, polychaetes, molluscs, ragworms, crustaceans, spiders, and frogspawn. Over winter they will supplement their diet with berries, seeds and grains.

3.2.49. The full Stage 1 screening assessment for Breydon Water Ramsar is found in Appendix A in Table A.6.

3.3. Ecological baseline of proposed scheme

General

3.3.1. The Proposed Scheme is located to the east of Norwich. The land classification is generally agricultural with large arable fields.

3.3.2. In 2016 and 2017, preliminary ecology surveys were undertaken which informed the requirement for subsequent protected species surveys.

3.3.3. In particular, wintering bird surveys were undertaken from January to March 2017, and in December 2017 and February 2018, see ES Chapter 8 (Biodiversity (**TR010040/APP/6.1**)).

3.3.4. In addition, an aquatic invertebrate specialist with expertise in lesser whirlpool ramshorn snails and Desmoulins whorl snails completed surveys for these species in June and July 2017.

3.3.5. Update wintering bird surveys were undertaken over the study area in January, February, November and December 2019, and the results of these most recent surveys have been used to inform this HRA report. Breeding bird surveys were also undertaken from April to June 2018, and from April to June 2020, the results of which have been used to inform this HRA report.

3.3.6. In addition, crossing point surveys were undertaken in July and August 2020 at several locations over the Proposed Scheme to assess whether and how barbastelle bats are utilising the study area and its environs and whether this species is crossing the existing road.

3.3.7. Full results of these surveys undertaken are detailed in ES Chapter 8 (Biodiversity (**TR010040/APP/6.1**)).

Principal habitats

3.3.8. The Phase 1 habitat survey data detailed in ES Chapter 8 (Biodiversity (**TR010040/APP/6.1**)) indicates that the main habitat in the area is arable farmland. There are some areas of woodland to the north of the A47 at North Burlingham, with some recently planted strips of woodland to the south. Field boundaries are generally hedgerows, although these are defunct in places and species poor.

3.3.9. None of the Annex I habitats that the Broads is designated for were found along the Proposed Scheme alignment. No evidence of fen orchid was found and, whilst this does not confirm absence, there is a lack of suitable habitat for this species in the study area.

Protected species

3.3.10. Otters are a qualifying feature for the Broads SAC and surveys were completed in February and April 2017. No signs of otter were recorded and there is a lack of suitable habitat and large watercourses that could be used by commuting or foraging otters within the study area and along the Proposed Scheme alignment. Therefore, due to the lack otter signs, and the lack of foraging and 'resting' areas across the site, otters are not considered a feature as part of the Proposed Scheme and will be screened out of further assessment accordingly.

3.3.11. The lesser whirlpool ramshorn snail and Desmoulin's whorl snail are two species that are qualifying feature for the Broads SAC. There is a lack of large wetland in the study area that could support either one of these species, and therefore both

species are not considered as features part of the Proposed Scheme and are therefore screened out of further assessment.

3.3.12. Wintering bird surveys were undertaken during the following months:

- January, February, March and December 2017
- February 2018
- January, February, November and December 2019

3.3.13. The results of these surveys were reviewed to see if any of the qualifying species for Broadland SPA utilise the habitats around the existing A47 between Blofield and Acle. Of the qualifying features for Broadland SPA, none were specifically recorded during the wintering bird surveys. However, marsh harrier was noted incidentally in the general vicinity during other surveys, such as during the Phase 1 habitat surveys in 2016 as shown in ES Chapter 8 (Biodiversity (**TR010040/APP/6.1**)).

3.3.14. Most of the remaining bird species are generally associated with aquatic habitats, which are not present in close proximity to the study area.

3.3.15. Qualifying features of Breydon Water SPA and Ramsar that were recorded on site during the wintering bird surveys include two flocks of golden plover containing nine and seven birds were observed feeding in fields at TG384100 and TG348104. A flock of 31 lapwings were observed flying west towards Blofield (TG3431110381) during December 2017 and a smaller flock of seven were observed flying north over the A47 near TG346096 in February 2018.

3.3.16. Bat activity crossing point surveys were undertaken in July and August 2020. The results of these surveys were analysied to ascertain if any barabstelle bats, which are the qualifying feature of Paston Great Barn SAC, utilise the habitats surrounding the existing A47 between Blofield and Acle. The surveys undertaken in July and August 2020 recorded barbastelle bats at Crossing Point (CP) locations 1 and 2 as described in ES Chapter 8 (Biodiversity (**TR010040/APP/6.1**)), (see also Appenix A, Figure 2). At CP1, one barbastelle bat was detected during the dusk survey on 14 July 2020 however due to the low light levels, it was not possible to ascertain whether this bat crossed the A47. In addition, one barbastelle bat was detected crossing the A47 on two occasions, during dawn surveys: one on 14 August and the other on 27 August 2020.

3.3.17. Barbastelle bats have been found commuting across the existing A47 to foraging grounds over agricultural areas in the vicinity of the A47. However, given the extent of available suitable habitat between the SAC and the site, it is considered likely that this species does not frequent the area and the above

effect pathways will not have a significant effect on the population within the SAC. Justification is given in paragraph 4.5.2.

3.3.18. Surveys undertaken as part of the Norwich Western Link Road (NWLR) and the Norwich Northern Distributor Road (NNDR) found bat roosts for barbastelle bats to be present in the Hall Hill and Broadway woodlands, and a colony in the Morton area to the west of Norwich. The Yare Valley is a foraging ground which lies approximately 2.5km to the south west of the site. Therefore, it is considered to be more likely that these barbastelle bats would be originating from these roosts rather than from Paston Great Barn SAC.

3.3.19. A map showing the presence of qualifying features that were recorded during the surveys over the study area is shown in Appendix E.

3.4. Limitations

3.4.1. There is potential for species to be missed or go unnoticed due to the nature of breeding bird and wintering bird surveys and possibilities of birds not vocalising or being in dense vegetation. There is also potential to miss crepuscular (i.e. dawn or dusk) species. During various other ecological surveys being undertaken in the area, casual sightings of crepuscular species were observed, and they have been considered in the final assessment.

3.4.2. During the breeding bird survey in April 2018, the weather conditions were sub-optimal, with low visibility caused by mist. Birds were mainly identified and recorded through audio location, with fewer birds recorded visually compared to the surveys carried out in May and June 2018.

3.4.3. Some of the barbastelle bat (*Barbastella barbastellus*) surveys were postponed and some interrupted due to poor weather conditions, and conditions that had the potential to damage the survey equipment. Because of this there may have been the potential to miss some barbastelle bat species that were crossing the road during this weather. While there has been some inconsistency in survey timings, this is not considered to be a significant limitation due to the surveys being undertaken within the recognised survey windows for detecting barbastelle activity.

3.4.4. The limitations identified in paragraphs 3.4.1 to 3.4.3 are not considered to be significant enough to have any material impact on the integrity of the assessment of this HRA.

3.5. Stage 1 screening: in combination

3.5.1. For the purposes of this assessment, developments have been divided into two categories as follows:

- a single project (the Proposed Scheme), which considers numerous different effects impacting a single receptor
- different projects, in combination with the Proposed Scheme.

3.5.2. The assessment of cumulative effects is fully detailed in ES Chapter 15 (Cumulative Effects (**TR010040/APP/6.1**)) and is summarised below.

Single project effects

3.5.3. All potential single project effects are presented in Tables A.1-A.3 in Appendix B. Further details of some potential effects are shown in Appendix B.

3.5.4. No single receptors or resources were predicted to experience significant cumulative effects as a result of the Proposed Scheme. However, there are two geographical areas (North Burlingham and Lingwood Road) with multiple receptors in proximity to one another identified as having effects as a result of the Proposed Scheme.

3.5.5. No single receptors or resources were predicted to experience significant cumulative effects as a result of the Proposed Scheme. However, there are two geographical areas (North Burlingham and Lingwood Road) with multiple receptors in proximity to one another where impacts have been identified as a result of the Proposed Scheme.

3.5.6. Within the area of North Burlingham, multiple effects have been identified which would likely result in a wider positive cumulative effect on the community. This includes visual improvements at Main Road, a new footway / cycleway, and moving the mainline away from the residential properties and thereby reducing traffic noise from the A47.

3.5.7. For Lingwood Road, the assessments within the chapters 5 to 15 of the ES (**TR010040/APP/6.1**) have identified multiple potentially significant adverse effects in this area. Following the design, mitigation and enhancement measures (including noise barriers and proposed planting) these effects are predicted to be reduced to non-significant and there would be no significant cumulative effects as a result of the Proposed Scheme as a single project.

Different project effects

3.5.8. The Zone of Influence (ZOI) and shortlist of developments is shown ES Chapter 15 (Cumulative (**TR010040/APP/6.1**)) and in Figure 15.1 (**TR010040/APP/6.3**). Assessment follows the methodology in Chapter 15. Following a meeting with Norfolk County Council and Broadland District Council in 2020 additional projects that were identified as having the potential to contribute to cumulative effects were added to the scope.

3.5.9. There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects.

3.6. Consultation with Natural England (NE)

3.6.1. The conclusions of the screening exercise undertaken in February 2020 were discussed with the NE Lead Advisor for the Norfolk and Suffolk Team. It was agreed that as the Assessment of Implications on European Sites report produced in 2017 was preliminary and based on information available to date that the screening exercise should be updated and reviewed as the scheme progresses. This report, together with the HRA undertaken in 2017, demonstrates compliance with this advice.

3.6.2. Consultation was undertaken in 2020 with a Principal Ecologist from Norfolk County Council to discuss the home ranges of barbastelle bats within the Norwich area of Norfolk. Barbastelle bats are likely to forage in the Yare Valley which lies approximately 2.5km south west of the site. It is considered that barbastelle bats may commute across the existing A47 between their roosts and the Yare Valley which hosts suitable foraging habitat for this species. This consultation informed the need to undertake bat activity surveys at certain likely crossing points across the Proposed Scheme, the results of which are detailed in ES Chapter 8 (Biodiversity (**TR010040/APP/6.1**)).

3.6.3. In addition, consultation was undertaken with Natural England on 28 September 2016 regarding this assessment and confirmed they concur with the conclusions of this assessment.

4. Screening Summary & Conclusion

4.1.1. The following international sites were considered in this assessment:

- The Broads SAC
- Broadland SPA
- Broadland Ramsar site
- Paston Great Barn SAC
- Breydon Water SPA
- Breydon Water Ramsar site.

4.1.2. As discussed in the screening matrices presented in Appendix A, the screening process highlighted the main causes of disturbance and changes in the key indicators of conservation value upon each site identified in Paragraph 4.1.1. The screening process assessed each potential affect to conclude whether they would cause a likely significant effect on the features associated with sites.

4.1.3. The Stage One Screening Assessment therefore concluded that there will be No Likely Significant Effect on any NSN site from the Proposed Scheme. These findings are summarised in the LA115 Matrix tables (Tables 4.1 to 4.6) below.

The Broads SAC

4.1.4. The lesser whirlpool ramshorn snail, Desmoulin's whorl snail and otters are three species that are qualifying feature for the Broads SAC. There is a lack of wetland in the study area that could support any one of these species, and therefore all three species are not considered as features part of the Proposed Scheme and are therefore screened out of further assessment.

Table 4.1 The Broads SAC conclusion table

Project Name	**A47 Blofield to North Burlingham Dualling**	
European Site under consideration	The Broads SAC	
Date	**Author (Name/Organisation)**	**Verified (Name/Organisation)**
November 2020	Ishbel Campbell, Sweco	Keith Ross, Sweco
Name and location of European Site:	The Broads SAC – Special Area of Conservation (Ref No. UK0013577) Location: 2.08km from the proposed works	
Description of the project:	A47 Blofield to North Burlingham Dualling: • The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east. • Whilst around half of the A47 is already dual carriageway, the Blofield to North Burlingham section is not, with studies having identified that the single carriageway section of the road no longer meets the needs of its users.	

	• Traffic volume is anticipated to increase over the lifespan of the road. This is considered in detail in the Transport Assessment (**TR010040/APP/7.3**). • The Development Consent Order (DCO) boundary is provided in Appendix D (Figure 1). • The Proposed Scheme is categorised as a Nationally Significant Infrastructure Project and therefore requires DCO.
Is the project directly connected with or necessary to the management of the site (provide details)?	No
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No, see Section 3.5 of assessment report
The assessment of significance of effects	
Describe how the project (alone or in combination) is likely to affect the European Site.	Pollution of watercourses Air pollution Noise disturbance of SAC features Light disturbance of SAC features
Explain why these effects are not considered significant.	No habitats suitable to support qualifying features of the Broads SAC, and no qualifying features themselves were found within the respective study areas of the species from the Proposed Scheme during the surveys. Water Pollution: During construction, standard construction best practice methods for pollution prevention and water management will be implemented as part of the Environmental Management Plan (EMP (**TR010040/APP/7.7**)). Guidance on best practice in relation to pollution prevention and water management is set out in CIRIA guidelines (Charles and Edward, 2015; Gaba *et al.* 2017; Murnane *et al*., 2006) and the Environment Agency's approach to groundwater protection (Environment Agency, 2017a) and groundwater protection guides (Environment Agency, 2017b). Monitoring of local non-designated watercourses, drainage ditches, and groundwaters at risk from pollution will be carried out prior to and during the construction phase. In addition, a temporary surface water drainage strategy shall be incorporated into the EMP (**TR010040/APP/7.7**). This is to prevent increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading. During operation, it is intended that the Proposed Scheme would utilise the existing drainage network where applicable. On the new carriageways the road drainage network would include standard design features such as filter drains carrier drains, and kerb and gullies. Drainage channels and combined kerb drains will be used where continuous drainage is required in flatter gradients. These will lead to an infiltration basin, infiltration trenches or soakaways. With the best practice measures, EMP (**TR010040/APP/7.7**), monitoring and Drainage Strategy (ES Appendix 13.2 (**TR010040/APP/6.2**) in place, it is considered that **no likely significant effects** will occur on the Ramsar or the qualifying features during operation. Air pollution: As construction activities are programmed to last less than two years it is unlikely there will be a significant long-lasting effect on air quality or affect the UK's ability to comply with the Air Quality Directive. In addition, with the recommendation of standard construction best practice c in place, the impact of construction dust is considered highly unlikely to trigger a significant air quality effect as stated in ES Chapter 5 (Air Quality (**TR010040/APP/6.1**)). Therefore, it is considered that any changes in air quality during construction will impose no likely significant effects on the qualifying interests of the Ramsar during construction. During operation, the total nitrogen deposition rate is above the lowest critical load range of eight for all three scenarios, however the change in deposition resulting from the Proposed Scheme is less than 1% of the lowest critical load value. The highest change as a percentage of the lower critical load value is 0.7%. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on the Ramsar or the qualifying features during operation. Noise disturbance: An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not

	predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results and it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone. Identified receptors of concern in the noise assessment detail in ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation. Light distrubance: Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared as part of standard construction best practice. In addition, the increase in night lighting over the Proposed Scheme is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing significant light at night. Therefore, it is considered that night lighting for the Proposed Scheme will impose no likely significant effects will occur on the SAC or the qualifying features. During operation, directional lighting is proposed to be at nine locations from the Norwich Road junction, at ten locations from the Wood Lane junction, and at three A47 crossings. Whilst the immediate area around the road will have a significant increase in night lighting, it is considered that this increase in lighting is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing existing significant levels of light at night. Therefore, it is considered that night lighting for the scheme will impose no likely significant effects will occur on key features of the SAC.		
List of agencies consulted: provide contact name and telephone or e-mail address.	Natural England		
Response to consultation	None required		
Data collected to carry out the assessment			
Who carried out the assessment	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed?
All information on the assessment process and data used for the assessment is set out in the full assessment report.			

Broadland SPA and Ramsar

4.1.5. Of the qualifying features for Broadland SPA and Ramsar site, none were specifically recorded during the wintering bird surveys. Pink-footed goose was recorded as flying over the site but not directly utilising the site. Marsh harrier noted incidentally in the general vicinity during other surveys. Most of the remaining bird species are generally associated with aquatic habitats, which are not present in close proximity to the study area.

Table 4.2 The Broadland SPA conclusion table

Project Name	**A47 Blofield to North Burlingham Dualling**	
European Site under consideration	Broadland SPA	
Date	**Author (Name/Organisation)**	**Verified (Name/Organisation)**
November 2020	Ishbel Campbell, Sweco	Keith Ross, Sweco
Name and location of European Site:	Broadland SPA – Special Protected Area (Ref No. UK9009253) Location: 2.08km from the proposed works	

Description of the project:	A47 Blofield to North Burlingham Dualling: • The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east. • Whilst around half of the A47 is already dual carriageway, the Blofield to North Burlingham section is not, with studies having identified that the single carriageway section of the road no longer meets the needs of its users. • Traffic volume is anticipated to increase over the lifespan of the road. This is considered in detail in the Transport Assessment (**TR010040/APP/7.3**). • The Development Consent Order (DCO) boundary is provided in Appendix D (Figure 1). • The Proposed Scheme is categorised as a Nationally Significant Infrastructure Project and therefore requires DCO.
Is the project directly connected with or necessary to the management of the site (provide details)?	No
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No, see Section 3.5 of assessment report
The assessment of significance of effects	
Describe how the project (alone or in combination) is likely to affect the European Site.	Pollution of watercourses Air pollution Noise disturbance of SPA features Light disturbance of SPA features
Explain why these effects are not considered significant.	The results from the surveys which has been undertaken since 2017 identified one marsh harrier in May 2018 however it was not considered to be breeding within the study area. Therefore, it can be concluded that the proposed works will not have an effect on these SPA species. The arable fields within the study area could provide a food source for Bewick's swan, gadwall and wigeon. However, none of these species was not recorded in the study area during the overwintering surveys in 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. The Proposed Scheme is near the existing A47 in an environment dominated by road noise, it is considered unlikely that wigeon and gadwall will be found in the vicinity of the road. Water Pollution: During construction, standard construction best practice methods for pollution prevention and water management will be implemented as part of the Environmental Management Plan (EMP (**TR010040/APP/7.7**)). Guidance on best practice in relation to pollution prevention and water management is set out in CIRIA guidelines (Charles and Edward, 2015; Gaba *et al.* 2017; Murnane *et al*., 2006) and the Environment Agency's approach to groundwater protection (Environment Agency, 2017a) and groundwater protection guides (Environment Agency, 2017b). Monitoring of local non-designated watercourses, drainage ditches, and groundwaters at risk from pollution will be carried out prior to and during the construction phase. In addition, a temporary surface water drainage strategy shall be incorporated into the EMP (**TR010040/APP/7.7**). This is to prevent increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading. During operation, it is intended that the Proposed Scheme would utilise the existing drainage network where applicable. On the new carriageways the road drainage network would include standard design features such as filter drains carrier drains, and kerb and gullies. Drainage channels and combined kerb drains will be used where continuous drainage is required in flatter gradients. These will lead to an infiltration basin, infiltration trenches or soakaways. With the best practice measures, EMP (**TR010040/APP/7.7**), monitoring and Drainage Strategy (ES Appendix 13.2 (**TR010040/APP/6.2**)) in place, it is considered that **no likely significant effects** will occur on the Ramsar or the qualifying features during operation.

	Air pollution: As construction activities are programmed to last less than two years it is unlikely there will be a significant long-lasting effect on air quality or affect the UK's ability to comply with the Air Quality Directive. In addition, with the recommendation of standard construction best practice c in place, the impact of construction dust is considered highly unlikely to trigger a significant air quality effect as stated in the ES Chapter 5 (Air Quality (**TR010040/APP/6.1**)). Therefore, it is considered that any changes in air quality during construction will impose no likely significant effects on the qualifying interests of the Ramsar during construction. During operation, the total nitrogen deposition rate is above the lowest critical load range of eight for all three scenarios, however the change in deposition resulting from the Proposed Scheme is less than 1% of the lowest critical load value. The highest change as a percentage of the lower critical load value is 0.7%. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on the Ramsar or the qualifying features during operation. Noise disturbance: An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results and it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone. Identified receptors of concern in the noise assessment detail in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation. Light distrubance: Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared as part of standard construction best practice. In addition, the increase in night lighting over the Proposed Scheme is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing significant light at night. Therefore, it is considered that night lighting for the Proposed Scheme will impose no likely significant effects will occur on the SAC or the qualifying features. During operation, directional lighting is proposed to be at nine locations from the Norwich Road junction, at ten locations from the Wood Lane junction, and at three A47 crossings. Whilst the immediate area around the road will have a significant increase in night lighting, it is considered that this increase in lighting is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing existing significant levels of light at night. Therefore, it is considered that night lighting for the scheme will impose no likely significant effects will occur on key features of the SAC.		
List of agencies consulted: provide contact name and telephone or e-mail address.	Natural England		
Response to consultation	None required		
Data collected to carry out the assessment			
Who carried out the assessment	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed?
All information on the assessment process and data used for the assessment is set out in the full assessment report.			

