A46 Newark Bypass

TR010065/APP/6.6

6.6 Environmental Statement
Habitat Regulations Assessment

APFP Regulation 5(2)(g)

Planning Act 2008

Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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The Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

A46 Newark Bypass

Development Consent Order 202[x]

ENVIRONMENTAL STATEMENT

HABITAT REGULATIONS ASSESSMENT

Regulation Number:	Regulation 5(2)(g)
Planning Inspectorate Scheme Reference	TR010065
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Author:	A46 Newark Bypass Project Team, National Highways

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Rev 1	April 2024	DCO Application
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Contents

Glossary

Term	Definition
Affected road network	The affected road network is made up of all roads that trigger the traffic screening criteria and adjoining roads within 200m (as defined by the Design Manual for Roads and Bridges standard for assessing the effects from changes to air quality (LA 105)).
Competent Authority	In relation to applications for Nationally Significant Infrastructure Projects (NSIPs), the relevant Secretary of State is the Competent Authority for the purposes of the Habitat Regulations.
De-minimis	Effects considered to be 'trivial' and those that have no appreciable effect on the site.
European Sites(s)	A site that forms part of the national site network in accordance with Regulation 3 of the Habitats Regulations and proposed Special Areas of Conservation, potential Special Protection Areas and proposed and listed Ramsar sites in accordance with Government policy.
Order Limits	Order Limits are the limits shown on the works plan within which the authorised project may be carried out. It defines the maximum area of land required both temporarily and permanently to construct, operate and maintain the scheme.
In-combination	An in-combination effect is an effect on a European Site that arises from the combination of the predicted effects of the scheme (which may or may not be significant) with effects from other plans or projects. The assessment of in-combination effects considers those projects or plans which: • projects that are under construction; • permitted application(s) not yet implemented; • submitted application(s) not yet determined; • all refusals subject to appeal procedures not yet determined; • projects on the Planning Inspectorate's National Infrastructure Programme of Projects; and • projects identified in the relevant development plan (and emerging development plans – with appropriate weight being given as they move closer to adoption) recognising that much information on any relevant proposals will be limited and a degree of uncertainty may be present.
Likely significant effects (LSEs)	Under the Habitat Regulations a significant effect is likely if: • It cannot be excluded, in that it is capable of having an effect, on the basis of objective information; and • It is likely to undermine the European Site's conservation objectives.
National Site Network	Includes both inshore and offshore marine areas in the UK and comprises: • Special Areas of Conservation and Special Protection Areas designated under the Conservation of Habitats and Species Regulations 2017 before exit day (from the EU) • Special Areas of Conservation and Special Protection Areas designated under the Conservation of Habitats and Species Regulations 2017 after exit day (from the EU).
Ramsar site	A wetland site of international importance as listed under the Convention on Wetlands of International Importance 1971 (as amended in 1982 and 1987).
The scheme	As detailed in Section 1.2, the proposed A46 Bypass works, comprising: • On-line widening for the majority of its length between Farndon Roundabout and the A1 (including the creation of new structures to accommodate widening at existing viaducts). • A new section of off-line dual carriageway proposed between the western and eastern sides of the A1.
Trans-Midlands Trade Corridor	A strategic movement corridor; identified as evidence supports that industries along this corridor are not only linked but also are dependent upon the strategic transport infrastructure. The corridor is largely defined by the A46, part of the Strategic Road Network, which runs for over 250 kilometres from the M5 at Tewkesbury to Grimsby and on to Hull via the A15; although there are also some important rail links which

Term	Definition
	mirror the corridor connecting a number of major towns and cities.

1 Introduction

1.1 The purpose of this report

1.1.1 The A46 Newark Bypass ("the Scheme") meets the criteria to be considered as a Nationally Significant Infrastructure Project (NSIP) under the Planning Act 2008 and thus requires an application for the grant of a Development Consent Order (DCO). The Scheme has been screened as requiring an Environmental Impact Assessment (EIA) and an Environmental Statement (ES) [APP-045 to APP-061 and AS-021] has been prepared to accompany the application for a DCO. The purpose of this report is to inform a Habitats Regulations Assessment (HRA) to be undertaken by the Secretary of State for Transport in accordance with The Conservation of Habitats and Species Regulations 2017 (as amended) ('Habitats Regulations') to determine whether 'the Scheme is likely to have significant effects on any European Site, either alone or in-combination with other plans or projects'.

1.1.2 Under Regulation 3 of the Habitats Regulations, the term national site network refers to the network of sites in the United Kingdom's territory consisting of sites designated either:

(a) immediately before exit day formed part of Natura 2000;

or

(b) at any time on or after exit day are European Sites, European marine sites and European offshore marine sites for the purposes of any of the retained transposing regulations'

1.1.3 "Natura 2000" means the European network of Special Areas of Conservation, and Special Protection Areas under the old Wild Birds Directive or the new Wild Birds Directive, provided for by Article 3(1) of the Habitats Directive (network of Special Areas of Conservation: Natura 2000).

1.1.4 With reference to the Planning Inspectorate's Advice Note 10[1] which addresses Habitats Regulation Assessment, the term 'European Site(s)' has been used throughout this assessment when referring to national site network sites and Ramsar sites, either individually or collectively, for ease of expression.

1.1.5 Several appendices accompany this report and contain supporting information to further inform the HRA, to be undertaken by the

[1] Infrastructure Planning Commission (2022) Advice Note 10: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects [online] available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-ten/ (last accessed June 2023).

Secretary of State. The appendices of this report comprise the following:

- Appendix A: Planning Inspectorate screening matrices
- Appendix B: Study area search distances for HRA – local impact area
- Appendix C: Study area search distances for HRA – wider impact area
- Appendix D: Citations / data sheets for each European Site
- Appendix E: Indicative Sherwood Forest Possible Potential Special Protection Area (ppSPA) boundary
- Appendix F: Traffic flow scenarios
- Appendix G: Fish Escape Passage Technical Note
- Appendix H: The Environment Agency's response following a review of the Fish Escape Passage Technical Note and Applicant's Response to Comments
- Appendix I: Natural England's response following a review of the Fish Escape Passage Technical Note and Applicant's Response to Comments

1.1.6 This HRA was updated in October 2024 during the DCO Examination in order to address Relevant Representations provided by Natural England in response to the DCO application (refer to Section 3.6 for further details).

1.2 Overview of the Scheme

1.3 Scheme context

1.3.1 The existing A46 forms part of the strategic Trans-Midlands Trade Corridor between the M5 in the south-west and the Humber Ports in the north-east.

1.3.2 The existing stretch of A46 between the Farndon Junction, to the west of Newark-on-Trent and the A1 to the east of Newark-on-Trent, is the last remaining stretch of single carriageway between the M1 and A1 and consequently queuing traffic is a regular occurrence, often impacting journey time reliability.

1.3.3 Further details on the need for the Scheme are contained within the Case for the Scheme [APP-190].

1.4 Scheme location

1.4.1 The Scheme will provide a dual carriageway on the A46 between Farndon and Winthorpe in Nottinghamshire. The Farndon roundabout is located at the western extent of the Scheme where the B6166 Farndon Road joins the existing A46.The Winthorpe junction is located at the eastern extent where the A1133 joins the existing A46.

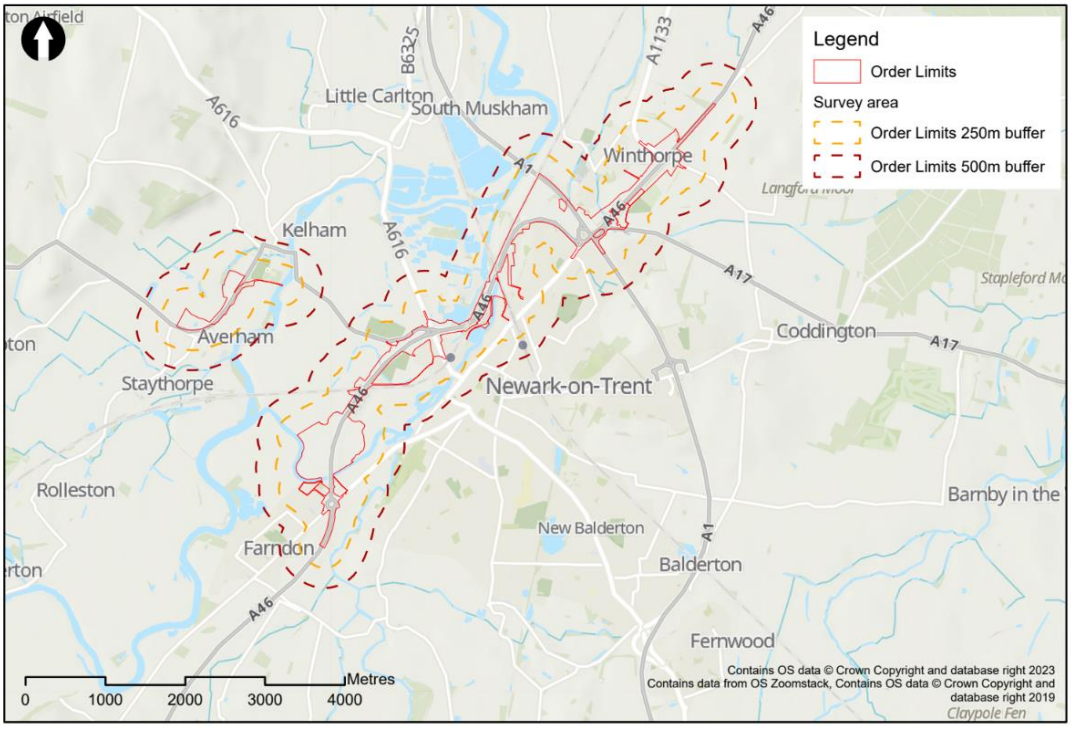
Along its route, it crosses the A617 and the B6326, at the Cattle Market junction, and the A1 between the Friendly Farmer and Brownhills roundabouts. Figure 1.1 below shows the Order Limits of the Scheme.

1.4.2 The Scheme would be situated within the county boundary of Nottinghamshire County Council and within the administrative boundary of Newark & Sherwood District Council.

1.4.3 The Scheme crosses the River Trent twice, the Nottingham to Lincoln railway line twice, and the East Coast Main Line once.

1.4.4 The existing A46, currently a single carriageway, is elevated on embankments due to the low-lying floodplain of the River Trent. This floodplain is located to the west of the A46 for the majority of the affected length, along with a section at the southern end on the eastern side of the A46. Several roundabouts form key junctions along the route, linking local A roads. Road infrastructure is softened by roadside vegetation in places and the River Trent is a strong natural influence within an otherwise built-up landscape. To the north of the A46, farmland dominates, interspersed with small-scale settlements. To the south of the A46, the town of Newark-on-Trent forms a notable urban settlement.

Figure 1.1: Order Limits



1.5 Scheme description

1.5.1 The section of the A46 that is to be upgraded is approximately 6.5 kilometres (approximately 4 miles) in length. The Scheme comprises on-line widening for the majority of its length between Farndon roundabout and the A1. A new section of offline dual carriageway is proposed between the western and eastern sides of the A1 before the new dual carriageway ties into the existing A46 to the west of Winthorpe roundabout. The widening works include earthwork widening along the existing embankments, and new structures where the route crosses the Nottingham to Lincoln and East Coast Main Line railway lines, River Trent, Brownhills Link and the A1.

1.5.2 A detailed description of the Scheme can be found in Chapter 2 (The Scheme) of the ES [APP-046] and at Section 2 of this report.

1.6 The Applicant

1.6.1 ‘The Applicant’ of this Scheme is National Highways. The Applicant is appointed and licensed by the Secretary of State for Transport as the strategic highways company for England and is responsible for operating, maintaining and improving the strategic road network in England. The network is made up of England’s motorways and all-purpose trunk roads (the major A- roads), and the existing A46 is part of the trunk road network for which the Applicant is responsible.

Following construction of the Scheme, the Applicant will be responsible for operating, maintaining and, under its general statutory powers in respect of the latter, improving the new route of the A46.

1.7 The Habitat Regulations Assessment process

1.7.1 There is a requirement under the Habitats Regulations to determine if a plan or project may have an adverse impact on a site designated under the same (or preceding Regulations) prior to any consent or permission being determined. The process of undertaking this assessment is known as a Habitats Regulations Assessment (HRA). As required under Regulation 63, the assessment is undertaken by the Secretary of State in relation to an order granting development consent, based upon information provided within this report and supporting appendices, representations made by Natural England and, where the Secretary of State considers it appropriate, taking the opinion of the general public.

1.7.2 The Habitats Regulations include measures to establish and maintain a network of sites protecting habitats which in themselves are valuable and the species they support. These sites form a network that across Europe is known as Natura 2000, and domestically also known collectively as European protected sites. Within the UK, this network consists of Special Protection Areas (SPAs) and Special Areas of Conservation (SACs), together with proposed SPAs (pSPAs)and candidate SACs (cSACs) and possible SACs (pSACs). This network also extends to marine environments, with wetland sites of international importance (Ramsar sites) also treated equally within this assessment framework. These sites are collectively referred to in this document as 'European Sites'.

1.7.3 The Habitats Regulations have been amended by The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019, due to the UK's exit from the EU. The effect of these amendments is largely related to terminology/wording. Requirements and processes remain the same, as protection levels remain unchanged. As such existing EU guidance[2]and preceding case law from the European Court of Justice (ECJ) [3] [4] [5] remains valid as a source of direction and

[2] Managing Natura 2000 Sites - The provisions of Article 6 of the 'Habitats' Directive 92/43/CEE (European Communities 2020).....

[3] Landelijke Vereniging tot Behoud van de Waddenzeecase/ Nederlandse Vereniging tot Bescherming van Vogels, European Court of Justice, Case C-127/02 'Waddenzee 2002'.

[4] Sweetman et al v An Bord Pleanala, European Court of Justice, Case C-258/11 'Sweetman 2011'.

[5] People over Wind/Sweetman v Coiltte Teorante, European Court of Justice Case C-323/17 'People over Wind 2017'.

6 Infrastructure Planning Commission (2022) Advice Note 10: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects [online] available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-ten/ (last accessed June 2023).

interpretation of the requirements of the legislation, although it should be noted that much case law has now been incorporated into guidance and/or best practice.

2 The Scheme

2.1 Introduction

2.1.1 The section of the A46 that is to be upgraded is approximately 6.5 kilometres (approximately 4 miles) in length. The Scheme comprises on-line widening for the majority of its length between Farndon roundabout and the A1. A new section of offline dual carriageway is proposed between the western and eastern sides of the A1 before the new dual carriageway ties into the existing A46 to the west of Winthorpe roundabout. The widening works include earthwork widening along the existing embankments, and new structures where the route crosses Nottingham to Lincoln and East Coast Main Line railway lines, River Trent, Brownhills link and the A1.

2.2 Description of the scheme

2.2.1 The Scheme layout has been designed in accordance with the Design Manual for Roads and Bridges (DMRB), which contains information about current design standards relating to the design, assessment and operation of motorway and all-purpose trunk roads in the United Kingdom. Further details are contained within the Scheme Design Report [APP-194]. The DCO application contains a number of plans that illustrate the design for the Scheme. The General Arrangement Plans [APP-007] provide an overview of the Scheme design. Engineering Plans and Sections for new structures are also contained within the DCO application [AS-008 to AS-012].

2.3 Mainline

2.3.1 The provision of a dual carriageway for a distance of 6.5 kilometres (approximately 4 miles) to provide two traffic lanes in both directions.

2.3.2 At its south-western limits, the dual carriageway ties in with the northern arm of the existing Farndon Roundabout which already has two lanes entering and exiting the roundabout. Travelling north-eastwards, the route follows the alignment of the existing A46 for a length of 2.5 kilometres. Over this length the existing A46 would remain in place as the new southbound carriageway and the road would be widened to the north-west, away from Newark-on-Trent, to form the new northbound carriageway. Retaining the existing A46 in place over this section would allow the existing vegetation on the eastern side of the road to be retained.

2.3.3 At the point where the new dual carriageway ties back into the existing A46, the existing dual carriageway would be retained up until Winthorpe Roundabout at the north-eastern extents of the Scheme. This includes retention of the existing central reserve and vegetation within it. Where the dual carriageway approaches Winthorpe Roundabout there would be localised widening to tie in with existing routes and the modified Winthorpe Roundabout.

2.4 Junctions

2.4.1 There are four new junctions that would be provided as part of the Scheme; Farndon Roundabout, Cattle Market Junction, Brownhills Junction and Winthorpe Roundabout. These are shown on the General Arrangement Plans [APP-007] and described further below.

Farndon Roundabout

2.4.2 The only amendments proposed by the Scheme to the five-arms of this roundabout would be to widen the entries from the A46 from two to three lanes. This would largely be constructed within the footprint of the existing road as the existing entry is slightly wider than needed, but would require some small scale, localised widening to accommodate the extra lane.

2.4.3 A third lane would also be provided on the east and west sides of the circulatory of the roundabout, with traffic signals on the A46 arms of the roundabout which will improve flows for both A46 and local traffic. This would largely be constructed by modifying the road markings within the existing roundabout footprint as the existing circulatory is wider than required for two lanes. Some widening would however be required on the inside of the northern quadrant to facilitate the traffic signals that would be installed at this location and the spiralised road markings where the lanes reduce from three lanes to two in this location.

Cattle Market Junction

2.4.4 As part of the Scheme the existing Cattle Market Roundabout would be enlarged in size to form a gyratory, with the mainline elevated over the top to separate local traffic and A46 mainline traffic. Northbound and southbound slip roads would be provided to allow traffic to pass between the roundabout and mainline. The northbound off-slip and southbound off-slip would be two lanes with taper diverges, widening to three lanes at the entry to the new gyratory. The northbound on-slip and southbound on-slip would be single lane slip roads with taper merges and two lanes at the exit from the roundabout.

2.4.5 The roundabout itself would be elongated to accommodate these slip roads and the gyratory widened to provide a third lane on the north and south sides of the gyratory, it would be partially signalised to

improve traffic flows. The elongation would be mainly to the south, with slight widening also to the north and east. The mainline would then pass over the centre of the new gyratory. The existing culvert beneath the roundabout would be extended to accommodate the widened earthworks.

2.4.6 The new A617 and A616 arms would maintain the two lane entry and single lane exit, however, the existing structure would need be widened to the west to accommodate the highway tie into the enlarged roundabout. This would allow the existing eastern kerb line and footpath to remain in place and avoid the need to widen the Grade II listed "Causeway Arches 500 metres north-west of level crossing" (known collectively as Smeaton's Arches) on the eastern side.

2.4.7 A third lane would be provided on the northbound entry from the Great North Road to the roundabout which would require widening of the existing road to the west. A second lane has also been added to the exit from the roundabout. This second lane would continue for around 200 metres down to the junction with Kelham Road to provide greater capacity for queuing traffic when the railway level crossing is closed and to prevent traffic from queuing back onto the A46 mainline. To accommodate the second lane the widening would largely be to the west of the Great North Road, allowing the existing kerb line and footpath on the eastern side to remain in place. There would however be some localised widening to the east of Great North Road on the immediate exit from the roundabout.

2.4.8 A walking and cycling route would be provided through the junction with signalised crossings on the eastern slip roads.

2.4.9 The existing private maintenance access on the south-western side of Cattle Market Roundabout would be closed for safety reasons, with alternative access provided from Kelham Road.

Brownhills Junction

2.4.10 To the west of the A1 a new grade separated Brownhills Junction would be provided to maintain local access from the A46 and to provide a link from the A46 to the A1 and A17. This is required as the new dual carriageway would now bypass the existing Brownhills and Friendly Farmer Roundabouts which previously provided that access.

2.4.11 The Brownhills Junction would consist of a new southbound on-slip from the existing Brownhills Roundabout, and a new northbound off-slip linking to a new roundabout that is located to the west of the A1 and north of the new dual carriageway. The new roundabout would provide local access to the businesses/properties in that location and would be connected to the existing Brownhills Roundabout via a new two-way link road.

2.4.12 The southbound on-slip would be a single lane with a parallel merge and two lanes from the exit of Brownhills Roundabout. As far as

possible this slip road would utilise the existing A46 and retain the vegetation along this corridor. A narrow widening would be required where the new on-slip joins the A46 within the grass verge, requiring a small retaining wall to retain the existing vegetation. The new eastbound off-slip would be a single lane with an auxiliary diverge and one lane on the entry to the new roundabout. This slip road would be formed on earthworks with 1:2 side slopes to minimise the impact on the flood zone. The new roundabout would be formed in earthworks with 1:2.5 side slopes. The level of the roundabout has been set such that it matches that of the existing A1 and to avoid it flooding. The roundabout needs to be lit for road safety reasons but these would be smaller than 10 metre high lighting columns to reduce light pollution to adjacent properties.

2.4.13 The new link road between the new roundabout and the existing Brownhills Roundabout would be a single lane in each direction, widening to three lanes on the approach to Brownhills Roundabout as per the existing entry. A right turn would be provided from part way along the southbound on-slip which would provide the access from Brownhills Roundabout to the new roundabout.

Winthorpe Roundabout

2.4.14 As part of the Scheme, Winthorpe Roundabout would be enlarged and partially signalised, with the Friendly Farmer link traffic passing through the centre of the roundabout in a through-about layout. Eastbound and westbound slip roads would be provided to allow traffic to merge and diverge between the mainline and the roundabout.

2.4.15 To achieve this the A46 would be widened on the approach to the roundabout to accommodate the tie-in to the larger roundabout, the addition of traffic signals, and to provide three lanes on both approaches. Two lanes would be maintained on each of the exits to the A46. The A1133 would also be realigned to the south-west to provide compliant deflection as it approaches the roundabout, with two lanes maintained on the approach and a single lane on the exit. Drove Lane would also be locally widened to accommodate the tie-in to the larger roundabout and to provide two lanes on the entry. A single lane would be maintained on the exit from the roundabout.

2.4.16 A new single carriageway link named the ‘Friendly Farmer Link’ would be constructed to the south of the dual carriageway that provides a link between Winthorpe Roundabout and Friendly Farmer Roundabout. There would be two lanes from the exit of Winthorpe Roundabout to this link and three lanes at the entry which would be controlled by traffic signals. The right-hand two lanes would pass through the centre of the roundabout to provide access to the A46 northbound only, whereas the left-hand lane would provide access to the circulatory of the roundabout to allow access to the A1133 and

Drove Lane. This would be provided with additional signage to ensure users are in the correct lane on approach to the roundabout.

2.4.17 The circulatory of the roundabout would vary between two and five lanes. This would require clear signage and road markings so that the roundabout is clear to understand for users. This would include the addition of a new signage gantry over the south-eastern portion of the circulatory where the circulatory splits to four lanes. The height of this gantry would be around 8 metres high as it needs to provide 6.45 metre clearance for high loads.

2.5 Local roads

2.5.1 Connections to all local roads in the vicinity of Farndon, Cattle Market and Winthorpe Junctions would be retained, with the new junction layouts being designed to accommodate them as discussed in the section above. This includes Fosse Road, Farndon Road, the A617, the A616, the Great North Road, Drove Lane and the A1133.

2.5.2 In addition, a new single carriageway link named the 'Friendly Farmer Link' would be provided between the Friendly Farmer Roundabout and the new enlarged roundabout at Winthorpe. This would be constructed on low level earthworks with 1:2.5 side slopes and would be separated from the dual carriageway by a road restraint system with anti-dazzle louvres on the top to prevent glare from the opposing carriageways.

2.5.3 The existing Brownhills Roundabout would be impacted slightly by the Scheme, however no works would be undertaken other than potential changes to traffic signs, road markings and highway lighting.

2.5.4 The existing Friendly Farmer Roundabout would also be impacted by the Scheme. Works to this roundabout would include a minor realignment to the eastbound approach from Brownhills and to the arm that would become the Friendly Farmer Link. In addition, there would be potential changes to traffic signs, road markings and highway lighting.

2.6 Floodplain compensation areas

2.6.1 The widened embankment for the A46 carriageway passes through land that is within the floodplain for the River Trent. By using this land, the Scheme has the potential to increase flood risk elsewhere unless mitigation is provided. This mitigation would include three floodplain compensation areas which would seek to provide an equivalent volume of floodplain storage in the local catchment by excavating land at similar elevations to that which would be displaced by the Scheme.

2.6.2 To demonstrate that the floodplain compensation areas are effective, analytical flood modelling has been carried out to quantify impacts caused by the Scheme, identify flood mitigation measures and optimise the floodplain compensation areas. Three areas have been identified for floodplain compensation. These are being referred to as the Kelham and Averham floodplain compensation area (FCA), Farndon West FCA and Farndon East FCA the locations of which are shown on the General Arrangement Plans [APP-007]. Further information on the FCAs are detailed within Appendix 13.2 (Flood Risk Assessment) of the ES Appendices [APP-177].

2.6.3 The floodplain compensation areas are designed to fit sympathetically into the surrounding landscape with shallow slopes back to existing ground levels with mixed grass seed planting. The design philosophy of the floodplain compensation areas is to ensure the land can continue to be used by the landowner. This would be possible for much of the land at the Kelham and Averham FCA, where the infrequency of flooding means that the land can be returned to arable use. It is proposed that Farndon East and West FCAs would become a wetland habitat. The northern part of Farndon West FCA would become floodplain grazing marsh. These features are shown on Figure 2.3 (Environmental Masterplan) of the ES Figures [AS-026].

2.7 Structures

2.7.1 A range of structures including overbridges, underbridges, retaining walls, culverts, Closed Circuit Television (CCTV) masts, a variable message sign and a sign gantry would be installed as part of the Scheme. The primary structures along the new dual carriageway are detailed below and are shown within the Structures General Arrangement Drawings [APP-014].

2.7.2 **Windmill Viaduct** – A new three span structure would be built alongside the existing, this would be similar visually to the existing, there would be a gap between the structures to allow both the inspection and maintenance to take place safely in the future. The bridge would be supported on bored concrete piles.

2.7.3 **Nottingham to Lincoln Railway Line Western Crossing** – A new structure would be built alongside the existing, which would be very similar visually to the existing. There would be a gap between the structures to allow both to be inspected and maintained safely in the future. The bridge would be supported on bored concrete piles.

2.7.4 **Cattle Market East** – The bridge would be a single span structure supported on bored concrete piles.

2.7.5 **Cattle Market West** – This bridge would be similar in structural form to Cattle Market Junction East.

2.7.6 **Nottingham to Lincoln Railway Line Eastern Crossing** – The existing bridge would be widened to the north to accommodate the additional width required for the dual carriageway. The form would match the existing, with a new steel parapet installed to the northern side of the bridge on the widened section. The bridge would be supported on bored concrete piles.

2.7.7 **Nether Lock Viaduct** – A new structure would be built alongside the existing, this would be very similar visually to the existing. There would be a gap between the structures to allow both to be inspected and maintained safely in the future. The bridge would be supported on bored concrete piles.

2.7.8 **Nether Lock Railway Crossing** – A new structure would be built alongside the existing, this would be a longer span than the existing to avoid the existing Lincoln line railway chord. There would be a gap between the structures to allow both to be inspected and maintained safely in the future. The bridge would be supported on bored concrete piles.

2.7.9 **Brownhills Junction Bridge** – This bridge would be identical in structural form to the Cattle Market Junction structures with a single span supported on bored concrete piles or a spread concrete foundation. This span would be longer than required to provide an open feel for walkers and cyclists using the walking/cycling route below.

2.7.10 **A1/A46 crossing** – A single span structure would be provided to pass over the existing A1 slip roads and the A1 mainline carriageway. The bridge would be supported on bored concrete piles or a spread concrete foundation.

2.7.11 To allow the new A1/A46 crossing to be constructed, there is a need for the existing Slough Dyke to be re-aligned and moved approximately 10 metres east to facilitate the installation of the new bridge west abutment. The channel profile (cross-sectional dimensions, and nature of riparian habitat) would be reinstated to match the existing channel. Scour protection will be provided in the vicinity of the western abutment. This is anticipated to consist of buried gabion baskets made up in-situ, filled with imported stone and covered with topsoil.

2.8 Drainage

2.8.1 Consultation with the Environment Agency, Nottinghamshire County Council (the Lead Local Flood Authority), Newark & Sherwood District Council and the Trent Valley Internal Drainage Board has shaped and influenced the drainage design and the assessment of flood risk, with an allowance for the effects of climate change included in the design.

2.8.2 As road drainage for the Scheme would discharge into networks maintained separately by the Applicant and the local authorities, the drainage design has accordingly been split into two networks:

- Local road drainage – which would be adopted by Nottingham County Council (other than Cattle Market Roundabout that will discharge into the Applicant's system).
- Road drainage for the strategic road network – which would be operated and maintained by the Applicant.

2.8.3 The surface water would be collected from the carriageway and conveyed to existing outfalls or to newly formed attenuation areas prior to outfalling into water courses and rivers. Water would generally be conveyed to the attenuation areas and outfalls along a network of swales located at the bottom of the widened embankments. Where this is not feasible then this would be conveyed within an underground piped network.

2.8.4 The swales and attenuation areas would be designed to clean the highway runoff water prior to discharge, removing silt and debris and where required removing water borne chemicals such as zinc and copper. Some existing ditches would be modified or realigned to accommodate the Scheme.

2.8.5 New culverts would be provided across the A617 at Kelham to connect the Kelham and Averham FCA to the River Trent flood zone. Several existing culverts located along the existing A46 would require extending as a result of the Scheme.

2.9 Road lighting

2.9.1 Road lighting incorporated into the design of the Scheme reflects the level of safety required for road users.

2.9.2 Lighting would be installed or modified at the following locations across the Scheme:

- Farndon Roundabout
- Cattle Market Junction
- Brownhills and Friendly Farmer Junctions including the slip roads into the Esso interchange
- Winthorpe Roundabout
- The single carriageway link between Friendly Farmer and Winthorpe

2.9.3 The requirements for road lighting at these locations has been determined based on increasing safety for all road users, the design of which has sought to minimise adverse impacts and effects on the following:

- Nocturnal species (for example bats)

- The existing landscape and visibility from nearby properties and dwellings after dark
- The setting of features associated with the historic environment (for example listed buildings)

2.9.4 The approach to the existing lighting on the dual carriageway between Friendly Farmer and Winthorpe Roundabout will be considered during detailed design using the DMRB TA501 (Road Lighting Appraisal). If the removal of existing light at these locations is safe and beneficial to environmental receptors, they will no longer be included in the design.

2.9.5 There will be no change from pre-construction baseline to highways lighting across the River Trent at Nether Lock Viaduct and Windmill Viaduct during operation. There is no existing lighting over Nether Lock Viaduct and Windmill Viaduct and the Scheme will not introduce any new lighting in closer proximity to the River Trent than is currently present.

2.10 Land take

2.10.1 The Order Limits defines the maximum area of land required both temporarily and permanently to construct, operate and maintain the Scheme, the extents of which are illustrated on Figure 1.1 (Order Limits) within Section 1 of this report.

3 Assessment methodology

3.1 Guidance

3.1.1 The following guidance documents have been referred to when undertaking this assessment:

- Habitats Regulation Assessment Advice Note 10: Habitat Regulations Assessment relevant to nationally significant infrastructure projects[6]
- Design Manual for Roads and Bridges (DMRB) LA 115 'Habitats Regulations assessment (formerly HD44/09)'[7].
- Design Manual for Roads and Bridges (DMRB) LA 108 'Biodiversity' (formerly IAN 130/10)'[8]
- Natural England's 'Habitats regulations assessments: protecting a European site' guide[9].

3.1.2 Specific advice notes are provided in relation to DCO applications on the Planning Inspectorate website (i.e. Habitats Regulation Assessment Advice Note 10). As such, there are often overlapping requirements for the DCO application documents when considering the Planning Inspectorate advice notes and other relevant standards and guidance (e.g., Design Manual for Roads and Bridges (DMRB)). For example, with reference to this Scheme, two HRA screening matrices are required; one based on the Planning Inspectorate guidance and one based on the DMRB guidance.

3.1.3 DMRB screening matrices can be found in Section 4 of this report. These tables present the information required to support the assessment of Likely Significant Effects (LSEs) on European Sites.

3.1.4 The Planning Inspectorate's screening matrices can be found in Appendix A. These can be cross-referenced with the DMRB screening matrices and detail the evidence to support the assessment of LSEs. These are a requirement of the Planning Inspectorate's Advice Note 10.[6]

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[6] Infrastructure Planning Commission (2022) Advice Note 10: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects [online] available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-ten/ (last accessed June 2023).

[7] Highways England (2020) Design Manual for Roads and Bridges (DMRB) LA 115 'Habitats Regulations assessment (formerly HD44/09)'. Revision 1. [online] available at: https://www.standardsforhighways.co.uk/dmrb/search/e2fdab58-d293-4af7-b737-b55e08e045ae (last accessed April 2023)

[8] Highways England (2020) Design Manual for Roads and Bridges (DMRB) LA 108 'Biodiversity (formerly IAN 130/10)'. Revision 1. [online] available at: https://www.standardsforhighways.co.uk/search/af0517ba-14d2-4a52-aa6d-1b21ba05b465 (last accessed July 2023)

[9] Natural England (2021) Habitats regulations assessments: protecting a European site. [online] available at: https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site (last accessed July 2023)

3.2 Habitat Regulations Assessment Process

3.2.1 The Scheme is a plan or project that is not directly connected with, or necessary to the management of a European Site, therefore HRA is required.

3.2.2 The HRA process consists of three stages, the need for each stage being informed by the outcome of the preceding one, to ensure an iterative and objective assessment.

3.2.3 The HRA process first considers whether the Scheme will give rise to any LSEs upon any European Sites (Stage 1) and, if so, goes on to consider whether these will adversely affect the integrity of any European Sites (Stage 2). Under the Habitats Regulations an effect is considered likely if:

- It cannot be excluded, in that it is capable of having an effect, on the basis of objective information.
- It is likely to undermine the Scheme's conservation objectives.

3.2.4 If the conclusion of Stage 1 Screening is that there will be no LSEs on any features of a European Site, there is no requirement to undertake further stages. Similarly, if the Stage 2 Appropriate Assessment concludes there will be no adverse effect on integrity of the European Site, then the assessment is concluded. The HRA stages are summarised within Table 3-1 below.

Table 3-1: HRA stages

Stage	Description
Screening (Stage 1)	This is the process which identifies the potential effects of the plan or project on the European Sites and considers if these are likely to be significant. Screening is an iterative process and before moving to Stage 2 it can be repeated if required. The description of the project shall not include mitigation measures that are introduced to avoid harm to the European Site or to avoid LSEs. If the Screening (Stage 1) identifies that the project or plan, alone or in-combination, may have LSEs on a European Site and/or its qualifying features, or if there is uncertainty, the Competent Authority must undertake an Appropriate Assessment (Stage 2) of the implications for that site in view of that site's conservation objectives.
Appropriate Assessment (Stage 2)	This stage involves the consideration of the predicted adverse effects of the project or plan either alone, or in-combination with other projects or plans, on the integrity of the European Site with respect to the site's structure, function, and conservation objectives. Additionally, where mitigation has been proposed to avoid or minimise LSEs, this stage includes assessment of the likely effectiveness of any mitigation applied. A key outcome of the Appropriate Assessment is to identify whether the integrity of the European Site(s) is likely to be adversely affected by the plan/project.
Derogation	If no suitable alternative solutions are available, Stage 3 requires an

Stage	Description
(Stage 3)	assessment of compensatory measures where, in the light of an assessment of Imperative Reasons of Overriding Public Interest ("IROPI"), it is considered that the project or plan should proceed. In making this assessment, it is important to recognise that it will be appropriate to the likely scale, importance, and impact of the proposed project. If it is impossible to avoid or mitigate the adverse impact, it must be demonstrated that there is IROPI.

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3.2.5 This assessment has been undertaken in an iterative and objective manner following the above stages, with reference to best practice guidance and relevant case law[10] [11] [12].

3.2.6 For this assessment, effects during the construction and operational phases are considered appropriate and have been scoped-in to the assessment. Decommissioning is not an integral planned element of the proposed Scheme and effects associated with decommissioning have therefore been scoped-out of this assessment. It is highly unlikely that the Scheme would be demolished after its design life, as the improvements would have become an integral part of the strategic and local road networks. The same approach has also been adopted within Chapter 8 (Biodiversity) of the ES [APP-052]. In the unlikely event of the Scheme needing to be demolished, this would conform to the statutory process in place at that time, including any requirements for further assessment (e.g., HRA or Environmental Impact Assessment).

3.2.7 The term 'de-minimis' has been used in relation to an impact that has no appreciable potential effect on a European Site and is thereby excluded from further assessment.

3.2.8 The HRA report contains the following:

- A summary table of all European Sites and qualifying features and each pathway of effect considered at each HRA Stage (screening, Appropriate Assessment (AA)/Imperative Reasons of Overriding Public Interest (IROPI), and the derogations, as applicable), for each phase of the Proposed Development (i.e. construction and operation) – see Section 4 and Appendix A of this report;
- A copy of the citation/Natura 2000 data sheet for each European Site – see Appendix D of this report;

[10] Landelijke Vereniging tot Behoud van de Waddenzeecase/ Nederlandse Vereniging tot Bescherming van Vogels, European Court of Justice, Case C-127/02 'Waddenzee 2002'.

[11] Sweetman et al v An Bord Pleanala, European Court of Justice, Case C-258/11 'Sweetman 2011'.

[12] People over Wind/Sweetman v Coiltte Teorante, European Court of Justice Case C-323/17 'People over Wind 2017'.

[13] https://magic.defra.gov.uk/ (accessed April 2023).

- A copy of the conservation objectives for all European Sites for which LSE have not been excluded and have been carried forward to HRA Stage 2 – see Table 4-1 within this report;
- A plan of the European Site(s) potentially affected in relation to the Proposed Development (as required to be submitted with the DCO application in accordance with Regulation 5(2)(l)(i) of the APFP Regulations) – see Appendix B and Appendix C of this report;
- A statement which identifies (with reasons) whether significant effects are considered to be likely in respect of European Sites in devolved administrations or within EEA States – see sections 4 and 5 of this report;
- Details of consultation held with the relevant ANCBs (including those in devolved administrations and/or relevant bodies in EEA States, where applicable), including any agreements made between the Applicant and the ANCBs; and,
- Cross references to relevant draft DCO requirements, development consent obligations and any other mechanisms proposed to secure measures relied upon in the AA and derogation cases (as applicable), including the identification of any factors that might affect the certainty or efficacy of their implementation – see sections 4 and 5 of this report.

3.3 Screening (Stage 1) Methodology

3.3.1 With reference to the DMRB standard on HRA (LA 115[7]), a search has been undertaken for all European Sites within 2 kilometres of the Scheme and, where bats are a qualifying feature of a European Site, within 30 kilometres of the Scheme. A search was also undertaken for receptors within the Impact Risk Zone for Sites of Special Scientific Interest (SSSIs) with reference to Natural England guidance. The searches were undertaken using the Defra's MAGIC.gov website[13].

3.3.2 Information gathered to inform the screening included the identification of:

- Any SPA, pSPA, SAC, cSAC, pSAC and Ramsar sites, including any marine or marine elements of these sites, meeting the search criteria listed in 3.3.3
- Potential effects resulting from the Scheme or in combination with other plans and projects
- The Zone of Influence (ZoI) of these effects, noting this may extend some distance from the site itself, it is not confined to activities on or adjacent to the site
- Any viable pathways for the project to the receptor (European Site itself or functionally linked land)

[13] https://magic.defra.gov.uk/ (accessed April 2023).

- The qualifying features of the designated site(s) in question
- The conservation objectives of the designated site, including any site sensitivities given within any supplementary advice, site improvement plan, or equivalent document published by the relevant nature conservation body.

3.3.3 A source-pathway-receptor approach has been undertaken at Stage 1 to identify potential adverse effects from changes to air quality and surface water and groundwater hydrology. Sites within the following buffers have been identified (see Appendices B and C of this report):

- European Sites within 200 metres of the air quality Affected Road Network (ARN). The ARN includes parts of the road network which are identified as likely to be affected by changes in air quality as a result of changes in traffic flows due to the Scheme. These comprise all roads that trigger the traffic screening criteria outlined in DMRB LA 105[14].
- European Sites that have surface water hydrological connectivity within 1 kilometre of the Scheme (DMRB LA 113[15]).
- European Sites containing Groundwater Dependent Terrestrial Ecosystem (GWDTEs) which have groundwater hydrological and hydrogeological connectivity within 1 kilometre of the Scheme (LA 113[15]).
- Any known areas of habitat outside of European Site boundaries, which play an important role in supporting the European Site and its features of interest (functionally linked land).

3.3.4 The above information has been reviewed in respect of each qualifying feature and potential development effect/impact pathway to inform an assessment of any LSEs.

3.3.5 Potential impacts considered are:

- Areas where there would be land take and habitat removal for the works (including functionally linked land/habitats)
- Areas where there is a risk of altering the hydrodynamic regime or a reduction in water quality
- Areas where there is a risk of an increase in air, noise, vibration and light pollution
- Areas where there is physical disturbance to international designated sites and/or their designated interest features

[14] Highways England (2019) Design Manual for Roads and Bridges (DMRB) LA 105 'Air quality' (formerly HA 207/07, IAN 170/12, IAN 174/13, IAN 175/13, part of IAN 185/15)'. Revision 0. [online] available at: https://standardsforhighways.co.uk/search/10191621-07df-44a3-892e-c1d5c7a28d90 (last accessed April 2023).

[15] Highways England (2020) Design Manual for Roads and Bridges (DMRB) LA 113 'Road drainage and the water environment' (formerly HD 45/09). Revision 1. [online] available at: https://standardsforhighways.co.uk/search/d6388f5f-2694-4986-ac46-b17b62c21727 (last accessed April 2023).

3.3.6 In line with relevant case law[16] [17] [18], this assessment has been undertaken in the absence of mitigation (including measures embedded into the Scheme where these are intended for the avoidance of effects upon a designated site).

3.4 In-combination assessment methodology

3.4.1 A review of the following resources was initially undertaken in August 2023 (submitted as part of the application for DCO) and updated in September 2024 to identify projects or plans which could result in a LSE(s) upon any European Sites, in-combination with the Scheme[19]:

- On-shore NSIPs and proposed NSIPs within the 'Yorkshire and the Humber' and 'East Midlands' regions (as listed on the Planning Inspectorate website),[20] where potential effects upon the European Sites listed in Section 4 were identified by the appropriate consultant, Natural England and/or the Competent Authority.
- Projects or plans within the Newark & Sherwood District, located within 2 kilometres of the River Trent.
- Projects or plans within 2 kilometres of the Humber Estuary SAC/Ramsar.

3.4.2 Planning applications within East Lindsey District Council are not included within the in-combination assessment. The East Lindsey District Planning portal does not offer a 'map search' function, nor an option search for applications subject to a HRA. As such, it was considered impractical to undertake a manual search of all planning applications within the East Lindsey District. The East Lindsey District Council boundary is located 34 kilometres north-east of the Scheme and the location of projects which would have been considered within the in-combination assessment are over 70 kilometres from the Scheme. This limitation is discussed further in Section 5 of this report.

3.4.3 A thorough search of each relevant local planning portal was searched for projects and plans which could impact upon the

[16] Landelijke Vereniging tot Behoud van de Waddenzeecase/ Nederlandse Vereniging tot Bescherming van Vogels, European Court of Justice, Case C-127/02 'Waddenzee 2002'.

[17] Sweetman et al v An Bord Pleanala, European Court of Justice, Case C-258/11 'Sweetman 2011'.

[18] People over Wind/Sweetman v Coiltte Teorante, European Court of Justice Case C-323/17 'People over Wind 2017'.

[19] To address Natural England comments NE5 and NE6 within their Relevant Representation [RR-044] on the geographic scope of the in-combination assessment, it can be confirmed that both NSIP and non-NSIP within 2km of the River Trent have been included in the in-combination assessment, as well as those within 2km of the SAC/ Ramsar.

[19] To address Natural England comments NE5 and NE6 within their Relevant Representation [RR-044] on the geographic scope of the in-combination assessment, it can be confirmed that both NSIP and non-NSIP within 2km of the River Trent have been included in the in-combination assessment, as well as those within 2km of the SAC/ Ramsar.

[20] https://infrastructure.planninginspectorate.gov.uk/ (lasted accessed April 2023)

European Sites in-combination with the Scheme as far as practicably possible. This search was reliant on the proper working of these portals, lying outside the control of the assessing ecologist.

3.4.4 Other than the reference to East Lindsey District Council above, the assessing ecologists are not aware of any further issues or restrictions to the identification of projects and plans for the in-combination assessment.

3.5 Appropriate Assessment (Stage 2) Methodology

3.5.1 Where a plan or project is likely to, or has the potential to, give rise to LSEs upon a European Site, an assessment must be made of the implications on the integrity of that site in view of that site's structure, function and conservation objectives and taking into account any site-specific supplementary advice or site improvement plan.

3.5.2 Where mitigation measures are to be applied to eliminate or reduce any effects identified in screening, these may be considered within the AA stage. Potential effects on site integrity may be direct or indirect and are dependent on the relationship between the source (proposed options' actions) and the receptor (the qualifying features of the European Site(s)). The significance of an impact is relative to the sensitivity, existing condition and conservation status of the qualifying features of the site and the scale of the impact in space and time.

3.5.3 Potential effects on the integrity of the European Site(s) would be evaluated with respect to the scale, extent and nature of the impact, for example the area of habitat affected, changes in hydrodynamics, potential changes in species distribution, and the duration of the impact.

3.5.4 Further to the HRA Stage 1 screening assessment, the HRA Stage 2 AA would include the following:

- A review of the sites identified at Stage 1 and confirm any additions or exclusions.
- Identification of the aspects of the Scheme that may significantly impact the conservation objectives of the European Site(s).

3.6 Consultation to date

3.6.1 As discussed in Section 1 of this report, the Scheme is classified as a NSIP and a DCO application is required, which is supported by an Environment Statement (ES) **(TR010065/PP/6.1)**. Regulation 10(1) of the EIA Regulations allows a person who proposes to make an application for an order granting development consent to ask the Secretary of State to state in writing its opinion as to the scope and level of detail of the information to be provided in the ES. The scoping

process is undertaken by the Planning Inspectorate on behalf of the Secretary of State. An Environmental Scoping Report[21] was produced for the Scheme and submitted to the Inspectorate in September 2022. The Scoping Opinion [APP-189] was received from the Inspectorate on 21 October 2022.

3.6.2 As part of the Scoping Opinion, Newark & Sherwood District Council confirmed their acceptance of the HRA approach detailed within the Scoping Report. The approach detailed in the Scoping Report requires the assessment of the Scheme in accordance with the following sources and with all receptors (designated sites, habitats and species) scoped-in to the assessment:

- DMRB LA 108 Biodiversity[22] and LA 115 Habitats Regulations assessment[7].
- Chartered Institute of Ecology and Environmental Management (CIEEM) Guidelines for Ecological Impact Assessment in the UK; and,
- CIEEM Sources of Survey Methods[23] (now withdrawn).

3.6.3 The approach detailed in 3.6.2 has been followed within this assessment. CIEEM Sources of Survey Methods has since been superseded by the CIEEM Good Practice Guidance for Habitats and Species[24] which has been used instead.

3.6.4 A technical note issued to Natural England at the option selection stage of the Scheme[25], identified no European Sites meeting the screening criteria. Natural England raised comments on this earlier assessment in relation to assessing whether there could be in-combination effects on European Sites from changes in air quality and therefore, an initial review of a regional traffic model (including other committed development) was used to inform a review of changes in air quality associated with the Affected Road Network (ARN) for the design at the earlier stage. No European Sites were found to be present within 200 metres of the ARN but it was stated within the technical note that once the preferred route and commencement of Preliminary Design stage of the Scheme was underway, analysis of expected traffic changes on modelled roads within 200 metres of European Sites would be carried out. It was agreed that at this point,

[21] National Highways (September 2022) A46 Newark Bypass Environmental Scoping Report [online] available at: TR010065-000002-A46N - Scoping Report.pdf (planninginspectorate.gov.uk) (last accessed March 2023).

[22] National Highways (2020) DMRB LA 108 – Biodiversity. Revision 1 [online] available at: https://www.standardsforhighways.co.uk/search/af0517ba-14d2-4a52-aa6d-1b21ba05b465.

[23] Chartered Institute of Ecology and Environmental Management (CIEEM) (2016) Sources of Survey Methods (SoSM) [online – now withdrawn]

[24] Chartered Institute of Ecology and Environmental Management (CIEEM) (2021) Good Practice Guidance for Habitats and Species Available at: Good-Practice-Guide-2023-edit.pdf (cieem.net) (last accessed July 2023)

[25] Regional Investment Programme A46 Newark Northern Bypass PCF Stage 2 Habitats Regulations Assessment 27/04/21, Ref: HE551478-ATK-EBD-XX-RP-LE-000002

where required, a comprehensive review of other plans and projects that may be relevant to an in-combination assessment would be undertaken. Now that a preferred route option is available, analysis of the potential effects of air pollution upon relevant European Sites has been included within this report.

3.6.5 Comments provided by Natural England as part of the Scoping Opinion (dated 10 October 2022)[26] stated:

"The A46 Newark Bypass NSIP is unlikely to adversely impact any European or internationally designated nature conservation sites or nationally designated sites and has not triggered an Impact Risk Zone."

No further comments were provided by Natural England in the Scoping Opinion with regards to HRA.

3.6.6 To support the DCO Application process, Statutory Consultation was undertaken for the Scheme between October and December 2022. A Preliminary Environmental Information Report (PEIR)[27] and a non-technical summary (NTS)[28] of the PEIR were published for statutory consultation and were available for both prescribed consultees and the general public to comment on. Further details on the statutory consultation undertaken can be found in the Consultation Report [APP-028] and the Consultation Report Annexes [APP-029 to APP-044].