Table 4.3 Broadland Ramsar conclusion table

Project Name	**A47 Blofield to North Burlingham Dualling**	
European Site under consideration	Broadland Ramsar	
Date	**Author (Name/Organisation)**	**Verified (Name/Organisation)**
November 2020	Ishbel Campbell, Sweco	Keith Ross, Sweco
Name and location of European Site:	Broadland Ramsar (Ref No. UK9009253) Location: 2.08km from the proposed works	
Description of the project:	A47 Blofield to North Burlingham Dualling: • The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east. • Whilst around half of the A47 is already dual carriageway, the Blofield to North Burlingham section is not, with studies having identified that the single carriageway section of the road no longer meets the needs of its users. • Traffic volume is anticipated to increase over the lifespan of the road. This is considered in detail in the Transport Assessment (**TR010040/APP/7.3**). • The Development Consent Order (DCO) boundary is provided in Appendix D (Figure 1). • The Proposed Scheme is categorised as a Nationally Significant Infrastructure Project and therefore requires DCO.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No, see Section 3.5 of assessment report	
The assessment of significance of effects		
Describe how the project (alone or in combination) is likely to affect the European Site.	Pollution of watercourses Air pollution Noise disturbance of Ramsar features Light disturbance of Ramsar features	
Explain why these effects are not considered significant.	Pink-footed geese were recorded as flying over the site during October 2017, and February and November 2019 but they were not recorded as using the arable fields in the Proposed Scheme. Although the arable fields are likely to provide a food source during the winter for pink-footed goose and graylag goose, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the Ramsar and that these species do not use the site. Greylag goose was not found in the vicinity of the site during the overwintering and breeding bird surveys. Bewick's swan was not recorded in the study area during the overwintering surveys in 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. Although the arable fields are likely to provide a food source during the winter, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the Ramsar. Water Pollution: During construction, standard construction best practice methods for pollution prevention and water management will be implemented as part of the Environmental Management Plan (EMP (**TR010040/APP/7.7**)). Guidance on best practice in relation to pollution prevention and water management is set out in CIRIA guidelines (Charles and Edward, 2015; Gaba *et al.* 2017; Murnane *et al*., 2006) and the Environment Agency's approach to groundwater protection (Environment Agency, 2017a) and groundwater protection guides (Environment Agency, 2017b). Monitoring of local non-designated watercourses, drainage ditches, and groundwaters at risk from pollution will be carried out prior to and during the construction phase. In addition, a temporary surface water drainage strategy shall be incorporated into the EMP (**TR010040/APP/7.7**). This is to prevent	

	increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading. During operation, it is intended that the Proposed Scheme would utilise the existing drainage network where applicable. On the new carriageways the road drainage network would include standard design features such as filter drains carrier drains, and kerb and gullies. Drainage channels and combined kerb drains will be used where continuous drainage is required in flatter gradients. These will lead to an infiltration basin, infiltration trenches or soakaways. With the best practice measures, EMP (**TR010040/APP/7.7**), monitoring and Drainage Strategy (ES Appendix 13.2 (**TR010040/APP/6.2**)) in place, it is considered that **no likely significant effects** will occur on the Ramsar or the qualifying features during operation. Air pollution: As construction activities are programmed to last less than two years it is unlikely there will be a significant long-lasting effect on air quality or affect the UK's ability to comply with the Air Quality Directive. In addition, with the recommendation of standard construction best practice c in place, the impact of construction dust is considered highly unlikely to trigger a significant air quality effect as stated in the ES Chapter 5 (Air Quality (**TR010040/APP/6.1**)). Therefore, it is considered that any changes in air quality during construction will impose no likely significant effects on the qualifying interests of the Ramsar during construction. During operation, the total nitrogen deposition rate is above the lowest critical load range of eight for all three scenarios, however the change in deposition resulting from the Proposed Scheme is less than 1% of the lowest critical load value. The highest change as a percentage of the lower critical load value is 0.7%. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on the Ramsar or the qualifying features during operation. Noise disturbance: An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results and it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone. Identified receptors of concern in the noise assessment detail in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation. Light distrubance: Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared as part of standard construction best practice. In addition, the increase in night lighting over the Proposed Scheme is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing significant light at night. Therefore, it is considered that night lighting for the Proposed Scheme will impose no likely significant effects will occur on the SAC or the qualifying features. During operation, directional lighting is proposed to be at nine locations from the Norwich Road junction, at ten locations from the Wood Lane junction, and at three A47 crossings. Whilst the immediate area around the road will have a significant increase in night lighting, it is considered that this increase in lighting is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing existing significant levels of light at night. Therefore, it is considered that night lighting for the scheme will impose no likely significant effects will occur on key features of the SAC.
List of agencies consulted: provide contact name and telephone or e-mail address.	Natural England
Response to consultation	None required

Data collected to carry out the assessment			
Who carried out the assessment	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed?
All information on the assessment process and data used for the assessment is set out in the full assessment report.			

Paston Great Barn SAC

4.1.6. The surveys undertaken in July and August 2020 recorded barbastelle bats crossing the A47 at Crossing Point 2 on just two occasions.

4.1.7. Barbastelle bats have been found commuting across the existing A47 to foraging grounds over agricultural areas in the vicinity of the A47. However, given the extent of available suitable habitat between the SAC and the site, it is considered likely that this species does not frequent the area and the above effect pathways will not have a significant effect on the population within the SAC.

4.1.8. Surveys undertaken as part of the Norwich Western Link Road (NWLR) and the Norwich Northern Distributor Road (NNDR) found bat roosts for barbastelle bats to be present in the Hall Hill and Broadway woodlands, and a colony in the Morton area to the west of Norwich. The Yare Valley is a foraging ground which lies approximately 2.5km to the south west of the site. Therefore, it is more likely that these barbastelle bats would be originating from these roosts rather than from Paston Great Barn SAC.

Table 4.4 Paston Great Barn SAC conclusion table

Project Name	**A47 Blofield to North Burlingham Dualling**	
European Site under consideration	Paston Great Barn SAC	
Date	**Author (Name/Organisation)**	**Verified (Name/Organisation)**
November 2020	Ishbel Campbell, Sweco	Keith Ross, Sweco
Name and location of European Site:	Paston Great Barn SAC – Special Area of Conservation (Ref No. UK0030235) Location: 24.5km from the proposed works.	
Description of the project:	A47 Blofield to North Burlingham Dualling: • The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east. • Whilst around half of the A47 is already dual carriageway, the Blofield to North Burlingham section is not, with studies having identified that the single carriageway section of the road no longer meets the needs of its users. • Traffic volume is anticipated to increase over the lifespan of the road. This is considered in detail in the Transport Assessment (**TR010040/APP/7.3**). • The Development Consent Order (DCO) boundary is provided in Appendix D (Figure 1). • The Proposed Scheme is categorised as a Nationally Significant Infrastructure Project and therefore requires DCO.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the	No, see Section 3.5 of assessment report	

project being assessed could affect the site (provide details)?	
The assessment of significance of effects	
Describe how the project (alone or in combination) is likely to affect the European Site.	Noise disturbance Light disturbance Mortality Air quality Habitat fragmentation
Explain why these effects are not considered significant.	Noise and vibration: An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results and it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone. Identified receptors of concern in the noise assessment detail in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on barbastelle bats. Lighting: Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared as part of standard construction best practice. In addition, the increase in night lighting over the Proposed Scheme is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing significant light at night. Therefore, it is considered that night lighting for the Proposed Scheme will impose no likely significant effects will occur on the SAC. During operation, directional lighting is proposed to be at nine locations from the Norwich Road junction, at ten locations from the Wood Lane junction, and at three A47 crossings. Whilst the immediate area around the road will have a significant increase in night lighting, it is considered that this increase in lighting is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing existing significant levels of light at night. Therefore, it is considered that night lighting for the scheme will impose no likely significant effects will occur on barbastelle bats. Mortality: Research by Zeal et al., (2012) included radiotracking surveys of barbastelle bats. The conclusion of the survey results states that in Devon, UK, non-breeding barbastelle bats travel up to a maximum of 20.4km from their roosting sites, whilst breeding bats (pregnant and lactating) travel a maximum of 8.7km from their roosts. In addition, whilst the Yare Valley has suitable foraging grounds for this species, in the form of riverine woodland, it is unlikely that bats from Paston Great Barn SAC will travel to this area. This is because the bats are more likely to forage in the Broads SAC, which lies 11.8km at its nearest point from Paston SAC. The riverine woodland habitat within the Broads SAC lies approximately 20.1km from Paston SAC. In addition, it is likely that the bats from Paston Great Barn SAC will also hibernate at this site and therefore the bats will have winter foraging grounds that are close to the SAC, when winter temperatures a mild enough to allow for winter foraging. Surveys undertaken as part of the Norwich Western Link Road (NWLR) and the Norwich Northern Distributor Road (NNDR) found bat roosts for barbastelle bats to be present in the Hall Hill and Broadway woodlands, and a colony in the Morton area to the west of Norwich. The Yare Valley is a foraging ground which lies approximately 2.5km to the south west of the site. Therefore, it is more likely that these barbastelle bats would be originating from these roosts rather than from Paston Great Barn SAC. Therefore, the Proposed Scheme is predicted to have **no likely significant effects** upon the barbastelle bats of Paston Great Barn SAC.

	Air quality: Air quality modelling has been undertaken using the approach outlined in LA 105, using the Interim HA Long Term Gap Analysis Calculator v1.1, as presented ES Chapter 5 (Air Quality (**TR010040/APP/6.1**)). Although a slight deterioration in air quality at 121 receptors has been predicted, 54 receptors are predicted to experience an improvement in annual mean NO_2 concentrations, and 4 receptors will experience no change as a result of the Proposed Scheme. The magnitude of change was assessed as small or imperceptible, resulting in no significant effect being predicted in Environmental Impact Assessment (EIA) terms. There are no receptors expected to exceed the annual mean NO_2 AQO in the opening year scenarios, all modelled receptors have predicted annual mean NO_2 concentrations well below the objective. In accordance with LA 105, no significant effects on human health or ecological receptors have been identified as a result of the operation of the Proposed Scheme. Furthermore, the operation of the Proposed Scheme is not predicted to affect compliance with the European Union (EU) Directive on ambient air quality. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on SAC during operation. In addition, none of the likely foraging areas for barbastelle bats are located where there is a direct hydrological link between the Proposed Scheme and these habitats and therefore it is likely that there will be no likely significant effects of ground water pollution upon this species. Habitat fragmentation: The surveys undertaken in July and August 2020 recorded barbastelle bats crossing the A47 at Crossing Point 2 on just two occasions. Barbastelle bats have been found commuting across the existing A47 to foraging grounds over agricultural areas in the vicinity of the A47. However, given the extent of available suitable habitat between the SAC and the site, it is considered likely that this species does not frequent the area and the above effect pathways will not have a significant effect on the population within the SAC.		
List of agencies consulted: provide contact name and telephone or e-mail address.	Natural England		
Response to consultation	None required		
Data collected to carry out the assessment			
Who carried out the assessment	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed?
All information on the assessment process and data used for the assessment is set out in the full assessment report.			

Breydon Water SPA and Ramsar

4.1.9. Two flocks of golden plover containing nine and seven birds were observed feeding in fields within the study area. Given the distance of the study area from Breydon Water, it is unlikely that these birds have come from Breydon Water to utilise the fields in the study area for foraging. Two flocks of lapwing were observed flying over the study area and not utilising it.

4.1.10. Due to the survey results that have been summarised in Section 3.1 and the subsequent rationale set out in Section 4 of this report, it can be concluded that the scheme will not have Likely Significant Effects upon any international sites. Therefore, these sites and their qualifying features are not considered to require escalation to the Appropriate Assessment stage of the HRA process.

Table 4.5 Breydon Water SPA conclusion table

Project Name	**A47 Blofield to North Burlingham Dualling**	
European Site under consideration	Breydon Water SPA	
Date	**Author (Name/Organisation)**	**Verified (Name/Organisation)**
November 2020	Ishbel Campbell, Sweco	Keith Ross, Sweco
Name and location of European Site:	Breydon Water SPA – Special Protected Area (Ref No. UK9009181) Location: 6.9km from the proposed works	
Description of the project:	A47 Blofield to North Burlingham Dualling: • The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east. • Whilst around half of the A47 is already dual carriageway, the Blofield to North Burlingham section is not, with studies having identified that the single carriageway section of the road no longer meets the needs of its users. • Traffic volume is anticipated to increase over the lifespan of the road. This is considered in detail in the Transport Assessment (**TR010040/APP/7.3**). • The Development Consent Order (DCO) boundary is provided in Appendix D (Figure 1). • The Proposed Scheme is categorised as a Nationally Significant Infrastructure Project and therefore requires DCO.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No, see Section 3.5 of assessment report	
The assessment of significance of effects		
Describe how the project (alone or in combination) is likely to affect the European Site.	Pollution of watercourses Air pollution Noise disturbance of SPA features Light disturbance of SPA features	
Explain why these effects are not considered significant.	The overwintering bird surveys in 2017 identified large numbers of lapwing and small numbers of golden plover in the study area. Lapwing were found in large numbers around the fields to the north and south of the A47 in January, with smaller numbers found during February and March. These were generally found in the arable fields. Golden plover were identified in the February and March surveys and were also generally found in the arable fields. Bewick's swan was not recorded in the study area during the overwintering surveys undertaken from 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. Although the arable fields are likely to provide a food source during the winter, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the SPA. The overwintering bird surveys in 2017 identified large numbers of lapwing and small numbers of golden plover in the study area. Lapwing were found in large numbers around the fields to the north and south of the A47 in January, with smaller numbers found during February and March. These were generally found in the arable fields. Golden plover were identified in the February and March surveys and were also generally found in the arable fields.	

	The arable fields within the study area could provide a food source for Bewick's swan. However, this species was not recorded in the study area during the overwintering surveys in 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. Water Pollution: During construction, standard construction best practice methods for pollution prevention and water management will be implemented as part of the Environmental Management Plan (EMP (**TR010040/APP/7.7**)). Guidance on best practice in relation to pollution prevention and water management is set out in CIRIA guidelines (Charles and Edward, 2015; Gaba *et al.* 2017; Murnane *et al*., 2006) and the Environment Agency's approach to groundwater protection (Environment Agency, 2017a) and groundwater protection guides (Environment Agency, 2017b). Monitoring of local non-designated watercourses, drainage ditches, and groundwaters at risk from pollution will be carried out prior to and during the construction phase. In addition, a temporary surface water drainage strategy shall be incorporated into the EMP (**TR010040/APP/7.7**). This is to prevent increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading. During operation, it is intended that the Proposed Scheme would utilise the existing drainage network where applicable. On the new carriageways the road drainage network would include standard design features such as filter drains carrier drains, and kerb and gullies. Drainage channels and combined kerb drains will be used where continuous drainage is required in flatter gradients. These will lead to an infiltration basin, infiltration trenches or soakaways. With the best practice measures, EMP (**TR010040/APP/7.7**), monitoring and Drainage Strategy (ES Appendix 13.2 (**TR010040/APP/6.2**)) in place, it is considered that **no likely significant effects** will occur on the Ramsar or the qualifying features during operation. Air pollution: As construction activities are programmed to last less than two years it is unlikely there will be a significant long-lasting effect on air quality or affect the UK's ability to comply with the Air Quality Directive. In addition, with the recommendation of standard construction best practice c in place, the impact of construction dust is considered highly unlikely to trigger a significant air quality effect as stated in the ES Chapter 5 (Air Quality (**TR010040/APP/6.1**)). Therefore, it is considered that any changes in air quality during construction will impose no likely significant effects on the qualifying interests of the Ramsar during construction. During operation, the total nitrogen deposition rate is above the lowest critical load range of eight for all three scenarios, however the change in deposition resulting from the Proposed Scheme is less than 1% of the lowest critical load value. The highest change as a percentage of the lower critical load value is 0.7%. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on the Ramsar or the qualifying features during operation. Noise disturbance: An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results and it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone. Identified receptors of concern in the noise assessment detail in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation. Light distrubance: Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared as part of standard construction best practice. In addition, the increase in night lighting over the Proposed Scheme is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing significant light at night. Therefore, it is considered that night lighting for the Proposed Scheme will impose no likely significant effects will occur on the SAC or the qualifying features. During operation, directional lighting is proposed to be at nine locations from the Norwich Road junction, at ten locations from the Wood Lane junction, and at three A47 crossings. Whilst the immediate area around the road will have a significant increase in night lighting, it is considered that this increase in lighting is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing existing

	significant levels of light at night. Therefore, it is considered that night lighting for the scheme will impose no likely significant effects will occur on key features of the SAC.		
List of agencies consulted: provide contact name and telephone or e-mail address.	Natural England		
Response to consultation	None required		
Data collected to carry out the assessment			
Who carried out the assessment	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed?
All information on the assessment process and data used for the assessment is set out in the full assessment report.			

Table 4.6 Breydon Water Ramsar conclusion table

Project Name	**A47 Blofield to North Burlingham Dualling**	
European Site under consideration	Breydon Water Ramsar	
Date	**Author (Name/Organisation)**	**Verified (Name/Organisation)**
November 2020	Ishbel Campbell, Sweco	Keith Ross, Sweco
Name and location of European Site:	Breydon Water Ramsar (Ref No. UK9009181) Location: 6.9km from the proposed works	
Description of the project:	A47 Blofield to North Burlingham Dualling: • The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east. • Whilst around half of the A47 is already dual carriageway, the Blofield to North Burlingham section is not, with studies having identified that the single carriageway section of the road no longer meets the needs of its users. • Traffic volume is anticipated to increase over the lifespan of the road. This is considered in detail in the Transport Assessment (**TR010040/APP/7.3**). • The Development Consent Order (DCO) boundary is provided in Appendix D (Figure 1). • The Proposed Scheme is categorised as a Nationally Significant Infrastructure Project and therefore requires DCO.	
Is the project directly connected with or necessary to the management of the site (provide details)?	No	
Are there other projects or plans that together with the project being assessed could affect the site (provide details)?	No, see Section 3.5 of assessment report	
The assessment of significance of effects		
Describe how the project (alone or in combination) is likely to affect the European Site.	Pollution of watercourses Air pollution Noise disturbance of SPA features Light disturbance of SPA features	

Explain why these effects are not considered significant.	The overwintering bird surveys in 2017 identified large numbers of lapwing and small numbers of golden plover in the study area. Lapwing were found in large numbers around the fields to the north and south of the A47 in January, with smaller numbers found during February and March. These were generally found in the arable fields. Golden plover were identified in the February and March surveys and were also generally found in the arable fields. Pink-footed geese were recorded as flying over the site during October 2017, and February and November 2019 but they were not recorded as using the arable fields in the Proposed Scheme. The overwintering bird surveys in 2017 identified large numbers of lapwing and small numbers of golden plover in the study area. Lapwing were found in large numbers around the fields to the north and south of the A47 in January, with smaller numbers found during February and March. These were generally found in the arable fields. Golden plover were identified in the February and March surveys and were also generally found in the arable fields. Pink-footed geese were recorded as flying over the site during October 2017, and February and November 2019 but they were not recorded as using the arable fields in the Proposed Scheme. It is unlikely that these species would travel from the SPA as far as the Proposed Scheme to reach foraging grounds in the summer or winter. It is likely that these large numbers may find winter and summer grounds in The Broads SAC and Broadland SPA and Ramsar site rather than the land over the Proposed Scheme. Therefore, No Likely Significant Effects are predicted. Water Pollution: During construction, standard construction best practice methods for pollution prevention and water management will be implemented as part of the Environmental Management Plan (EMP (**TR010040/APP/7.7**)). Guidance on best practice in relation to pollution prevention and water management is set out in CIRIA guidelines (Charles and Edward, 2015; Gaba *et al.* 2017; Murnane *et al*., 2006) and the Environment Agency's approach to groundwater protection (Environment Agency, 2017a) and groundwater protection guides (Environment Agency, 2017b). Monitoring of local non-designated watercourses, drainage ditches, and groundwaters at risk from pollution will be carried out prior to and during the construction phase. In addition, a temporary surface water drainage strategy shall be incorporated into the EMP (**TR010040/APP/7.7**). This is to prevent increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading. During operation, it is intended that the Proposed Scheme would utilise the existing drainage network where applicable. On the new carriageways the road drainage network would include standard design features such as filter drains carrier drains, and kerb and gullies. Drainage channels and combined kerb drains will be used where continuous drainage is required in flatter gradients. These will lead to an infiltration basin, infiltration trenches or soakaways. With the best practice measures, EMP (**TR010040/APP/7.7**), monitoring and Drainage Strategy (ES Appendix 13.2 (**TR010040/APP/6.2**)) in place, it is considered that **no likely significant effects** will occur on the Ramsar or the qualifying features during operation. Air pollution: As construction activities are programmed to last less than two years it is unlikely there will be a significant long-lasting effect on air quality or affect the UK's ability to comply with the Air Quality Directive. In addition, with the recommendation of standard construction best practice c in place, the impact of construction dust is considered highly unlikely to trigger a significant air quality effect as stated in the ES Chapter 5 (Air Quality (**TR010040/APP/6.1**)). Therefore, it is considered that any changes in air quality during construction will impose no likely significant effects on the qualifying interests of the Ramsar during construction. During operation, the total nitrogen deposition rate is above the lowest critical load range of eight for all three scenarios, however the change in deposition resulting from the Proposed Scheme is less than 1% of the lowest critical load value. The highest change as a percentage of the lower critical load value is 0.7%. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on the Ramsar or the qualifying features during operation. Appendix B gives the specific information regarding the air quality modelling upon Breydon Water SPA in operation. Noise disturbance: An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the

	noise modelling results and it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone. Identified receptors of concern in the noise assessment detail in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation. Light distrubance: Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared as part of standard construction best practice. In addition, the increase in night lighting over the Proposed Scheme is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing significant light at night. Therefore, it is considered that night lighting for the Proposed Scheme will impose no likely significant effects will occur on the SAC or the qualifying features. During operation, directional lighting is proposed to be at nine locations from the Norwich Road junction, at ten locations from the Wood Lane junction, and at three A47 crossings. Whilst the immediate area around the road will have a significant increase in night lighting, it is considered that this increase in lighting is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing existing significant levels of light at night. Therefore, it is considered that night lighting for the scheme will impose no likely significant effects will occur on key features of the SAC.		
List of agencies consulted: provide contact name and telephone or e-mail address.	Natural England		
Response to consultation	None required		
Data collected to carry out the assessment			
Who carried out the assessment	Sources of data	Level of assessment completed	Where can the full results of the assessment be accessed and viewed?
All information on the assessment process and data used for the assessment is set out in the full assessment report.			