3.6.7 Comments provided by Natural England as part of their statutory consultation response (dated 12 December 2022) in relation to the Sherwood ppSPA stated:

"Natural England would welcome the opportunity to review the Affected Road Network used to scope the assessment of impacts from traffic emissions. This is likely to be submitted with the ES and will provide greater understanding of what designated sites could be impacted by the proposed scheme. Natural England agree with the assessment methodology section however the study area does indicate that impacts to the habitat that supports populations of nightjar and/or woodlark present in the Sherwood Forest area will be considered, although the PEIR does state that an updated ARN will be used to produce the ES. Nightjar and Woodlark present in Sherwood are estimated to be nationally significant according to surveys in 2004 and 2006, impacts to habitat as a result of atmospheric pollutions generated during the

[26] Natural England (2022) *Environmental Impact Assessment Scoping consultation under Regulation 10 of the Infrastructure Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) – Regulation 11, Proposal: Scoping consultation for Environmental Statement, Location: A46 Newark Bypass* [online] Available at: https://infrastructure.planninginspectorate.gov.uk/wp-content/ipc/uploads/projects/TR010065/TR010065-000029-Natural%20England.pdf (last accessed April 2023).

[27] National Highways (2022). Preliminary Environmental Information Report [online] available at: Preliminary Environmental Information Volume 1 Main Report.pdf (citizenspace.com) (last accessed March 2023).

[28] National Highways (2022). Non-Technical Summary [online] available at: Preliminary Environmental Information Volume 3 NonTechnical Summary.pdf (citizenspace.com) (last accessed March 2023).

construction and/or the operational phase may need to be considered in line with the Birds Directive.[29]"

3.6.8 Consideration of the potential for effects upon the Sherwood Forest ppSPA (indicative ppSPA boundary located approximately 17 kilometres west of the Scheme) has therefore been included within this report. While the status of the Sherwood Forest ppSPA remains unconfirmed, no defined boundary exists for the site. As such, the assumed boundary for the purposes of the assessment comprises the Important/Core Areas shown in Appendix E, as recommended by the relevant Natural England advice note[30]. This assessment has used the updated ARN to assess the impacts of atmospheric pollutants on designated sites during operation.

3.6.9 Comments provided by the Environment Agency as part of their statutory consultation response in relation to the Humber Estuary SAC stated:

"The potential flood compensation area around Kelham and Averham needs to ensure there is no detrimental impact to the river habitat as it is an incredibly important area for fish and fish spawning, including protected species such as lamprey. The Humber SAC is downstream but functionally linked as the lamprey move up river to spawn. Any change to habitat or water quality would need an HRA. It sounds however that the compensation area is most likely in the floodplain rather than works to the river itself but it this is something that will need to considered due to the importance of the area."

3.6.10 Consideration of the potential for effects upon habitats and/or water quality of the River Trent, which acts as functionally linked habitat to the Humber Estuary SAC and Ramsar (which also cites lamprey), has therefore been included within this report.

3.6.11 A meeting with Natural England was held 3 May 2023, to provide feedback on the results of the 'Report to inform HRA'. Natural England have raised no objections to the methodology, mitigation and results of Stages 1 and 2 of the HRA process presented to them.

3.6.12 A meeting with the Environment Agency was held 5 May 2023 to provide feedback on the results of the 'Report to inform HRA'. As above, the methodology, mitigation and results of Stages 1 and 2 of the HRA process were presented. Advice was provided by the Environment Agency on seasonality of fish breeding and migration in the River Trent and the natural re-profiling of ditches.

[29] Natural England (2022), Natural England's comments in respect of A46 Newark Bypass, promoted by National Highways

[30] Natural England (2014) *Advice Note to Local Planning Authorities regarding the consideration of likely effects on the breeding population of nightjar and woodlark in the Sherwood Forest region*. [online] available at: https://www.mansfield.gov.uk/downloads/file/482/natural-england-s-advice-notes-on-the-sherwood-ppspa-2014 (last accessed July 2023)

3.6.13 A further meeting with the Environment Agency on 20 June 2023 involved discussions regarding the requirement for works near a main river. This included discussions relating to the inclusion of fish escape passages within the Farndon East FCA wetland design (now relevant to Farndon West FCA). Outcomes of the discussion included a confirmed Environment Agency preference for more 'natural' channel profiles for the proposed fish escapes (to reflect the location of these features lower in the river catchment and to offer great biodiversity interest) and for all pools/ponds to be connected back to the River Trent (to avoid entrapment of fish during flood events).

3.6.14 Continued discussions are being held with the Environment Agency and will draw on shared knowledge and lessons learned from previous schemes to inform the implementation of mitigation measures into the detailed design. Proposed mitigation measures associated with the protection of the Humber Estuary Ramsar/SAC and/or lamprey are common practice and do not require any untested or bespoke methods. The Environment Agency (Fisheries, Biodiversity and Geomorphology teams) have raised no objections to these proposed mitigation measures or the initial Farndon East wetland area design (which is now to be implemented in Farndon West FCA), including the provision of fish escape passages into the River Trent. Following consultation with the Environment Agency, the specific number, location and design of fish escape passages will be finalised during detailed design.

3.6.15 The application for the DCO was submitted in April 2024. In August 2024, as part of the DCO examination process, Natural England submitted their Relevant Representations [RR-044] for the Scheme. Natural England's Relevant Representation NE1 – NE8 related to the HRA and is summarised below:

- **NE1:** With regard to embedded mitigation for the Humber Estuary SAC and Ramsar, construction silt management measures are not specified in the Drainage Strategy Report;
- **NE2:** HRA screening - omission of discussion regarding the 'loss of lamprey individuals'
- **NE3:** HRA screening - limited explanation provided regarding 'de minimis' impact of construction piling on key species (lamprey)
- **NE4:** HRA screening – operational lighting
- **NE5:** HRA screening - in-combination assessment (Scheme location criteria)
- **NE6:** HRA screening: in-combination assessment lacks sufficient detail

- **NE7:** HRA Appropriate Assessment - prevention of light spill impact on migrating lamprey does not follow mitigation hierarchy
- **NE8:** HRA Appropriate Assessment - mitigation to prevent entrapment/isolation of lamprey during flooding – consideration of climate change and more frequent flooding

3.6.16 This version of the HRA has been updated to address these comments following consultation with Natural England and the Environment Agency.

4 Screening (Stage 1)

4.1 Identification of European Sites

4.1.1 A search for European Sites using the criteria outlined in the methodology identified the following:

4.1.2 There are no European Sites within 2 kilometres of the Scheme.

4.1.3 There are no European Sites where bats are a qualifying feature within 30 kilometres of the Scheme.

4.1.4 There are no European Sites that are hydrologically connected within 1 kilometre of the Scheme.

4.1.5 There are no European Sites within 200 metres of the Scheme's air quality Affected Road Network (ARN).

4.1.6 There are no European Sites containing GWDTEs which have groundwater hydrological and hydrogeological connectivity within 1 kilometres of the Scheme

4.1.7 The absence of any European Sites meeting the above criteria from within these search zones are illustrated within Appendix B and Appendix C.

4.1.8 Three European Sites were identified with hydrological connectivity (functionally linked land) to the Scheme (via the River Trent) and the information is listed in the Table 4-1 below (citations provided within Appendix D). As such, the Humber Estuary SAC and Ramsar site have been scoped into this assessment.

Table 4-1: European Sites identified using search criteria

Designated Site	**Designation criteria**	Conservation objectives	**Distance**
The Humber Estuary SAC	Annex I habitats including estuaries (1130) and mudflats and sandflats not covered by seawater at low tide (1140) are the primary reason for selection of this site. Annex II fish species (river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*) are a qualifying feature and the River Trent could be used by breeding and migrating lamprey.	Ensure that the integrity of the site is maintained or restored as appropriate and ensure that the site contributes to achieving the Favorable 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	53 kilometres directly between the Order Limits and the European Sites and 75 kilometres via the channel of the River Trent.

Designated Site	**Designation criteria**	Conservation objectives	**Distance**
		habitats and habitats of qualifying species rely; ○ The populations of qualifying species; and ○ The distribution of qualifying species within the site.	
The Humber Estuary Ramsar	The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons. Fish species (river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*) are a qualifying feature and the River Trent could be used by breeding and migrating lamprey.	N/A	
The Humber Estuary SPA	The site qualifies under article 4.2 of the Directive (79/409/EEC) as it is used regularly by over 20,000 waterbirds in any season. In the non-breeding season, the area regularly supports 153,934 individual waterbirds	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 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; and ○ The distribution of the qualifying features within the site	63 kilometres directly between the Order Limits and the European Sites and 88 kilometres via the channel of the River Trent.

4.1.9 The Humber Estuary SAC and Ramsar have been scoped into this assessment for potential impacts on breeding and migrating lamprey.

4.1.10 Given the distance of the SAC/Ramsar from the Order Limits (53 kilometres directly between the Order Limits and the European Sites and 75 kilometres via the channel of the River Trent), the potential for impacts upon habitats cited under the SAC and Ramsar designations and for impacts upon all of the other qualifying species (grey seal *Halichoerus grypus*, various bird species and the non-breeding waterfowl assemblage) has been scoped out. The Humber Estuary SPA, designated for various bird species and the non-breeding waterfowl assemblage, has been scoped out for the same reason.

4.1.11 The indicative boundary for the Sherwood Forest ppSPA is located approximately 17 kilometres from the Scheme and over 200 meters from the ARN. As such, Sherwood ppSPA is considered unlikely to be directly impacted by the Scheme or by any changes to local air quality (typically considered to be within 200 metres or a road/the ARN, with reference to the DMRB LA 105). Furthermore, habitats within and adjacent to the Scheme area are considered to be largely unsuitable for the species which may form qualifying features of Sherwood Forest ppSPA (woodlark *Lullula arborea* and nightjar *Caprimulgus europaeus*), with suitable habitats restricted to small areas. No records of either woodlark or nightjar were returned within 2 kilometres of the Scheme by the local record centre and no observations of these species were made during breeding bird and wintering bird surveys. Further details are provided in Appendix 8.5 (Breeding Bird Technical Report) [APP-150] and Appendix 8.6 (Wintering Bird Technical Report) [APP-151] of the ES Appendices. The potential for impacts upon woodlark and nightjar, which may form qualifying features of Sherwood Forest ppSPA, have therefore been scoped out of this assessment.

4.2 Assessment of likely significant effects

4.2.1 The following Screening (Stage 1) information has been produced to assess the potential effects resulting from the construction and operation of the Scheme and to identify any LSEs on the Humber Estuary SAC/Ramsar and lamprey qualifying features. The screening exercise is based upon the tabular format provided within Design Manual for Roads and Bridges (DMRB*) LA 115.*[7]

4.2.2 The assessment includes an appraisal of the effects of any other plans or projects which, in-combination with the proposed development, might be likely to have a significant effect on the European Sites (Table 4-2).

4.2.3 Within the Screening (Stage 1), only general embedded mitigation for the Scheme (i.e., measures not directly adopted to mitigate impacts upon the SAC/Ramsar) have been included.

4.3 Assessment of in-combination effects

4.3.1 Please refer to the ‘In-combination effects’ section of Table 4-2 below for details of the projects or plans considered for in-combination effects and the relevant impact pathways for each project/plan.

Table 4-2: Stage 1 HRA screening matrix Humber Estuary SAC/Ramsar

Scheme	**A46 Newark Bypass**	
European Site under consideration	Humber Estuary SAC/Ramsar	
Date: June 2023	Author: JS	Verified: BC
Description of Scheme: Refer to Section 2.		
Describe any likely direct, indirect or secondary impacts of the Scheme (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 Scheme description is provided in Section 2. During construction, traffic flows would increase due to the movement of works and staff vehicles. There would be a maximum of 131 two-way heavy-duty vehicle (HDV) annual average daily traffic (AADT) movements associated with the construction phase, on Winthorpe Road off the A46 northbound. Other roads would also experience temporary increases and decreases in traffic flows due to temporary traffic management (e.g., road closures and segregation of routes). The initial construction year would see the largest number of construction vehicle movement, followed by year two. Movements in years three and four would be 10%, or less, of the total number of construction vehicle movements along any given route. During operation, traffic flows are forecast to increase along the A46 due to the increased capacity, with increases of between 11,800 to 13,100 AADT between Farndon Roundabout and Brownhills Roundabout. Increased operational traffic flows are also forecast along the A17-A46-A617 route, with A17 increases of between 2,300 – 5,600 AADT; A46 increases between the Brownhills and Cattle Market roundabouts of 11,800 AADT; and A617 increases of 1,300 AADT Reduced operational flows are forecast between the Friendly Farmer and Brownhills roundabout (-21,400 AADT) along the A1 east of Newark-on-Trent (-400 to -1,500 AADT), Newark Southern Link Road (-1,600 AADT) and along B-roads though Newark-on-Trent (-400 to -4,700 AADT). Refer to Appendix F for the traffic flow scenario figures for both 2028 and 2043. Increased traffic flows could local air quality within proximity of the ARN; however, the SAC/Ramsar is located 53 kilometres from the Scheme, far outside of the typical impact zone for air pollution (typically 200 metres, with reference to DMRB LA 105).	
Land take	No permanent or temporary land take would be required from the SAC/Ramsar boundary.	
Distance from the European Site or key	At the closest point, the Order Limits are located 53 kilometres south from the boundary of the SAC /	

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features of the site (from edge of the Scheme assessment corridor)	Ramsar (75 kilometres downstream via the channel of the River Trent).
	
	The River Trent is functionally linked to the Humber Estuary SAC/Ramsar and could be used by lamprey species for breeding. The nearest known record of lamprey species (as available via NBN Atlas[31]) is for river lamprey, located near the British Sugar Factory in 1999[32] (within 250 metres of the Order Limits, assumed north of the Order Limits but this is unclear due to poor spatial resolution of the record). The most recent record of a lamprey species is for river lamprey in 2009,[33] located 5 kilometres from the Scheme. No records of sea lamprey were provided by NBN Atlas within 10 kilometres of the Scheme and no records of lamprey species were provided by the Local Ecological Records Centre within 2 kilometres of the Scheme.
	
	Construction of a new viaduct structure adjacent to the existing Windmill Viaduct would include the extension of existing sheet piling along the riverbank (40 metres) and the creation of new foundations (no construction required within the river) for the new viaduct spans. Construction of a new viaduct structure adjacent to Nether Lock would also require piling for the creation of new foundations (no construction required within the river) for the new viaduct spans. Embedded mitigation measures for these works in close proximity to the River Trent include:
	• the installation of silt fencing and protective fencing along boundary of worksite and the waterway, to prevent pollution (e.g., sediment or building materials);
	• use of cut-off ditches to collect site run-off passed through settling lagoons or silt traps to allow removal of sediments prior to discharge;
	• stockpile maintenance methods such as cordoned off soil stockpiles with secure fencing or tape to prevent any disturbances or contamination by other construction activities;
	• The following standard guidance will also be adhered to:
	  ○ EA PPG1: Basic good environmental practices
	  ○ EA PPG5: Works in, near or over watercourses

[31] https://nbnatlas.org/ [online] (last accessed April 2023)

[32] Made available by the Environment Agency by Open Government Licence. Available online at: [redacted] (last accessed April 2023)

[33] Made available by the Environment Agency by Open Government Licence. Available online at: [redacted] (last accessed April 2023)

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	○ EA PPG6: Construction and demolition sites ○ CIRIA Guidance C532 'Control of water pollution from construction sites - Guidance for consultants and contractors' ○ CIRIA's Guidance C811 'Environmental good practice on site' ○ CIRIA's Guidance C648 'Control of water pollution from linear construction projects: Technical Guidance ○ Environment Agency's 'Protect groundwater and prevent groundwater pollution' ○ EA PPG7 'The safe operation of refuelling facilities' ○ EA PPG13 'Vehicle washing and cleaning' The Environment Agency raised concerns associated with the potential impacts upon fish/fish spawning/fish migration, particularly protected species such as lamprey. Suitable habitat for lamprey spawning is likely to be present both up and down stream of the Scheme, with lamprey migrating upstream (through the Scheme area) to spawning ground. Lamprey migrate upstream during the night-time hours and seek refuge during the daytime. With piling works to be undertaken during the day, it is unlikely that migrating lamprey (during the night) would be subject to negative impacts and therefore, negative impacts on the population associated with the SAC/Ramsar is also considered unlikely. Whilst lamprey are a low hearing sensitivity fish species, some disturbance would be encountered during the day, which could disturb resting adult lamprey (seeking refuge) and larval lamprey within fine sediment beds (if present). This impact is considered to be localised (to areas within proximity of Windmill Viaduct and Nether Lock Viaduct) and temporary, with lamprey (and other fish) likely relocating to other suitable refuges/habitat in adjacent areas. With regards to potential impacts upon spawning lamprey, the river areas within proximity of the proposed piling works are considered to be sub-optimal for lamprey spawning, due to the slow water flow and no favourable areas for spawning observed within or adjacent to these areas. No impacts upon the SAC/Ramsar would arise as a result of the proximity of works associated with the Scheme. Whilst a temporary and localised impact would occur along the functionally linked River Trent as a result of piling works, this would not alter the potential functionality of the River Trent as a lamprey migratory corridor and is unlikely to prevent lamprey from breeding/impact upon the lamprey population.
Resource requirements (from the European Site or from areas in proximity to the site, where of relevance to consideration of impacts)	No resources would be taken from, or in close proximity to, the boundary of the SAC/Ramsar. However, use of the River Trent (functionally linked habitat to the SAC/Ramsar) and the associated Old Trent Dyke is proposed to facilitate water runoff.

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	The following general embedded mitigation measures have been designed into the Scheme: • The design of river crossings has considered the interaction of the Scheme with the River Trent and other watercourses, including bed and bank substrate, to minimise the impact on fluvial systems where safe and practical to do so. • Where possible, the design would incorporate drainage into existing infrastructure such as outfalls, swales/ditches and culverted pipes. This would minimise the loss and damage to riparian and aquatic habitat, including disturbance of sediments and therefore reduce impacts to spawning fish. Where this is not possible, the absence of this measure is not considered to form a pathway for potential impacts upon the SAC/Ramsar. • Standard measures to prevent pollution would also be adopted, as listed above.
Emissions (e.g., polluted surface water runoff - both soluble and insoluble pollutants, atmospheric pollution)	Pollution (in general) and to groundwater sources are referenced as a vulnerability of the SAC/Ramsar within the citation documentation. Emissions considered relevant to this assessment are; air pollution from construction and operational vehicle movements, road runoff discharges (operation) and artificial lighting (construction only). Construction activities are likely to cause a localised and temporary reduction in air quality due to emissions from construction vehicles and localised congestion. Reduction in air quality is usually localised (to 200 metres) and given the distance of the SAC / Ramsar from the Order Limits (53 kilometres), no impacts upon the SAC / Ramsar as a result or air quality changes associated with the Scheme are anticipated. The Scheme design includes operational road runoff discharges into the River Trent and Old Trent Dyke; however, the following has been designed within the Scheme as general embedded mitigation measures: • Prior to discharge into the Dyke/River, runoff from the Scheme would pass through swales and discharge into forebays, followed by attenuation basins, before then entering the watercourses (via controlled outflow). This system would function to settle out and filter any sediments, hydrocarbons, dissolved metals and contaminants (such as engine oil, brake fluids and antifreeze) that may be contained in the water. • Silt curtains would be used to reduce sediment deposition into the fluvial system. • Where technically feasible Sustainable Drainage Systems (SuDS) have been implemented to

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	effectively manage pollution risk associated with road runoff. The installation of bridge beams for the Nether Lock Viaduct and Windmill Viaduct would be undertaken during the night-time hours over a period of approximately two-weeks for each viaduct, to minimise the impact upon road and rail travel. These works are scheduled for May 2026, during the latter part of the lamprey migration season. This could result in artificial light spill upon the River Trent, potentially temporarily restricting night-time movement of lamprey (disturbance only). Artificial lighting, a mixture of static and task lighting, would be required to facilitate a safe working environment during night-time works for bridge beam installation along the southern branch of the River Trent. These works are to run for four consecutive working weeks (Monday to Friday) (two weeks per viaduct), which is for two weeks at each viaduct (total of four weeks). Whilst embedded mitigation includes for directional lighting to “minimise light spill onto retained habitats”, this maintains a degree of uncertainty as to whether artificial light spill, albeit minimised, creates a temporary semi-permeable ‘barrier’ of light across the width of the River Trent. Temporary semi-permeable ‘barrier’ refers to when a crane slews and the lighting on the boom casts across the water before coming to rest on the beam lift. However, it is noted that this would likely only ever be for short amounts of time (the slewing of the crane would take place approximately four times during a night shift, with the slew taking approximately 30 minutes, with works occurring over 4 weeks in total). The River Trent is approximately 30 metres wide at the location of the works and therefore, as the crane slews, only a section of the width of the watercourse would be illuminated at any one time. Therefore, the light spill is unlikely to sever the migratory route along the southern branch as there will be dark areas either side, that has potential to disturb lamprey migration rather than prevent movement. Furthermore, the migratory route along the northern branch of the River Trent will be unaffected by construction works. The presence of artificial lighting during construction could result in a temporary semi-permeable barrier effect upon migrating and breeding lamprey, potentially resulting in disturbance to the movement of lamprey during the night-time hours and in turn impacting upon the population size lamprey associated with the SAC/Ramsar. For the most part, no impacts on the SAC/Ramsar, or the qualifying features, are predicted as a direct or indirect result of emissions during construction and operational of the Scheme. However, the potential for artificial lighting spill during night-time bridge beam installation works remains and could result in disturbance to movement of migrating lamprey and therefore at this stage a LSE cannot reasonably be discounted.

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Excavation requirements (e.g., impacts of local hydrogeology)	Excavation would be required to create three new floodplain compensation areas (Kelham and Averham FCA, Farndon West FCA and Farndon East FCA), to mitigate for the loss of existing floodplain. These works would primarily be land-based works and whilst a small number of connections would need to be made to the existing watercourse network, no major works to the River Trent itself would be required. Excavated material from the Farndon East FCA, Farndon West FCA and Brownhills Borrow Pit would provide the structural fill to the widened embankments of the A46, therefore reducing the need to send material to landfill and import material from other locations. General excavation would also be required for embankment widening along the route of the Scheme. The Environment Agency raised concerns associated with the potential impacts upon fish/fish spawning/fish migration, particularly protected species such as lamprey. In the absence of mitigation, lamprey individuals could become trapped in Farndon East FCA and Farndon West FCA (due to the creation of deep pools at this site) when flood waters retreat, should flood events occur during the lamprey migration/breeding period and should lamprey be using the River Trent as a migratory route. This could therefore have a negative impact upon the population density of lamprey associated with the SAC/Ramsar. Due to the infrequency of water conveyance to the Kelham and Averham FCA, with the site only being flooded in storm events more severe than the 1 in 30 year event, the risk to lamprey due to entrapment within this FCA is considered to be negligible. As such, LSE on the SAC/ Ramsar due to lamprey entrapment within the Kelham and Averham FCA are not anticipated.
Transportation requirements	Transportation of materials, site operatives and machinery would be required to facilitate construction works. This may result in increased congestion of routes within the Order Limits, as a result of additional vehicle movements and traffic management. Given the distance of the Scheme from the SAC/Ramsar, increased congestion of routes within and around the Order Limits is not considered to result in any potential pathways for LSE upon the SAC/Ramsar. For construction of the new Windmill Viaduct and Nether Lock Viaduct, a safety boat would be deployed in the River Trent during works above the River. This would include the use of a safety boat during the night-time hours. The boat would remain moored in-place and manned during the deck construction works, ready to mobilise should it be required to respond to an incident. The boat would not be constantly running or moving. It is not anticipated that this safety boat use would result in a significant increase in boat movements, which could result in increased physical and noise disturbance upon lamprey.

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Duration of construction, operation, etc	Construction is currently programmed to commence in June 2025 (pre-commencement works), with main construction works beginning in August 2025. The anticipated completed date is November 2028. Whilst works (including piling works) may overlap with the lamprey migratory and spawning season, piling works will be undertaken during the daytime, which will avoid the migration of lamprey during the night-time hours. Whilst daytime piling works could result in disturbance of resting lamprey and any larval lamprey within suitable sediments (if present), these works will be temporary and localised, with fish species likely relocated to suitable habitat in adjacent areas. Given the absence of favourable areas for spawning observed within areas adjacent to piling works (as detailed earlier in this table under 'Distance from the European Site or key features of the site'), impacts upon spawning lamprey are considered unlikely.
Description of avoidance and/or mitigation measures, including information on:	
Nature of proposals	General embedded measures are incorporated into the Scheme to prevent, avoid and reduce the effects of the Scheme. These include protocols to prevent pollution of the fluvial system and prevent/reduce loss or disturbance of fluvial habitats, which are also considered relevant to this assessment. Best practice measures would also be employed during construction to avoid or reduce the impacts of the Scheme upon the fluvial system. The requirement for additional mitigation to combat possible LSEs has been identified within the boxes 'Emissions' (potential disturbance of lamprey migratory routes through artificial light spill) and 'Excavations Requirements' (potential entrapment or isolation of lamprey) and these will be addressed in the Appropriate Assessment (Stage 2), detailed in Section 5.
Location	Measures would be provided throughout the extent of the Order Limits during construction and operation; however, these are largely associated with the River Trent (including Nether Lock and Windmill Viaduct) and adjacent habitats/works areas (e.g., Farndon East FCA, Farndon West FCA and drainage routes to the River Trent).
Evidence for effectiveness	The measures proposed are commonly used and implemented on similar road schemes, where the effectiveness of these measures has been proven.
Mechanism for delivery (legal conditions,	Measures would be secured and delivered through the powers and requirements contained within

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restrictions or other legally enforceable obligations)	the draft DCO [REP2-002].
Characteristics of European Site	
A brief description of the European Site to be produced, including information on:	
Name of European Site and its EU code	Humber Estuary SAC (UK0030170)/Ramsar (UK11031)
Location and distance of the European Site from the proposed works	Located 53 kilometres north of the Scheme (75 kilometres via the channel of the River Trent).
European Site size	36,657.15 hectares/37987.8 hectares
Key features of the European Site including the primary reasons for selection and any other qualifying interests	**Humber Estuary SAC** Annex I habitats that are a primary reason for selection of this site: • Estuaries • Mudflats and sandflats not covered by seawater at low tide Annex I habitats present as a qualifying feature, but not a primary reason for selection of this site: • Sandbanks which are slightly covered by sea water all the time • Coastal lagoons • Salicornia and other annuals colonizing mud and sand • Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) • Embryonic shifting dunes • Shifting dunes along the shoreline with *Ammophila arenaria* (white dunes) • Fixed coastal dunes with herbaceous vegetation (grey dunes) • Dunes with *Hippopha rhamnoides* Annex II species that are a primary reason for selection of this site: • Not applicable Annex II species present as a qualifying feature, but not a primary reason for site selection: • Sea lamprey *Petromyzon marinus* • River lamprey *Lampetra fluviatilis* • Grey seal

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	Humber Estuary Ramsar Criterion 1 • Representative example of near natural estuary Criterion 3 • Breeding colony of grey seals Criterion 5 • Assemblages of non-breeding waterfowl Criterion 6 • Internationally important populations of red knot *Calidris canutus* (breeding and non-breeding), common shelduck *Tadorna tadorna* (non-breeding), dunlin *Calidris alpina* breeding and non-breeding, black-tailed godwit *Limosa limosa*, redshank *Tringa totanus* (non-breeding), and bar-tailed godwit *Limosa lapponica* (breeding) Criterion 8 • River lamprey • Sea lamprey
Vulnerability of the European Site - any information available from the standard data forms on potential effect pathways	• Changes in abiotic conditions • Industrial or commercial areas • Human induced changes in hydraulic conditions • Pollution in general and to groundwater (point sources and diffuse sources) • Abiotic (slow) natural processes • Disturbance to vegetation • Vegetation succession • Water diversion • Recreation • Coastal squeeze
European Site conservation objectives	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

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	• The structure and function of the habitats of qualifying species • The supporting processes on which qualifying natural habitats and 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 Scheme (either alone or in-combination with other plans or projects) likely to give rise to impacts on the European Site.	
The Scheme risks potential impacts upon river and sea lamprey within the River Trent, which acts as functionally linked land to the Humber Estuary SAC/Ramsar. Artificial light spill during night-time works, to facilitate a safe working environment for bridge beam installation, risks potentially creating a temporary semi-permeable 'barrier' effect with potential to restrict/disturb the migration of lamprey. Flooding of the Farndon East FCA and Farndon West FCA could result in the entrapment or isolation (loss) of lamprey individuals and prevent these individuals from migrating/breeding. Daytime piling works are considered unlikely to negatively impact upon migrating lamprey; however, a de-minimis level impact upon resting lamprey or larval lamprey (if present) could be encountered. In-combination effects from on-shore NSIPs, proposed NSIPs and other projects and plans could be encountered in association with these three impacts. Given the distance of the SAC/Ramsar from the Order Limits (53 kilometres directly between the Order Limits and the European Sites or 75 kilometres via the channel of the River Trent), the potential for impacts upon habitats cited under the SAC and Ramsar designations for the other qualifying species (grey seal, various bird species and the non-breeding waterfowl assemblage) has been scoped out.	
Initial assessment	
The key characteristics of the site and the details of the European Site to be considered in identifying potential impacts. Describe any likely changes to the site arising as a result of:	

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Reduction of habitat area	No impact. There would be no land take from the SAC or Ramsar boundaries, nor any functional land (suitable for qualifying species) attributed to the SAC/Ramsar.
Disturbance to key species	Daytime pilings works Piling works associated with the Scheme are considered unlikely to impact upon migrating lamprey; however, temporary and localised disturbance of resting and larval lamprey (if present) is possible. Vibratory piling is much quieter than impact piling but occurs for longer, meaning longer exposure times to lamprey. The type of piling for each location will depend on the site conditions during construction, so impact piling cannot be ruled out at this stage of the Scheme delivery to minimise disturbance. For this reason, this Habitat Regulations Assessment applies a precautionary approach, assuming that impact piling will be required during construction. Piling works will be undertaken in the daytime to avoid sensitive periods for lamprey migration (nighttime hours). This means that the piling works could impact lamprey resting nearby in the day. However, lamprey lack a swim bladder and as such are categorised as low hearing sensitivity fish, as these species detect sound particle motion within a narrow band of frequencies, rather than sound pressure. This physiology makes lamprey inherently resilient to the kinds of physical injury (e.g. barotrauma) that other fish species can experience as a result of adverse levels of underwater sound and vibration, and therefore physical injury is highly unlikely to occur. It is considered that lamprey would need to make contact with a vibrating surface for a response to be likely (i.e. localised impact). Their behavioural response is likely to include swimming away and a change of swimming direction, orientation or position in the water column. However, the risk of more significant responses from vibratory piling, such as startle reactions, is low. Proposed piling at Nether Lock Viaduct and Windmill Viaduct will be set back from the bank. Therefore, the disturbance pathway (through earth then water), mean lamprey will not be able to come into direct contact with the source of vibration. As detailed in Chapter 8 (Biodiversity) of the Environmental Statement [APP-052], the northern branch of the River Trent is considered the main route for lamprey migration and will likely act as a bypass to the upper reaches during piling works along the southern branch of the river. This branch of the River Trent is currently more affected by the light distribution from nearby urban areas compared with the northern branch (the part of the river that passes through Kelham); therefore light spill during construction will be along a section of the watercourse which is already subject to artificial light. The southern branch is also only available to migratory lamprey when Nether Lock is open and therefore is considered semi-permeable to migratory lamprey. The northern branch, considered the main route for migratory lamprey, provides more favourable conditions for migration, given the permeability and

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	reduced lighting along this stretch. Furthermore, works at Kelham and Averham FCA will be completed prior to commencement of main alignment works. A precautionary approach was applied assuming a de-minimis level impact on resting lamprey on their migration journey, instead of a neutral impact, due to daytime piling works. Artificial light spill Artificial light spill associated with unavoidable night-time bridge beam installation risks creating a temporary semi-permeable 'barrier'/disturbance to lamprey migration. Temporary semi-permeable 'barrier' refers to when a crane slews and the lighting on the boom casts across the water before coming to rest on the beam lift. However, it is noted that this would likely only ever be for short amounts of time (the slewing of the crane would take place approximately four times during a night shift, with the slew taking approximately 30 minutes, with works occurring over 4 weeks in total). The River Trent is approximately 30 metres wide at the location of the works and therefore, as the crane slews, only a section of the width of the watercourse would be illuminated at any one time. Therefore, the light spill is unlikely to sever the migratory route as there will be dark areas either side.
Habitat or species fragmentation	No temporary or permanent physical barriers to movement of lamprey would be created as a result of the Scheme; however, artificial light spill associated with night-time bridge works does risk creating a temporary and localised semi-permeable 'barrier' to lamprey migration (disturbance only to migrating lamprey), as detailed earlier in this HRA. The Farndon East FCA and Farndon West FCA could trap lamprey individuals as flood waters recede, should flood events be encountered during the lamprey migration (November – May, inclusive) and breeding season, (March to May, inclusive). The following details how a low risk of entrapment of 'individuals' as a proportion of the lamprey population to be impacted by the Scheme was concluded. Pre-construction, flood water in the fields proposed for the Farndon FCAs naturally drains into Old Trent Dyke, following the topography of the land. This flows northwards, meandering through Cattle Market roundabout and eventually joins the River Trent again, downstream of Nether Weir near suitable spawning substrate. Adult river lamprey stop feeding when they enter freshwater to begin their migration upstream to

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	spawning sites, after which, all adult lamprey species die after spawning. Most adult river lamprey found in fresh water are either migrating upstream to spawn or are dying after spawning (natural cause of death). Following construction, if individual adult lamprey that have not yet spawned were subject to entrapment in the excavated Farndon FCAs as flood water recedes (draining into Old Trent Dyke), there is potential that they may not survive until the next flood event (having exerted their energy migrating and no longer foraging). As river lamprey require flowing water through silt and sand substrate to spawn, they would not be able to spawn within the Farndon FCAs before dying. Adult river lamprey physiology facilitates their migration in winter and early spring when water flows are greater, hiding under stones and vegetation (sucking disk to cling to rocks). Therefore, the likelihood of river lamprey being swept up by flood water is considered low, as they would likely take refuge until suitable conditions resumed for their migration. As such, whilst it is considered unlikely that adult lamprey would be entrapped in the Farndon FCAs following flood water recedence (incidental individuals only), measures were proposed in agreement with the Environment Agency to mitigate the remaining uncertainty of the implications for the site in view of that Humber Estuary SAC/ Ramsar conservation objectives. There is negligible potential for larvae (ammocoetes) to become entrapped in the Farndon FCAs, as high flows during spates are likely to wash eggs and larvae downstream before they would become trapped in the Farndon FCAs. However, there is a minor risk that during flood events they could be held within backwaters within the Order Limits, such as within the Farndon FCAs or Old Trent Dyke. Furthermore, if a future independent development upstream of the Scheme resulted in the disturbance of silt beds/nurseries upstream of Farndon, then the entrapment of these lamprey life stages cannot be ruled out. Due to the infrequency of water conveyance to the Kelham and Averham FCA, with the site only being flooded in storm events more severe than the 1 in 30 year event, the risk to lamprey due to entrapment within this FCA is considered to be negligible. As such, LSE on the SAC/ Ramsar due to lamprey entrapment within the Kelham and Averham FCA are not anticipated.
Reduction in species density	Disturbance to lamprey migration (via artificial light spill or entrapment of individuals within the Farndon East FCA and Farndon West FCA) could impact upon species density of the lamprey populations associated with the SAC/Ramsar. However, artificial light use would be temporary, only encountered during bridge beam installation and the entrapment of individuals is of low risk for at all lamprey life stages, due to their physiology.
Changes in key indicators of conservation value (e.g., water quality)	Due to the distance of the SAC/Ramsar from the Order Limits and the embedded mitigation measures within the Scheme, it is not considered that the Scheme would result in adverse changes

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	to key indicators or reduce the conservation value of the SAC/Ramsar.
Climate change	Climate change could impact upon habitats within the SAC/Ramsar due to changes in temperature and rainfall, for example. Whilst an overall increase in vehicle movements is anticipated within the operational Scheme, the works aim to reduce congestion (and idling vehicles) and enable more consistent traffic speeds and smoother journey conditions to be achieved, thereby reducing pollution levels. At least 50% of the Scheme would also be subject to speed restrictions or reductions to 50mph, which would contribute towards reduced emissions. Furthermore, air quality is expected to improve in the future, mainly due to reduced vehicle emissions, improved abatement technology and a shift towards cleaner energy. Drainage design and the assessment of flood risk within the Scheme has allowed for the effects of climate change meaning it is not expected to change the hydraulic regime in the catchment. It is not considered that the Scheme would result in significant adverse impacts upon or changes to the SAC/Ramsar as a result of impacts of climate change.
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	Structure is taken to correspond to the distribution and abundance of habitats that support the qualifying features of the SAC and Ramsar site. Due to the absence of impact pathways as a result of the Scheme, no interference with the structure of the SAC and Ramsar site is predicted.
Interference with key relationships that define the function of the site	Function is taken to mean the capacity of the SAC and Ramsar sites to support the species for which it is designated. Temporary and localised disturbance of migratory routes (the River Trent) and the potential entrapment/isolation (loss) of lamprey individuals (within Farndon East FCA and Farndon West FCA) could impact upon the ability for these species to migrate and breed.
Indicate the significance as a result of the identification of impacts set out above in terms of:	
Reduction of habitat area	No LSEs.
Disturbance to key species	No LSEs for the Scheme alone.

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Habitat or species fragmentation	Possibility for LSEs associated with the temporary and localised fragmentation of migratory habitat (the River Trent) and the fragmentation/isolation of individual lamprey (within Farndon East FCA and Farndon West FCA).
Loss	Possibility for LSEs through the loss of lamprey individuals (from entrapment/isolation).
Fragmentation	No LSEs associated with fragmentation of the SAC or Ramsar sites.
Disruption	No LSEs associated with disruption of the SAC or the Ramsar sites.
Disturbance	No LSEs associated with disturbance of the SAC or the Ramsar sites.
Change to key elements of the site	No LSEs.

Describe from the above those elements of the Scheme, or combination of elements, where the above impacts are likely to be significant or where the scale or magnitude of impacts is not known.

Scheme effects

A precautionary approach was applied assuming a de-minimis level potential impact, instead of a neutral impact, resulting from noise/vibration disturbance (as a result of piling works) on resting lamprey and larval lamprey (if present), and, in isolation, the conservation objectives of the SAC/Ramsar.

Entrapment/isolation of individuals within the Farndon East FCA and Farndon West FCA during periods of flooding is possible (although considered a low risk) and sufficient uncertainty remains such that a LSE occurring cannot be discounted. Light spill during bridge beam installation could create a temporary semi-permeable 'barrier' potentially resulting in disturbance to lamprey migration and a LSE cannot be ruled out.

Possible impacts associated with fish entrapment/isolation, temporary disturbance of migratory routes and noise/vibration disturbance are considered further within the assessment of in-combination effects.

In-combination effects

The potential for in-combination effects upon lamprey is detailed for each relevant Nationally Significant Infrastructure Projects (NSIP) and potential NSIP below.

In-combination effects associated with noise/vibration disturbance are considered unlikely to occur, given the de-minimis level impact upon migrating lamprey within the Scheme. Whilst there is a risk of disturbance of resting lamprey or larval lamprey (if present) during the daytime, these impacts would be localised and as lamprey are a low hearing sensitivity fish species, the impacts are not considered to be significant. These works are therefore not considered likely to contravene the conservation objectives of the Humber Estuary SAC/Ramsar, either alone or in combination with other schemes and therefore are not considered further within the in-combination assessment within the HRA or within Stage 2 (Appropriate Assessment).

Consideration of the potential for in-combination effects of fish entrapment/isolation and temporary disturbance of migratory routes are discussed further

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in Section 5, owing to the sufficient uncertainty of LSEs upon lamprey.

NSIPs and impact pathways relevant to the in-combination assessment

Project	Distance from SAC/Ramsar	Relevant impact pathways (to lamprey)	Scope for in-combination effects
Able Marine Energy Park and Material Change 1/Change 2	Within boundary of SAC/ Ramsar	• Noise disturbance	**No** An in-combination effect on lamprey due to noise and vibration has been ruled out due to the de-minimis effect of the Scheme along this impact pathway.
Immingham Eastern Ro-Ro Terminal	Within boundary of SAC/ Ramsar	• Disturbance through noise and vibration • Toxic and non-toxic contamination	**No** An in-combination effect on lamprey due to noise and vibration has been ruled out due to the de-minimis effect of the Scheme along this impact pathway. There is no pathway for impacts to the SAC/ Ramsar on Toxic/ non-toxic contamination because of the Scheme and therefore no scope for in-combination impacts.
Immingham Green Energy Terminal	Within boundary of SAC/ Ramsar	• Disturbance through noise and vibration • Changes in water and sediment quality during operation	**No** An in-combination effect on lamprey due to noise and vibration has been ruled out due to the de-minimis effect of the Scheme along this impact pathway. There is no pathway from the Scheme during operation that would give rise to in-combination effects on lamprey due to water and sediment quality.
North Lincolnshire Green Energy Park	0.10km south of the SAC/ Ramsar	None - lamprey screened out. Considered unlikely to be affected significantly by piling associated with	**No** An in-combination effect on lamprey due to piling (noise

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		the project.	and vibration) has been ruled out due to the de-minimis effect of the Scheme along this impact pathway.
Viking CCS Pipeline	0.20km south of SAC/ 1.29km south of Ramsar	• Killing or injury • Noise and visual disturbance • Water Quality	**No** With mitigation measures in place, Adverse Effects on the Integrity (AEoI) on the SAC/ Ramsar with regard to impacts to lamprey have been ruled out for the Viking CSS pipeline. An in-combination effect on lamprey due to noise and vibration has been ruled out due to the de-minimis effect of the Scheme along this impact pathway. There is no pathway from the Scheme during operation that would give rise to in-combination effects on lamprey due to water quality.
Humber Low Carbon Pipelines	0.31km south of the SAC/ Ramsar	To date, only a scoping report has been submitted; however, the following potential pathway has been identified: • Pollution of the River Ouse or Humber during construction or decommission.	**No** There is no pathway from the Scheme during operation that would give rise to in-combination effects on lamprey due to pollution/ changes in water quality.
Keadby 3 Carbon Capture Power Station	Within boundary of SAC/ Ramsar	• Visual and noise/vibration disturbance • Water quality • Entrapment	**No** An in-combination effect on lamprey due to noise and vibration has been ruled out due to the de-minimis effect of the Scheme along this impact pathway. There is no pathway from the Scheme during operation that would give rise to in-combination effects on lamprey due to pollution/ changes in water quality. There is potential for LSE on the SAC/ Ramsar due to

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			entrapment of lamprey arising from the dewatering of the cofferdam during construction of the NSIP. With mitigation measures in place, the HRA for the NSIP concluded that there would be no AEoI on the SAC/ Ramsar as a result of this potential impact pathway. Due to the distance between the Scheme and the NSIP (approximately 53km) and due to the impact pathway for the NSIP being short-term (construction phase only), in-combination effects on the SAC/ Ramsar due to entrapment of lamprey are not anticipated.
Drax Re-power	6.00km south of the SAC/ Ramsar	• Hydrological changes (quality/flow)	**No** There is no pathway from the Scheme that would give rise to effects on lamprey due to hydrological changes, in combination with this NSP.
Tween Bridge Solar Farm	6.20km west of the SAC/ Ramsar	To date, only an Environmental Impact Assessment scoping report has been submitted, which states that statutory designated sites over 2 kilometres from the site will be 'scoped out' of the assessment. A scoping response by Natural England highlighted the potential for hydrological connection between the project site and the SAC, and for consideration to be given to potential hydrological changes and water quality.	**No** There is no pathway from the Scheme during operation that would give rise to in-combination effects on lamprey due to pollution / changes in water quality or hydrology.
Drax Bioenergy with Carbon Capture and Storage Project	6.40km west of the SAC/ Ramsar	Noise/vibration disturbance screened out due to distance of the SAC (6.4 kilometres) from the project site.	**No** An in-combination effect on lamprey due to noise and vibration has been ruled out due to the de-minimis effect

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			of the Scheme along this impact pathway.
Continental Link Multi-Purpose Interconnector	9.00km north of SAC/ Ramsar	Currently at pre-application stage. No impacts pathways have yet been identified as part of the application, however, destruction/disturbance of lamprey marine habitat and construction phase disturbance of individuals is possible.	**No** The application for the NSIP is expected to be submitted for DCO in 2029 and therefore the construction phase would not be in alignment with that of the Scheme and in combination effects would not arise during construction. Due to the distance of the NSIP from the Scheme (80lm north), in-combination effects are considered unlikely.

Non-NSIPs and impact pathways relevant to the in-combination assessment.

Project	Planning Reference	Local Authority	Distance from SAC/ Ramsar or A46 Scheme	Relevant impact pathways (to lamprey)	Scope for in-combination effects
Hydroelectric generation plant and associated infrastructure	18/01515/FULM	Newark & Sherwood	5.3 km southwest of the Scheme	No disruption to migrating or foraging lamprey was anticipated after Stage 1 Screening but the following pathways during construction were taken to Stage 2 Appropriate Assessment. • Increased suspension of sediments in the water column • Potential disruption of spawning during construction works • Potential to introduce invasive species and pathogens to the site • Potential harm from dewatering • Potential mortality from pollution incidents • Potential reduced capacity for fish passage during construction works With mitigation measures in place there were no AEoI of the SAC/ Ramsar.	**No** The proposed project is approximately 11.3km upstream from the Scheme along the River Trent. The Construction Method Statement for the hydroelectric scheme detailed that the construction phase would be complete in October 2023. The construction phase for the Scheme is due to commence in August 2025. Therefore in-combination effects are not anticipated.

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				There are no pathways for the proposed hydroelectric project to give rise to Likely Significant Effects on lamprey during operation.	
Construction of a tidal flood defense	18/02895/STPLF	East Riding of Yorkshire	Adjacent to boundary of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Erection of 115 dwellings and associated works	21/03132/STPLF	East Riding of Yorkshire	0.3 km north of SAC/ Ramsar	• Water pollution • Changed water chemistry	**No** There are no pathways from the Scheme that would give rise to in-combination effects on lamprey due to pollution/ changes in water quality or chemistry.
Change of use for provision of two sports pitches, with associated works	23/00564/STPLF	East Riding of Yorkshire	1.2km north of SAC/ Ramsar	• Water pollution • Changed water chemistry	**No** There are no pathways from the Scheme that would give rise to in-combination effects on lamprey due to pollution/ changes in water quality or chemistry.
Erection of a raised platform to site Principal Supply Point (PSP) container and associated infrastructure	23/00101/PLF	East Riding of Yorkshire	Adjacent to SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Alterations to barbette including	23/00488/PLB	East Riding of Yorkshire	Within boundary of	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**

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replacement of steel panels with new straps			SAC/ Ramsar		
10 year extension of the use of 14 wind turbines	21/03800/STVARE	East Riding of Yorkshire	2.8km south of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Construction of sub-surface cable route from Drax Power Station to Fraisthorpe Coastline	22/01990/STPLFE	East Riding of Yorkshire	3.5km north of SAC/ Ramsar	• Water contamination	**No** There are no pathways from the Scheme that would give rise to in-combination effects on lamprey due to water contamination
Planning Permission for the construction of a Relief Road from Thorpe Road to Station Road	22/02118/STPLFE	East Riding of Yorkshire	2.1km north of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Planning Application discharges conditions relate to (Approved) application 08/01710/STOUTE Capitol Park (Mixed B1, B2 and B8 employment development, Hotel, Class A3, A4 and A5 facilities, Car Showrooms and associated landscaping and engineering works).	24/30218/CONDET	East Riding of Yorkshire	1.3km West of the SAC/ Ramsar boundary	No relevant impact pathways. No HRA produced. Surface water to discharge to watercourse. Foul water will discharge to public foul water sewer.	**No** The Humber Estuary SAC is sufficiently removed from the Application Site as to be unaffected by the proposals and will not affect the integrity of the designated site.