5. References

5.1.1. DEPARTMENT FOR TRANSPORT (2015). Road Investment Strategy: for the 2015/16 – 2019/20 Road Period. Presented to Parliament pursuant to section 3 of the Infrastructure Act 2015.

5.1.2. Judgement of the Court (Grand Chamber) 7 September 2004 in Case C-127/02 Reference for a preliminary ruling under Article 234EC from the Raad van State (Netherlands), made by decision of 27 March 2002, registered at the Court on 8 April 2002, in the proceedings brought by Landelijke Vereniging tot Behoud vand de Waddenzee, Nederlandse Vereniging tot Bescherming van Vogels against Staatssecretaris van Landbouw, Natuurbeheer en Visserij.

5.1.3. EUROPEAN COMMISSION (2018). Managing Natura 2000 Sites. The Provisions of Article 6 of the Habitats Directive 92/43/EEC.

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Appendix A. DMRB Screening Matrices

Potential effects upon the designated sites which are considered in this assessment are provided below in Tables A.1 to A.6 to be in line with DMRB LA115 (Habitats Regulations Assessment).

The European sites included within the screening assessment are:

- The Broads SAC
- Broadland SPA
- Broadland Ramsar site
- Paston Great Barn SAC
- Breydon Water SPA
- Breydon Water Ramsar site

The Broads SAC

Table A.1 The Broads SAC Screening Matrix

Project:	A47 Blofield to North Burlingham Dualling	
European site under consideration	The Broads SAC	
Date:	**Author (name/organisation):**	**Verified (Name/Organisation):**
November 2020	Ishbel Campbell, Sweco	Keith Ross, Sweco
Description of project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of:		
• Size and scale (road type and probable traffic volume)	• The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east. • Whilst around half of the A47 is already dual carriageway, the Blofield to North Burlingham section is not, with studies having identified that the single carriageway section of the road no longer meets the needs of its users. • Traffic volume is anticipated to increase over the lifespan of the road. This is considered in detail in the Transport Assessment (**TR010040/APP/7.3**). • The Development Consent Order (DCO) boundary is provided in Appendix D (Figure 1). • The Proposed Scheme is categorised as a Nationally Significant Infrastructure Project and therefore requires DCO.	
• Land-take	The DCO boundary is provided in Appendix D (Figure 1). No land-take is required in the SAC. The scheme land-take is currently unknown as designs are still being finalised.	
• Distance from the European Site or key features of the site (from	Approximately 2.08km to the south of the Proposed Scheme.	

edge of the project assessment corridor)	
• Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	Not applicable as no land-take or resource requirements from The Broads SAC are required.
• Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	Construction: Nitrogen dioxide from diesel-powered plant during construction. Proposed works machinery will be diesel / petrol powered, and on-site generators will also be required. Potential for spills during refuelling and machine servicing. Air quality modelling shows that during construction, there is no anticipated change in air quality of The Broads SAC. Operation: Ongoing emissions from vehicles usage of the road (no increase in vehicle emissions concluded from air quality modelling). At operation, there is no anticipated change in air quality at The Broads SAC. The air quality assessment has been undertaken using standardised methodologies and data sets.
• Excavation requirements (e.g. impacts of local hydrogeology)	All excavations are located in the vicinity of the new and existing roads. Excavations will not be deep enough to impact local hydrogeology. All excavated material will be stored in a safe location to prevent rainwater leaching silts into the waterbodies.
• Transportation requirements	Machinery will be transported to and from the site, this will be standard construction equipment of excavators, trucks etc..
• Duration of construction, operation, etc.	Construction is likely to commence in the summer months of 2022 and occur for the duration of 22 months.
• Other.	N/A
Description of avoidance and/or mitigation measures *Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:*	
• Nature of proposals	No mitigation measures required.
• Location	
• Evidence for effectiveness	
• Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	
Characteristics of European Site(s) **A brief description of the European Site should be produced, including information on:**	
Name of European Site and its EU code	The Broads SAC – Special Area of Conservation (Ref No. UK0013577)
Location and distance of the European Site from the proposed works	The Broads SAC – 2.08km from the proposed works
European Site size	The Broads SAC – 5,885ha

Key features of the European Site including the primary reasons for selection and any other qualifying interests	Annex I habitats that are a primary reason for selection: • Hard oligo-mesotrophic waters with benthic vegetation of *Chara spp*. • Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation • Transition mires and quaking bogs • Calcareous fens with Cladium mariscus and species of the *Caricion davallianae* • Alkaline fens • Alluvial forests with *Alnus glutinosa* and *Fraxinus excelsior* (*Alno-Padion, Alnion incanae, Salicion albae*) Annex I habitats present as a qualifying feature but not a primary reason for selection: • Molinia meadows on calcareous, peaty or clayey silt laden soils (*Molinion caeruleae*) Annex II species that are a primary reason for selection of this site: • Desmoulin's whorl snail *Vertigo moulinsiana* • Fen orchid *Liparis loeselii* • Lesser whirlpool ramshorn snail *Anisus vorticulus* Annex II species present as a qualifying feature, but not a primary reason for selection: • Otter *Lutra lutra*
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Threats to the site include water pollution, invasive species, siltation of waterbodies, changes in water levels, hydrological changes, water abstraction, changes in land use, inappropriate ditch management, scrub succession and disturbance from recreational use.
European Site conservation objectives – where these are readily available	The conservation objectives for the site are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the favourable conservation status of its qualifying features, by maintaining or restoring: • The extent and distribution of qualifying natural habitats and habitats of qualifying species. • The structure and function (including typical species) of qualifying natural habitats. • The structure and function of the habitats of qualifying species. • The supporting processes on which qualifying natural habitats and the habitats of qualifying species rely. • The populations of qualifying species. • The distribution of qualifying species within the site.
Assessment criteria **Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.**	
The vulnerabilities of each feature cited within the SAC are listed below. Full detailed descriptions can be found in Section 2.4.5 (which also pertains to Broadland Ramsar). Within the scope of the proposed works we have scoped out all the vulnerabilities except the following: water pollution, invasive non-native species, human disturbance. <u>Minimising disturbance caused by human activity (Noise)</u> The works will create noise during the construction activities and potential for increased noise during operation. <u>Water Pollution</u> It is considered that pollution through spillages may have a negative effect on the water quality thus impacting the designated sites. The machinery used during the works require fuel and chemicals to perform the tasks and this may lead to accidental spillages.	

Air Quality Effects from increases in air pollution due to increased traffic volume and/or traffic flow during operation may have an impact on Ramsar features.
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:

Reduction of habitat area	There is to be no reduction in habitat area within the SAC boundary.

Disturbance to key features

Noise and Vibration Disturbance

An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results and it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone.

Identified receptors of concern in the noise assessment detail in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation.

Appendix B (potential effects) gives further information regarding the noise and vibration modelling of the Proposed Scheme.

The results from the surveys which has been undertaken since 2017 did not identify any otters or either snail species within the 250m of the proposed works. Therefore, it can be concluded that the proposed works will not have an effect on these SAC species.

Lighting Disturbance

Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared as part of standard construction best practice. In addition, the increase in night lighting over the Proposed Scheme is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing significant light at night. Therefore, it is considered that night lighting for the scheme will impose no likely significant effects will occur on the SAC or the qualifying features.

During operation, directional lighting is proposed to be at nine locations from the Norwich Road junction, at ten locations from the Wood Lane junction, and at three A47 crossings. Whilst the immediate area around the road will have a significant increase in night lighting, it is considered that this increase in lighting is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing existing significant levels of light at night. Therefore, it is considered that night lighting for the Proposed Scheme will impose no likely significant effects will occur on key features of the SAC.

Air Pollution

As construction activities are programmed to last less than two years it is unlikely there will be a significant long-lasting effect on air quality or affect the UK's ability to comply with the Air Quality Directive. In addition, with the recommendation of standard construction best practice c in place, the impact of construction dust is considered highly unlikely to trigger a significant air quality effect as stated in ES Chapter 5 (Air Quality (**TR010040/APP/6.1**)). Therefore, it is considered that any changes in air quality during construction will impose no likely significant effects on the qualifying interests of the Ramsar during construction.

During operation, the total nitrogen deposition rate is above the lowest critical load range of eight for all three scenarios, however the change in deposition resulting from the Proposed Scheme is less than 1% of the lowest critical load value. The highest change as a percentage of the lower critical load value is 0.7%. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on the Ramsar or the qualifying features during operation.

Appendix B (potential effects) gives further information regarding air quality modelling pertaining to the Proposed Scheme.

Water Pollution

During construction, standard construction best practice methods for pollution prevention and water management will be implemented as part of the Environmental Management Plan (EMP (**TR010040/APP/7.7**)). Guidance on best practice in relation to pollution prevention and water management is set out in CIRIA guidelines (Charles and Edward, 2015; Gaba *et al.* 2017; Murnane *et al*., 2006) and the Environment Agency's approach to groundwater protection (Environment Agency, 2017a) and groundwater protection guides (Environment Agency, 2017b). Monitoring of local non-designated watercourses, drainage ditches, and groundwaters at risk from pollution will be carried out prior to and during the construction phase. In addition, a temporary surface water drainage strategy shall be incorporated into the EMP (**TR010040/APP/7.7**). This is to prevent increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading.

During operation, it is intended that the Proposed Scheme would utilise the existing drainage network where applicable. On the new carriageways the road drainage network would include standard design features such as filter drains carrier drains, and kerb and gullies. Drainage channels and combined kerb drains will be used where continuous drainage is required in flatter gradients. These will lead to an infiltration basin, infiltration trenches or soakaways. With the best practice measures, EMP (**TR010040/APP/7.7**), monitoring and Drainage Strategy (ES Appendix 13.2 (**TR010040/APP/6.2**)) in place, it is considered that **no likely significant effects** will occur on the Ramsar or the qualifying features during operation.

Appendix B (potential effects) gives further information regarding the road drainage and water environment pertaining to the Proposed Scheme.

Spread of INNS

One INNS was found on site which is Canadian pondweed, found during the Habitat Suitability Index surveys for great crested newt carried out in May 2020. This stand lies outside of the boundary of the Proposed Scheme and therefore is not due to be disturbed by construction works.

There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects

Habitat or species fragmentation	There is to be no habitat loss within the SAC boundary.
Reduction in species density	The key feature potentially sensitive to noise within the SAC is otter. Noise modelling demonstrates that it is highly unlikely that any noise disturbance will be of a magnitude to result in a reduction in the species density of otters using the SAC. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results. A construction noise assessment has been undertaken. It is concluded that, with the installation of standard construction best practice measures significant construction noise effects are not predicted. Surveys undertaken in 2017 concluded that no signs of otter were recorded and there is a lack of suitable habitat and large watercourses that could be used by commuting or foraging otters within the study area and along the Proposed Scheme alignment. Therefore, due to the lack otter signs, and the lack of foraging and 'resting' areas across the site, otters are not considered a feature as part of the Proposed Scheme and will be screened out of further assessment accordingly and we can conclude that the noise levels would be highly unlikely to cause a negative effect on otter density in the SAC. Neither species of lesser whirlpool ramshorn snails and Desmoulins whorl snails was found during the surveys. Therefore, both snail species has been screened out from further assessment as the Proposed Scheme does not affect any waterbodies that have suitable habitat for supporting this species therefore no effect pathways to populations of these species within the Broads SAC. No habitats suitable to support qualifying features of the Broads SAC, and no qualifying features themselves were found within the respective study areas of the species from the Proposed Scheme during the surveys. No Likely Significant Effect
Changes in key indicators of conservation value (water quality, etc)	No Likely Significant Effect

Climate change	An assessment was undertaken which considered the Proposed Scheme's effect on climate (i.e. increases in carbon emissions) as well as the potential vulnerability of the Proposed Scheme to climate change. The construction, operation and use of the Proposed Scheme is predicted to increase carbon emissions by approximately 159,102 tonnes carbon dioxide equivalent (tCO_2e) over the appraisal period of 60 years (up to 2085). As per DMRB guidance, Proposed Scheme carbon emissions have been compared with the Government's published UK carbon budgets. These budgets currently account for UK emissions to 2032, representing 31% of the Proposed Scheme appraisal period. The remaining increase in emissions anticipated during the appraisal period from 2032 to 2085 have no carbon budget for comparison, therefore a definitive assessment of materiality is not possible. The vulnerability of Proposed Scheme assets to projected changes in climate during operation has been assessed, and the Proposed Scheme has been deemed resilient. Therefore, no significant effects as a result of climate change are anticipated.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	There will be no impacts on The Broads SAC through the interference with the key relationships which define the structure of the site.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	As there will be no reduction in the habitat within the SAC it has been concluded that there will be No Likely Significant Effect
Disturbance to key species	No qualifying species of The Broads SAC will be impacted and therefore No likely Significant Effect is anticipated
Habitat or species fragmentation	No habitat or species fragmentation will occur as part of the works and therefore it has been concluded there will be no Likely Significant Effect
Loss	There will be no habitat loss from the proposed works and therefore it was concluded there will be No Likely Significant Effect
Fragmentation	There will be no fragmentation across the site from the proposed works and therefore it is concluded that there will be No Likely Significant Effect
Disruption	No Likely Significant Effect
Disturbance	No Likely Significant Effect
Change to key elements of the site (e.g. water quality, hydrological regime etc)	No Likely Significant Effect
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
The impacts upon the key habitat and species features from both noise disturbance, pollution and air quality and lighting have been assessed in detail. Evidence from both noise and air quality modelling and the surveys undertaken on site since 2017 in combination with strict DMRB stated guidance on drainage and air quality assessments have concluded that there will be No Likely Significant Effect on SAC features both during construction and operation.	
Outcome of screening stage (delete as appropriate).	**No Likely Significant Effect**
Are the appropriate statutory environmental bodies in agreement with	Natural England (NE) have been consulted regarding this HRA report and confirmed that NE are satisfied with the conclusions that there will be no likely significant effects upon The Broads SAC as a result of the Proposed Scheme.

this conclusion (delete as appropriate and attached relevant correspondence).	

Broadland SPA

Table A.2 Broadland SPA Screening Matrix

Project:	A47 Blofield to North Burlingham Dualling	
European site under consideration	Broadland SPA	
Date:	**Author (name/organisation):**	**Verified (Name/Organisation):**
November 2020	Ishbel Campbell, Sweco	Keith Ross, Sweco
Description of project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of:		
• Size and scale (road type and probable traffic volume)	• The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east. • Whilst around half of the A47 is already dual carriageway, the Blofield to North Burlingham section is not, with studies having identified that the single carriageway section of the road no longer meets the needs of its users. • Traffic volume is anticipated to increase over the lifespan of the road. This is considered in detail in the Transport Assessment (**TR010040/APP/7.3**). • The Development Consent Order (DCO) boundary is provided in Appendix D (Figure 1). • The Proposed Scheme is categorised as a Nationally Significant Infrastructure Project and therefore requires DCO.	
• Land-take	The DCO boundary is provided in Appendix D (Figure 1). No land-take is required in the SPA. The scheme land-take is currently unknown as designs are still being finalised.	
• Distance from the European Site or key features of the site (from edge of the project assessment corridor)	Approximately 2.08km to the proposed works	
• Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	Not applicable as no land-take from Broadland SPA is required.	
• Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	Construction: Nitrogen dioxide from diesel-powered plant during construction. Proposed works machinery will be diesel / petrol powered, and on-site generators will also be required. Potential for spills during refuelling and machine servicing. Air quality modelling shows that during construction, there is no anticipated change in air quality of Broadland SPA.	

	Operation: Ongoing emissions from vehicles usage of the road (no increase in vehicle emissions concluded from air quality modelling). At operation, there is no anticipated change in air quality at Broadland SPA. The air quality assessment has been undertaken using standardised methodologies and data sets.
• Excavation requirements (e.g. impacts of local hydrogeology)	All excavations are located in the vicinity of the new and existing roads. Excavations will not be deep enough to impact local hydrogeology. All excavated material will be stored in a safe location to prevent rainwater leaching silts into the waterbodies.
• Transportation requirements	Machinery will be transported to and from the site, this will be standard construction equipment of excavators, trucks etc..
• Duration of construction, operation, etc.	Construction is likely to commence in the summer months of 2022 and occur for the duration of 22 months.
• Other.	N/A
Description of avoidance and/or mitigation measures *Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:*	
• Nature of proposals	No mitigation measures included.
• Location	
• Evidence for effectiveness	
• Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	
Characteristics of European Site(s) **A brief description of the European Site should be produced, including information on:**	
Name of European Site and its EU code	Broadland SPA – Special Protected Area (Ref No. UK9009253)
Location and distance of the European Site from the proposed works	Broadland SPA – 2.08km from the proposed works
European Site size	Broadland SPA – 5,508ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	Broadland SPA Ruff *Philomachus pugnax* Eurasian marsh harrier *Circus aeruginosus* (breeding population) Hen harrier *Circus cyaneus* Eurasian wigeon *Anas penelope* Northern shoveler *Anas clypeata* Gadwall *Anas strepera* Great bittern *Botaurus stellaris* (breeding population) Bewick's swan *Cygnus columbianus bewickii* Whooper swan *Cygnus cygnus*
Vulnerability of the European Site – any information available from the standard data	Pressures on the site include modification of cultivation practices, grazing, changes in land use such as annual and perennial non-timber crops, forest plantation, pollution to groundwater, invasive species and changes in abiotic conditions. Additional pressures

forms on potential effect pathways	include those to wintering birds, which are vulnerable to disturbance, especially from recreational activities such as boating. Those that pertain to the Proposed Scheme are: pollution to groundwater, invasive species and human distrubance to the bird species.
European Site conservation objectives – where these are readily available	The conservation objectives are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features. • The structure and function of the habitats of the qualifying features. • The supporting processes on which the habitats of the qualifying features rely. • The population of each of the qualifying features. • The distribution of the qualifying features within the site.
Assessment criteria **Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.**	
Within the scope of the proposed works we have scoped out all the vulnerabilities except the following: water pollution, changes in water levels, hydrological changes, human disturbanc, spread of invasive non-native species. Minimising disturbance caused by human activity (Noise) The works will create noise during the construction activities and potential for increased noise during operation. Hydrological Changes Road design may affect natural flow pathways which may induce hydrological changes of local waterbodies connected to the Proposed Scheme. Water Pollution It is considered that pollution through spillages may have a negative effect on the water quality thus impacting the designated sites. The machinery used during the works require fuel and chemicals to perform the tasks and this may lead to accidental spillages. Air Quality Effects from increases in air pollution due to increased traffic volume and/or traffic flow during operation may have an impact on the SPA site features. Minimising disturbance caused by human activity (Mortality) The works will increase volume of traffic thereby increasing the risk of mortality of any barbastelles on site. Minimising loss of habitat availability The works will sever existing commuting routes across the road due to road widening.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	There is to be no reduction in habitat area within the SPA site boundary.
Disturbance to key features	
Noise and Vibration Disturbance An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results and it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone.	

Identified receptors of concern in the noise assessment detail in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation.

Appendix B (potential effects) gives further information regarding the noise and vibration modelling of the Proposed Scheme.

The results from the surveys which has been undertaken since 2017 identified one marsh harrier in May 2018 however it was not considered to be breeding within the study area. Therefore, it can be concluded that the proposed works will not have an effect on these SPA species.