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Construction of sports pitches, erection of associated buildings, spectator stands and floodlighting following demolition of existing infrastructure, re-modelling of existing access and construction of boundary wall, vehicle parking toilets, storage and maintenance	23/01847/PLF	East Riding of Yorkshire	950m West of the SAC/ Ramsar boundary	No relevant impact pathways. No HRA produced. The development of the site is constrained within the redline boundary and is not expected to impact any perceivable connective corridors to the Humber Estuary SAC, therefore were not considered further.	**No** There are no pathways from the Scheme that would give rise to in-combination effects on lamprey.
Submission of details required by Condition 8 (scheme for any removal of fabric not already identified) for planning permission 21/03194/PLB Railway Swing Bridge Refurbishment works	23/30008/CONDET	East Riding of Yorkshire	Within the SAC/ Ramsar boundary	No impact pathway to lamprey.	**No**
Outline - Residential development of up to 64 dwellings (Access to be considered)	24/00022/STOUT	East Riding of Yorkshire	1.6km North of the SAC/ Ramsar boundary	No impact pathway to lamprey.	**No** Application withdrawn
Demolition of former offices and water storage tank	24/01779/DEMNOT	East Riding of Yorkshire	1.5km North of the SAC/ Ramsar	No impact pathway to lamprey.	**No**

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			boundary		
Erection of a building, installation of drying equipment and ventilation/odour abatement equipment	24/00928/CM	East Riding of Yorkshire	560m North of the SAC/ Ramsar boundary	Stage 2 Appropriate Assessment scoped out impacts to lamprey	**No**
Erection of 2 wind turbines	23/01982/STPLFE	East Riding of Yorkshire	580m North of the SAC/ Ramsar boundary	No impact pathway to lamprey.	**No** There are no pathways from the Scheme that would give rise to in-combination effects on lamprey.
Erection of 172 dwellings, open space, landscaping and associated infrastructure	22/03861/STPLF	East Riding of Yorkshire	1.7km Northeast of the SAC/ Ramsar boundary	No impact pathway to lamprey.	**No**
Change of use for provision of 2 sports pitches with associated works including parking, drainage, access and vehicular passing places on Common Lane (to be developed in connection with residential application at Welton Low Road Allocation ECB-B)	23/00564/STPLF	East Riding of Yorkshire	1.2km North of the SAC/ Ramsar boundary	No impact pathway to lamprey.	**No**
Outline - Erection of up to 120 dwellings with landscaping,	22/03465/STOUT	East Riding of Yorkshire	1.6km Northeast of the SAC/	No impact pathway to lamprey.	**No**

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access and associated works following demolition and clearance of existing structures and ground remodelling (access to be considered)			Ramsar boundary		
Erection of 115 dwellings, and associated public open space, access, landscaping and associated infrastructure	21/03132/STPLF	East Riding of Yorkshire	400m Northwest of the SAC/ Ramsar boundary	Stage 2 Appropriate Assessment scoped out impacts to lamprey	**No**
Construction and operation of a hydrogen production facility with carbon capture (referred to as H2H Saltend)	23/02216/CME	East Riding of Yorkshire	190m West of the SAC/ Ramsar boundary	No impact pathway to lamprey.	**No**
Construction of a facility to receive and process up to 600 tonnes per day of raw gaseous carbon dioxide (CO2) from Vivergo Fuels Ltd with new pipeline connection to existing marine terminal installed on an existing pipe bridge extending from the	24/01021/STPLF	East Riding of Yorkshire	Within the SAC/ Ramsar boundary	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**

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production area to the jetty					
Outline - Erection of a 'Green' Hydrogen Energy Production Facility and Associated Utilities Infrastructure and Piperack (Access, Layout and Scale to be considered)	24/00012/STOUT	East Riding of Yorkshire	1.3km Northeast of the SAC/ Ramsar boundary	HRA concludes no likely significant effects on lamprey and no potential for in-combination effects re. lamprey (scoped out at Stage 1 screening).	Scoped out – no impact pathways
Excavation of land to create brackish lagoons and construction of islands and bunds to form wetland habitat and water storage to include the extraction of water from Keyingham Drain	23/01384/STPLF	East Riding of Yorkshire	40m North of the SAC/ Ramsar boundary	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Erection of a pumping station with eel pass and mechanical, electrical, instrumentation, control and automation (MEICA) compound and associated works	23/03745/STPLF	East Riding of Yorkshire	600m North of the SAC/ Ramsar boundary	No impact pathway to lamprey. HRA concludes lamprey are absent upstream of the existing pumping station. This existing pumping station prevents migration upstream. No in-combination impacts on lamprey habitat are anticipated. Habitats present in Winestead Drain and the wider catchment currently are not suitable for lamprey species (report May 2024).	**No** There are no pathways from the Scheme that would give rise to in-combination effects on lamprey.
Submission of details required by Condition 6 (land remediation	24/30106/CONDET	East Riding of Yorkshire	Within the SAC/ Ramsar boundary	Potential for any LSEs upon lamprey ruled out at HRA Stage 2 Appropriate assessment.	**No**

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verification) of planning permission 19/00786/STPLFE					
Planning permission for the creation of coastal grazing marsh on arable land	PA/2023/233	North Lincolnshire	Adjacent SAC/ Ramsar, along the River Trent to the west.	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Planning permission to construct a 10MW solar farm with associated access, landscaping and infrastructure	PA/2021/1359	North Lincolnshire	2.1km south of the SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Planning permission to erect two single-storey units with potential for sub-division to a maximum of six units, use Class B2 General Industry and B8 Storage or distribution with trade counter, parking and service area	PA/2022/1482	North Lincolnshire	Adjacent to Ramsar; 0.7km south of SAC.	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Outline planning permission for a residential development of up to 390 dwellings with associated infrastructure, and with appearance, landscaping, layout	PA/2021/2151	North Lincolnshire	2km south of Ramsar; 2.7km south of SAC	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**

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and scale reserved for subsequent consideration					
Planning permission to create a lorry park with associated car parking, fencing, external lighting columns and landscaping	PA/2021/2257	North Lincolnshire	0.2km of Ramsar; 0.8 km south of SAC.	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Planning permission to erect two single-storey units with potential for sub-division to a maximum of six units, use Class B2 General Industry and B8 Storage or distribution with trade counter, parking and service area	PA/2022/1482	North Lincolnshire	Adjacent to Ramsar; 0.7 km south of SAC	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Planning permission to repair and reconstruct the bullnose of the dock to improve navigation and to deepen and widen the dock to increase the time window for ship access	PA/2023/234	North Lincolnshire	Adjacent to Ramsar/ SAC.	• Direct loss of intertidal habitat • Impacts to water quality • Indirect damage from construction activities • Increased suspended sediment loadings and seabed deposition	**No** This development is located adjacent to the SAC/ Ramsar, approximately 53km north of the Scheme. There are no pathways from the Scheme that would give rise to in-combination effects on lamprey due to loss of intertidal habitat, water quality impacts,

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					damage from construction activities and increased sediment suspension loading.
Full planning application for enabling works on land east of Rosper Road, Killingholme	PA/2023/502	North Lincolnshire	0.5km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Planning permission to erect a monopole manufacturing facility	PA/2021/1525	North Lincolnshire	0.5km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Hybrid application comprising full planning permission for the construction of a hardstanding area for external level storage with landscaping, drainage, access and associated works, and outline planning permission to erect 26,096m² floor space for industrial/storage and distribution	PA/2022/1223	North Lincolnshire	1.2km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Planning permission for the construction and operation of a post-combustion carbon capture plant	PA/2023/422	North Lincolnshire	2.8km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Planning permission for the construction and operation of a	PA/2023/421	North Lincolnshire	1.5km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**

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post-combustion carbon capture plant					
EIA scoping request for three wind turbines – CON/2023/635	PA/SCO/2023/2	North Lincolnshire	1.2km Southwest of the SAC/ Ramsar boundary	No relevant impact pathways.	**No**
Planning permission to erect one wind turbine. Associated and ancillary infrastructure.	PA/2024/397	North Lincolnshire	900m Southwest of the SAC/ Ramsar boundary	No relevant impact pathways.	**No**
EIA Scoping request for a 100MW hydrogen electrolyser together with an underground electrical cable connection to the Hornsea Two onshore substation, water discharge and a hydrogen export pipeline to the Humber Refinery	PA/SCO/2022/13	North Lincolnshire	1.4km Southwest of the SAC/ Ramsar boundary	No relevant impact pathways.	**No**
Planning permission for a car storage and distribution facility, port related storage,	PA/2017/2141	North Lincolnshire	600m Southwest of the SAC/ Ramsar boundary		**No** Application Withdrawn

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engineering works, pre-delivery inspection facility building, other minor buildings, lighting columns and other minor works					
EIA screening request for permanent construction & operation of car storage & distribution facility	PA/SCR/2018/14	North Lincolnshire	900m Southwest of the SAC/ Ramsar boundary	No relevant impact pathways.	**No**
EIA Screening Opinion for the development of 2 building and open storage along with associated buildings, landscaping, attenuation, access and parking provision (both cars and HGV's)	PA/SCR/2024/8	North Lincolnshire	300m South of the SAC/ Ramsar boundary	No relevant impact pathways.	**No**
Outline planning permission for 34 dwellings with	PA/2019/1698	North Lincolnshire	50m South of the SAC/ Ramsar boundary		**No** Application withdrawn

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appearance, landscaping and scale reserved for subsequent approval					
Planning permission for part demolition and conversion of existing engineering workshop to form seven townhouses including creation of new access on to Chapel Lane and associated works	PA/2022/2020	North Lincolnshire	800m Southwest of the SAC/ Ramsar boundary	No relevant impact pathways.	**No**
Outline planning permission to erect 50 dwellings with all matters reserved for subsequent consideration	PA/2020/1285	North Lincolnshire	650m South of the SAC/ Ramsar boundary		**No** Application withdrawn
Planning permission to erect 19 lodges, new access road and associated hardstanding	PA/2021/813	North Lincolnshire	Within the SAC/ Ramsar boundary		**No** Application withdrawn
Outline application for the erection of 29	PA/2018/2047	North Lincolnshire	800m Southwest of the SAC/		**No** Application withdrawn

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bungalows with all matters reserved.			Ramsar boundary		
Outline application to erect 93 dwellings	DM/0068/22/OUT	North East Lincolnshire	1.7km southwest of SAC/ Ramsar	• Water pollution / contamination	**No** There are no pathways from the Scheme that would give rise to in-combination effects on lamprey due to water pollution/ contamination.
Erection of 225 dwellings with access off Midfield Road and Andrew Road	DM/0696/19/FUL	North East Lincolnshire	1.3km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Demolition and removal of all existing buildings and structures on site	DM/1109/22/FUL	North East Lincolnshire	Adjacent to SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Local Development Order to provide outline consent for uses in relation to Renewables Industries and particularly operations and maintenance opportunities servicing the North Sea Wind Farms	DC/750/12/EMA	North East Lincolnshire	Adjacent to SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Erection of an onshore aquaculture farm (Sui Generis) with associated water	DM/0539/23/FUL	North East Lincolnshire	Adjacent to SAC/ Ramsar	• Water pollution / contamination	**No** There are no pathways from the Scheme that

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extraction and effluent discharge from and to Grimsby Docks					would give rise to in-combination effects on lamprey due to water pollution/ contamination.
Demolition of existing ambient warehouse, loading dock, coldstore 2 and maintenance garage, and erection of replacement building for B2/B8 and ancillary office floorspace under use Class E	DM/1022/21/FUL	North East Lincolnshire	0.1km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Erection of Lifeboat Station, slipway and associated works	DM/1126/14/FUL	North East Lincolnshire	Within boundary of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Outline application with access and layout details for mixed B1, B2, B8 industrial park with ancillary A3, A4, A5 units	DC/730/07/IMM	North East Lincolnshire	0.9km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Hybrid application seeking outline consent with access, landscaping and scale to be considered for the development of a 62ha Business Park	DM/0105/18/FUL	North East Lincolnshire	2.5km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**

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Change of use from arable fields to mitigation area for a quality habitat area for Special Protection Area (SPA) birds	DM/0099/18/FUL	North East Lincolnshire	1km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Erection of plant/structures and ancillary equipment associated with the proposed enhanced digestion Scheme, including the demolition of 3 items of existing equipment within the sludge treatment centre	DC/1007/11/FRE	North East Lincolnshire	Adjacent to SAC/ Ramsar	• Water pollution / contamination	**No** There are no pathways from the Scheme that would give rise to in-combination effects on lamprey due to water pollution/ contamination.
Erection of two storey building for new custody suite, ancillary offices, store and associated car parking	DM/0723/17/FUL	North East Lincolnshire	0.6km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Rock revetment repair and reinforcement along a 4.5km section of the Humber Estuary	DM/1071/22/FUL	North East Lincolnshire	Within SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Replacement of existing obsolete power generation equipment with new, containerised, gas engine generators, to	DM/0104/16/FUL	North East Lincolnshire	0.4km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**

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act as a reserve generation site					
Proposed tyre pyrolysis plant including 20m high flue, associated buildings, treatment and storage plant and tanks	DM/1103/22/FUL	North East Lincolnshire	0.2km southwest of SAC/ Ramsar	• Water pollution • Noise and vibration disturbance	**No** An in-combination effect on lamprey due to noise and vibration has been ruled out due to the de-minimis effect of the Scheme along this impact pathway.
Erection of industrial building and adjoined two-storey office/control room to create power plant	DM/0195/17/FUL	North East Lincolnshire	0.7km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Erection of industrial building and adjoined two-storey office/control room to create power plant	DM/0329/18/FUL	North East Lincolnshire	0.7km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Application for integrated electricity generating station fuelled by biomass processing refinery	DC/303/07/IMM	North East Lincolnshire	Adjacent to SAC/ Ramsar	• Water pollution	**No** There are no pathways from the Scheme that would give rise to in-combination effects on lamprey due to water pollution.
Development of a sustainable transport fuels facility, including various stacks up to 80m high	DM/0664/19/FUL	North East Lincolnshire	Adjacent to SAC/ Ramsar	• Water pollution • Direct loss / damage to habitat	**No** There are no pathways from the Scheme that would give rise to in-

Scheme		A46 Newark Bypass			
					combination effects on lamprey due to water pollution or direct loss/ damage to habitats.
Construction of an energy from waste facility including emissions stack(s)	DM/1070/18/FUL	North East Lincolnshire	0.2km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Construction of a dissolved Acetylene manufacturing plant	DC/685/11/IMM	North East Lincolnshire	1km southwest of SAC/ Ramsar	Potential for any LSEs upon lamprey ruled out at Stage 1 Screening.	**No**
Retrospective redevelopment of outdoor activities area with associated landscaping, drainage and underground infrastructure	DM/1133/23/FUL	North East Lincolnshire	300m Southwest of the SAC/ Ramsar boundary	No relevant impact pathways	**No**
Amended Plans and Description for demolition and removal of all existing buildings and structures on site, alteration to existing access and formation of holiday park	DM/1109/22/FUL	North East Lincolnshire	270m Southwest of the SAC/ Ramsar boundary	No relevant impact pathways	**No**

Scheme		**A46 Newark Bypass**			
Erection of replacement secondary school and facilities, including three storey main building with sports hall, dining hall, classrooms, educational facilities, demolition of existing buildings, installation of MUGA, substation and temporary construction access via Humberston Road.	DM/0750/23/FUL	North East Lincolnshire	1.8km Southwest of the SAC/ Ramsar boundary	Stage 2 Appropriate Assessment scoped out impacts to lamprey	**No**
Erection of an onshore aquaculture farm with associated water extraction and effluent discharge	DM/0539/23/FUL	North East Lincolnshire	50m West of the SAC/ Ramsar boundary	Water pollution / contamination	**No** There are no pathways from the Scheme that would give rise to in-combination effects on lamprey due to water pollution / contamination.
Demolition of the existing Fish Sheds and erection of eight standalone buildings, floating Lido with associated public	DM/0344/24/FUL	North East Lincolnshire	600m South of the SAC/ Ramsar boundary	The Appropriate Assessment within the Shadow HRA concludes that mitigation during construction can remove the likelihood of LSEs. Results of the eDNA surveys indicate the likely absence of river and seas lamprey.	**No** There are no pathways from the Scheme that would give rise to in-combination effects on lamprey due to toxicity of

Scheme		A46 Newark Bypass			
realm works, car parking and various associated works.				Natural England has requested further information re. surface water (due to toxicity to qualifying fish) and info on species other than lamprey.	surface water.
Regulation 3 application to partially demolish and redevelop western element of Freshney Place shopping centre	DM/0979/22/FUL	North East Lincolnshire	1.3km Southwest of the SAC/ Ramsar boundary	No relevant impact pathways	**No**
Rock revetment repair and reinforcement along a 4.5km section of the Humber Estuary.	DM/1071/22/FUL	North East Lincolnshire	Within the SAC/ Ramsar boundary	No relevant impact pathways	**No**
Alterations and extensions to an existing cold storage facility	DM/0201/23/FUL	North East Lincolnshire	1.1km Southwest of the SAC/ Ramsar boundary	No relevant impact pathways	**No**
Proposed new extension to estate road and access bridge serving IGE development site	DM/0130/23/FUL	North East Lincolnshire	700m Southwest of the SAC/ Ramsar boundary	No relevant impact pathways	**No**
Construction and operation of a solar farm and battery	DM/0108/24/FUL	North East Lincolnshire	1.5km Southwest of the SAC/ Ramsar	No relevant impact pathways	**No**

Scheme			**A46 Newark Bypass**		
energy storage system (BESS) with associated works, equipment, infrastructure and landscaping.			boundary		
Outcome of screening stage	**Sufficient uncertainty remains** regarding the impacts of artificial light spill and the entrapment/isolation (loss) of lamprey individuals.				
Are the appropriate statutory environmental bodies in agreement with this conclusion?	Conclusions of this assessment have been presented to both Natural England and the Environment Agency (see section 3 of this report). However, formal acceptance of this assessment has yet to be received.				

5 Appropriate assessment (Stage 2)

5.1 Introduction

5.1.1 The Stage 1 screening assessment was unable to exclude the possibility of the potential for LSEs upon the Humber Estuary SAC/Ramsar. Therefore, further assessment is required at Stage 2 to assess the impact on the conservation objectives of this area. The qualifying features and conservation objectives are discussed in Table 4-1, above.

5.1.2 The following impacts were considered to potentially give rise to LSEs upon river lamprey and sea lamprey; qualifying species under the SAC and Ramsar designations:

- Entrapment/isolation (loss) of lamprey individuals within Farndon East FCA and Farndon West FCA during periods of flooding.
- Temporary disturbance of lamprey migratory routes along the river to spawning habitat upstream (as a result of artificial light spill during bridge beam installation).

5.1.3 Avoidance and mitigation measures associated with these impacts are detailed in the sections below.

5.1.4 All other potential impacts were considered unlikely to give rise to LSEs, given the absence of pathways or the embedded mitigation/nature of the proposed works associated with the Scheme.

5.2 Entrapment/isolation of lamprey (within Farndon East and Farndon West FCA)

5.2.1 During the operational phase, flooding of the Farndon East FCA and Farndon West FCA could result in the aforementioned low risk of entrapment/isolation (loss) of lamprey individuals (all life stages), should a flood event occur during the lamprey migration or breeding period.

5.2.2 This could contravene conservation objectives associated with maintaining the population and distribution of qualifying species of the Humber Estuary SAC/Ramsar (i.e., river and sea lamprey), and could constitute a LSE (without implementation of mitigation).

5.2.3 To mitigate for this potential LSE, fish escape passages are proposed within both the newly created Farndon East FCA and Farndon West FCA (due to the creation of deep pools at this site). For lamprey (during times of migration or breeding) and any other fish which may enter the Farndon East FCA or Farndon West FCA during flood events, these passages would provide an escape route back to the

River Trent and prevent/reduce the risk of entrapment. Following receipt of the Relevant Representation from Natural England [RR-044], the Applicant has brought forward the refinement of the fish escape passage design and produced a Technical Note outlining fish escape passage options considered and justification for the preferred option (see Appendix G). The Environment Agency acknowledges that Option 4 (the Preferred Option) is a viable design option for the provision of fish escape passages (Appendix H). The design of the fish escape passages incorporates the Environment Agency's recommendations for them to be a naturalised shape and measure a minimum of 0.5 metres wide and 0.3 metres deep. Natural England welcomes the approach for the fish passages to be naturalised routes and requests that all future design iterations adopt this approach (Appendix I). The specific number, location and design of fish escape passages will be finalised during detailed design. These details are provided in Table 3-2 Register of Environmental Actions and Commitments (REAC) of the First Iteration Environmental Management Plan (EMP) [REP2-010]. The pools within Farndon West FCA would be excavated to a maximum depth of 2-3 metres below ground level to provide stable thermal properties for the survival of fish until the next flood event, should individuals not use the fish escape passage as flood water recedes. Similarly, the lake proposed in Farndon East FCA would be excavated to a maximum depth of 4 metres.

5.2.4 Entrapment/isolation of lamprey within the Farndon East FCA and Farndon West FCA would only occur during the migration and breeding period for lamprey. The inclusion of these fish escape passages provides opportunities for lamprey to return to the River Trent; therefore, the potential for lamprey entrapment/isolation associated with the Scheme is considered to be sufficiently reduced and the residual impact upon lamprey considered to be negligible. As such, no Adverse Effect on Integrity is anticipated with regards to lamprey entrapment/isolation within the Farndon East FCA and Farndon West FCA.

5.3 Temporary disturbance of migratory routes (via artificial light spill)

5.3.1 Artificial light spill during night-time works, to facilitate a safe working environment for bridge beam installation across four consecutive working weeks (Monday to Friday), risks potential light disturbance, which could potentially restrict the migration of lamprey. Lamprey migration season is November – May, inclusive.

5.3.2 The following information provides further evidence that the mitigation hierarchy has been applied and justification why the timing of bridge beam installation works cannot fully avoid the lamprey migration

season or be undertaken in the daytime (which would remove lighting as an impact pathway on lamprey). Whilst the bridge beam installation works will endeavour to avoid the lamprey migration season, the bridge beam installation is weather dependent, with a particular need to avoid high winds. It is anticipated that the window for this work would best be undertaken in spring and summer months due to the reliability of the weather. In addition, the bridge beam installation at certain locations (e.g. Nether Lock) will also be constrained by possession availability on the East Coast Mainline. The works are also needed to be undertaken at night due to safety considerations with regard to the proximity of the lifting operations adjacent to live traffic and asset protection requirements by Network Rail, as well as to comply with the requirements of the Canal and Rivers Trust. Therefore, whilst the exact timing of the installation may change, it cannot be guaranteed that the bridge beam installation works would be able to avoid the lamprey migration season and thus this pathway for a potential likely significant effect was taken through to Stage 2 Appropriate Assessment.

5.3.3 Bridge beam installation is programmed to be undertaken consecutively for two weeks at each viaduct (total of four weeks) during May 2026. These works would therefore occur within the latter stages of the typical lamprey migration period (November – May) and account for a seventh of this period. Seasonal variables in the year of construction could either delay or provide suitable conditions for early migration, or shorten or length the period of migration.

5.3.4 Whilst the bridge beam installation works will endeavour to avoid the lamprey migration season, there are timing constraints to this element of the works. Bridge beam installation at certain locations (e.g. Nether Lock Viaduct) will be constrained by possession availability on the East Coast Mainline. The works are also weather dependent, with a particular need to avoid high winds and therefore it is anticipated that the window for this work would best be undertaken in spring and summer months due to the reliability of the weather. Therefore, whilst the exact timing of the installation may change, it cannot be guaranteed that the bridge beam installation works would be able to avoid the lamprey migration season.

5.3.5 Under the current works programme the bridge beam installations would be undertaken in two locations along the southern branch of the River Trent. This branch of the River Trent is currently more affected by the light distribution from nearby urban areas compared with the northern branch (the part of the river that passes through Kelham); therefore light spill during construction will be along a section of the watercourse which is already subject to artificial light. The southern branch is also only available to migratory lamprey when Nether Lock is open and therefore is considered semi-permeable to migratory lamprey. The northern branch, considered the main route for migratory lamprey, provides more favourable conditions for

migration, given the permeability and reduced lighting along this stretch. Therefore, the southern branch of the River Trent, where works are located, can be bypassed by migrating lamprey by using the northern branch of the River Trent. With the opportunity for lamprey to use this available channel, the impacts to the lamprey as a result of the works are likely to be minimal, however, additional mitigation detailed below is considered best practice and would further lessen any impacts the artificial lighting may have on the river.

5.3.6 Additional mitigation, further to embedded mitigation, would *"minimise light spill onto retained habitats"*. The following is therefore proposed:

- Static, task lighting with cowls should direct light towards the areas of works to minimise light spill on lamprey migratory routes.
- Night working will be restricted along the majority of the working width along the River Trent to minimise the requirement for artificial lighting, thereby avoiding disturbance effects of artificial lighting on sensitive ecological features.
- Where this is not possible, static, task lighting with cowls will direct light towards the areas of works and avoid direct illumination of the River Trent. The only exception to this would be during crane slewing, where the lighting on the boom may cast across the water before coming to rest on the beam lift, which would be temporary and short-term (taking place over four 30-minute intervals during a night shift).

5.3.7 These details are provided in Table 3-2 REAC of the First Iteration EMP [REP2-010].

5.3.8 During beam installation at the new Nether Lock and Windmill Viaducts, with the addition of the above-listed mitigation measures, the potential for the temporary disturbance of lamprey migratory routes associated with the Scheme is considered to be sufficiently reduced and the residual impact upon lamprey is considered to be negligible. As such, an Adverse Effect on Integrity (AEoI) of the site with regards to disturbance of lamprey migration routes can be ruled out.

5.4 Assessment of the Scheme alone

5.4.1 Electro-fishing will be undertaken as part of fish rescue in two areas across the Scheme, one around the sheet piling extension by Windmill Viaduct, and the second in Slough Dyke (also includes water abstraction). This multi-species fish mitigation was not included in the initial submission of this Habitat Regulations Assessment as Slough Dyke is considered unsuitable for sea and river lamprey, though it may be suitable for brook lamprey (not a reason for the designated sites) and lamprey are unlikely to take refuge in the spaces of the gabion baskets (adjacent to piling at Windmill Viaduct). Therefore, electro-fishing and water abstraction are not considered an impact

pathway on the integrity of these qualifying species and were scoped out at Habitat Regulations Assessment Stage 1 Screening. This information was presented to Natural England (16/09/2024) to explain the written responses to their Relevant Representation [RR-044]. Natural England commented that whilst electro-fishing is not specifically mitigation for lamprey, it may have a beneficial effect. However, Natural England acknowledged that it is unlikely that lamprey will use these areas.