The arable fields within the study area could provide a food source for Bewick's swan, gadwall and wigeon. However, none of these species was not recorded in the study area during the overwintering surveys in 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. The Proposed Scheme is near the existing A47 in an environment dominated by road noise, it is considered unlikely that wigeon and gadwall will be found in the vicinity of the road.

Lighting

Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared as part of standard construction best practice. In addition, the increase in night lighting over the Proposed Scheme is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing significant light at night. Therefore, it is considered that night lighting for the scheme will impose no likely significant effects will occur on the SPA or the qualifying features.

During operation, directional lighting is proposed to be at nine locations from the Norwich Road junction, at ten locations from the Wood Lane junction, and at three A47 crossings. Whilst the immediate area around the road will have a significant increase in night lighting, it is considered that this increase in lighting is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing existing significant levels of light at night. Therefore, it is considered that night lighting for the Proposed Scheme will impose no likely significant effects will occur on key features of the SPA.

Air Pollution

As construction activities are programmed to last less than two years it is unlikely there will be a significant long-lasting effect on air quality or affect the UK's ability to comply with the Air Quality Directive. In addition, with the recommendation of standard construction best practice c in place, the impact of construction dust is considered highly unlikely to trigger a significant air quality effect as stated in ES Chapter 5 (Air Quality (**TR010040/APP/6.1**). Therefore, it is considered that any changes in air quality during construction will impose no likely significant effects on the qualifying interests of the Ramsar during construction.

During operation, the total nitrogen deposition rate is above the lowest critical load range of eight for all three scenarios, however the change in deposition resulting from the Proposed Scheme is less than 1% of the lowest critical load value. The highest change as a percentage of the lower critical load value is 0.7%. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on the Ramsar or the qualifying features during operation.

Appendix B (potential effects) gives further information regarding air quality modelling pertaining to the Proposed Scheme.

Water Pollution

During construction, standard construction best practice methods for pollution prevention and water management will be implemented as part of the Environmental Management Plan (EMP (**TR010040/APP/7.7**)). Guidance on best practice in relation to pollution prevention and water management is set out in CIRIA guidelines (Charles and Edward, 2015; Gaba *et al.* 2017; Murnane *et al*., 2006) and the Environment Agency's approach to groundwater protection (Environment Agency, 2017a) and groundwater protection guides (Environment Agency, 2017b). Monitoring of local non-designated watercourses, drainage ditches, and groundwaters at risk from pollution will be carried out prior to and during the construction phase. In addition, a temporary surface water drainage strategy shall be incorporated into the EMP (**TR010040/APP/7.7**). This is to prevent increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading.

During operation, it is intended that the Proposed Scheme would utilise the existing drainage network where applicable. On the new carriageways the road drainage network would include standard design features such as filter drains carrier drains, and kerb and gullies. Drainage channels and combined kerb drains will be used where continuous drainage is required in flatter gradients. These will lead to an infiltration basin, infiltration trenches or soakaways. With the best practice measures, EMP (**TR010040/APP/7.7**), monitoring and Drainage Strategy (ES Appendix 13.2 (**TR010040/APP/6.2**)) in place, it is considered that **no likely significant effects** will occur on the Ramsar or the qualifying features during operation.

Appendix B (potential effects) gives further information regarding the road drainage and water environment pertaining to the Proposed Scheme.

Spread of INNS

One INNS was found on site which is Canadian pondweed, found during the Habitat Suitability Index surveys for great crested newt carried out in May 2020. This stand lies outside of the boundary of the Proposed Scheme and therefore is not due to be disturbed by construction works. There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects. <u>Habitat loss</u> Although the arable fields are likely to provide a food source during the winter for pink-footed goose and graylag goose, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the SPA and that these species do not use the site. As pink-footed geese were not found to be utilising the site, it is considered that there is an unlikely risk of mortality through vehicle collisions during operation. Greylag goose was not found in the vicinity of the site during the overwintering and breeding bird surveys. Bewick's swan was not recorded in the study area during the overwintering surveys in 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. Although the arable fields are likely to provide a food source during the winter, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the SPA.	
Habitat or species fragmentation	There is to be no habitat loss within the SPA boundary. Vegetation clearance will be minimal, limited only to only within the red line boundary. There will be no large-scale vegetation clearance which will result in no habitat or species fragmentation.
Reduction in species density	One marsh harrier was recorded flying over the site in May 2018, during the breeding bird surveys. The breeding status was recorded as 'non-breeding'. Marsh harriers will range of agricultural land close to wetland habitat whilst foraging for small mammals and birds and it is considered that the agricultural land within the scheme will provide foraging habitat for this species. Noise modelling demonstrates that it is highly unlikely that any noise disturbance will be of a magnitude to result in a reduction in the species density of marsh harrier using the SPA. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results. A construction noise assessment has been undertaken. It is concluded that, with the installation of standard construction best practice measures significant construction noise effects are not predicted. None of the species for which the Broadland SPA is designated for overwintering populations were recorded within the study area during the wintering bird surveys undertaken in 2019, December 2017 and February 2018 as detailed in ES Chapter 8 (Biodiversity (**TR010040/APP/6.1**). No Likely Significant Effect
Changes in key indicators of conservation value (water quality, etc)	No Likely Significant Effect
Climate change	An assessment was undertaken which considered the Proposed Scheme's effect on climate (i.e. increases in carbon emissions) as well as the potential vulnerability of the Proposed Scheme to climate change. The construction, operation and use of the Proposed Scheme is predicted to increase carbon emissions by approximately 159,102 tonnes carbon dioxide equivalent (tCO_2e) over the appraisal period of 60 years (up to 2085). As per DMRB guidance, Proposed Scheme carbon emissions have been compared with the Government's published UK carbon budgets. These budgets currently account for UK emissions to 2032, representing 31% of the Proposed Scheme appraisal period. The remaining increase in emissions anticipated during the appraisal period from 2032 to 2085 have no carbon budget for comparison, therefore a definitive assessment of materiality is not possible. The vulnerability of Proposed Scheme assets to projected changes in climate during operation has been assessed, and the Proposed Scheme has been deemed resilient. Therefore, no significant effects as a result of climate change are anticipated.
Describe any likely impacts on the European Site as a whole in terms of:	

Interference with the key relationships that define the structure of the site	There will be no impacts on Broadland SPA through the interference with the key relationships which define the structure of the site.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	As there will be no reduction in the habitat within the SPA it has been concluded that there will be No Likely Significant Effect
Disturbance to key species	No qualifying species of SPA will be impacted and therefore No likely Significant Effect is anticipated.
Habitat or species fragmentation	No habitat or species fragmentation will occur as part of the works and therefore it has been concluded there will be no Likely Significant Effect
Loss	There will be no habitat loss from the proposed works and therefore it was concluded there will be No Likely Significant Effect.
Fragmentation	There will be no fragmentation across the site from the proposed works and therefore it is concluded that there will be No Likely Significant Effect.
Disruption	No Likely Significant Effect
Disturbance	No Likely Significant Effect
Change to key elements of the site (e.g. water quality, hydrological regime etc)	No Likely Significant Effect
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
The impacts upon the key habitat and species features from both noise disturbance, pollution and air quality and lighting have been assessed in detail. Evidence from both noise and air quality modelling and the surveys undertaken on site since 2017 in combination with strict DMRB stated guidance on drainage and air quality assessments have concluded that there will be No Likely Significant Effect on SPA features both during construction and operation.	
Outcome of screening stage (delete as appropriate).	**No Likely Significant Effect**
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attached relevant correspondence).	Natural England (NE) have been consulted regarding this HRA report and confirmed that NE are satisfied with the conclusions that there will be no likely significant effects upon Broadland SPA as a result of the Proposed Scheme.

Broadland Ramsar

Table A.3 Broadland Ramsar Screening Matrix

Project:	A47 Blofield to North Burlingham Dualling	
European site under consideration	Broadland Ramsar	
Date:	**Author (name/organisation):**	**Verified (Name/Organisation):**
November 2020	Ishbel Campbell, Sweco	Keith Ross, Sweco

Description of project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of:	
• Size and scale (road type and probable traffic volume)	• The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east. • Whilst around half of the A47 is already dual carriageway, the Blofield to North Burlingham section is not, with studies having identified that the single carriageway section of the road no longer meets the needs of its users. • Traffic volume is anticipated to increase over the lifespan of the road. This is considered in detail in the Transport Assessment (**TR010040/APP/7.3**). • The Development Consent Order (DCO) boundary is provided in Appendix D (Figure 1). • The Proposed Scheme is categorised as a Nationally Significant Infrastructure Project and therefore requires DCO.
• Land-take	The DCO boundary is provided in Appendix D (Figure 1). No land-take is required in the Ramsar. The scheme land-take is currently unknown as designs are still being finalised.
• Distance from the European Site or key features of the site (from edge of the project assessment corridor)	Approximately 2.08km to the proposed works
• Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	Not applicable as no land-take from Broadland Ramsar is required.
• Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	Construction: Nitrogen dioxide from diesel-powered plant during construction. Proposed works machinery will be diesel / petrol powered, and on-site generators will also be required. Potential for spills during refuelling and machine servicing. Air quality modelling shows that during construction, there is no anticipated change in air quality of Broadland Ramsar. Operation: Ongoing emissions from vehicles usage of the road (no increase in vehicle emissions concluded from air quality modelling). At operation, there is no anticipated change in air quality at Broadland Ramsar. The air quality assessment has been undertaken using standardised methodologies and data sets.
• Excavation requirements (e.g. impacts of local hydrogeology)	All excavations are located in the vicinity of the new and existing roads. Excavations will not be deep enough to impact local hydrogeology. All excavated material will be stored in a safe location to prevent rainwater leaching silts into the waterbodies.
• Transportation requirements	Machinery will be transported to and from the site, this will be standard construction equipment of excavators, trucks etc.
• Duration of construction, operation, etc.	Construction is likely to commence in the summer months of 2022 and occur for the duration of 22 months.
• Other.	N/A

Description of avoidance and/or mitigation measures *Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:*	
• Nature of proposals	No mitigation measures included.
• Location	
• Evidence for effectiveness	
• Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	
Characteristics of European Site(s) **A brief description of the European Site should be produced, including information on:**	
Name of European Site and its EU code	Broadland Ramsar (Ref No. UK9009253)
Location and distance of the European Site from the proposed works	Broadland Ramsar – 2.08km from the proposed works
European Site size	Broadland Ramsar – 5,508ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	The site qualifies under Ramsar criterion 2 – it supports a number of rare species and habitats within the biogeographical zone context, including the following Habitats Directive Annex I features: • Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (sedges) • Alkaline fens • Alluvial forests with *Alnus glutinosa* (alder) and *Fraxinus excelsior* (ash). Annex II species: • Desmoulin's whorl snail *Vertigo moulinsiana* • Otter *Lutra lutra* • Fen orchid *Liparis loeselii*. It also qualifies under Ramsar criterion 6 – species/populations occurring at levels of international importance. Species with peak counts in winter: • Bewick's swan *Cygnus columbianus bewickii* • Eurasian wigeon *Anas penelope* • Gadwall *Anas strepera strepera* • Northern shoveler *Anas clypeata*. Species/populations identified subsequent to designation for possible future consideration under criterion 6, species with peak counts in winter: • Pink-footed goose *Anser brachyrhynchus* • Greylag goose *Anser anser anser*
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	Pressures on the site include modification of cultivation practices, grazing, changes in land use such as annual and perennial non-timber crops, forest plantation, pollution to groundwater, invasive species and changes in abiotic conditions. Additional pressures include those to wintering birds, which are vulnerable to disturbance, especially from recreational activities such as boating. Those that pertain to the Proposed Scheme are: pollution to groundwater, invasive species and human distrubance to the bird species.

European Site conservation objectives – where these are readily available	The conservation objectives are to ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Birds and Habitats Directives, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features. • The structure and function of the habitats of the qualifying features. • The supporting processes on which the habitats of the qualifying features rely. • The population of each of the qualifying features. • The distribution of the qualifying features within the site.

Assessment criteria

Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.

Within the scope of the proposed works we have scoped out all the vulnerabilities except the following: water pollution, siltation of waterbodies, changes in water levels, hydrological changes, human disturbance.

Minimising disturbance caused by human activity (Noise)

The works will create noise during the construction activities and potential for increased noise during operation.

Hydrological Changes

Road design may affect natural flow pathways which may induce hydrological changes of local waterbodies connected to the Proposed Scheme.

Water Pollution/Siltation of Waterbodies

It is considered that pollution through spillages may have a negative effect on the water quality thus impacting the designated sites.

The machinery used during the works require fuel and chemicals to perform the tasks and this may lead to accidental spillages.

Earthworks during construction may lead to siltation of waterbodies.

Air Quality

Effects from increases in air pollution due to increased traffic volume and/or traffic flow during operation may have an impact on the Ramsar site features.

Initial assessment

The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:

Reduction of habitat area	There is to be no reduction in habitat area within the Ramsar site boundary.

Disturbance to key features

Noise and Vibration Disturbance

An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results and it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone.

Identified receptors of concern in the noise assessment detail in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation.

Appendix B (potential effects) gives further information regarding the noise and vibration modelling of the Proposed Scheme.

Pink-footed geese were recorded as flying over the site during October 2017, and February and November 2019 but they were not recorded as using the arable fields in the Proposed Scheme.

	Water Pollution During construction, standard construction best practice methods for pollution prevention and water management will be implemented as part of the Environmental Management Plan (EMP (**TR010040/APP/7.7**)). Guidance on best practice in relation to pollution prevention and water management is set out in CIRIA guidelines (Charles and Edward, 2015; Gaba *et al.* 2017; Murnane *et al*., 2006) and the Environment Agency's approach to groundwater protection (Environment Agency, 2017a) and groundwater protection guides (Environment Agency, 2017b). Monitoring of local non-designated watercourses, drainage ditches, and groundwaters at risk from pollution will be carried out prior to and during the construction phase. In addition, a temporary surface water drainage strategy shall be incorporated into the EMP (**TR010040/APP/7.7**). This is to prevent increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading. During operation, it is intended that the Proposed Scheme would utilise the existing drainage network where applicable. On the new carriageways the road drainage network would include standard design features such as filter drains carrier drains, and kerb and gullies. Drainage channels and combined kerb drains will be used where continuous drainage is required in flatter gradients. These will lead to an infiltration basin, infiltration trenches or soakaways. With the best practice measures, EMP (**TR010040/APP/7.7**), monitoring and Drainage Strategy (ES Appendix 13.2 (**TR010040/APP/6.2**)) in place, it is considered that **no likely significant effects** will occur on the Ramsar or the qualifying features during operation. Appendix B (potential effects) gives further information regarding the road drainage and water environment pertaining to the Proposed Scheme. Air Pollution As construction activities are programmed to last less than two years it is unlikely there will be a significant long-lasting effect on air quality or affect the UK's ability to comply with the Air Quality Directive. In addition, with the recommendation of standard construction best practice c in place, the impact of construction dust is considered highly unlikely to trigger a significant air quality effect as stated in the ES Chapter 5 (Air Quality (**TR010040/APP/6.1**) Therefore, it is considered that any changes in air quality during construction will impose no likely significant effects on the qualifying interests of the Ramsar during construction. During operation, the total nitrogen deposition rate is above the lowest critical load range of eight for all three scenarios, however the change in deposition resulting from the Proposed Scheme is less than 1% of the lowest critical load value. The highest change as a percentage of the lower critical load value is 0.7%. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on the Ramsar or the qualifying features during operation. Appendix B (potential effects) gives further information regarding air quality modelling pertaining to the Proposed Scheme. Habitat loss Although the arable fields are likely to provide a food source during the winter for pink-footed goose and graylag goose, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the Ramsar and that these species do not use the site. As pink-footed geese were not found to be utilising the site, it is considered that there is an unlikely risk of mortality through vehicle collisions during operation. Greylag goose was not found in the vicinity of the site during the overwintering and breeding bird surveys. Bewick's swan was not recorded in the study area during the overwintering surveys in 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. Although the arable fields are likely to provide a food source during the winter, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the Ramsar. No likely significant effect due to lack of suitable habitat to support otter and no otter signs recorded during 2017 surveys. Spread of INNS One INNS was found on site which is Canadian pondweed, found during the Habitat Suitability Index surveys for great crested newt carried out in May 2020. This stand lies outside of the boundary of the Proposed Scheme and therefore is not due to be disturbed by construction works. In addition, none of the qualifying habitats of the Broadland Ramsar, not the fen orchid was found over the study area during the surveys that were undertaken since 2017. There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects.
Habitat or species fragmentation	There is to be no habitat loss within the Ramsar boundary. No Likely Significant Effect
Reduction in species density	Pink-footed geese were recorded flying over the site during the wintering bird surveys of October 2017, and February and November 2019. Noise modelling demonstrates that it is highly unlikely that any noise disturbance will be of a magnitude to result in a reduction in the species density or pink-footed goose using the Ramsar. A baseline

	noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results. A construction noise assessment has been undertaken. It is concluded that, with the installation of standard construction best practice measures significant construction noise effects are not predicted. During the surveys undertaken in December 2017, 120 pink-footed geese were recorded on site, however as this species is listed as "species/populations identified subsequent to designation for possible future consideration under criterion 6, species with peak counts in winter" they are considered not yet qualified for the Ramsar citation. No Likely Significant Effect
Changes in key indicators of conservation value (water quality, etc)	No Likely Significant Effect
Climate change	An assessment was undertaken which considered the Proposed Scheme's effect on climate (i.e. increases in carbon emissions) as well as the potential vulnerability of the Proposed Scheme to climate change. The construction, operation and use of the Proposed Scheme is predicted to increase carbon emissions by approximately 159,102 tonnes carbon dioxide equivalent (tCO_2e) over the appraisal period of 60 years (up to 2085). As per DMRB guidance, Proposed Scheme carbon emissions have been compared with the Government's published UK carbon budgets. These budgets currently account for UK emissions to 2032, representing 31% of the Proposed Scheme appraisal period. The remaining increase in emissions anticipated during the appraisal period from 2032 to 2085 have no carbon budget for comparison, therefore a definitive assessment of materiality is not possible. The vulnerability of Proposed Scheme assets to projected changes in climate during operation has been assessed, and the Proposed Scheme has been deemed resilient. Therefore, no significant effects as a result of climate change are anticipated.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	There will be no impacts on Broadland Ramsar through the interference with the key relationships which define the structure of the site.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	As there will be no reduction in the habitat within the Ramsar it has been concluded that there will be No Likely Significant Effect
Disturbance to key species	No qualifying species of the Ramsar will be impacted and therefore No likely Significant Effect is anticipated.
Habitat or species fragmentation	No habitat or species fragmentation will occur as part of the works and therefore it has been concluded there will be no Likely Significant Effect
Loss	There will be no habitat loss from the proposed works and therefore it was concluded there will be No Likely Significant Effect.
Fragmentation	There will be no fragmentation across the site from the proposed works and therefore it is concluded that there will be No Likely Significant Effect.
Disruption	No Likely Significant Effect
Disturbance	No Likely Significant Effect
Change to key elements of the site (e.g. water	No Likely Significant Effect

quality, hydrological regime etc)	
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
The impacts upon the key habitat and species features from both noise disturbance, pollution and air quality and lighting have been assessed in detail. Evidence from both noise and air quality modelling and the surveys undertaken on site since 2017 in combination with strict DMRB stated guidance on drainage and air quality assessments have concluded that there will be No Likely Significant Effect on Ramsar features both during construction and operation.	
Outcome of screening stage (delete as appropriate).	**No Likely Significant Effect**
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attached relevant correspondence).	Natural England (NE) have been consulted regarding this HRA report and confirmed that NE are satisfied with the conclusions that there will be no likely significant effects upon Broadland Ramsar as a result of the Proposed Scheme.

Paston Great Barn SAC

Table A.4 Paston Great Barn Screening Matrix

Project:	A47 Blofield to North Burlingham Dualling	
European site under consideration	Paston Great Barn	
Date:	**Author (name/organisation):**	**Verified (Name/Organisation):**
November 2020	Ishbel Campbell, Sweco	Keith Ross, Sweco
Description of project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of:		
• Size and scale (road type and probable traffic volume)	• The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east. • Whilst around half of the A47 is already dual carriageway, the Blofield to North Burlingham section is not, with studies having identified that the single carriageway section of the road no longer meets the needs of its users. • Traffic volume is anticipated to increase over the lifespan of the road. This is considered in detail in the Transport Assessment (**TR010040/APP/7.3**). • The Development Consent Order (DCO) boundary is provided in Appendix D (Figure 1). • The Proposed Scheme is categorised as a Nationally Significant Infrastructure Project and therefore requires DCO.	
• Land-take	The DCO boundary is provided in Appendix D (Figure 1). No land-take is required in the SAC. The scheme land-take is currently unknown as designs are still being finalised.	