5.4.2 The mitigation measures detailed above, with regards to the entrapment/isolation of lamprey and temporary disturbance of migratory routes, are considered to prevent or sufficiently reduce the impact upon lamprey so as to achieve a negligible residual impact. Therefore, adverse impacts upon the integrity of the Humber Estuary SAC/Ramsar can be ruled out.

5.5 Assessment of the Scheme in-combination

5.5.1 Adverse impacts upon the integrity of the Humber Estuary SAC/Ramsar have been ruled out following the adoption of appropriate mitigation measures. As such, the adverse effects of the Scheme in-combination with any of the projects and plans detailed in Table 4-2 can also be ruled out.

5.5.2 As adverse impacts upon the integrity of the Humber Estuary SAC/Ramsar have been ruled out, the absence of possible in-combination projects from with the East Lindsey District Council area is not considered to be a significant limitation upon this assessment.

6 Summary and conclusions

6.1.1 The Screening (Stage 1) assessment identified the potential for LSEs associated with the temporary disturbance of lamprey migration routes (via artificial lighting) and the entrapment/isolation (loss) of lamprey individuals within the Farndon East FCA and Farndon West FCA, during flood events occurring within the lamprey migration and breeding period.

6.1.2 The DMRB screening matrix can be found in Section 4 of this report, while the Planning Inspectorate's screening matrices can be found in Appendix A.

6.1.3 An Appropriate Assessment (Stage 2) was undertaken with regards to the pathways with the potential to give rise to LSEs. Appropriate mitigation including more detailed control of artificial lighting during night-time bridge works and the inclusion of fish escape passages within Farndon East FCA and Farndon West FCA are considered to prevent, or sufficiently reduce, the impact upon lamprey, so as to achieve a negligible residual impact. No AEoI of the Humber Estuary SAC/Ramsar are therefore anticipated as a result of the Scheme.

6.1.4 Embedded measures and essential mitigation measures detailed within the Stage 1 Screening and Stage 2 Appropriate Assessment respectively are considered to achieve an overall negligible residual effect upon lamprey. Mitigation measures that are being pursued are common practice and do not require any untested or bespoke methods. AEoI of the Humber Estuary SAC and Ramsar site associated within the Scheme, either alone or in-combination with any other projects or plans, can be ruled out. Therefore, there is not considered to be a requirement to proceed to Stage 3 (Derogation).

A. Appendix: Planning Inspectorate screening matrices

A.1.0.1 Potential effects upon the European Sites which are considered within this Habitat Regulations Stage 1 Report are as follows:

A. Reduction of habitat area
B. Disturbance to key species
C. Habitat or species fragmentation
D. Reduction in species density
E. Changes in key indicators of conservation value (e.g., water quality)
F. Climate change

A.1.0.2 The European Sites included within the screening assessment are:

- Humber Estuary Special Area of Conservation (SAC)
- Humber Estuary Ramsar

A.1.0.3 Evidence of likely significant effects on their qualifying feature is detailed within the footnotes to the screen matrices below Table A-2.

A.1.0.4 Matrix Key:

✓ = Likely significant effect cannot be excluded

× = Likely significant effect can be excluded

C = construction

O = operation

IC = in-combination

Scoped out of Stage 1 screening

Considered within Stage 1 screening and Stage 2 appropriate assessment

Appendix Table A-1: Humber Estuary SAC Planning Inspectorate's screening matrix

Name of European Site: Humber Estuary SAC																		
EU Code: UK0030170																		
Distance to NSIP: 53 kilometres north																		
European Site features	**Likely effects of NSIP**																	
Effect (as listed above, page 84)	**A**			**B**			**C**			**D**			**E**			**F**		
Stage of development	**C**	**O**	**IC**	**C**	**O**	**IC**	**C**	**O**	**IC**	**C**	**O**	**IC**	**C**	**O**	**IC**	**C**	**O**	**IC**
Annex I Habitats																		
Estuaries	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Mudflats and sandflats not covered by seawater at low tide	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Sandbanks which are slightly covered by sea water all the time	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Coastal Lagoons	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Salicornia and other annuals colonizing mud and sand	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Embryonic shifting dunes*	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Shifting dunes along the shoreline with Ammophila arenaria (white dunes)	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Fixed coastal dunes with herbaceous vegetation (grey dunes) feature	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Dunes with *Hippopha rhamnoides*	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Annex II Species																		
Sea lamprey *Petromyzon marinus*	×b	×b	✓ h	✓ c	×d	✓ h	✓e	×d	✓ h	✓e	×d	✓ h	×f	×f	✓ h	×g	×g	✓ h
River lamprey *Lampetra fluviatilis*	×b	×b	✓ h	✓ c	×d	✓ h	✓e	×d	✓ h	✓e	×d	✓ h	×f	×f	✓ h	×g	×g	✓ h
Grey seal	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a

Appendix Table A-2: Humber Estuary Ramsar Planning Inspectorate's screening matrix

Name of European Site: Humber Estuary Ramsar																		
EU Code: UK11031																		
Distance to NSIP: 53 kilometres north																		
European Site features	**Likely effects of NSIP**																	
Effect (as listed above, page 84)	**A**			**B**			**C**			**D**			**E**			**F**		
Stage of development	**C**	**O**	**IC**	**C**	**O**	**IC**	**C**	**O**	**IC**	**C**	**O**	**IC**	**C**	**O**	**IC**	**C**	**O**	**IC**
Annex I Habitats																		
Criterion 1 – Representative example of near natural estuary	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Criterion 3 – Breeding colony of grey seals	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Criterion 5 – Assemblages of non-breeding waterfowl	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Criterion 6 – Internationally important populations of red knot (breeding and non-breeding), common shelduck (non-breeding), dunlin breeding and non-breeding, black-tailed godwit, redshank (non-breeding), and bar-tailed godwit (breeding)	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a	×a
Criterion 8 – River lamprey and sea lamprey	×b	×b	✓ h	✓ c	×d	✓ h	✓e	×d	✓ h	✓e	×d	✓ h	×f	×f	✓ h	×g	×g	✓ h

Planning Inspectorate's Screening Matrices - Footnotes

(a) Given the distance of the Special Area of Conservation (SAC) from the Order Limits (53 kilometres directly between the Order Limits and the European Sites and 75 kilometres via the channel of the River Trent), the potential for impacts upon habitats cited under the SAC designation or the other qualifying species (grey seal, various bird species and the non-breeding waterfowl assemblage) has been scoped out.

(b) There would be no land take from the SAC/Ramsar boundaries, nor any functional land linked to these designated sites.

(c) Artificial light spill associated with night-time bridge works does risk creating a temporary and localised semi-permeable 'barrier' to lamprey migration. The proposed Farndon East FCA and Farndon West FCA could trap lamprey individuals as flood waters recede, should flood events be encountered during the lamprey migration/breeding season.

(d) No effects anticipated during this phase of the Scheme.

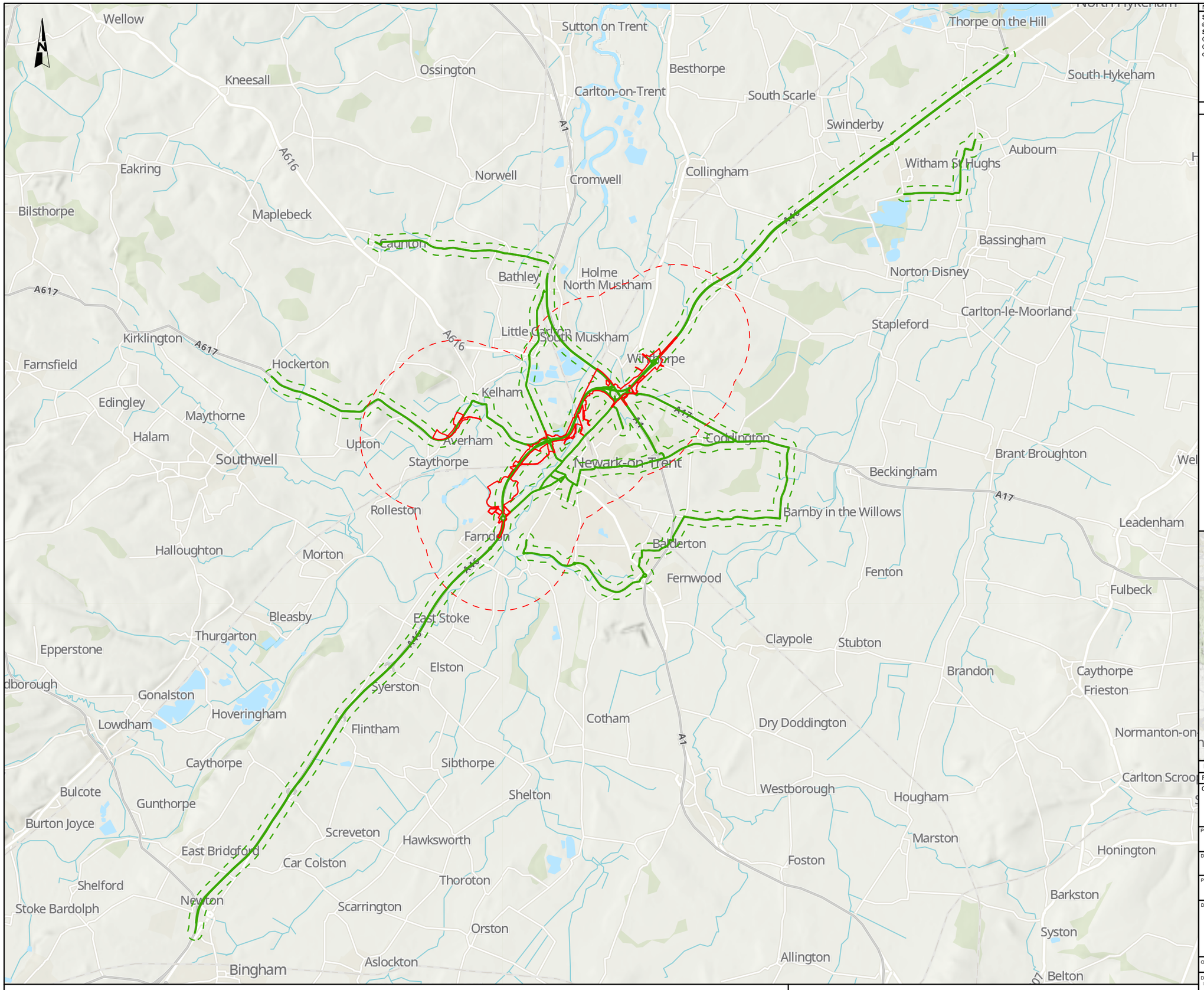
(e) Disturbance of lamprey migration (via temporary artificial light spill or entrapment of individuals within Farndon East FCA and Farndon West) could impact upon species density of the lamprey populations associated with the SAC/Ramsar.

(f) Due to the distance of the SAC/Ramsar from the Order Limits and the embedded mitigation measures within the Scheme, it is not considered that the Scheme would result in adverse changes to key indicators or reduce the conservation value of the SAC/Ramsar.

(g) The Scheme would reduce congestion to enable more consistent speeds and smoother journey conditions. At least 50% of the Scheme route would see restrictions of reductions of speeds to 50 miles per hour, contributing towards reducing pollution levels. Drainage design and the assessment of flood risk within the Scheme has allowed for the effects of climate change meaning it is not expected to change the hydraulic regime in the catchment.

(h) There is scope for in-combination effects upon lamprey species, following the identification of a number of projects and plans which could, in combination with the Scheme, adversely effect lamprey species.

B. Appendix: Study area search distances for HRA – Local Impact Area



NOTES

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KEY TO SYMBOLS

- Order Limits
- 2km buffer from Order Limits
- Affected Road Network (Air Quality)
- Affected Road Network (Air Quality) 200m buffer

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P04	20/10/2023	FOURTH DRAFT	DT	BC	JB

CLIENT: national highways

PURPOSE OF ISSUE: DCO APPLICATION

DEVELOPMENT CONSENT ORDER NUMBER: TR010065

PROJECT TITLE: A46 NEWARK BYPASS

DRAWING TITLE: Appendix B
Study Area Search Distances for HRA - Local Impact Area

ORIGINAL SIZE: A3 SCALE: 1:100,000

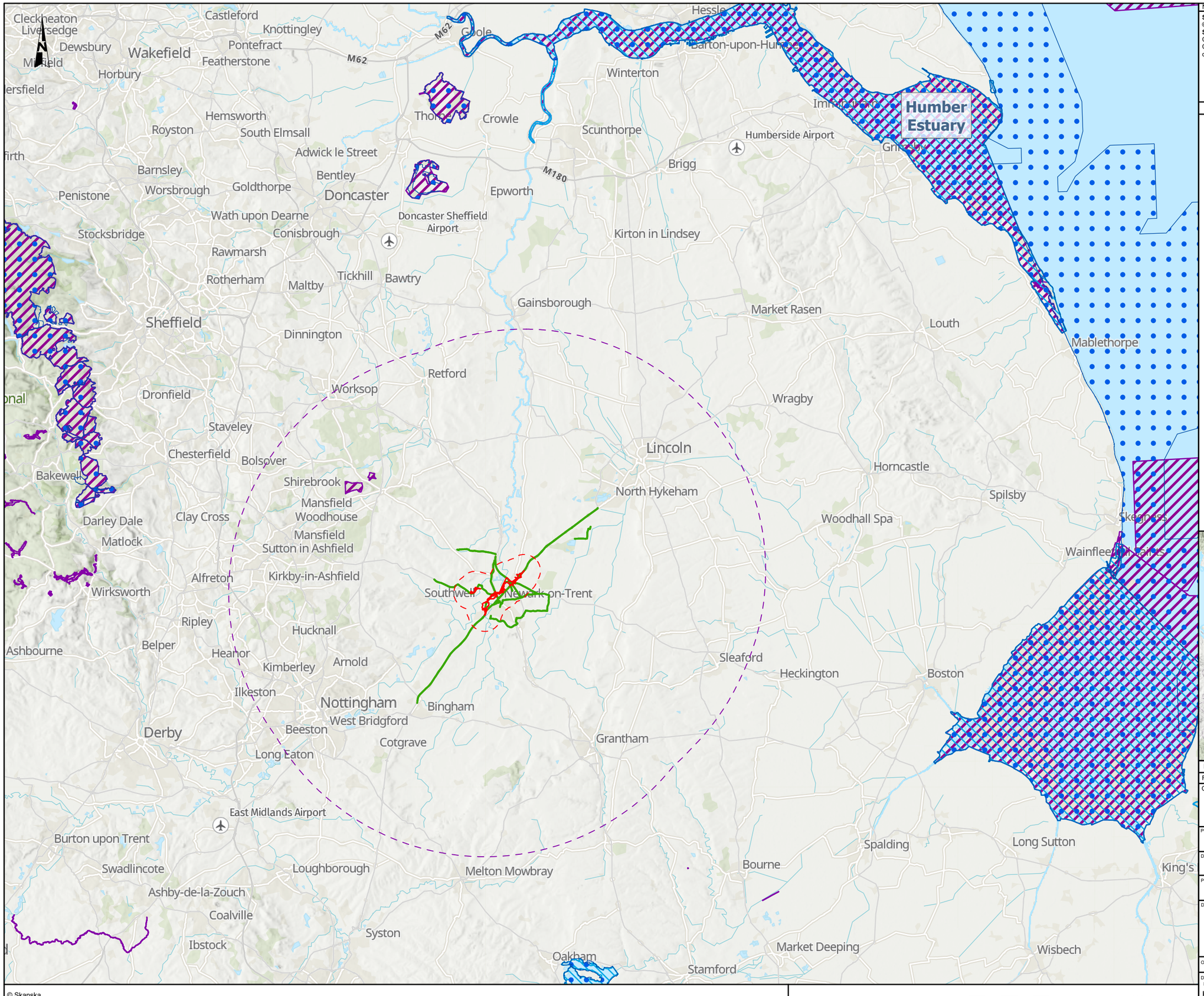
DRAWING NUMBER: HE PIN HE551478 | ORIGINATOR SKAG | VOLUME EBD | LOCATION CONWI_CONW | TYPE DR | ROLE LE | NUMBER 00128

PROJECT REF NO.: HE551478

REVISION: P04

0 2 4 Kilometres

C. Appendix: Study area search distances for HRA – Wider Impact Area



NOTES

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KEY TO SYMBOLS

- Order Limits
- 2km buffer from Order Limits
- 30km buffer from Order Limits
- Affected Road Network (Air Quality)
- Special Protection Area
- Ramsar
- Special Area of Conservation

REV.	DATE	AMENDMENT DETAILS	ORIG	CHK'D	APP'D
P04	20/10/2023	FOURTH DRAFT	DT	BC	JB

CLIENT: national highways

PURPOSE OF ISSUE: DCO APPLICATION

DEVELOPMENT CONSENT ORDER NUMBER: TR010065

PROJECT TITLE: A46 NEWARK BYPASS

DRAWING TITLE: Appendix C
Study Area Search Distances for HRA - Wider Impact Area

ORIGINAL SIZE: A3
SCALE: 1:450,000

DRAWING NUMBER: HE PIN HE551478 | ORIGINATOR SKAG | VOLUME EBD | LOCATION CONWI_CONW | TYPE DR | ROLE LE | NUMBER 00129

PROJECT REF NO.: HE551478

REVISION: P04

D. Appendix: Citations/data sheets for each European Site

EC Directive 79/409 on the Conservation of Wild Birds
Special Protection Area (SPA)

Name: Humber Estuary

Unitary Authorities/Counties: City of Kingston-upon-Hull, East Riding of Yorkshire, Lincolnshire, North East Lincolnshire, North Lincolnshire

Component SSSIs: The SPA encompasses all or parts of the following Sites of Special Scientific Interest (SSSIs): Humber Estuary SSSI, North Killingholme Haven Pits SSSI, Saltfleetby-Theddlethorpe Dunes SSSI, and The Lagoons SSSI.

Site description: The Humber Estuary is located on the east coast of England, and comprises extensive wetland and coastal habitats. The inner estuary supports extensive areas of reedbed, with areas of mature and developing saltmarsh backed by grazing marsh in the middle and outer estuary. On the north Lincolnshire coast, the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. Parts of the estuary are owned and managed by conservation organisations. The estuary supports important numbers of waterbirds (especially geese, ducks and waders) during the migration periods and in winter. In summer, it supports important breeding populations of bittern *Botaurus stellaris*, marsh harrier *Circus aeruginosus*, avocet *Recurvirostra avosetta* and little tern *Sterna albifrons*.

Size of SPA: The SPA covers an area of 37,630.24 ha.

Qualifying species:
The site qualifies under **article 4.1** of the Directive (79/409/EEC) as it is used regularly by 1% or more of the Great Britain populations of the following species listed in Annex I in any season:

Annex I species	Count and season	Period	% of GB population
Avocet *Recurvirostra avosetta*	59 individuals – wintering	5 year peak mean 1996/97 – 2000/01	1.7%
Bittern *Botaurus stellaris*	4 individuals – wintering	5 year peak mean 1998/99 – 2002/03	4.0%
Hen harrier *Circus cyaneus*	8 individuals – wintering	5 year peak mean 1997/98 – 2001/02	1.1%
Golden plover *Pluvialis apricaria*	30,709 individuals – wintering	5 year peak mean 1996/97 – 2000/01	12.3%
Bar-tailed godwit *Limosa lapponica*	2,752 individuals – wintering	5 year peak mean 1996/97 – 2000/01	4.4%
Ruff *Philomachus pugnax*	128 individuals – passage	5 year peak mean 1996-2000	1.4%
Bittern *Botaurus stellaris*	2 booming males – breeding	3 year mean 2000-2002	10.5%
Marsh harrier *Circus aeruginosus*	10 females – breeding	5 year mean 1998-2002	6.3%
Avocet *Recurvirostra avosetta*	64 pairs – breeding	5 year mean 1998 – 2002	8.6%
Little tern *Sterna albifrons*	51 pairs – breeding	5 year mean 1998-2002	2.1%

The site qualifies under **article 4.2** of the Directive (79/409/EEC) as it is used regularly by 1% or more of the biogeographical populations of the following regularly occurring migratory species (other than those listed in Annex I) in any season:

Migratory species	Count and season	Period	% of subspecies/ population
Shelduck *Tadorna tadorna*	4,464 individuals – wintering	5 year peak mean 1996/97 – 2000/01	1.5% Northwestern Europe (breeding)
Knot *Calidris canutus*	28,165 individuals – wintering	5 year peak mean 1996/97 – 2000/01	6.3% *islandica*
Dunlin *Calidris alpina*	22,222 individuals – wintering	5 year peak mean 1996/97 – 2000/01	1.7% *alpina*, Western Europe (non-breeding)
Black-tailed godwit *Limosa limosa*	1,113 individuals – wintering	5 year peak mean 1996/97 – 2000/01	3.2% *islandica*
Redshank *Tringa totanus*	4,632 individuals – wintering	5 year peak mean 1996/97 – 2000/01	3.6% *brittanica*
Knot *Calidris canutus*	18,500 individuals – passage	5 year peak mean 1996 – 2000	4.1% *islandica*
Dunlin *Calidris alpina*	20,269 individuals – passage	5 year peak mean 1996 – 2000	1.5% *alpina*, Western Europe (non-breeding)
Black-tailed godwit *Limosa limosa*	915 individuals – passage	5 year peak mean 1996 – 2000	2.6% *islandica*
Redshank *Tringa totanus*	7,462 individuals – passage	5 year peak mean 1996 – 2000	5.7% *brittanica*

Bird counts from: Wetland Bird Survey (WeBS) database and *The Humber Estuary: A comprehensive review of its nature conservation interest* (Allen *et al.* 2003).

Assemblage qualification:
The site qualifies under **article 4.2** of the Directive (79/409/EEC) as it is used regularly by over 20,000 waterbirds (waterbirds as defined by the Ramsar Convention) in any season:

In the non-breeding season, the area regularly supports 153,934 individual waterbirds (five year peak mean 1996/97 – 2000/01), including dark-bellied brent goose *Branta bernicla bernicla*, shelduck *Tadorna tadorna*, wigeon *Anas penelope*, teal *Anas crecca*, mallard *Anas platyrhynchos*, pochard *Aythya ferina*, scaup *Aythya marila*, goldeneye *Bucephala clangula*, bittern *Botaurus stellaris*, oystercatcher *Haematopus ostralegus*, avocet *Recurvirostra avosetta*, ringed plover *Charadrius hiaticula*, golden plover *Pluvialis apricaria*, grey plover *P. squatarola*, lapwing *Vanellus vanellus*, knot *Calidris canutus*, sanderling *C. alba*, dunlin *C. alpina*, ruff *Philomachus pugnax*, black-tailed godwit *Limosa limosa*, bar-tailed godwit *L. lapponica*, whimbrel *Numenius phaeopus*, curlew *N. arquata*, redshank *Tringa totanus*, greenshank *T. nebularia* and turnstone *Arenaria interpres*.

Non-qualifying species of interest: The SPA is used by non-breeding merlin *Falco columbarius*, peregrine *F. peregrinus* and short-eared owl *Asio flammeus*, and breeding common tern *Sterna hirundo* and kingfisher *Alcedo atthis* (all species listed in Annex I to the EC Birds Directive) in numbers of less than European importance (less than 1% of the GB population).

Status of SPA:
1) Humber Flats, Marshes and Coast (Phase 1) SPA was classified on 28 July 1994.
2) The extended and renamed Humber Estuary SPA was classified on 31 August 2007.

This citation relates to a site entered in the Register of European Sites for Great Britain.
Register reference number: UK9006111
Date of registration: 31 August 2007

Signed: [redacted]

On behalf of the Secretary of State for Environment, Food and Rural Affairs

Information Sheet on Ramsar Wetlands (RIS)

Categories approved by Recommendation 4.7 (1990), as amended by Resolution VIII.13 of the 8th Conference of the Contracting Parties (2002) and Resolutions IX.1 Annex B, IX.6, IX.21 and IX. 22 of the 9th Conference of the Contracting Parties (2005).

Notes for compilers:

1. The RIS should be completed in accordance with the attached *Explanatory Notes and Guidelines for completing the Information Sheet on Ramsar Wetlands*. Compilers are strongly advised to read this guidance before filling in the RIS.

2. Further information and guidance in support of Ramsar site designations are provided in the *Strategic Framework for the future development of the List of Wetlands of International Importance* (Ramsar Wise Use Handbook 7, 2nd edition, as amended by COP9 Resolution IX.1 Annex B). A 3rd edition of the Handbook, incorporating these amendments, is in preparation and will be available in 2006.

3. Once completed, the RIS (and accompanying map(s)) should be submitted to the Ramsar Secretariat. Compilers should provide an electronic (MS Word) copy of the RIS and, where possible, digital copies of all maps.

1. Name and address of the compiler of this form:

FOR OFFICE USE ONLY.