• Distance from the European Site or key features of the site (from edge of the project assessment corridor)	Approximately 24.5km to the proposed works
• Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	Not applicable as no land-take from Paston Great Barn is required.
• Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	Construction: Nitrogen dioxide from diesel-powered plant during construction. Proposed works machinery will be diesel / petrol powered, and on-site generators will also be required. Potential for spills during refuelling and machine servicing. Air quality modelling shows that during construction, there is no anticipated change in air quality of the SAC. Operation: Ongoing emissions from vehicles usage of the road (no increase in vehicle emissions concluded from air quality modelling). Air quality modelling shows that in operation, there is no anticipated change in air quality of the SAC.
• Excavation requirements (e.g. impacts of local hydrogeology)	All excavations are located in the vicinity of the new and existing roads. Excavations will not be deep enough to impact local hydrogeology. All excavated material will be stored in a safe location to prevent rainwater leaching silts into the waterbodies.
• Transportation requirements	Machinery will be transported to and from the site, this will be standard construction equipment of excavators, trucks etc.
• Duration of construction, operation, etc.	Construction is likely to commence in the summer months of 2022 and occur for the duration of 22 months.
• Other.	N/A
Description of avoidance and/or mitigation measures *Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:*	
• Nature of proposals	No mitigation measures included.
• Location	
• Evidence for effectiveness	
• Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	
Characteristics of European Site(s) **A brief description of the European Site should be produced, including information on:**	
Name of European Site and its EU code	Paston Great Barn SAC – Special Area of Conservation (Ref No. UK0030235)
Location and distance of the European Site from the proposed works	Paston Great Barn SAC – 24.5km from the proposed works
European Site size	Paston Great Barn SAC – 0.95ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	Paston Great Barn SAC – maternity roost of barbastelle bats (refer to Section 2.6)

Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	The following pressures are those which pose a threat to the FCS of the qualifying feature of the SAC: • Change to site conditions • Wildfire and arson • Offsite habitat availability and management • Public access and human disturbance • Predation. Those that pertain to the Proposed Scheme are: • Change to site conditions • Offsite habitat availability and management • Human disturbance
European Site conservation objectives – where these are readily available	Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the favourable conservation status (FCS) of its qualifying features, by maintaining or restoring: • The extent and distribution of the habitats of qualifying species • The structure and function of the habitats of qualifying species • The supporting processes on which the habitats of qualifying species rely • The populations of qualifying species • The distribution of qualifying species within the site
Assessment criteria **Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.**	
Within the scope of the proposed works we have scoped out all the vulnerabilities except the following: offsite habitat availability and management, human disturbance. <u>Minimising disturbance caused by human activity (Noise)</u> The works will create noise during the construction activities and potential for increased noise during operation. <u>Minimising disturbance caused by human activity (Mortality)</u> The works will increase volume of traffic thereby increasing the risk of mortality of any barbastelles on site. <u>Minimising loss of habitat availability</u> The works will sever existing commuting routes across the road due to road widening. <u>Air Quality</u> Effects from increases in air pollution due to increased traffic volume and/or traffic flow during operation may have an impact on the SAC site features.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	
Reduction of habitat area	There is to be no reduction in habitat area within the SAC itself. Vegetation clearance will be required for construction however this is restricted to within 15m of the existing road and the Red Line Boundary. Vegetation suitable to support barbastelle bats commuting across the existing road is being removed.
Disturbance to key features	
<u>Noise and Vibration Disturbance</u> An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results and it is considered that **no likely significant effects** will occur on	

the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone.

Identified receptors of concern in the noise assessment detail in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation.

Appendix B (potential effects) gives further information regarding the noise and vibration modelling pertaining to the Proposed Scheme.

As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on barbastelle bats.

Lighting

Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared as part of standard construction best practice. In addition, the increase in night lighting over the Proposed Scheme is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing significant light at night. Therefore, it is considered that night lighting for the scheme will impose no likely significant effects will occur on the SAC.

During operation, directional lighting is proposed to be at nine locations from the Norwich Road junction, at ten locations from the Wood Lane junction, and at three A47 crossings. Whilst the immediate area around the road will have a significant increase in night lighting, it is considered that this increase in lighting is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing existing significant levels of light at night. Therefore, it is considered that night lighting for the Proposed Scheme will impose no likely significant effects will occur on barbastelle bats.

Mortality

Research by Zeal et al., (2012) included radiotracking surveys of barbastelle bats. The conclusion of the survey results states that in Devon, UK, non-breeding barbastelle bats travel up to a maximum of 20.4km from their roosting sites, whilst breeding bats (pregnant and lactating) travel a maximum of 8.7km from their roosts. In addition, whilst the Yare Valley has suitable foraging grounds for this species, in the form of riverine woodland, it is unlikely that bats from Paston Great Barn SAC will travel to this area. This is because the bats are more likely to forage in the Broads SAC, which lies 11.8km at its nearest point from Paston SAC. The riverine woodland habitat within the Broads SAC lies approximately 20.1km from Paston SAC. In addition, it is likely that the bats from Paston Great Barn SAC will also hibernate at this site and therefore the bats will have winter foraging grounds that are close to the SAC, when winter temperatures a mild enough to allow for winter foraging.

Surveys undertaken as part of the Norwich Western Link Road (NWLR) and the Norwich Northern Distributor Road (NNDR) found bat roosts for barbastelle bats to be present in the Hall Hill and Broadway woodlands, and a colony in the Morton area to the west of Norwich. The Yare Valley is a foraging ground which lies approximately 2.5km to the south west of the site. Therefore, it is more likely that these barbastelle bats would be originating from these roosts rather than from Paston Great Barn SAC.

Therefore, the Proposed Scheme is predicted to have **no likely significant effects** upon the barbastelle bats of Paston Great Barn SAC.

Air quality

Air quality modelling has been undertaken using the approach outlined in LA 105, using the Interim HA Long Term Gap Analysis Calculator v1.1, as presented in ES Chapter 5 (Air Quality (**TR010040/APP/6.1**). Although a slight deterioration in air quality at 121 receptors has been predicted, 54 receptors are predicted to experience an improvement in annual mean NO_2 concentrations, and 4 receptors will experience no change as a result of the Proposed Scheme. The magnitude of change was assessed as small or imperceptible, resulting in no significant effect being predicted in EIA terms. There are no receptors expected to exceed the annual mean NO_2 AQO in the opening year scenarios, all modelled receptors have predicted annual mean NO_2 concentrations well below the objective. In accordance with LA 105, no significant effects on human health or ecological receptors have been identified as a result of the operation of the Proposed Scheme. Furthermore, the operation of the Proposed Scheme is not predicted to affect compliance with the European Union (EU) Directive on ambient air quality. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on SAC during operation.

In addition, none of the likely foraging areas for barbastelle bats are located where there is a direct hydrological link between the proposed scheme and these habitats and therefore it is likely that there will be no likely significant effects of ground water pollution upon this species.

Appendix B (potential effects) gives further information regarding air quality modelling pertaining to the Proposed Scheme.

Habitat fragmentation

The surveys undertaken in July and August 2020 recorded barbastelle bats crossing the A47 at Crossing Point 2 on just two occasions. Barbastelle bats have been found commuting across the existing A47 to foraging grounds over agricultural areas in the vicinity of the A47. However, given the extent of available suitable habitat between the SAC and the site, it is considered likely that this species does not frequent the area and the above effect pathways will not have a significant effect on the population within the SAC. There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects.	
Habitat or species fragmentation	There is to be no habitat loss within the SAC boundary. Vegetation clearance will be minimal, limited only to only within the red line boundary. There will be no large-scale vegetation clearance which will result in no habitat or species fragmentation. However, habitat fragmentation at the existing crossing points of barbastelle bats is likely to affect their commuting routes.
Reduction in species density	No Likely Significant Effect
Changes in key indicators of conservation value (water quality, etc)	No Likely Significant Effect
Climate change	An assessment was undertaken which considered the Proposed Scheme's effect on climate (i.e. increases in carbon emissions) as well as the potential vulnerability of the Proposed Scheme to climate change. The construction, operation and use of the Proposed Scheme is predicted to increase carbon emissions by approximately 159,102 tonnes carbon dioxide equivalent (tCO_2e) over the appraisal period of 60 years (up to 2085). As per DMRB guidance, Proposed Scheme carbon emissions have been compared with the Government's published UK carbon budgets. These budgets currently account for UK emissions to 2032, representing 31% of the Proposed Scheme appraisal period. The remaining increase in emissions anticipated during the appraisal period from 2032 to 2085 have no carbon budget for comparison, therefore a definitive assessment of materiality is not possible. The vulnerability of Proposed Scheme assets to projected changes in climate during operation has been assessed, and the Proposed Scheme has been deemed resilient. Therefore, no significant effects as a result of climate change are anticipated.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	There will be no impacts on Paston Great Barn SAC through the interference with the key relationships which define the structure of the site.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	As there will be no reduction in the habitat within the SAC it has been concluded that there will be No Likely Significant Effect
Disturbance to key species	No Likely Significant Effect.
Habitat or species fragmentation	No habitat or species fragmentation will occur as part of the works and therefore it has been concluded there will be no Likely Significant Effect
Loss	There will be no habitat loss from the proposed works and therefore it was concluded there will be No Likely Significant Effect.
Fragmentation	There will be no fragmentation across the site from the proposed works and therefore it is concluded that there will be No Likely Significant Effect.
Disruption	No Likely Significant Effect

Disturbance	No Likely Significant Effect
Change to key elements of the site (e.g. water quality, hydrological regime etc)	No Likely Significant Effect
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
The impacts upon the key habitat and species features from both noise disturbance, pollution and air quality and lighting have been assessed in detail. Evidence from both noise and air quality modelling and the surveys undertaken on site since 2017 in combination with strict DMRB stated guidance on drainage and air quality assessments have concluded that there will be No Likely Significant Effect on SAC features both during construction and operation.	
Outcome of screening stage (delete as appropriate).	**No Likely Significant Effect**
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attached relevant correspondence).	Natural England (NE) have been consulted regarding this HRA report and confirmed that NE are satisfied with the conclusions that there will be no likely significant effects upon Paston Great Barn SAC as a result of the Proposed Scheme.

Breydon Water SPA

Table A.5 Breydon Water SPA Screening Matrix

Project:	A47 Blofield to North Burlingham Dualling	
European site under consideration	Breydon Water SPA	
Date:	**Author (name/organisation):**	**Verified (Name/Organisation):**
November 2020	Ishbel Campbell, Sweco	Keith Ross, Sweco
Description of project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of:		
• Size and scale (road type and probable traffic volume)	• The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east. • Whilst around half of the A47 is already dual carriageway, the Blofield to North Burlingham section is not, with studies having identified that the single carriageway section of the road no longer meets the needs of its users. • Traffic volume is anticipated to increase over the lifespan of the road. This is considered in detail in the Transport Assessment (**TR010040/APP/7.3**). • The Development Consent Order (DCO) boundary is provided in Appendix D (Figure 1). • The Proposed Scheme is categorised as a Nationally Significant Infrastructure Project and therefore requires DCO.	
• Land-take	The DCO boundary is provided in Appendix D (Figure 1). No land-take is required in the SAC. The scheme land-take is currently unknown as designs are still being finalised.	

• Distance from the European Site or key features of the site (from edge of the project assessment corridor)	Approximately 6.9km to the proposed works
• Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	Not applicable as no land-take from Breydon Water SPA is required.
• Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	Construction: Nitrogen dioxide from diesel-powered plant during construction. Proposed works machinery will be diesel / petrol powered, and on-site generators will also be required. Potential for spills during refuelling and machine servicing. Air quality modelling shows that during construction, there is no anticipated change in air quality of the SPA. Operation: Ongoing emissions from vehicles usage of the road (no increase in vehicle emissions concluded from air quality modelling). Air quality modelling shows that in operation, there is no LSE of increase in air quality of the SPA.
• Excavation requirements (e.g. impacts of local hydrogeology)	All excavations are located in the vicinity of the new and existing roads. Excavations will not be deep enough to impact local hydrogeology. All excavated material will be stored in a safe location to prevent rainwater leaching silts into the waterbodies.
• Transportation requirements	Machinery will be transported to and from the site, this will be standard construction equipment of excavators, trucks etc..
• Duration of construction, operation, etc.	Construction is likely to commence in the summer months of 2022 and occur for the duration of 22 months.
• Other.	N/A
Description of avoidance and/or mitigation measures *Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:*	
• Nature of proposals	No mitigation measures included.
• Location	
• Evidence for effectiveness	
• Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	
Characteristics of European Site(s) **A brief description of the European Site should be produced, including information on:**	
Name of European Site and its EU code	Breydon Water SPA – Special Protected Area (Ref No. UK9009181)
Location and distance of the European Site from the proposed works	Breydon Water SPA – 6.9km from the proposed works
European Site size	Breydon Water SPA – approximately 493ha

Key features of the European Site including the primary reasons for selection and any other qualifying interests	Breydon Water SPA During the breeding season the area regularly supports: • Common tern *Sterna hirundo* Over winter the site regularly supports: • Bewick's swan *Cygnus columbianus bewickii* • Golden plover *Pluvialis apricaria* • Pied avocet *Recurvirostra avosetta* • Ruff *Philomachus pugnax* • Lapwing *Vanellus vanellus* • Internationally important assemblage of waterfowl
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	The site is vulnerable to changes in drainage, drought and poor water management as well as disturbance from recreational activities.
European Site conservation objectives – where these are readily available	The conservation objectives are to ensure the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features. • The structure and function of the habitats of the qualifying features. • The supporting processes on which the habitats of the qualifying features rely. • The population of each of the qualifying features. • The distribution of the qualifying features within the site
Assessment criteria **Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.**	
Within the scope of the proposed works we have scoped out all the vulnerabilities except the following: water pollution, changes in water levels, hydrological changes, human disturbanc, spread of invasive non-native species. <u>Minimising disturbance caused by human activity (Noise)</u> The works will create noise during the construction activities and potential for increased noise during operation. <u>Hydrological Changes</u> Road design may affect natural flow pathways which may induce hydrological changes of local waterbodies connected to the Proposed Scheme. <u>Water Pollution</u> It is considered that pollution through spillages may have a negative effect on the water quality thus impacting the designated sites. The machinery used during the works require fuel and chemicals to perform the tasks and this may lead to accidental spillages. <u>Air Quality</u> Effects from increases in air pollution due to increased traffic volume and/or traffic flow during operation may have an impact on the SPA site features. <u>Minimising disturbance caused by human activity (Mortality)</u> The works will increase volume of traffic thereby increasing the risk of mortality of any barbastelles on site. <u>Minimising loss of habitat availability</u> The works will sever existing commuting routes across the road due to road widening.	
Initial assessment The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	

Reduction of habitat area	There is to be no reduction in habitat area within the SPA site boundary.
Disturbance to key features	
Noise and Vibration Disturbance An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results and it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone. Identified receptors of concern in the noise assessment detail in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation. Appendix B (potential effects) gives further information regarding the potential effects of noise and vibration upon the designated sites. The Proposed Scheme lies approximately 8km north west of Breydon Water SPA, however, the habitats around the A47 are suitable for foraging lapwing and golden plover. There is a possibility that the birds identified during the surveys may be part of the Breydon Water populations. The overwintering bird surveys in 2017 identified large numbers of lapwing and small numbers of golden plover in the study area. Lapwing were found in large numbers around the fields to the north and south of the A47 in January, with smaller numbers found during February and March. These were generally found in the arable fields. Golden plover were identified in the February and March surveys and were also generally found in the arable fields It is considered that the timescale proposed from the programme of works is suitable to reduce general disturbance to species which have been recorded in the area. As works will only last a duration of 22 months with the more disturbing activities limited to summer months, only two months (March & September) of the wintering bird season has the potential to be affected and there is no land loss of suitable foraging or roosting habitat. Lighting Disturbance Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared as part of standard construction best practice. In addition, the increase in night lighting over the Proposed Scheme is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing significant light at night. Therefore, it is considered that night lighting for the scheme will impose no likely significant effects will occur on the SPA or the qualifying features as the species of migratory bird which are cited on the SPA designation are not nocturnal species. During operation, directional lighting is proposed to be at nine locations from the Norwich Road junction, at ten locations from the Wood Lane junction, and at three A47 crossings. Whilst the immediate area around the road will have a significant increase in night lighting, it is considered that this increase in lighting is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing existing significant levels of light at night. Therefore, it is considered that night lighting for the Proposed Scheme will impose no likely significant effects will occur on key features of the SPA. Air Pollution As construction activities are programmed to last less than two years it is unlikely there will be a significant long-lasting effect on air quality or affect the UK's ability to comply with the Air Quality Directive. In addition, with the recommendation of standard construction best practice c in place, the impact of construction dust is considered highly unlikely to trigger a significant air quality effect as stated in the ES Chapter 5 (Air Quality (**TR010040/APP/6.1**). Therefore, it is considered that any changes in air quality during construction will impose no likely significant effects on the qualifying interests of the SPA during construction. During operation, the total nitrogen deposition rate is above the lowest critical load range of eight for all three scenarios, however the change in deposition resulting from the Proposed Scheme is less than 1% of the lowest critical load value. The highest change as a percentage of the lower critical load value is 0.7%. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on the SPA or the qualifying features during operation. Appendix B (potential effects) gives further information regarding air quality modelling pertaining to the Proposed Scheme. Appendix B gives the specific information regarding the air quality modelling upon Breydon Water SPA in operation.	

	Water Pollution During construction, standard construction best practice methods for pollution prevention and water management will be implemented as part of the Environmental Management Plan (EMP (**TR010040/APP/7.7**)). Guidance on best practice in relation to pollution prevention and water management is set out in CIRIA guidelines (Charles and Edward, 2015; Gaba *et al.* 2017; Murnane *et al*., 2006) and the Environment Agency's approach to groundwater protection (Environment Agency, 2017a) and groundwater protection guides (Environment Agency, 2017b). Monitoring of local non-designated watercourses, drainage ditches, and groundwaters at risk from pollution will be carried out prior to and during the construction phase. In addition, a temporary surface water drainage strategy shall be incorporated into the EMP (**TR010040/APP/7.7**). This is to prevent increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading. With the measures detailed above, it is considered that road drainage works will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying interests during construction. During operation, as part of the design of the road are to be maintained during operation. In addition, it is intended that the Proposed Scheme would utilise the existing drainage network where applicable. On the new carriageways the road drainage network would include standard design features such as filter drains carrier drains, and kerb and gullies. Drainage channels and combined kerb drains will be used where continuous drainage is required in flatter gradients. These will lead to an infiltration basin, infiltration trenches or soakaways. With the best practice measures, EMP (**TR010040/APP/7.7**), monitoring and Drainage Strategy (ES Appendix 13.2 (**TR010040/APP/6.2**)) in place, it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation. Appendix B (potential effects) gives further information regarding the road drainage and water environment pertaining to the Proposed Scheme. Habitat loss The overwintering bird surveys in 2017 identified large numbers of lapwing and small numbers of golden plover in the study area. Lapwing were found in large numbers around the fields to the north and south of the A47 in January, with smaller numbers found during February and March. These were generally found in the arable fields. Golden plover were identified in the February and March surveys and were also generally found in the arable fields. Bewick's swan was not recorded in the study area during the overwintering surveys undertaken from 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. Although the arable fields are likely to provide a food source during the winter, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the SPA. The overwintering bird surveys in 2017 identified large numbers of lapwing and small numbers of golden plover in the study area. Lapwing were found in large numbers around the fields to the north and south of the A47 in January, with smaller numbers found during February and March. These were generally found in the arable fields. Golden plover were identified in the February and March surveys and were also generally found in the arable fields. The arable fields within the study area could provide a food source for Bewick's swan. However, this species was not recorded in the study area during the overwintering surveys in 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. Spread of INNS One INNS was found on site which is Canadian pondweed, found during the Habitat Suitability Index surveys for great crested newt carried out in May 2020. This stand lies outside of the boundary of the Proposed Scheme and therefore is not due to be disturbed by construction works. There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects.
Habitat or species fragmentation	There is to be no habitat loss within the SPA boundary.
Reduction in species density	It is unlikely that golden plover and lapwing would travel from the SPA as far as the Proposed Scheme to reach foraging grounds in the summer or winter. It is likely that these large numbers may find winter and summer grounds in The Broads SAC and Broadland SPA and Ramsar site rather than the land over the Proposed Scheme. Therefore, No Likely Significant Effects are predicted.
Changes in key indicators of conservation value (water quality, etc)	No Likely Significant Effect
Climate change	An assessment was undertaken which considered the Proposed Scheme's effect on climate (i.e. increases in carbon emissions) as well as the potential vulnerability of the Proposed Scheme to climate change. On a precautionary basis the impact on climate

	from Proposed Scheme emissions were assessed as significant primarily due to the lack of publication on the carbon budget post 2032. The vulnerability of Proposed Scheme assets to projected changes in climate during operation has been assessed, and the Proposed Scheme has been deemed resilient. Therefore, no significant effects as a result of climate change are anticipated.
Describe any likely impacts on the European Site as a whole in terms of:	
Interference with the key relationships that define the structure of the site	There will be no impacts on Broadland SPA through the interference with the key relationships which define the structure of the site.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	As there will be no reduction in the habitat within the SPA it has been concluded that there will be No Likely Significant Effect
Disturbance to key species	No Likely Significant Effect.
Habitat or species fragmentation	There is to be no habitat loss within the SPA boundary.
Loss	There will be no habitat loss from the proposed works and therefore it was concluded there will be No Likely Significant Effect.
Fragmentation	There will be no fragmentation across the site from the proposed works and therefore it is concluded that there will be No Likely Significant Effect.
Disruption	No Likely Significant Effect
Disturbance	No Likely Significant Effect
Change to key elements of the site (e.g. water quality, hydrological regime etc)	No Likely Significant Effect
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
The impacts upon the key habitat and species features from both noise disturbance, pollution and air quality and lighting have been assessed in detail. Evidence from both noise and air quality modelling and the surveys undertaken on site since 2017 in combination with strict DMRB stated guidance on drainage and air quality assessments have concluded that there will be No Likely Significant Effect on SPA features both during construction and operation.	
Outcome of screening stage (delete as appropriate).	**No Likely Significant Effect**
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attached relevant correspondence).	Natural England (NE) have been consulted regarding this HRA report and confirmed that NE are satisfied with the conclusions that there will be no likely significant effects upon Breydon Water SPA as a result of the Proposed Scheme.

Breydon Water Ramsar

Table A.6 Breydon Water Ramsar Screening Matrix

Project:	A47 Blofield to North Burlingham Dualling	
European site under consideration	Breydon Water Ramsar	
Date:	**Author (name/organisation):**	**Verified (Name/Organisation):**
November 2020	Ishbel Campbell, Sweco	Keith Ross, Sweco
Description of project Describe any likely direct, indirect or secondary impacts of the project (either alone or in combination with other plans or projects) on the European Site by virtue of:		
• Size and scale (road type and probable traffic volume)	• The Blofield to North Burlingham section of the A47 is located approximately nine kilometres to the east of Norwich. This 2.6km of single carriageway forms a part of the main arterial highway route connecting Norwich with Great Yarmouth to the east. • Whilst around half of the A47 is already dual carriageway, the Blofield to North Burlingham section is not, with studies having identified that the single carriageway section of the road no longer meets the needs of its users. • Traffic volume is anticipated to increase over the lifespan of the road. This is considered at in detail in the Transport Assessment (**TR010040/APP/7.3**). • The Development Consent Order (DCO) boundary is provided in Appendix D (Figure 1). • The Proposed Scheme is categorised as a Nationally Significant Infrastructure Project and therefore requires DCO.	
• Land-take	The DCO boundary is provided in Appendix D (Figure 1). No land-take is required in the SAC. The scheme land-take is currently unknown as designs are still being finalised.	
• Distance from the European Site or key features of the site (from edge of the project assessment corridor)	Approximately 6.9km to the proposed works	
• Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	Not applicable as no land-take from Breydon Water Ramsar is required.	
• Emissions (e.g. polluted surface water runoff – both soluble and insoluble pollutants, atmospheric pollution)	Construction: Nitrogen dioxide from diesel-powered plant during construction. Proposed works machinery will be diesel / petrol powered, and on-site generators will also be required. Potential for spills during refuelling and machine servicing. Air quality modelling shows that during construction, there is no anticipated change in air quality of the Ramsar. Operation: Ongoing emissions from vehicles usage of the road (no increase in vehicle emissions concluded from air quality modelling). Air quality modelling shows that in operation, there is no LSE of increase in air quality of the Ramsar.	
• Excavation requirements (e.g. impacts of local hydrogeology)	All excavations are located in the vicinity of the new and existing roads. Excavations will not be deep enough to impact local hydrogeology. All excavated material will be stored in a safe location to prevent rainwater leaching silts into the waterbodies.	

• Transportation requirements	Machinery will be transported to and from the site, this will be standard construction equipment of excavators, trucks etc..
• Duration of construction, operation, etc.	Construction is likely to commence in the summer months of 2022 and occur for the duration of 22 months.
• Other.	N/A
Description of avoidance and/or mitigation measures *Describe any assumed (plainly established and uncontroversial) mitigation measures, including information on:*	
• Nature of proposals	No mitigation measures included.
• Location	
• Evidence for effectiveness	
• Mechanism for delivery (legal conditions, restrictions or other legally enforceable obligations)	
Characteristics of European Site(s) **A brief description of the European Site should be produced, including information on:**	
Name of European Site and its EU code	Breydon Water Ramsar (Ref No. UK9009181)
Location and distance of the European Site from the proposed works	Breydon Water Ramsar – 6.9km from the proposed works
European Site size	Breydon Water Ramsar – approximately 493ha
Key features of the European Site including the primary reasons for selection and any other qualifying interests	Breydon Water Ramsar It qualifies under Ramsar criterion 6 by supporting species/populations occurring at levels of international importance. Species with peak counts in winter: • Bewick's swan Cygnus *columbianus bewickii* • Northern lapwing *Vanellus vanellus* Species/populations identified subsequent to designation for possible future consideration under criterion 6, with peak counts in winter: • Pink-footed goose *Anser brachyrhynchus* • Eurasion wigeon *Anas penelope* • Northern shoveler *Anas clypeata* • Golden plover *Pluvialis apricaria apricaria* • Black-tailed godwit *Limosa limosa islandica*
Vulnerability of the European Site – any information available from the standard data forms on potential effect pathways	The site is vulnerable to changes in drainage, drought and poor water management as well as disturbance from recreational activities.
European Site conservation objectives – where these are readily available	The conservation objectives are to ensure the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring: • The extent and distribution of the habitats of the qualifying features.

	• The structure and function of the habitats of the qualifying features. • The supporting processes on which the habitats of the qualifying features rely. • The population of each of the qualifying features. • The distribution of the qualifying features within the site.

Assessment criteria

Describe the individual elements of the project (either alone or in combination with other plans or projects) likely to give rise to impacts on the European Site.

Within the scope of the proposed works we have scoped out all the vulnerabilities except the following: water pollution, changes in water levels, hydrological changes, human disturbanc, spread of invasive non-native species.

Minimising disturbance caused by human activity (Noise)

The works will create noise during the construction activities and potential for increased noise during operation.

Hydrological Changes

Road design may affect natural flow pathways which may induce hydrological changes of local waterbodies connected to the Proposed Scheme.

Water Pollution

It is considered that pollution through spillages may have a negative effect on the water quality thus impacting the designated sites.

The machinery used during the works require fuel and chemicals to perform the tasks and this may lead to accidental spillages.

Air Quality

Effects from increases in air pollution due to increased traffic volume and/or traffic flow during operation may have an impact on the Ramsar site features.

Minimising disturbance caused by human activity (Mortality)

The works will increase volume of traffic thereby increasing the risk of mortality of any barbastelles on site.

Minimising loss of habitat availability

The works will sever existing commuting routes across the road due to road widening.

Initial assessment

The key characteristics of the site and the details of the European Site should be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:

Reduction of habitat area	There is to be no reduction in habitat area within the Ramsar site boundary. Vegetation clearance will be required for construction however this is restricted to within 15m of the existing road and the Red Line Boundary. No vegetation being removed is used by, or suitable to support, any of the key features of the Ramsar.

Disturbance to key features

Noise and Vibration

An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR01004/APP/6.1**)). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results and it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone.

Identified receptors of concern in the noise assessment detail in the ES Chapter 11 (Noise and Vibration (**TR01004/APP/6.1**)) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation.

Appendix B (potential effects) gives further information regarding the potential effects of noise and vibration upon the designated sites.

The overwintering bird surveys in 2017 identified large numbers of lapwing and small numbers of golden plover in the study area. Lapwing were found in large numbers around the fields to the north and south of the A47 in January, with smaller numbers found during February and March. These were generally found in the arable fields. Golden plover were identified in the February and March surveys and were also generally found in the arable fields. Pink-footed geese were recorded as flying over the site during October 2017, and February and November 2019 but they were not recorded as using the arable fields in the Proposed Scheme.

Lighting

Construction will take place mainly throughout the daytime, and night lighting will only take place in areas that have had vegetation cleared as part of standard construction best practice. In addition, the increase in night lighting over the Proposed Scheme is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing significant light at night. Therefore, it is considered that night lighting for the scheme will impose no likely significant effects will occur on the Ramsar site or the qualifying features.

During operation, directional lighting is proposed to be at nine locations from the Norwich Road junction, at ten locations from the Wood Lane junction, and at three A47 crossings. Whilst the immediate area around the road will have a significant increase in night lighting, it is considered that this increase in lighting is not considered to have any significant effects upon the international sites due to the presence of the villages of Blofield, Brundall and Acle providing existing significant levels of light at night. Therefore, it is considered that night lighting for the scheme will impose no likely significant effects will occur on key features of the Ramsar.

Air Pollution

As construction activities are programmed to last less than two years it is unlikely there will be a significant long-lasting effect on air quality or affect the UK's ability to comply with the Air Quality Directive. In addition, with the recommendation of standard construction best practice c in place, the impact of construction dust is considered highly unlikely to trigger a significant air quality effect as stated in the ES Chapter 5 (Air Quality (**TR01004/APP/6.1**)). Therefore, it is considered that any changes in air quality during construction will impose no likely significant effects on the qualifying interests of the Ramsar during construction.

During operation, the total nitrogen deposition rate is above the lowest critical load range of eight for all three scenarios, however the change in deposition resulting from the Proposed Scheme is less than 1% of the lowest critical load value. The highest change as a percentage of the lower critical load value is 0.7%. The assessment has therefore concluded that there will be **no significant air quality effects** as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on the Ramsar or the qualifying features during operation.

Appendix B (potential effects) gives further information regarding air quality modelling pertaining to the Proposed Scheme.

Appendix B gives the specific information regarding the air quality modelling upon Breydon Water Ramsar in operation.

Water Pollution

During construction, standard construction best practice methods for pollution prevention and water management will be implemented as part of the Environmental Management Plan (EMP (**TR010040/APP/7.7**)). Guidance on best practice in relation to pollution prevention and water management is set out in CIRIA guidelines (Charles and Edward, 2015; Gaba *et al.* 2017; Murnane *et al*., 2006) and the Environment Agency's approach to groundwater protection (Environment Agency, 2017a) and groundwater protection guides (Environment Agency, 2017b). Monitoring of local non-designated watercourses, drainage ditches, and groundwaters at risk from pollution will be carried out prior to and during the construction phase. In addition, a temporary surface water drainage strategy shall be incorporated into the EMP (**TR010040/APP/7.7**). This is to prevent increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading.

During operation, it is intended that the Proposed Scheme would utilise the existing drainage network where applicable. On the new carriageways the road drainage network would include standard design features such as filter drains carrier drains, and kerb and gullies. Drainage channels and combined kerb drains will be used where continuous drainage is required in flatter gradients. These will lead to an infiltration basin, infiltration trenches or soakaways. With the best practice measures, EMP (**TR010040/APP/7.7**), monitoring and Drainage Strategy (ES Appendix 13.2 (**TR010040/APP/6.2**)) in place, it is considered that **no likely significant effects** will occur on the Ramsar or the qualifying features during operation.

Appendix B (potential effects) gives further information regarding the road drainage and water environment pertaining to the Proposed Scheme.

Habitat loss

The overwintering bird surveys in 2017 identified large numbers of lapwing and small numbers of golden plover in the study area. Lapwing were found in large numbers around the fields to the north and south of the A47 in January, with smaller numbers found during February and March. These were generally found in the arable fields. Golden plover were identified in the February and March surveys and were also generally found in the arable fields. Pink-footed geese were recorded as flying over the site during October 2017, and February and November 2019 but they were not recorded as using the arable fields in the Proposed Scheme.

The overwintering bird surveys in 2017 identified large numbers of lapwing and small numbers of golden plover in the study area. Lapwing were found in large numbers around the fields to the north and south of the A47 in January, with

smaller numbers found during February and March. These were generally found in the arable fields. Golden plover were identified in the February and March surveys and were also generally found in the arable fields. Pink-footed geese were recorded as flying over the site during October 2017, and February and November 2019 but they were not recorded as using the arable fields in the Proposed Scheme.

The arable fields within the study area could provide a food source for Bewick's swan and wigeon. However, none of these species was not recorded in the study area during the overwintering surveys in 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. The Proposed Scheme is near the existing A47 in an environment dominated by road noise, it is considered unlikely that wigeon and gadwall will be found in the vicinity of the road. Therefore, disturbance is not considered to have a likely significant effect upon these species.

Bewick's swan and wigeon were not recorded in the study area during the overwintering surveys undertaken from 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. Although the arable fields are likely to provide a food source during the winter, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the Ramsar.

Spread of INNS

One INNS was found on site which is Canadian pondweed, found during the Habitat Suitability Index surveys for great crested newt carried out in May 2020. This stand lies outside of the boundary of the Proposed Scheme and therefore is not due to be disturbed by construction works.

There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects.

Habitat or species fragmentation	There is to be no habitat loss within the Ramsar boundary.
Reduction in species density	The overwintering bird surveys in 2017 identified large numbers of lapwing and small numbers of golden plover in the study area. Lapwing were found in large numbers around the fields to the north and south of the A47 in January, with smaller numbers found during February and March. These were generally found in the arable fields. Golden plover were identified in the February and March surveys and were also generally found in the arable fields. Pink-footed geese were recorded as flying over the site during October 2017, and February and November 2019 but they were not recorded as using the arable fields in the Proposed Scheme. It is unlikely that these species would travel from the SPA as far as the Proposed Scheme to reach foraging grounds in the summer or winter. It is likely that these large numbers may find winter and summer grounds in The Broads SAC and Broadland SPA and Ramsar site rather than the land over the Proposed Scheme. Therefore, No Likely Significant Effects are predicted.
Changes in key indicators of conservation value (water quality, etc)	No Likely Significant Effect
Climate change	An assessment was undertaken which considered the Proposed Scheme's effect on climate (i.e. increases in carbon emissions) as well as the potential vulnerability of the Proposed Scheme to climate change. The construction, operation and use of the Proposed Scheme is predicted to increase carbon emissions by approximately 159,102 tonnes carbon dioxide equivalent (tCO_2e) over the appraisal period of 60 years (up to 2085). As per DMRB guidance, Proposed Scheme carbon emissions have been compared with the Government's published UK carbon budgets. These budgets currently account for UK emissions to 2032, representing 31% of the Proposed Scheme appraisal period. The remaining increase in emissions anticipated during the appraisal period from 2032 to 2085 have no carbon budget for comparison, therefore a definitive assessment of materiality is not possible. The vulnerability of Proposed Scheme assets to projected changes in climate during operation has been assessed, and the Proposed Scheme has been deemed resilient. Therefore, no significant effects as a result of climate change are anticipated.
Describe any likely impacts on the European Site as a whole in terms of:	

Interference with the key relationships that define the structure of the site	There will be no impacts on Breydon Water Ramsar through the interference with the key relationships which define the structure of the site.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	As there will be no reduction in the habitat within the Ramsar it has been concluded that there will be No Likely Significant Effect
Disturbance to key species	No Likely Significant Effect.
Habitat or species fragmentation	No habitat or species fragmentation will occur as part of the works and therefore it has been concluded there will be no Likely Significant Effect
Loss	There will be no habitat loss across the site due to the proposed works and therefore it is concluded that there will be No Likely Significant Effect.
Fragmentation	There will be no fragmentation across the site due to the proposed works and therefore it is concluded that there will be No Likely Significant Effect.
Disruption	No Likely Significant Effect
Disturbance	No Likely Significant Effect
Change to key elements of the site (e.g. water quality, hydrological regime etc)	No Likely Significant Effect
Describe from the above those elements of the project, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.	
The impacts upon the key habitat and species features from both noise disturbance, pollution and air quality and lighting have been assessed in detail. Evidence from both noise and air quality modelling and the surveys undertaken on site since 2017 in combination with strict DMRB stated guidance on drainage and air quality assessments have concluded that there will be No Likely Significant Effect on Ramsar features both during construction and operation.	
Outcome of screening stage (delete as appropriate).	**No Likely Significant Effect**
Are the appropriate statutory environmental bodies in agreement with this conclusion (delete as appropriate and attached relevant correspondence).	Natural England (NE) have been consulted regarding this HRA report and confirmed that NE are satisfied with the conclusions that there will be no likely significant effects upon Breydon Water Ramsar as a result of the Proposed Scheme.

Appendix B. Potential Effects

All potential effects have been split into either construction or operation effects for the purposes of this HRA report, whilst ES Chapter 8 (Biodiversity (**TR010040/APP/6.1**)) may highlight some of these potential effects as being permanent, as opposed to construction or operation effects.

Construction

Noise and Vibration

Identified receptors of concern in the noise assessment detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)) are those located within 30m of the construction works. With standard construction best practice, construction works are not due to reach a significant observed adverse effect level (SOAEL), and therefore these receptors are not expected to experience any significant effects due to construction noise and vibration.

A construction noise assessment has been undertaken of all receptors within 300m of the Proposed Scheme. It is concluded that, with the installation of standard construction best practice measures significant construction noise effects are not predicted on any of these receptors within 300m. The designated sites within the NSN network like approximately 2km from the Proposed Scheme. The proposed standard construction best practice measures include temporary noise barriers, and noise monitoring, and Section 61 prior consent applications where necessary.

For the construction traffic assessment, a study area shall be defined to include a 50m width from the kerb line of public roads with the potential for an increase in the baseline noise level of 1dB(A) or more as a result of the addition of construction traffic to existing traffic levels. Providing vehicle movements and routes are restricted as described in this chapter, increases in the baseline noise level due to the addition of construction related traffic are predicted to remain below 1dB(A). Therefore, a study area for the construction traffic assessment is considered unnecessary.

An assessment of construction vibration impacts has been undertaken and detailed in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)). It is concluded that, standard construction best practice measures in include early warning, pre-condition surveys, short work durations, and vibration monitoring, the Proposed Scheme is not predicted to give rise to any potential significant effects. A baseline noise survey was undertaken in June 2018 to gain an understanding of the existing noise climate within the vicinity of the Proposed Scheme. The findings of the survey have been reviewed against the noise modelling results and it is considered that **no likely significant effects** will

occur on the NSN network and Ramsar sites as they are approximately 2km away from the site and therefore outside of the noise assessment zone.

Road Drainage and Water Environment

During construction, standard construction best practice methods for pollution prevention and water management will be implemented as part of the Environmental Management Plan (EMP (**TR010040/APP/7.7**)). Guidance on best practice in relation to pollution prevention and water management is set out in CIRIA guidelines (Charles and Edward, 2015; Gaba *et al.* 2017; Murnane *et al*., 2006) and the Environment Agency's approach to groundwater protection (Environment Agency, 2017a) and groundwater protection guides (Environment Agency, 2017b). Monitoring of local non-designated watercourses, drainage ditches, and groundwaters at risk from pollution will be carried out prior to and during the construction phase. In addition, a temporary surface water drainage strategy shall be incorporated into the EMP. This is to prevent increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading.

Temporary drainage from the main construction compound would typically be collected within a ditch surrounding the compound and redirected to settlement ponds before being discharged to either a surface watercourse or ground. As discharge to a surface watercourse is not feasible, the temporary drainage is likely to discharge to ground. Infiltration features must be suitably designed taking into account the ground conditions.

A temporary surface water drainage strategy shall be incorporated into the EMP (**TR010040/APP/7.7**) to prevent increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading. Drainage will be constructed in the early stages of the Proposed Scheme. Increased flood risk and negative impacts on surface water receptors caused by an increase in hardstanding area and alteration of ground levels leading to an increase in the peak flow rate, volume or change in the direction of surface water runoff shall be managed by the implementation of a temporary surface water drainage strategy. No likely significant adverse effects are predicted during construction of the Proposed Scheme, subject to the standard construction best practice measures included in the EMP. Relevant sections of the EMP will be appended to this report once they have been produced. With the measures detailed above, it is considered that road drainage works will impose **no likely significant effects** will occur on the SPA or the qualifying interests during construction.

Results from the ground water assessment undertaken in the ES Chapter 13 (Road Drainage and Water Environment (**TR010040/APP/6.1**)) show that there

is the potential for mobilisation of sediment and contaminants from surface water runoff into drainage ditches and ponds from road construction activities, such as earthworks, construction dewatering, plant and vehicle washing. Construction activities, including the demobilisation of site compounds, increase the risk of a pollution incident from accidental spillages or leakage of fuels, oils, chemicals, wastewater, concrete or cement admixtures used.

The Proposed Scheme is due to sever a naturally occurring flow pathway during flood events. Therefore, to reinstate this natural flow pathway, potential flooding caused by extreme rainfall events shall be managed by the implementation of a construction-phase drainage system. This shall also include the construction of 'dry culverts' or cross drains to maintain natural flood flow pathways where they are intercepted by the Proposed Scheme. This will allow any surplus surface water to be redirected into infiltration strips and basins before going to ground. A temporary surface water drainage strategy shall be incorporated into the EMP (**TR010040/APP/7.7**) to prevent increased flood risk to people and property elsewhere, and to manage pollution risks most commonly associated with increased sediment loading. Drainage will be constructed in the early construction phases of the Proposed Scheme.