DD MM YY

Designation date | Site Reference Number

Joint Nature Conservation Committee
Monkstone House
City Road
Peterborough
Cambridgeshire PE1 1JY
UK
Telephone/Fax: +44 (0)1733 – 562 626 / +44 (0)1733 – 555 948
Email: RIS@JNCC.gov.uk

2. Date this sheet was completed/updated:

Designated: 31 August 2007

3. Country:

UK (England)

4. Name of the Ramsar site:

Humber Estuary

5. Designation of new Ramsar site or update of existing site:

This RIS is for: Updated information on an existing Ramsar site

6. For RIS updates only, changes to the site since its designation or earlier update:

a) Site boundary and area:

The boundary has been extended

** Important note: If the boundary and/or area of the designated site is being restricted/reduced, the Contracting Party should have followed the procedures established by the Conference of the Parties in the Annex to COP9 Resolution IX.6 and provided a report in line with paragraph 28 of that Annex, prior to the submission of an updated RIS.

b) Describe briefly any major changes to the ecological character of the Ramsar site, including in the application of the Criteria, since the previous RIS for the site:

7. Map of site included:

Refer to Annex III of the *Explanatory Notes and Guidelines*, for detailed guidance on provision of suitable maps, including digital maps.

a) A map of the site, with clearly delineated boundaries, is included as:

i) **hard copy** (required for inclusion of site in the Ramsar List): *yes* ✓ -or- *no* □;
ii**) an electronic format** (e.g. a JPEG or ArcView image) Yes
iii) **a GIS file providing geo-referenced site boundary vectors and attribute tables** *yes* ✓ -or- *no* □;

b) Describe briefly the type of boundary delineation applied:

e.g. the boundary is the same as an existing protected area (nature reserve, national park etc.), or follows a catchment boundary, or follows a geopolitical boundary such as a local government jurisdiction, follows physical boundaries such as roads, follows the shoreline of a waterbody, etc.

The site boundary is the same as, or falls within, an existing protected area.

For precise boundary details, please refer to paper map provided at designation

8. Geographical coordinates (latitude/longitude):

053 32 59 N 000 00 03 E

9. General location:

Include in which part of the country and which large administrative region(s), and the location of the nearest large town.

Nearest town/city: Kingston-upon-Hull

The Humber Estuary is located on the boundary between the East Midlands Region and the Yorkshire and the Humber Region, on the east coast of England bordering the North Sea.

Administrative region: City of Kingston upon Hull; East Riding of Yorkshire; Humberside; Lincolnshire; North East Lincolnshire; North Lincolnshire

10. Elevation (average and/or max. & min.) (metres): 11. Area (hectares): 37987.8

Min. -13
Max. 10
Mean No information available

12. General overview of the site:

Provide a short paragraph giving a summary description of the principal ecological characteristics and importance of the wetland.

The Humber Estuary is the largest macro-tidal estuary on the British North Sea coast. It drains a catchment of some 24,240 square kilometres and is the site of the largest single input of freshwater from Britain into the North Sea. It has the second-highest tidal range in Britain (max 7.4 m) and approximately one-third of the estuary is exposed as mud or sand flats at low tide. The inner estuary supports extensive areas of reedbed with areas of mature and developing saltmarsh backed in places by limited areas of grazing marsh in the middle and outer estuary. On the north Lincolnshire coast the saltmarsh is backed by low sand dunes with marshy slacks and brackish pools. The Estuary regularly supports internationally important numbers of waterfowl in winter and nationally important breeding populations in summer.

13. Ramsar Criteria:

Circle or underline each Criterion applied to the designation of the Ramsar site. See Annex II of the *Explanatory Notes and Guidelines* for the Criteria and guidelines for their application (adopted by Resolution VII.11).

1, 3, 5, 6, 8

14. Justification for the application of each Criterion listed in 13 above:

Provide justification for each Criterion in turn, clearly identifying to which Criterion the justification applies (see Annex II for guidance on acceptable forms of justification).

Ramsar criterion 1

The site is a representative example of a near-natural estuary with the following component habitats: dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons.

It is a large macro-tidal coastal plain estuary with high suspended sediment loads, which feed a dynamic and rapidly changing system of accreting and eroding intertidal and subtidal mudflats, sandflats, saltmarsh and reedbeds. Examples of both strandline, foredune, mobile, semi-fixed dunes, fixed dunes and dune grassland occur on both banks of the estuary and along the coast. The estuary supports a full range of saline conditions from the open coast to the limit of saline intrusion on the tidal rivers of the Ouse and Trent. Wave exposed sandy shores are found in the outer/open coast areas of the estuary. These change to the more moderately exposed sandy shores and then to sheltered muddy shores within the main body of the estuary and up into the tidal rivers. The lower saltmarsh of the Humber is dominated by common cordgrass *Spartina anglica* and annual glasswort *Salicornia* communities. Low to mid marsh communities are mostly represented by sea aster *Aster tripolium*, common saltmarsh grass *Puccinellia maritima* and sea purslane *Atriplex portulacoides* communities. The upper portion of the saltmarsh community is atypical, dominated by sea couch *Elytrigia atherica* (*Elymus pycnanthus*) saltmarsh community. In the upper reaches of the estuary, the tidal marsh community is dominated by the common reed *Phragmites australis* fen and sea club rush *Bolboschoenus maritimus* swamp with the couch grass *Elytrigia repens (Elymus repens)* saltmarsh community. Within the Humber Estuary Ramsar site there are good examples of four of the five physiographic types of saline lagoon.

Ramsar criterion 3

The Humber Estuary Ramsar site supports a breeding colony of grey seals *Halichoerus grypus* at Donna Nook. It is the second largest grey seal colony in England and the furthest south regular breeding site on the east coast. The dune slacks at Saltfleetby-Theddlethorpe on the southern extremity of the Ramsar site are the most north-easterly breeding site in Great Britain of the natterjack toad *Bufo calamita*.

Ramsar criterion 5

Assemblages of international importance:

153,934 waterfowl, non-breeding season

(5 year peak mean 1996/97-2000/2001)

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Eurasian golden plover, *Pluvialis apricaria*

altifrons subspecies – NW Europe, W Continental Europe, NW Africa population

17,996 individuals, passage, representing an average of 2.2% of the population

(5 year peak mean 1996-2000)

Red knot, *Calidris canutus*

islandica subspecies

18,500 individuals, passage, representing an average of 4.1% of the population

(5 year peak mean 1996-2000)

Dunlin, *Calidris alpina*
alpina subspecies – Western Europe (non-breeding) population
20,269 individuals, passage, representing an average of 1.5% of the population
(5 year peak mean 1996-2000)

Black-tailed godwit, *Limosa limosa*
islandica subspecies
915 individuals, passage, representing and average of 2.6% of the population
(5 year peak mean 1996-2000)

Common redshank, *Tringa totanus*
brittanica subspecies
7,462 individuals, passage, representing an average of 5.7% of the population
(5 year peak mean 1996-2000)

Common shelduck, *Tadorna tadorna*
Northwestern Europe (breeding) population
4,464 individuals, wintering, representing an average of 1.5% of the population
(5 year peak mean 1996/7-2000/1)

Eurasian golden plover, *Pluvialis apricaria*
altifrons subspecies – NW Europe, W Continental Europe, NW Africa population
30,709 individuals, wintering, representing an average of 3.8% of the population
(5 year peak mean 1996/7-2000/1)

Red knot, *Calidris canutus*
islandica subspecies
28,165 individuals, wintering, representing an average of 6.3% of the population
(5 year peak mean 1996/7-2000/1)

Dunlin, *Calidris alpina*
alpina subspecies – Western Europe (non-breeding) population
22,222 individuals, wintering, representing an average of 1.7% of the population
(5 year peak mean 1996/7-2000/1)

Black-tailed godwit, *Limosa limosa*
islandica subspecies
1,113 individuals, wintering, representing an average of 3.2% of the population
(5 year peak mean 1996/7-2000/1)

Bar-tailed godwit , *Limosa lapponica*
lapponica subspecies
2,752 individuals, wintering, representing an average of 2.3% of the population
(5 year peak mean 1996/7-2000/1)

Common redshank, *Tringa totanus*
brittanica subspecies
4,632 individuals, wintering, representing an average of 3.6% of the population
(5 year peak mean 1996/7-2000/1)

Ramsar criterion 8
The Humber Estuary acts as an important migration route for both river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus* between coastal waters and their spawning areas.

Ramsar criterion 5

Assemblages of international importance:

Species with peak counts in winter:
153934 waterfowl (5 year peak mean 1998/99-2002/2003)

Ramsar criterion 6 – species/populations occurring at levels of international importance.

Qualifying Species/populations (as identified at designation):

Species with peak counts in spring/autumn:

European golden plover , *Pluvialis apricaria apricaria*, P. a. altifrons Iceland & Faroes/E Atlantic	17996 individuals, representing an average of 2.2% of the population (1996-2000)
Red knot , *Calidris canutus islandica*, W & Southern Africa	18500 individuals, representing an average of 4.1% of the population (1996-2000)
(wintering)	
Dunlin , *Calidris alpina alpina*, W Siberia/W Europe	20269 individuals, representing an average of 1.5% of the population (1996-2000)
Black-tailed godwit , *Limosa limosa islandica*, Iceland/W Europe	915 individuals, representing an average of 2.6% of the population (1996-2000)
Common redshank , *Tringa totanus totanus*,	7462 individuals, representing an average of 5.7% of the population (1996-2000)

Species with peak counts in winter:

Common shelduck , *Tadorna tadorna*, NW Europe	4464 individuals, representing an average of 1.5% of the population (1996/7 to 2000/1)
European golden plover , *Pluvialis apricaria apricaria*, P. a. altifrons Iceland & Faroes/E Atlantic	30709 individuals, representing an average of 3.8% of the population (1996/7 to 2000/1)
Red knot , *Calidris canutus islandica*, W & Southern Africa	28165 individuals, representing an average of 6.3% of the population (1996/7 to 2000/1)
(wintering)	
Dunlin , *Calidris alpina alpina*, W Siberia/W Europe	22222 individuals, representing an average of 1.7% of the population (1996/7 to 2000/1)

Black-tailed godwit , *Limosa limosa islandica*, Iceland/W Europe	1113 individuals, representing an average of 3.2% of the population (1996/7 to 2000/1)
Bar-tailed godwit , *Limosa lapponica lapponica*, W Palearctic	2752 individuals, representing an average of 2.3% of the population (1996/7 to 2000/1)

Contemporary data and information on waterbird trends at this site and their regional (sub-national) and national contexts can be found in the Wetland Bird Survey report, which is updated annually. See www.bto.org/survey/webs/webs-alerts-index.htm.
See Sections 21/22 for details of noteworthy species
Details of bird species occuring at levels of National importance are given in Section 22

15. Biogeography (required when Criteria 1 and/or 3 and /or certain applications of Criterion 2 are applied to the designation):

Name the relevant biogeographic region that includes the Ramsar site, and identify the biogeographic regionalisation system that has been applied.

a) biogeographic region:

Atlantic

b) biogeographic regionalisation scheme (include reference citation):

Council Directive 92/43/EEC

16. Physical features of the site:

Describe, as appropriate, the geology, geomorphology; origins - natural or artificial; hydrology; soil type; water quality; water depth, water permanence; fluctuations in water level; tidal variations; downstream area; general climate, etc.

Soil & geology	neutral, shingle, sand, mud, clay, alluvium, sedimentary, sandstone, sandstone/mudstone, limestone/chalk, gravel, nutrient-rich
Geomorphology and landscape	lowland, coastal, floodplain, shingle bar, intertidal sediments (including sandflat/mudflat), estuary, islands, cliffs
Nutrient status	eutrophic
pH	circumneutral
Salinity	brackish / mixosaline, fresh, saline / euhaline
Soil	mainly mineral
Water permanence	usually permanent
Summary of main climatic features	Annual averages (Cleethorpes, 1971–2000) (www.metoffice.com/climate/uk/averages/19712000/sites/cleethorpes.html) Max. daily temperature: 13.1° C Min. daily temperature: 6.4° C Days of air frost: 29.0 Rainfall: 565.4 mm Hrs. of sunshine: 1521.9

General description of the Physical Features:

The Humber estuary is approximately 70 km long from the limit of saline intrusion on the River Ouse at Boothferry to the estuary mouth at Spurn Head, where it enters the North Sea. The area of the estuary is approx. 365 km2, and it has a width of 6.6 km at the mouth.

The Humber is a macro-tidal estuary with a tidal range of 7.4 m, the second-largest range in the UK and comparable to other macro-tidal estuaries worldwide. It is a shallow and well mixed estuary, with an average depth of 6.5m rising to 13.2 m at the mouth.

The Humber is the second-largest coastal plain estuary in the UK, and the largest coastal plain estuary on the east coast of Britain. Suspended sediment concentrations are high, and are derived from a variety of sources, including marine sediments and eroding boulder clay along the Holderness coast. This is the northernmost of the English east coast estuaries whose structure and function is intimately linked with soft eroding shorelines.

Upstream from the Humber Bridge, the navigation channel undergoes major shifts from north to south banks. This section of the estuary is noteworthy for extensive mud and sand bars, which in places form semi-permanent islands.

The estuary covers the full salinity range from fully marine at the mouth of the estuary (Spurn Head) to the limit of saline intrusion on the Rivers Ouse and Trent)). A salinity gradient from north to south bank is observed in the outer estuary, due to the incoming tide flowing along the north bank, while the fresh water keeps to the south bank as it discharges to the sea. As salinity declines upstream, reedbeds and brackish saltmarsh communities fringe the estuary..

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17. Physical features of the catchment area:

Describe the surface area, general geology and geomorphological features, general soil types, general land use, and climate (including climate type).

The Humber catchment covers an area of ca. 24,240 km2, more than 20% of the land area of England. Average annual precipitation in the upland areas of the catchment is as much as 1000 mm. Average freshwater flow into the Humber estuary from the rivers is 250 m3s-1, ranging from 60 m3s-1 in drier periods to 450 m3s-1 in wet periods. Peak flows of up to 1500 m3s-1 have been recorded during floods. The rivers Trent and Ouse, which provide the main fresh water flow into the Humber, drain large industrial and urban areas to the south and west (River Trent), and less densely populated agricultural areas to the north and west (River Ouse). The Trent/Ouse confluence is known as Trent Falls.

On the north bank of the Humber estuary the principal river is the river Hull, which flows through the city of Kingston-upon-Hull, and has a tidal length of 32 km, up to the Hempholme Weir. The Hull provides only about 1% of the freshwater input to the estuary. On the south bank, the River Ancholme enters the Humber at South Ferriby, but the tide is excluded by a sluice and a tidal lock. Altogether, the total tidal length of rivers and estuary is 313 km.

There are several major urban centres within the river catchments. Nottingham, Leicester, and the West Midlands/Birmingham conurbation are drained by the Trent, the Leeds-Bradford area in West Yorkshire is drained by the Aire/Calder and the Sheffield/Rotherham/Doncaster area in South Yorkshire is drained by the Don. There are also large rural regions, whose populations are currently experiencing high population growth, while the urban areas are showing a small decline. The 1992 population for the Ouse catchment was 4.1 million, and for the Trent catchment was 7.1 million. The population of Humberside, which comprises North and North-east Lincolnshire, the East Riding of Yorkshire, and Kingston-upon-Hull (Hull), was just under 0.9 million. Land use around the estuary itself is 50-98% agricultural, within only two areas of high population/ industry – the major conurbation around Kingston-upon-Hull (Hull) on the north bank, and several large industrial areas around Grimsby/ Immingham/ Cleesthorpes on the south bank.

The area around the Humber estuary is low-lying, and much land-claim of wetlands and supratidal zones, as well as parts of the intertidal zone, was carried out in the past two centuries. The mid to

outer estuary (Humber Bridge to Spurn Point) changed from a region of low water erosion in the 19th century to one of accretion in the 20th century, nonetheless a net loss of intertidal zone of some 3000 ha has taken place since the mid-19th century. Around the estuary some 894 km2 of land are below the 5 m contour, protected by extensive coastal defences. Most of the sediment entering the estuary comes from the North Sea, and a large part of it is believed to come from the continuing erosion of the Holderness Cliffs, which form the coastline to the north of the estuary mouth at Spurn Head. The estuary currently has approximately 1,775 ha of saltmarsh

18. Hydrological values:

Describe the functions and values of the wetland in groundwater recharge, flood control, sediment trapping, shoreline stabilization, etc.

Sediment trapping

19. Wetland types:

Marine/coastal wetland

Code	Name	% Area
F	Estuarine waters	66.8
G	Tidal flats	26.4
H	Salt marshes	4.7
E	Sand / shingle shores (including dune systems)	0.8
7	Gravel / brick / clay pits	0.5
Q	Saline / brackish lakes: permanent	0.3
J	Coastal brackish / saline lagoons	0.3
Other	Other	0.1
9	Canals and drainage channels	0.01
Y	Freshwater springs	0.01

20. General ecological features:

Provide further description, as appropriate, of the main habitats, vegetation types, plant and animal communities present in the Ramsar site, and the ecosystem services of the site and the benefits derived from them.

Description

Much of the intertidal area of the Humber Estuary consists of mudflats with fringing saltmarsh. There are smaller areas of intertidal sand flats, and sand dunes. The saltmarsh is both eroding and accreting; although coastal squeeze is resulting in net losses, and cord grass Spartina anglica is a major colonising species. In areas of reduced salinity such as the Upper Humber there are extensive areas of common reed Phragmites australis with some sea club-rush Bolboschoenus maritimus. Mid-level saltmarsh tends to be much more floristically diverse, and in the higher level marsh with its dendritic network of drainage channels, salt pans and borrow pits grasses dominate with thrift Armeria maritima where the marsh is grazed by cattle and sheep. Extensive areas of eel grass Zostera marina and Z. nolti have been known to occur at Spurn Bight, although in recent years records are limited. Behind the sandflats of the Cleethorpes coast the mature sand-dune vegetation contains some locally and nationally rare species including chestnut flat sedge Blysmus rufus, bulbous meadow grass Poa bulbosa and dense silky-bent Apera interrupta. The sand dunes, which cap the shingle spit that forms Spurn Peninsula are dominated by marram grass Ammophila arenaria and patches of dense sea buckthorn Hippophae rhamnoides.

Ecosystem services

Aesthetic

Education

Food

Recreation

Storm/wave protection

21. Noteworthy flora:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in **12**. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

None reported

22. Noteworthy fauna:

Provide additional information on particular species and why they are noteworthy (expanding as necessary on information provided in **12**. Justification for the application of the Criteria) indicating, e.g. which species/communities are unique, rare, endangered or biogeographically important, etc., including count data. *Do not include here taxonomic lists of species present – these may be supplied as supplementary information to the RIS.*

Birds

Species Information

Species Information

Birds

Species currently occurring at levels of national importance:

Great bittern, *Botaurus stellaris*
stellaris subspecies – W Europe, NW Africa (breeding) population
2 booming males, breeding, representing an average of 10.5% of the GB population
(3 year mean 2000-2002)

Eurasian marsh harrier, *Circus aeruginosus*
Europe population
10 females, breeding, representing an average of 6.3% of the GB population
(5 year mean 1998-2002)

Pied avocet, *Recurvirostra avosetta*
Western Europe (breeding) population
64 pairs, breeding, representing an average of 8.6% of the GB population
(5 year mean 1998-2002)

Little tern, *Sterna albifrons*
albifrons subspecies, Western Europe (breeding) population
51 pairs, breeding, representing an average of 2.1% of the GB population
(5 year mean 1998-2002)

Dark-bellied brent goose, *Branta bernicla*
bernicla subspecies
2,098 individuals, wintering, representing an average of 2.1% of the GB population
(5 year peak mean 1996/7-2000/1)

Eurasian wigeon, *Anas penelope*
Northwestern Europe (non-breeding) population
5,044 individuals, wintering, representing an average of 1.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Common teal, *Anas crecca*
crecca subspecies, Northwestern Europe (non-breeding population)
2,322 individuals, wintering, representing an average of 1.2% of the GB population

(5 year peak mean 1996/7-2000/1)

Common pochard, *Aythya ferina*
Northeastern & Northwestern Europe (non-breeding) population
719 individuals, wintering, representing an average of 1.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Greater scaup, *Aythya marila*
marila subspecies, Western Europe (non-breeding) population
127 individuals, wintering, representing an average of 1.7% of the GB population
(5 year peak mean 1996/7-2000/1)

Common goldeneye, *Bucephala clangula*
clangula subspecies, Northwestern & Central Europe (non-breeding) population
467 individuals, wintering, representing an average of 1.9% of the GB population
(5 year peak mean 1996/7-2000/1)

Great bittern, *Botaurus stellaris*
stellaris subspecies – W Europe, NW Africa (breeding) population
4 individuals, wintering, representing an average of 4.0% of the GB population
(5 year peak mean 1998/9-2002/3)

Hen harrier, *Circus cyaneus*
Europe population
8 individuals, wintering, representing an average of 1.1% of the GB population
(5 year peak mean 1997/8-2001/2)

Eurasian oystercatcher, *Haematopus ostralegus*
ostralegus subspecies
3,503 individuals, wintering, representing an average of 1.1% of the GB population
(5 year peak mean 1996/7-2000/1)

Pied avocet, *Recurvirostra avosetta*
Western Europe (breeding) population
59 individuals, wintering, representing an average of 1.7% of the GB population
(5 year peak mean 1996/7-2000/1)

Great ringed plover, *Charadrius hiaticula*
hiaticula subspecies
403 individuals, wintering, representing an average of 1.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Grey plover, *Pluvialis squatarola*
squatarola subspecies, Eastern Atlantic (non-breeding) population
1,704 individuals, wintering, representing an average of 3.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Northern lapwing, *Vanellus vanellus*
Europe (breeding) population
22,765 individuals, wintering, representing an average of 1.1% of the GB population
(5 year peak mean 1996/7-2000/1)

Sanderling, *Calidris alba*
Eastern Atlantic (non-breeding) population

486 individuals, wintering, representing an average of 2.3% of the GB population
(5 year peak mean 1996/7-2000/1)

Curlew, *Numenius arquata*
arquata subspecies
3,253 individuals, wintering, representing an average of 2.2% of the GB population
(5 year peak mean 1996/7-2000/1)

Ruddy turnstone, *Arenaria interpres*
interpres subspecies, Northeastern Canada & Greenland (breeding) population
629 individuals, wintering, representing an average of 1.3% of the GB population
(5 year peak mean 1996/7-2000/1)

Great ringed plover, *Charadrius hiaticula*
psammodroma subspecies
1,766 individuals, passage, representing an average of 5.9% of the GB population
(5 year peak mean 1996-2000)

Grey plover, *Pluvialis squatarola*
squatarola subspecies, Eastern Atlantic (non-breeding) population
1,590 individuals, passage, representing an average of 2.3% of the GB population
(5 year peak mean 1996-2000)

Sanderling, *Calidris alba*
Eastern Atlantic (non-breeding) population
818 individuals, passage, representing an average of 2.7% of the GB population
(5 year peak mean 1996-2000)

Ruff, *Philomachus pugnax*
Western Africa (non-breeding) population
128 individuals, passage, representing an average of 1.4% of the GB population
(5 year peak mean 1996-2000)

Whimbrel, *Numenius phaeopus*
islandicus subspecies
113 individuals, passage, representing an average of 2.3% of the GB population
(5 year peak mean 1996-2000)

Common greenshank, *Tringa nebularia*
Northwestern Europe (breeding) population
77 individuals, passage, representing an average of 5.5% of the GB population
(5 year peak mean 1996-2000)

23. Social and cultural values:

Describe if the site has any general social and/or cultural values e.g. fisheries production, forestry, religious importance, archaeological sites, social relations with the wetland, etc. Distinguish between historical/archaeological/religious significance and current socio-economic values.

Aesthetic
Aquatic vegetation (e.g. reeds, willows, seaweed)
Archaeological/historical site
Environmental education/ interpretation
Fisheries production
Livestock grazing
Non-consumptive recreation

Sport fishing
Sport hunting
Tourism
Transportation/navigation

b) Is the site considered of international importance for holding, in addition to relevant ecological values, examples of significant cultural values, whether material or non-material, linked to its origin, conservation and/or ecological functioning? No

If Yes, describe this importance under one or more of the following categories:

i) sites which provide a model of wetland wise use, demonstrating the application of traditional knowledge and methods of management and use that maintain the ecological character of the wetland:

ii) sites which have exceptional cultural traditions or records of former civilizations that have influenced the ecological character of the wetland:

iii) sites where the ecological character of the wetland depends on the interaction with local communities or indigenous peoples:

iv) sites where relevant non-material values such as sacred sites are present and their existence is strongly linked with the maintenance of the ecological character of the wetland:

24. Land tenure/ownership:

Ownership category	On-site	Off-site
Non-governmental organisation (NGO)	+	+
Local authority, municipality etc.	+	+
National/Crown Estate	+	+
Private	+	+
Public/communal	+	+

25. Current land (including water) use:

Activity	On-site	Off-site
Nature conservation	+	+
Tourism	+	+
Recreation	+	+
Current scientific research	+	
Cutting of vegetation (small-scale/subsistence)	+	
Fishing: commercial	+	+
Fishing: recreational/sport	+	+
Gathering of shellfish	+	+
Bait collection	+	+
Permanent arable agriculture		+
Permanent pastoral agriculture	+	+
Hunting: recreational/sport	+	+
Industrial water supply	+	+
Industry	+	+
Sewage treatment/disposal	+	+
Harbour/port	+	+

Flood control	+	+
Irrigation (incl. agricultural water supply)		+
Mineral exploration (excl. hydrocarbons)		+
Oil/gas exploration	+	+
Transport route	+	+
Domestic water supply		+
Urban development		+
Non-urbanised settlements		+
Military activities	+	+
Horticulture (incl. market gardening)		+

26. Factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

Explanation of reporting category:

1. *Those factors that are still operating, but it is unclear if they are under control, as there is a lag in showing the management or regulatory regime to be successful.*
2. *Those factors that are not currently being managed, or where the regulatory regime appears to have been ineffective so far.*

NA = Not Applicable because no factors have been reported.