It is assumed the main construction compound would incorporate a closed drainage system that temporarily discharges to ground. Discharges to groundwater (or sewer and surface water) must only be made with the appropriate consents or permits in place.

The potential for impacts to occur as a result of contamination from accidental spillages should be minimised by the following measures:

- Appropriate storage of construction materials, including bunding of storage tanks, use of silt fencing and covering stockpiles.
- Spill kits should be located on sites near to ordinary watercourses and within the works compounds and staff should be trained in their use.
- Emergency response procedures included in the EMP (**TR010040/APP/7.7**) to handle any leakages or spillages of potentially contaminating substances.

No pollution pathways should be created between the construction sites, including material lay down areas, and ordinary watercourses. Measures shall be implemented to prevent surface water runoff containing suspended sediment reaching main rivers or ordinary watercourses through overland flow during rainfall events. This shall include an appropriate treatment train to prevent accidental spillages reaching groundwater, remove sediment and other contaminants as well as attenuating runoff. This shall be specified as part of a temporary surface water drainage strategy within the EMP (**TR010040/APP/7.7**).

Increased flood risk and negative impacts on surface water receptors caused by an increase in hardstanding area and alteration of ground levels leading to an increase in the peak flow rate, volume or change in the direction of surface water runoff shall be managed by the implementation of a temporary surface water drainage strategy.

No likely significant adverse effects are predicted during construction of the Proposed Scheme, subject to the standard construction best practice measures. This is noted in the Environmental Management Plan (DCO Document 7.7).

With the measures detailed above, it is considered that road drainage works will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying interests during construction.

Operation

Noise and Vibration

The operational study area for this assessment has been defined as the area within 600m of new road links or road links physically changed or bypassed by the project. This has been extended to include the area 50 metres either side of road links identified with a moderate or major noise change in the short-term or long-term. I.e. where the basic noise level changes show possible significant effects, as described in DMRB LA 111. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the SPA or the qualifying features during operation.

An analysis of other road links with potential to experience a short term basic noise level (BNL) change of more than 1.0dB(A) as a result of the project concluded that roads with a minor change in BNL (1.0-2.9dB) were a continuation of links within the above study area. DMRB LA 111 initial assessment of significance class minor magnitude of change as ‘not significant’, with no reasons for modifying this initial assessment at these links. As such, these road links were excluded from the modelled study area.

Identified receptors of concern in the noise assessment detail in the ES Chapter 11 (Noise and Vibration (**TR010040/APP/6.1**)) are those located within 600m of the construction works. As effects for operation of the road are not due exceed the SOAEL, from the first year of opening and into the long-term, it is considered that any changes in noise and vibration will impose **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation.

Air Quality

Of the three ecological transects modelled in the assessment, transect number 1 - Breydon Water (SPA, Ramsar) predicted annual mean NO_x concentrations greater than the annual mean NO_x objective of 30 µg/m^3 in the Baseline, Do-Minimum and Do-Something scenarios.

The ecological receptors closest to the edge of the designated sites exceeded the objective in transect 1.

Table B.7 details the results for the points within the transect which were closest to the road and edge of the designated sites, predicting the highest concentrations. Receptors beyond this point did not exceed the NO_x AQO of 30 µg/m^3 and have not been presented in Table B.7. The full set of results along all transects can be found in the ES Chapter 5 (Air Quality (**TR010040/APP/6.1**)).

The Proposed Scheme has predicted a slight increase in annual mean NO_x concentrations at the designated site. This is largely due to the designated site being located within close proximity to the A47 in Great Yarmouth. This road will experience a high level of traffic change (change in flows greater than 1,000) with the Proposed Scheme in place.

Table B.7: Ecological designated site transects results

Transect	Transect ID	Distance from road (m)	Annual mean NOx concentration (µg/m^3)			
			Base 2015	DM 2025	DS 2025	DS - DM
1 - Breydon Water SPA, Breydon Water Ramsar	Breydon_Water_01	10	**92.7**	**51.9**	**52.8**	0.9
	Breydon_Water_02	20	**64.7**	**37.6**	**38.1**	0.5
	Breydon_Water_03	30	**52.2**	**31.1**	**31.5**	0.4
	Breydon_Water_04	40	**45.5**	27.7	28.0	0.3
	Breydon_Water_05	50	**41.1**	25.5	25.8	0.3
	Breydon_Water_06	60	**38.0**	23.9	24.2	0.3

Note: Exceedances of the AQO have been highlighted in bold

5.1.17. As exceedances of the annual mean NO_x were observed in all three modelled scenarios for Transect IDs 1 to 3, a nitrogen deposition assessment was conducted to assess whether there was potential for a significant impact to be predicted.

5.1.18. The background nitrogen deposition rates (kg N/ha/yr) were sourced from the Air Pollution Information System (APIS) website. The APIS website was used to identify which feature of the Breydon Water SPA and Ramsar habitats were the most sensitive to nitrogen deposition. The species with the lowest critical load rate for the Breydon Water SPA was used as worst case in the assessment.

5.1.19. The most sensitive site feature for Breydon Water is the Sterna hirundo (common tern). The relevant nitrogen critical load class is the coastal stable dune grasslands – acid type which has the most sensitive critical load. A summary of the background and critical load values used in this assessment is presented in Table B.8.

Table B.8: Background nitrogen deposition rates and critical load values for *Sterna hirundo*

Site Feature	Nitrogen critical load class	Critical Load (kg N/ha/yr)	Average background nitrogen deposition rate (kg N/ha/yr)	Species sensitive to nitrogen deposition?
Sterna hirundo (common tern)	Coastal stable dune grasslands – acid type	8-10	14.3	Yes

The total receptor nitrogen deposition rate was compared against the critical load values of the most sensitive site feature for the designated habitat. This approach is consistent with LA 105. Results for the comparison against the critical load values are presented in Table B.9.

Table B.9: Comparison of total nitrogen deposition rates against the critical load

Transect receptor ID	Distance from road (m)	Total nitrogen deposition rate (kg N/ha/yr)				DM-DS as % of lower critical load
		Base 2015	DM 2025	DS 2025	DM-DS	
Breydon_Water_01	10	18.79	16.84	16.89	0.06	0.7
Breydon_Water_02	20	17.21	15.89	15.93	0.04	0.46
Breydon_Water_03	30	16.44	15.45	15.48	0.03	0.35

5.1.20. The total nitrogen deposition rate is above the lowest critical load range of eight for all three scenarios, however the change in deposition resulting from the Proposed Scheme is less than 1% of the lowest critical load value. The highest change as a percentage of the lower critical load value is 0.7%. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation.

Road Drainage and Water Environment

During operation, as part of the design of the road are to be maintained during operation. In addition, it is intended that the Proposed Scheme would utilise the existing drainage network where applicable. On the new carriageways the road drainage network would include standard design features such as filter drains carrier drains, and kerb and gullies. Drainage channels and combined kerb drains will be used where continuous drainage is required in flatter gradients. These will lead to an infiltration basin, infiltration trenches or soakaways. With the best practice measures, EMP (**TR010040/APP/7.7**), monitoring and Drainage Strategy (ES Appendix 13.2 (**TR010040/APP/6.2**) in place, it is considered that **no likely significant effects** will occur on the NSN network and Ramsar sites or their qualifying features during operation.

Appendix C. PINS Screening Matrices

Screening Matrices

Potential effects upon the designated sites which are considered in this assessment are provided below in Table C.1 to be in line with PINS Advice Note 10.

The European sites included within the screening assessment are:

- The Broads SAC
- Broadland SPA
- Broadland Ramsar site
- Paston Great Barn SAC
- Breydon Water SPA
- Breydon Water Ramsar site

Table C.1: Potential Effects upon the designated sites with reference to PINS Advice Note 10.

Designation	Effects in submission information	Presented in screening matrix as
The Broads SAC	Mortality of vegetation through pollution	Vegetation mortality - pollution
	Acidification of water column and substrate through sediment run-off and subsequent change in botanical communities	Change in botanical communities
	Mortality of vegetation through increase in disease from sediment run-off	Vegetation mortality - disease
Broadland SPA	Mortality through increased air or ground water pollution	Mortality - pollution
	Mortality through traffic collision	Mortality - collision
	Reducing foraging habitat can increase competition for resources and affect survival	Mortality – reduced food sources

Designation	Effects in submission information	Presented in screening matrix as
	Increased noise disturbance reducing breeding success	Reduced breeding success- Noise disturbance
Broadland Ramsar	Mortality through increased air or ground water pollution	Mortality - pollution
	Mortality through traffic collision	Mortality - collision
	Reducing foraging habitat can increase competition for resources and affect survival	Mortality – reduced food sources
	Increased noise disturbance reducing breeding success	Reduced breeding success- Noise disturbance
	Mortality of vegetation through pollution	Vegetation mortality - pollution
	Acidification of water column and substrate through sediment run-off and subsequent change in botanical communities	Change in botanical communities
	Mortality of vegetation through increase in disease from sediment run-off	Vegetation mortality - disease
Paston Great Barn SAC	Mortality through increased air or ground water pollution	Mortality - pollution
	Mortality through traffic collision	Mortality - collision
	Reducing foraging habitat can increase competition for resources and affect survival	Mortality – reduced food sources
	Increased noise disturbance reducing breeding success	Reduced breeding success - disturbance
Breydon Water SPA	Mortality through increased air or ground water pollution	Mortality - pollution
	Mortality through traffic collision	Mortality - collision
	Reducing foraging habitat can increase competition for resources and affect survival	Mortality – reduced food sources
	Increased noise disturbance reducing breeding success	Reduced breeding success- Noise disturbance
Breydon Water Ramsar	Mortality through increased air or ground water pollution	Mortality - pollution
	Mortality through traffic collision	Mortality - collision

Designation	Effects in submission information	Presented in screening matrix as
	Reducing foraging habitat can increase competition for resources and affect survival	Mortality – reduced food sources
	Increased noise disturbance reducing breeding success	Reduced breeding success- Noise disturbance

Evidence for, or against, likely significant effects on the European site(s) and its qualifying feature(s) is detailed within the footnotes to the screening matrices below.

Matrix Key:

- ✓ = Likely significant effect cannot be excluded
- ✕ = Likely significant effect can be excluded
- C = construction
- O = operation
- D =decommissioning
- n/a = where effects are not applicable

The assessment in line with PINS Advice Note 10 is given below in Table 6-8 to Table 6-13.

The Broads SAC

Table C.2: Screening matrix of the potential likely significant effects upon The Broads SAC.

Name of European Site and Designation: The Broads SAC												
EU Code: UK0013577												
Distance to NSIP: 2.08km												
European site features	**Likely effects of NSIP**											
Effect	Mortality - pollution			Mortality - disease			Acidification - Change in botanical communities			In-combination effects		
Stage of Development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Hard oligo-mesotrophic waters with benthic vegetation of Chara spp	✕a,b	✕ a,b	n/a	✕a,b	✕a,b	n/a	n/a	n/a	n/a	✕e	✕e	n/a
Natural eutrophic lakes with Magnopotamion or Hydrocharition-type vegetation	✕a,b	✕a,b	n/a	✕a,b	✕a,b	n/a	n/a	n/a	n/a	✕e	✕e	n/a
Transition mires and quaking bogs	✕a,b	✕a,b	n/a	✕a,b	✕a,b	n/a	n/a	n/a	n/a	✕e	✕e	n/a
Calcareous fens with Cladium mariscus and species of the Caricion davallianae	✕a,b	✕a,b	n/a	✕a,b	✕a,b	n/a	✕a,b	✕a,b	n/a	✕e	✕e	n/a
Alkaline fens	✕a,b	✕a,b	n/a	✕a,b	✕a,b	n/a	✕a,b	✕a,b	n/a	✕e	✕e	n/a

Alluvial forests with Alnus glutinosa and Fraxinus excelsior	✕a,b	✕a,b	n/a	✕a,b	✕a,b	n/a	n/a	n/a	n/a	✕e	✕e	n/a
Desmoulin's whorl snail	✕b,c	✕ b,c	n/a	✕ b,c	✕ b,c	n/a	n/a	n/a	n/a	✕e	✕e	n/a
Lesser whirlpool ramshorn snail	✕ b,c	✕ b,c	n/a	✕ b,c	✕ b,c	n/a	n/a	n/a	n/a	✕e	✕e	n/a
Otter	✕b,d	✕b,d	n/a	✕b,d	✕b,d	n/a	n/a	n/a	n/a	✕e	✕e	n/a

A

None of the qualifying habitats for the Broads SAC are located where there is a direct hydrological link between the Proposed Scheme and these qualifying habitats. The nearest point of the Broads SAC lies 2.08 km from the Proposed Scheme. No likely significant effect is expected as standard construction best practice measures will be employed during the construction phase. Any effluents will be attenuated appropriately as described in Section 4.1.

B

No habitats suitable to support qualifying features of the Broads SAC, and no qualifying features themselves were found within the respective study areas of the species from the Proposed Scheme during the surveys.

C

Neither species of lesser whirlpool ramshorn snails and Desmoulins whorl snails was found during the surveys. Therefore, both snail species has been screened out from further assessment as the Proposed Scheme does not affect any waterbodies that have suitable habitat for supporting this species therefore no effect pathways to populations of these species within the Broads SAC.

D

Otters are a qualifying feature for the Broads SAC and surveys were completed in February and April 2017. No signs of otter were recorded and there is a lack of suitable habitat and large watercourses that could be used by commuting or foraging otters within the study area and along the Proposed Scheme alignment. Therefore, due to the lack otter signs, and the lack of foraging and 'resting' areas across the site, otters are not considered a feature as part of the Proposed Scheme and will be screened out of further assessment accordingly.

E

There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects.

Broadland SPA

Table C.3: Screening matrix of the potential likely significant effects upon Broadland SPA.

Name of European Site and Designation: Broadland SPA															
EU Code: UK9009253															
Distance to NSIP: 2.08km															
European site features	**Likely effects of NSIP**														
Effect	Mortality - pollution			Mortality - collision			Mortality – reduced food sources/ loss of habitat			Reduced breeding success – noise disturbance			In-combination effects		
Stage of Development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*

Ruff Wigeon Gadwall	×a	×a	n/a	×	×a	n/a	×a	×a	n/a	×a	×a	n/a	×g	×g	n/a
Marsh harrier (breeding population)	×b	×b	n/a	×	×b	n/a	×b	×	n/a	×b	×b	n/a	×g	×g	n/a
Hen harrier	×c	×c	n/a	×	×c	n/a	×c	×	n/a	×c	×c	n/a	×g	×g	n/a
Shoveler	×d	×d	n/a	×d	×d	n/a	n/a	n/a	n/a	×d	×d	n/a	×g	×g	n/a
Great bittern (breeding population)	×e	×e	n/a	×e	×e	n/a	n/a	n/a	n/a	×e	×e	n/a	×g	×g	n/a
Bewick's swan Whooper swan	×f	×f	n/a	×f	×f	n/a	×f	×	n/a	×f	×f	n/a	×g	×g	n/a

A

For ruff, gadwall and wigeon, the loss of habitat will be minimal for junctions and access roads are not considered to have a likely significant effect. The scheme is near the existing A47 in an environment dominated by road noise, it is considered unlikely that the qualifying bird species will be found in the vicinity of the road. None of these species were recorded in the area during surveys.

B

Marsh harrier were observed foraging in the general vicinity of the route during ecology surveys in January 2019. One single marsh harrier was observed flying north over the site in May 2018. This was not considered to be breeding in the area. Although marsh harrier is not considered to breed on or near the site. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for these species.

C

Hen harrier were not recorded in the area during any surveys and they may not commonly use the habitats around the A47 given more suitable habitat within and closer to the SPA boundary. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for these species.

D

Shoveler were not recorded during the overwintering bird surveys and it is unlikely they would be found in the vicinity of the Proposed Scheme due to lack of suitable habitat. No likely significant effect is expected.

E

Bittern were not found on site during the breeding bird surveys. They have specific habitat requirements and are not likely to be found in the vicinity of these options. Suitable habitat for them is too far from the scheme for construction noise to be an issue.

F

Neither Bewick's swan nor whooper swan were recorded in the study area during the 2017, 2018 or 2019 overwintering bird surveys. Although the arable fields are likely to provide a food source during the winter, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the SPA. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for these species.

G

There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects.

Broadland Ramsar

Table C.4: Screening matrix of the potential likely significant effects upon Broadland Ramsar.

Name of European Site and Designation: Broadland Ramsar																		
EU Code: UK9009253																		
Distance to NSIP: 2.08km																		
European site features	**Likely effects of NSIP**																	
Effect	Mortality – pollution / disease			Mortality - collision			Mortality – competition for reduced food sources			Reduced breeding success – noise disturbance			Acidification - Change in botanical communities			In combination effects		
Stage of Development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Calcareous fens with *Cladium mariscus* and species of the *Caricion davallianae* (sedges)	×a	×a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	×a	×a	n/a	×i	×i	n/a
Alkaline Fens	×a	×a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	×a	×a	n/a	×i	×i	n/a
Alluvial forests with *Alnus glutinosa* (alder) and *Fraxinus excelsior* (ash).	×a	×a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	×a	×a	n/a	×i	×i	n/a
Desmoulin's whorl snail	×b	×b	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	×i	×i	n/a
Otter	×c	×c	n/a	×c	×c	n/a	×c	×c	n/a	×c	×c	n/a	n/a	n/a	n/a	×i	×i	n/a

Fen orchid	×a	×a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	n/a	×a	×a	n/a	×i	×i	n/a
Bewick's swan	×d	×d	n/a	×d	×d	n/a	×d	×d	n/a	×d	×d	n/a	n/a	n/a	n/a	×i	×i	n/a
Wigeon	×e	×e	n/a	×e	×e	n/a	×e	×e	n/a	×e	×e	n/a	n/a	n/a	n/a	×i	×i	n/a
Gadwall	×e	×e	n/a	×e	×e	n/a	×e	×e	n/a	×e	×e	n/a	n/a	n/a	n/a	×i	×i	n/a
Shoveler	×f	×f	n/a	×f	×f	n/a	×f	×f	n/a	×f	×f	n/a	n/a	n/a	n/a	×i	×i	n/a
Pink-footed goose	×h	×h	n/a	×h	×h	n/a	×g,h	×g,h	n/a	×h	×h	n/a	n/a	n/a	n/a	×i	×i	n/a
Greylag goose	×g	×g	n/a	×g	×g	n/a	×g	×g	n/a	×g	×g	n/a	n/a	n/a	n/a	×i	×i	n/a

A

None of the qualifying habitats for Broadland Ramsar are located where there is a direct hydrological link between the Proposed Scheme and these qualifying habitats. The nearest point of the Broadland Ramsar lies 2.08 km from the Proposed Scheme. No habitats suitable to support qualifying features of the Broadland Ramsar, and no qualifying features themselves were found within the respective study areas of the species from the Proposed Scheme during the surveys. No likely significant effect is expected as standard construction best practice measures will be employed during the construction phase. Any effluents will be attenuated appropriately as described in Section 4.1.

B

No Desmoulin's whorl snails were found during the surveys. Therefore, this species has been screened out from further assessment as the Proposed Scheme does not affect any waterbodies that have suitable habitat for supporting this species therefore no effect pathways to populations of these species within the Broadland Ramsar.

C

Otters are a qualifying feature for the Broads SAC and surveys were completed in February and April 2017. No signs of otter were recorded and there is a lack of suitable habitat and large watercourses that could be used by commuting or foraging otters within the study area and along the Proposed Scheme alignment. Therefore, due to the lack otter signs,

and the lack of foraging and 'resting' areas across the site, otters are not considered a feature as part of the Proposed Scheme and will be screened out of further assessment accordingly.

D

Although the arable fields are likely to provide a food source during the winter, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the SPA. Bewick's swan was not recorded in the study area during the overwintering surveys in 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species.

E

For gadwall and wigeon, neither of these species were found on site during the overwintering and breeding bird surveys. The scheme is near the existing A47 in an environment dominated by road noise and therefore it is considered unlikely that wigeon and gadwall will be found in the vicinity of the road. Loss of habitat will be minimal for junctions and access roads and not considered to have a likely significant effect.

F

Shoveler were not recorded during the overwintering bird surveys and it is unlikely they would be found in the vicinity of the Proposed Scheme due to lack of suitable habitat. No likely significant effect is expected.

G

For greylag goose and pink-footed goose it is considered unlikely that these species will forage around the study area. There is more suitable foraging habitat within and closer to the boundary of the SPA and that these species do not use the site. Greylag goose was not found in the vicinity of the site during the overwintering and breeding bird surveys

H

Pink-footed goose was recorded flying over the study area during the overwintering surveys in February 2019. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. As pink-footed geese were not found to be utilising the site, it is considered that there is an unlikely risk of mortality through vehicle collisions during operation.

I

There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects.

Paston Great Barn SAC

Table C.5: Screening matrix of the potential likely significant effects upon Paston Great Barn SAC.

Name of European Site and Designation: Paston Great Barn SAC															
EU Code: UK0030235															
Distance to NSIP: 24.5km															
European site features	**Likely effects of NSIP**														
Effect	Mortality - pollution			Mortality - collision			Mortality – reduced food sources			Reduced breeding success – noise disturbance			In-combination effects		
Stage of Development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Barbastelle bat	✕d	✕d	n/a	✕a-c	✕a-c	n/a	✕a	✕a	n/a	✕a-c	✕a-c	n/a	✕e	✕e	n/a

A

Research by Zeal et al., (2012) included radiotracking surveys of barbastelle bats. The conclusion of the survey results states that in Devon, UK, non-breeding barbastelle bats travel up to a maximum of 20.4km from their roosting sites, whilst breeding bats (pregnant and lactating) travel a maximum of 8.7km from their roosts. In addition, whilst the Yare Valley has suitable foraging grounds for this species, in the form of riverine woodland, it is unlikely that bats from Paston Great Barn SAC will travel to this area. This is because the bats are more likely to forage in the Broads SAC, which lies 11.8km at its nearest point from Paston SAC. The riverine woodland habitat within the Broads SAC lies approximately 20.1km from Paston SAC. In addition, it is likely that the bats from Paston Great Barn SAC will also hibernate at this site and therefore the bats will have winter foraging grounds that are close to the SAC, when winter temperatures a mild enough to allow for winter foraging.

B

The surveys undertaken in July and August 2020 recorded barbastelle bats crossing the A47 at Crossing Point 2 on just two occasions. Barbastelle bats have been found commuting across the existing A47 to foraging grounds over agricultural areas in the vicinity of the A47. However, given the extent of available suitable habitat between the SAC and the site, it is considered likely that this species does not frequent the area and the above effect pathways will not have a significant effect on the population within the SAC.

C

Surveys undertaken as part of the Norwich Western Link Road (NWLR) and the Norwich Northern Distributor Road (NNDR) found bat roosts for barbastelle bats to be present in the Hall Hill and Broadway woodlands, and a colony in the Morton area to the west of Norwich. The Yare Valley is a foraging ground which lies approximately 2.5km to the south west of the site. Therefore, it is more likely that these barbastelle bats would be originating from these roosts rather than from Paston Great Barn SAC

D

Air quality modelling has been undertaken using the approach outlined in LA 105, using the Interim HA Long Term Gap Analysis Calculator v1.1, as presented in ES Chapter 5 (Air Quality (**TR010040/APP/6.1**)). Although a slight deterioration in air quality at 121 receptors has been predicted, 54 receptors are predicted to experience an improvement in annual mean NO_2 concentrations and 4 receptors will experience no change as a result of the Proposed Scheme. The magnitude of change was assessed as small or imperceptible, resulting in no significant effect being predicted in EIA terms. There are no receptors expected to exceed the annual mean NO_2 AQO in the opening year scenarios, all modelled receptors have predicted annual mean NO_2 concentrations well below the objective. In accordance with LA 105, no significant effects on human health or ecological receptors have been identified as a result of the operation of the Proposed Scheme. Furthermore, the operation of the Proposed Scheme is not predicted to affect compliance with the European Union (EU) Directive on ambient air quality. The assessment has therefore concluded that there will be no significant air quality effects as a result from the operation of the Proposed Scheme and that no likely significant effects will occur on the NSN network and Ramsar sites or their qualifying features during operation. In addition, none of the likely foraging areas for barbastelle bats are located where there is a direct hydrological link between the Proposed Scheme and these habitats and therefore it is likely that there will be no likely significant effects of ground water pollution upon this species.

E

There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects.

Breydon Water SPA

Table C.6: Screening matrix of the potential likely significant effects upon Breydon Water SPA.

Name of European Site and Designation: Breydon Water SPA
EU Code: UK9009181

Distance to NSIP: 6.9km															
European site features	**Likely effects of NSIP**														
Effect	Mortality - pollution			Mortality - collision			Mortality – competition for reduced food sources			Reduced breeding success – noise disturbance			In-combination effects		
Stage of Development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Common tern (breeding population)	×a	×a	n/a	×a	×a	n/a	×a	×a	n/a	×a	×a	n/a	×g	×g	n/a
Bewick's swan	×b	×b	n/a	×b	×b	n/a	×b	×b	n/a	×b	×b	n/a	×g	×g	n/a
Golden plover	×c	×c	n/a	×c	×c	n/a	×c	×c	n/a	×c	×c	n/a	×g	×g	n/a
Pied avocet	×d	×d	n/a	×d	×d	n/a	×d	×d	n/a	×d	×d	n/a	×g	×g	n/a
Ruff	×a	×a	n/a	×a	×a	n/a	×a	×a	n/a	×a	×a	n/a	×g	×g	n/a
Lapwing	×e	×e	n/a	×e	×e	n/a	×e	×e	n/a	×e	×e	n/a	×g	×g	n/a
Internationally important assemblage of waterfowl	×f	×f	n/a	×f	×f	n/a	×f	×f	n/a	×f	×f	n/a	×g	×g	n/a

A

Ruff were not recorded in the study area during the wintering bird surveys and therefore the loss of habitat will be minimal for junctions and access roads are not considered to have a likely significant effect. The scheme is near the existing A47 in an environment dominated by road noise, it is considered unlikely that the qualifying bird species will be found in the vicinity of the road. In addition, Common tern were not found in the study area during the breeding bird surveys and there is no breeding habitat on site to support this species.

B

Bewick's swan were not recorded in the study area during the 2017, 2018 or 2019 overwintering bird surveys. Although the arable fields are likely to provide a food source during the winter, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the SPA. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for these species.

C

Small numbers of golden plover recorded present however, this species from the SPA is unlikely to travel from the SPA as far as the scheme to reach foraging grounds in the summer or winter It is likely that these large numbers may find winter and summer grounds in The Broads SAC and Broadland SPA and Ramsar site.

D

Pied avocet were not recorded foraging over the study area during the bird surveys. There is no suitable habitat in the study area and, given the extent of suitable habitat within the SPA, it is considered likely that this species does not frequent the area and loss of foraging habitat will not have a significant effect on the population.

E

Lapwing was recorded present: 7 individuals observed flying north over the A47 near TG346096 in December 2017. 31 individuals were observed flying west towards Blofield (TG3431110381) in February 2018. December 2017 distance from Proposed Scheme = 8.5km and February 2018 distance from the Proposed Scheme = 11.8km. However, this species from the SPA is unlikely to travel from the SPA as far as the scheme to reach foraging grounds in the summer or winter. It is likely that these large numbers may find winter and summer grounds in The Broads SAC and Broadland SPA and Ramsar site rather than in the study area itself and therefore, no likely significant effects are anticipated from the Proposed Scheme onto this species.

F

The study area does not have sufficient habitat to support large assemblages of waterfowl and therefore it is likely that these large numbers may find winter and summer grounds in The Broads SAC and Broadland SPA and Ramsar site.

G

There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects.

Breydon Water Ramsar

Table C.7: Screening matrix of the potential likely significant effects upon Breydon Water SPA.

Name of European Site and Designation: Breydon Water Ramsar															
EU Code: UK9009181															
Distance to NSIP: 6.9km															
European site features	**Likely effects of NSIP**														
Effect	Mortality - pollution			Mortality - collision			Mortality – competition for reduced food sources			Reduced breeding success – noise disturbance			In-combination effects		
Stage of Development	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*	*C*	*O*	*D*
Bewick's swan	✕a	✕a	n/a	✕a	✕a	n/a	✕a	✕a	n/a	✕a	✕a	n/a	✕g	✕g	n/a
Pink-footed goose	✕b	✕b	n/a	✕b	✕b	n/a	✕b	✕b	n/a	✕b	✕b	n/a	✕g	✕g	n/a
Wigeon	✕c	✕c	n/a	✕c	✕c	n/a	✕c	✕c	n/a	✕c	✕c	n/a	✕g	✕g	n/a
Shoveler	✕d	✕d	n/a	✕d	✕d	n/a	✕d	✕d	n/a	✕d	✕d	n/a	✕g	✕g	n/a
Golden plover	✕e	✕e	n/a	✕e	✕e	n/a	✕e	✕e	n/a	✕e	✕e	n/a	✕g	✕g	n/a

Lapwing	✕f	✕f	n/a	✕f	✕f	n/a	✕f	✕f	n/a	✕f	✕f	n/a	✕g	✕g	n/a
Black-tailed godwit	✕d	✕d	n/a	✕d	✕d	n/a	✕d	✕d	n/a	✕d	✕d	n/a	✕g	✕g	n/a

A

Although the arable fields are likely to provide a food source during the winter, it is considered likely that there is more suitable foraging habitat within and closer to the boundary of the SPA. Bewick's swan was not recorded in the study area during the overwintering surveys in 2017. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species.

B

Pink-footed goose was recorded flying over the study area during the overwintering surveys in February 2019. It is considered that the loss of agricultural grassland/arable land is not likely to be significant for this species. As pink-footed geese were not found to be utilising the site, it is considered that there is an unlikely risk of mortality through vehicle collisions during operation. It is considered unlikely that pink-footed goose will forage around the study area. There is more suitable foraging habitat within and closer to the boundary of the Ramsar site and that these species do not use the site.

C

Wigeon were not found on site during the overwintering and breeding bird surveys. The scheme is near the existing A47 in an environment dominated by road noise and therefore it is considered unlikely that wigeon will be found in the vicinity of the road. Loss of habitat will be minimal for junctions and access roads and not considered to have a likely significant effect.

D

Neither shoveler nor black-tailed godwit were recorded during the overwintering bird surveys and it is unlikely they would be found in the vicinity of the Proposed Scheme due to lack of suitable habitat. No likely significant effect is expected.

E

Two flocks of golden plover containing 9 and 7 birds were observed feeding in fields at TG384100 and TG348104. Distance from Breydon Water 8km & 11.4km. However, this species from the SPA is unlikely to travel from the SPA as far as the scheme to reach foraging grounds in the summer or winter. It is likely that these large numbers may find winter and summer grounds in The Broads SAC and Broadland SPA and Ramsar site.

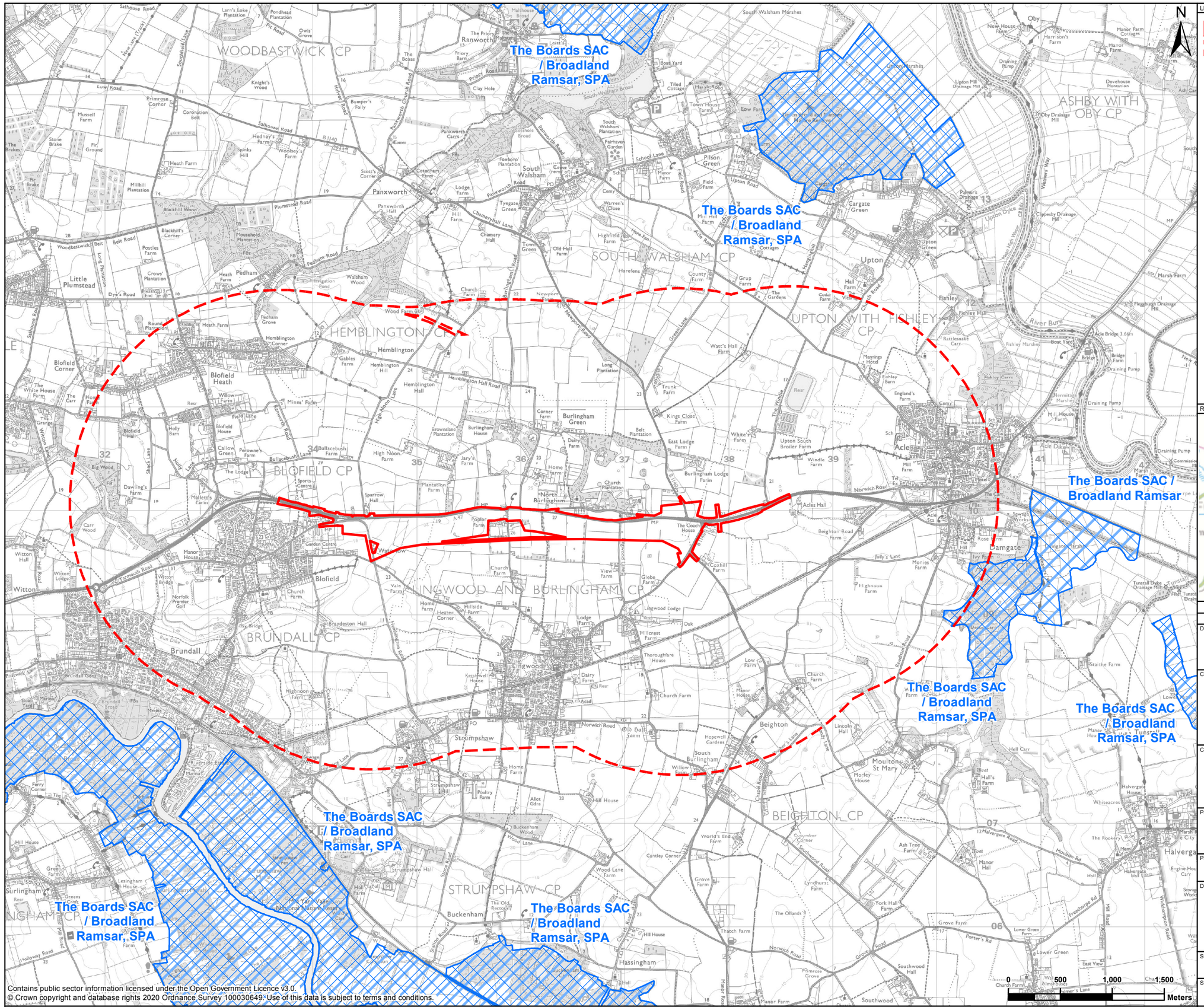
F

Lapwing was recorded present: 7 individuals observed flying north over the A47 near TG346096 in December 2017. 31 individuals were observed flying west towards Blofield (TG3431110381) in February 2018. December 2017 distance from Proposed Scheme = 8.5km and February 2018 distance from the Proposed Scheme = 11.8km. However, this species from the SPA is unlikely to travel from the SPA as far as the scheme to reach foraging grounds in the summer or winter. It is likely that these large numbers may find winter and summer grounds in The Broads SAC and Broadland SPA and Ramsar site rather than in the study area itself and therefore, no likely significant effects are anticipated from the Proposed Scheme onto this species.

G

There are no identified projects within the ZOI anticipated to result in significant effects that would require additional mitigation in response to cumulative effects.

Appendix D. Map of Designated Sites



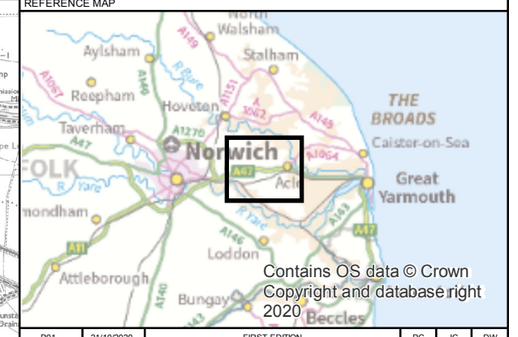
LEGEND

- Red line boundary
- Study area - 2km buffer

International Designated Sites

- Ramsar site
- Special Area of Conservation (SAC)
- Special Protection Area (SPA)

REFERENCE MAP



REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01	21/10/2020	FIRST EDITION	PC	IC	DW

DESIGNER: SWECO

CONTRACTOR: GallifordTry

CLIENT: highways england

PROJECT TITLE: A47 BLOFIELD TO NORTH BURLINGHAM

PROJECT STAGE: PCF STAGE 3

DRAWING TITLE: FIGURE 1 - DESIGNATED SITES

SUITABILITY: FOR INFORMATION

SHEET SIZE	SCALE	STATUS
A3	1:35,000	S2

DRAWING NUMBER: HE551490-GTY-EBD-000-DR-GI-30002

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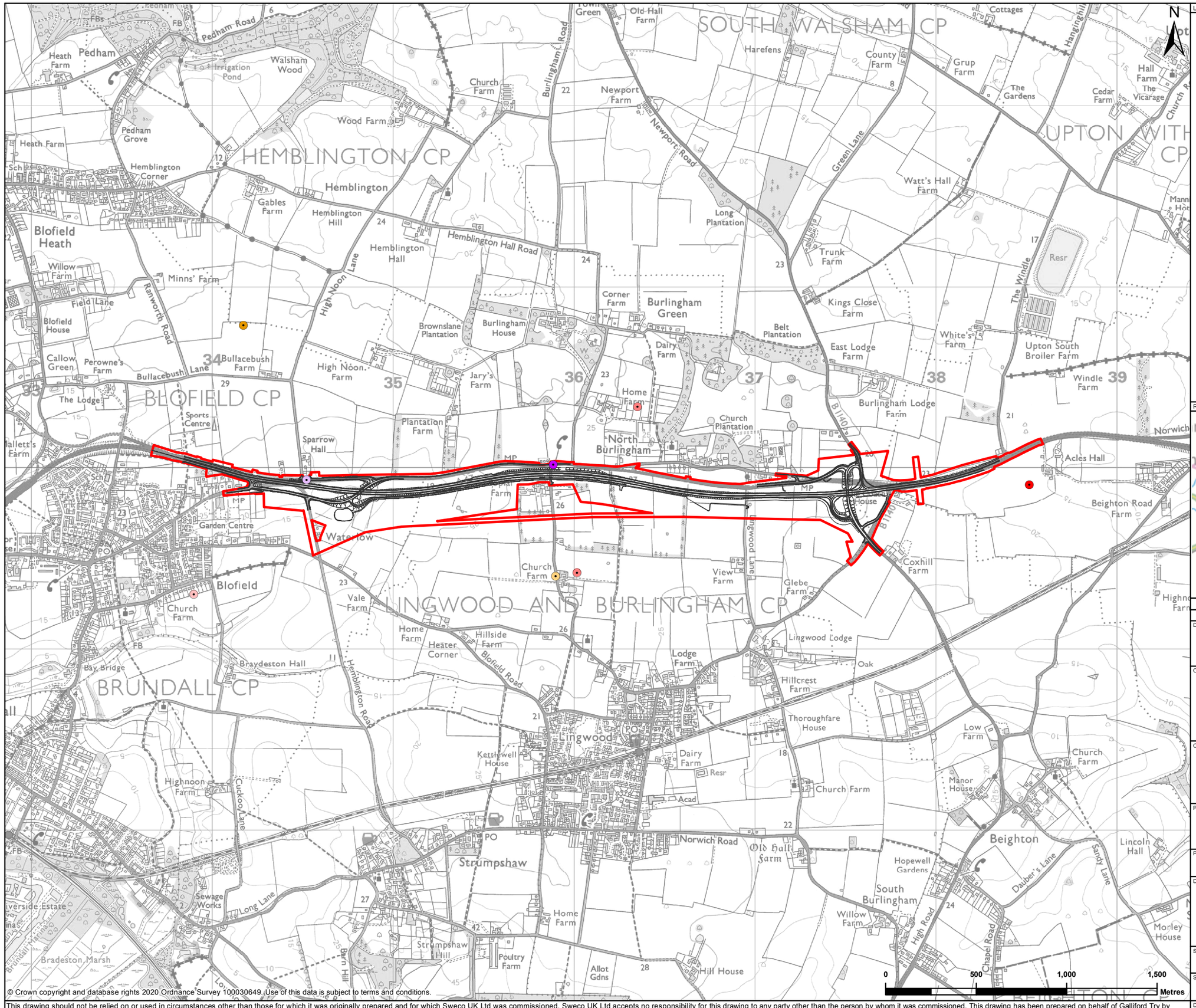
Appendix E. Survey Results of Qualifying Features



N

LEGEND

- Red line boundary
- Proposed scheme design
- Marsh harrier (MH), January 2019
- Marsh harrier (MH), May 2018
- Pink-footed goose (PG), February 2019
- Pink-footed goose (PG), November 2019
- Pink-footed goose (PG), October 2017
- Golden plover (GP), February 2018
- Lapwing (LW), February 2018
- Barbastelle bat (BB), July 2020
- Barbastelle bat (BB), August 2020

REFERENCE MAP

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REV	DATE	REVISION NOTE	ORG	CHK'D	APP'D
P01	16/12/2020	AMENDMENTS TO DESIGN	PC	IC	DW

DESIGNER

SWECO

CONTRACTOR

GallifordTry

CLIENT

highways england

PROJECT TITLE

A47 BLOFIELD TO NORTH BURLINGHAM

PROJECT STAGE

PCF STAGE 3

DRAWING TITLE

FIGURE 2 - PRESENCE OF WINTERING AND BREEDING BIRDS AND BATS OF NATIONAL SITE NETWORK OVER THE PROPOSED SCHEME

SUITABILITY

FOR INFORMATION

SHEET SIZE	SCALE	STATUS
A3	1:20,000	S2

DRAWING NUMBER

HE551490-GTY-EBD-000-DR-GI-30001

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