Adverse Factor Category	Reporting Category	Description of the problem (Newly reported Factors only)	On-Site	Off-Site	Major Impact?
Disturbance to vegetation through cutting / clearing	1	Reedbeds being cut and cleared on margins of pits associated with angling. Management agreements and enforcement to address.	+		
Vegetation succession	1	Lack of reedbed management leading to scrub encroachment. Management agreement to address.	+		
Water diversion for irrigation/domestic/industrial use	1	Abstraction causes reduced freshwater input. Review of consents well advanced but not yet implemented.	+	+	
Overfishing	2	Substantial lamprey by-catch in eel nets in River Ouse.		+	
Pollution – domestic sewage	1	Reduced dissolved oxygen in River Ouse is a barrier to fish migration. Review of consents well advanced but not yet implemented.	+	+	+
Pollution – agricultural fertilisers	1	Reduced dissolved oxygen in River Ouse is a barrier to fish migration. To be addressed through Catchment Sensitive Farming Initiatives and implementation of Water Framework Directive.	+	+	+
Recreational/tourism disturbance (unspecified)	1	Particularly illegal access by motorised recreational vehicles and craft. Control through management scheme.	+		

Other factor	1	Coastal squeeze causing loss of intertidal habitats and saltmarsh due to sea level rise and fixed defences. The Humber Flood Risk Management Strategy has been developed and is being implemented.	+		+

For category 2 factors only.
What measures have been taken / are planned / regulatory processes invoked, to mitigate the effect of these factors?
Overfishing - Overfishing – to be considered through an 'in-combination' assessment of possible factors as part of the Review of Consents exercise.

Is the site subject to adverse ecological change? YES

27. Conservation measures taken:

List national category and legal status of protected areas, including boundary relationships with the Ramsar site; management practices; whether an officially approved management plan exists and whether it is being implemented.

Conservation measure	On-site	Off-site
Site/ Area of Special Scientific Interest (SSSI/ASSI)	+	+
National Nature Reserve (NNR)	+	
Special Protection Area (SPA)	+	
Land owned by a non-governmental organisation for nature conservation	+	+
Management agreement	+	+
Site management statement/plan implemented	+	
Area of Outstanding National Beauty (AONB)		+
Special Area of Conservation (SAC)	+	
IUCN (1994) category IV	+	

b) Describe any other current management practices:
The management of Ramsar sites in the UK is determined by either a formal management plan or through other management planning processes, and is overseen by the relevant statutory conservation agency. Details of the precise management practises are given in these documents.

28. Conservation measures proposed but not yet implemented:

e.g. management plan in preparation; official proposal as a legally protected area, etc.

No information available

29. Current scientific research and facilities:

e.g. details of current research projects, including biodiversity monitoring; existence of a field research station, etc.

Fauna.
Numbers of migratory and wintering wildfowl and waders are monitored annually as part of the national Wetland Birds Survey (WeBS) organised by the British Trust for Ornithology, Wildfowl & Wetlands Trust, the Royal Society for the Protection of Birds and the Joint Nature Conservation Committee.
Seal populations are monitored by the Sea Mammal Research Unit
Humber Wader Ringing Group
Spurn Bird Observatory
National Nature Reserve monitoring

Environment.
Institute of Estuarine & Coastal Studies, Hull: various
Industrial Concerns: monitoring on behalf of companies such as Associated British Ports and BP
Environment Agency monitoring: various
Geomorphological studies associated with shoreline management planning
National Nature Reserve monitoring

30. Current communications, education and public awareness (CEPA) activities related to or benefiting the site:

e.g. visitor centre, observation hides and nature trails, information booklets, facilities for school visits, etc.

There are a four National Nature Reserves with associated facilities within the Ramsar site (Spurn, Far Ings, Donna Nook and Saltfleetby – Theddlethorpe Dunes) and a number of other visitor, information and/or education centres including the Spurn Bird Observatory, the Cleethorpes Discovery Centre, Water's Edge and Far Ings. A wide range of Humber wide and area-specific information is available through a range of media (eg leaflets, displays, internet etc) including 'Humber Estuary European Marine Site Codes of Conduct' developed with a range of stakeholders to cover a range of recreational and educational activities and 'Coastal Futures' – a partnership project working with local communities affected by flood risk and associated issues including managed realignment includes proactive education work within schools.

31. Current recreation and tourism:

State if the wetland is used for recreation/tourism; indicate type(s) and their frequency/intensity.

Activities, Facilities provided and Seasonality.
Sailing: marinas at Brough, Winteringham, Hull, Grimsby and South Ferriby.

Bathing etc: Cleethorpes (some 6m visitors/yr).

Walking/Horse riding: throughout

Beach fishing, match sea-fishing, non-commercial bait digging.

Non-commercial samphire collection

Wildfowling

Tourist amusements: Cleethorpes.

Bird watching: throughout but particularly at Blacktoft Sands RSPB reserve and the four National Nature Reserves.

32. Jurisdiction:

Include territorial, e.g. state/region, and functional/sectoral, e.g. Dept. of Agriculture/Dept. of Environment, etc.

Head, Natura 2000 and Ramsar Team, Department for Environment, Food and Rural Affairs, European Wildlife Division, Zone 1/07, Temple Quay House, 2 The Square, Temple Quay, Bristol, BS1 6EB

33. Management authority:

Provide the name and address of the local office(s) of the agency(ies) or organisation(s) directly responsible for managing the wetland. Wherever possible provide also the title and/or name of the person or persons in this office with responsibility for the wetland.

Site Designations Manager, English Nature, Sites and Surveillance Team, Northminster House, Northminster Road, Peterborough, PE1 1UA, UK

34. Bibliographical references:

Scientific/technical references only. If biogeographic regionalisation scheme applied (see **15** above), list full reference citation for the scheme.

Site-relevant references

Site-relevant references

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Please return to: **Ramsar Secretariat, Rue Mauverney 28, CH-1196 Gland, Switzerland**
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STANDARD DATA FORM for sites within the ‘UK national site network of European sites’

Special Protection Areas (SPAs) are classified and Special Areas of Conservation (SACs) are designated under:

- the Conservation of Habitats and Species Regulations 2017 (as amended) in England and Wales (including the adjacent territorial sea) and to a limited extent in Scotland (reserved matters) and Northern Ireland (excepted matters);
- the Conservation (Natural Habitats &c.) Regulations 1994 (as amended) in Scotland;
- the Conservation (Natural Habitats, &c) Regulations (Northern Ireland) 1995 (as amended) in Northern Ireland; and
- the Conservation of Offshore Marine Habitats and Species Regulations 2017 (as amended) in the UK offshore area.

Each SAC or SPA (forming part of the UK national site network of European sites) has its own Standard Data Form containing site-specific information. The information provided here generally follows the same documenting format for SACs and SPAs, as set out in the [redacted]

Please note that these forms contain a number of codes, all of which are explained either within the data forms themselves or in the end notes.

More general information on SPAs and SACs in the UK is available from the SPA homepage and SAC homepage on the JNCC website. These webpages also provide links to Standard Data Forms for all SAC and SPA sites in the UK.

https://jncc.gov.uk/

NATURA 2000 - STANDARD DATA FORM

For Special Protection Areas (SPA),
Proposed Sites for Community Importance (pSCI),
Sites of Community Importance (SCI) and
for Special Areas of Conservation (SAC)

SITE **UK0030170**

SITENAME **Humber Estuary**

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1. SITE IDENTIFICATION

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1.1 Type	1.2 Site code
B	UK0030170

1.3 Site name

Humber Estuary

1.4 First Compilation date	1.5 Update date
2007-08	2015-12

1.6 Respondent:

Name/Organisation: Joint Nature Conservation Committee

Address: Joint Nature Conservation Committee Monkstone House City Road Peterborough PE1 1JY

Email:

Date site proposed as SCI:	2007-08
Date site confirmed as SCI:	2008-12
Date site designated as SAC:	2009-12
National legal reference of SAC designation:	Regulations 11 and 13-15 of the Conservation of Habitats and Species Regulations 2010 (http://www.legislation.gov.uk/uksi/2010/490/contents/made).

2. SITE LOCATION

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2.1 Site-centre location [decimal degrees]:

Longitude	Latitude
-0.734722222	53.58916667

2.2 Area [ha]:

36657.15

2.3 Marine area [%]

91.6

2.4 Sitelength [km]:

0.0

2.5 Administrative region code and name

NUTS level 2 code	Region Name
UKE1	East Yorkshire and Northern Lincolnshire
UKF3	Lincolnshire
UKZZ	Extra-Regio

2.6 Biogeographical Region(s)

Atlantic (100.0 %)

3. ECOLOGICAL INFORMATION

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3.1 Habitat types present on the site and assessment for them

Annex I Habitat types						Site assessment			
Code	PF	NP	Cover [ha]	Cave [number]	Data quality	A|B|C|D	A|B|C		
						Representativity	Relative Surface	Conservation	Global
1110			1656.9	0	P	C	A	C	C
1130			36657.15	0	G	B	B	B	B
1140			9384.23	0	G	B	B	B	B
1150	X		7.33	0	G	C	C	B	C
1210				0		D			
1310			47.65	0	P	C	C	B	C
1320			135.63	0	G	D			
1330									

			784.46	0	G	C	B	C	C
2110			18.33	0	G	C	A	C	C
2120			14.66	0	G	C	B	C	C
2130	X		14.66	0	G	C	C	C	C
2160			65.98	0	G	C	B	C	C

- **PF:** for the habitat types that can have a non-priority as well as a priority form (6210, 7130, 9430) enter "X" in the column PF to indicate the priority form.
- **NP:** in case that a habitat type no longer exists in the site enter: x (optional)
- **Cover:** decimal values can be entered
- **Caves:** for habitat types 8310, 8330 (caves) enter the number of caves if estimated surface is not available.
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation)

3.2 Species referred to in Article 4 of Directive 2009/147/EC and listed in Annex II of Directive 92/43/EEC and site evaluation for them

Species					Population in the site						Site assessment			
G	Code	Scientific Name	S	NP	T	Size		Unit	Cat.	D.qual.	A|B|C|D	A|B|C		
						Min	Max				Pop.	Con.	Iso.	Glo.
F	1102	Alosa alosa			p				P	DD	D			
F	1103	Alosa fallax			p				P	DD	D			
M	1364	Halichoerus grypus			p	1800	1800	i		G	C	B	B	C
F	1099	Lampetra fluviatilis			p				P	DD	A	B	C	C
F	1095	Petromyzon marinus			p	251	500	i		M	B	C	C	C
M	1365	Phoca vitulina			p				P	DD	D			

- **Group:** A = Amphibians, B = Birds, F = Fish, I = Invertebrates, M = Mammals, P = Plants, R = Reptiles
- **S:** in case that the data on species are sensitive and therefore have to be blocked for any public access enter: yes
- **NP:** in case that a species is no longer present in the site enter: x (optional)
- **Type:** p = permanent, r = reproducing, c = concentration, w = wintering (for plant and non-migratory species use permanent)
- **Unit:** i = individuals, p = pairs or other units according to the Standard list of population units and codes in accordance with Article 12 and 17 reporting (see reference portal)
- **Abundance categories (Cat.):** C = common, R = rare, V = very rare, P = present - to fill if data are deficient (DD) or in addition to population size information
- **Data quality:** G = 'Good' (e.g. based on surveys); M = 'Moderate' (e.g. based on partial data with some extrapolation); P = 'Poor' (e.g. rough estimation); VP = 'Very poor' (use this category only, if not even a rough estimation of the population size can be made, in this case the fields for population size can remain empty, but the field "Abundance categories" has to be filled in)

4. SITE DESCRIPTION

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4.1 General site character

Habitat class	% Cover
N03	4.4
N07	0.4
N04	0.4
N02	94.9
Total Habitat Cover	100.10000000000002

Other Site Characteristics

1 Terrestrial: Soil & Geology: shingle,sedimentary,sandstone,neutral,mud,sand,alluvium,clay 2 Terrestrial: Geomorphology and landscape: coastal,floodplain,lowland 3 Marine: Geology: gravel,mud,sedimentary,sand,sandstone/mudstone,clay,shingle,limestone/chalk 4 Marine: Geomorphology: shingle bar,lagoon,islands,estuary,subtidal sediments (including sandbank/mudbank),intertidal sediments (including sandflat/mudflat),cliffs

4.2 Quality and importance

Sandbanks which are slightly covered by sea water all the time for which the area is considered to support a significant presence. Estuaries for which this is considered to be one of the best areas in the United Kingdom. Mudflats and sandflats not covered by seawater at low tide for which this is considered to be one of the best areas in the United Kingdom. Coastal lagoons for which the area is considered to support a significant presence. Salicornia and other annuals colonising mud and sand for which the area is considered to support a significant presence. Atlantic salt meadows (Glauco-Puccinellietalia maritimae) for which the area is considered to support a significant presence. Embryonic shifting dunes for which the area is considered to support a significant presence. which is considered to be rare as its total extent in the United Kingdom is estimated to be less than 1000 hectares. Shifting dunes along the shoreline with Ammophila arenaria (?white dunes?) for which the area is considered to support a significant presence. Dunes with Hippophae rhamnoides for which the area is considered to support a significant presence. which is considered to be rare as its total extent in the United Kingdom is estimated to be less than 1000 hectares. Fixed dunes with herbaceous vegetation (?grey dunes?) for which the area is considered to support a significant presence. Petromyzon marinus for which the area is considered to support a significant presence. Lampetra fluviatilis for which the area is considered to support a significant presence. Halichoerus grypus for which the area is considered to support a significant presence.

4.3 Threats, pressures and activities with impacts on the site

The most important impacts and activities with high effect on the site

Negative Impacts			
Rank	Threats and pressures [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	M01		B
H	E02		O
H	J02		B
H	H02		B
H	K01		I

Positive Impacts			
Rank	Activities, management [code]	Pollution (optional) [code]	inside/outside [i|o|b]
H	D05		I
H	A02		I
H	B02		I
H	A04		I

Rank: H = high, M = medium, L = low

Pollution: N = Nitrogen input, P = Phosphor/Phosphate input, A = Acid input/acidification, T = toxic inorganic chemicals, O = toxic organic chemicals, X = Mixed pollutions

i = inside, o = outside, b = both

4.5 Documentation

Conservation Objectives - the Natural England links below provide access to the Conservation Objectives (and other site-related information) for its terrestrial and inshore Natura 2000 sites, including conservation

advice packages and supporting documents for European Marine Sites within English waters and for cross-border sites. See also the 'UK Approach' document for more information (link via the JNCC website).

Link(s): http://publications.naturalengland.org.uk/category/6490068894089216

http://publications.naturalengland.org.uk/category/3212324
http://jncc.defra.gov.uk/pdf/Natura2000_StandardDataForm_UKApproach_Dec2015.pdf

5. SITE PROTECTION STATUS (optional)

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5.1 Designation types at national and regional level:

Code	Cover [%]	Code	Cover [%]	Code	Cover [%]
UK01	1.8	UK04	100.0		

6. SITE MANAGEMENT

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6.1 Body(ies) responsible for the site management:

Organisation:	Natural England
Address:	
Email:	

6.2 Management Plan(s):

An actual management plan does exist:

☐	Yes
☐	No, but in preparation
☒	No

6.3 Conservation measures (optional)

For available information, including on Conservation Objectives, see Section 4.5.

EXPLANATION OF CODES USED IN THE SPECIAL AREA OF CONSERVATION (SAC) AND SPECIAL PROTECTION AREA (SPA) STANDARD DATA FORMS

The codes in the table below generally follow those explained in the official European Union guidelines for the Standard Data Form (also referencing the relevant page number).

1.1 Site type

CODE	DESCRIPTION	PAGE NO
A	SPA (classified Special Protection Area)	53
B	cSAC, SCI or SAC (candidate Special Area of Conservation, Site of Community Importance, designated Special Area of Conservation)	53
C	SPA area/boundary is the same as the cSAC/SCI/SAC i.e. a co-classified/designated site (Note: this situation only occurs in Gibraltar)	53

3.1 Habitat code

CODE	DESCRIPTION	PAGE NO
1110	Sandbanks which are slightly covered by sea water all the time	57
1130	Estuaries	57
1140	Mudflats and sandflats not covered by seawater at low tide	57
1150	Coastal lagoons	57
1160	Large shallow inlets and bays	57
1170	Reefs	57
1180	Submarine structures made by leaking gases	57
1210	Annual vegetation of drift lines	57
1220	Perennial vegetation of stony banks	57
1230	Vegetated sea cliffs of the Atlantic and Baltic Coasts	57
1310	Salicornia and other annuals colonizing mud and sand	57
1320	Spartina swards (Spartinion maritimae)	57
1330	Atlantic salt meadows (Glauco-Puccinellietalia maritimae)	57
1340	Inland salt meadows	57
1420	Mediterranean and thermo-Atlantic halophilous scrubs (Sarcocornetea fruticosi)	57
2110	Embryonic shifting dunes	57
2120	Shifting dunes along the shoreline with Ammophila arenaria ("white dunes")	57
2130	Fixed coastal dunes with herbaceous vegetation ("grey dunes")	57
2140	Decalcified fixed dunes with Empetrum nigrum	57
2150	Atlantic decalcified fixed dunes (Calluno-Ulicetea)	57
2160	Dunes with Hippopha• rhamnoides	57
2170	Dunes with Salix repens ssp. argentea (Salicion arenariae)	57
2190	Humid dune slacks	57
21A0	Machairs (* in Ireland)	57
2250	Coastal dunes with Juniperus spp.	57
2330	Inland dunes with open Corynephorus and Agrostis grasslands	57
3110	Oligotrophic waters containing very few minerals of sandy plains (Littorelletalia uniflorae)	57
3130	Oligotrophic to mesotrophic standing waters with vegetation of the Littorelletea uniflorae and/or of the Isoëto-Nanojuncetea	57
3140	Hard oligo-mesotrophic waters with benthic vegetation of Chara spp.	57
3150	Natural eutrophic lakes with Magnopotamion or Hydrocharition - type vegetation	57

CODE	DESCRIPTION	PAGE NO
3160	Natural dystrophic lakes and ponds	57
3170	Mediterranean temporary ponds	57
3180	Turloughs	57
3260	Water courses of plain to montane levels with the Ranunculion fluitantis and Callitricho-Batrachion vegetation	57
4010	Northern Atlantic wet heaths with Erica tetralix	57
4020	Temperate Atlantic wet heaths with Erica ciliaris and Erica tetralix	57
4030	European dry heaths	57
4040	Dry Atlantic coastal heaths with Erica vagans	57
4060	Alpine and Boreal heaths	57
4080	Sub-Arctic Salix spp. scrub	57
5110	Stable xerothermophilous formations with Buxus sempervirens on rock slopes (Berberidion p.p.)	57
5130	Juniperus communis formations on heaths or calcareous grasslands	57
6130	Calaminarian grasslands of the Violetalia calaminariae	57
6150	Siliceous alpine and boreal grasslands	57
6170	Alpine and subalpine calcareous grasslands	57
6210	Semi-natural dry grasslands and scrubland facies on calcareous substrates (Festuco-Brometalia) (* important orchid sites)	57
6230	Species-rich Nardus grasslands, on silicious substrates in mountain areas (and submountain areas in Continental Europe)	57
6410	Molinia meadows on calcareous, peaty or clayey-silt-laden soils (Molinion caeruleae)	57
6430	Hydrophilous tall herb fringe communities of plains and of the montane to alpine levels	57
6510	Lowland hay meadows (Alopecurus pratensis, Sanguisorba officinalis)	57
6520	Mountain hay meadows	57
7110	Active raised bogs	57
7120	Degraded raised bogs still capable of natural regeneration	57
7130	Blanket bogs (* if active bog)	57
7140	Transition mires and quaking bogs	57
7150	Depressions on peat substrates of the Rhynchosporion	57
7210	Calcareous fens with Cladium mariscus and species of the Caricion davallianae	57
7220	Petrifying springs with tufa formation (Cratoneurion)	57
7230	Alkaline fens	57
7240	Alpine pioneer formations of the Caricion bicoloris-atrofuscae	57
8110	Siliceous scree of the montane to snow levels (Androsacetalia alpinae and Galeopsietalia ladani)	57
8120	Calcareous and calcshist screes of the montane to alpine levels (Thlaspietea rotundifolii)	57
8210	Calcareous rocky slopes with chasmophytic vegetation	57
8220	Siliceous rocky slopes with chasmophytic vegetation	57
8240	Limestone pavements	57
8310	Caves not open to the public	57
8330	Submerged or partially submerged sea caves	57
9120	Atlantic acidophilous beech forests with Ilex and sometimes also Taxus in the shrublayer (Quercion robori-petraeae or Ilici-Fagenion)	57
9130	Asperulo-Fagetum beech forests	57
9160	Sub-Atlantic and medio-European oak or oak-hornbeam forests of the Carpinion betuli	57
9180	Tilio-Acerion forests of slopes, screes and ravines	57
9190	Old acidophilous oak woods with Quercus robur on sandy plains	57
91A0	Old sessile oak woods with Ilex and Blechnum in the British Isles	57
91C0	Caledonian forest	57
91D0	Bog woodland	57
91E0	Alluvial forests with Alnus glutinosa and Fraxinus excelsior (Alno-Padion, Alnion incanae, Salicion albae)	57
91J0	Taxus baccata woods of the British Isles	57

3.1 Habitat representativity (abbreviated to 'Representativity' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent representatively	57
B	Good representatively	57
C	Significant representatively	57
D	Non-significant presence representatively	57

3.1 Relative surface

CODE	DESCRIPTION	PAGE NO
A	> 15%-100%	58
B	> 2%-15%	58
C	≤ 2%	58

3.1 Degree of conservation (abbreviated to 'Conservation' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	59
B	Good conservation	59
C	Average or reduced conservation	59

3.1 Global assessment (abbreviated to 'Global' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	59
B	Good value	59
C	Significant value	59

3.2 Population (abbreviated to 'Pop.' in data form)

CODE	DESCRIPTION	PAGE NO
A	> 15%-100%	62
B	> 2%-15%	62
C	≤ 2%	62
D	Non-significant population	62

3.2 Degree of conservation (abbreviated to 'Con.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent conservation	63
B	Good conservation	63
C	Average or reduced conservation	63

3.2 Isolation (abbreviated to 'Iso.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Population (almost) Isolated	63
B	Population not-isolated, but on margins of area of distribution	63
C	Population not-isolated within extended distribution range	63

3.2 Global Grade (abbreviated to 'Glo.' or 'G.' in data form)

CODE	DESCRIPTION	PAGE NO
A	Excellent value	63
B	Good value	63
C	Significant value	63

3.3 Other species – essentially covers bird assemblage types

CODE	DESCRIPTION	PAGE NO
WATR	Non-breeding waterbird assemblage	UK specific code
SBA	Breeding seabird assemblage	UK specific code

BBA	Breeding bird assemblage (applies only to sites classified pre 2000)	UK specific code

4.1 Habitat class code

CODE	DESCRIPTION	PAGE NO
N01	Marine areas, Sea inlets	65
N02	Tidal rivers, Estuaries, Mud flats, Sand flats, Lagoons (including saltwork basins)	65
N03	Salt marshes, Salt pastures, Salt steppes	65
N04	Coastal sand dunes, Sand beaches, Machair	65
N05	Shingle, Sea cliffs, Islets	65
N06	Inland water bodies (Standing water, Running water)	65
N07	Bogs, Marshes, Water fringed vegetation, Fens	65
N08	Heath, Scrub, Maquis and Garrigue, Phygrana	65
N09	Dry grassland, Steppes	65
N10	Humid grassland, Mesophile grassland	65
N11	Alpine and sub-Alpine grassland	65
N14	Improved grassland	65
N15	Other arable land	65
N16	Broad-leaved deciduous woodland	65
N17	Coniferous woodland	65
N19	Mixed woodland	65
N21	Non-forest areas cultivated with woody plants (including Orchards, groves, Vineyards, Dehesas)	65
N22	Inland rocks, Screes, Sands, Permanent Snow and ice	65
N23	Other land (including Towns, Villages, Roads, Waste places, Mines, Industrial sites)	65
N25	Grassland and scrub habitats (general)	65
N26	Woodland habitats (general)	65

4.3 Threats code

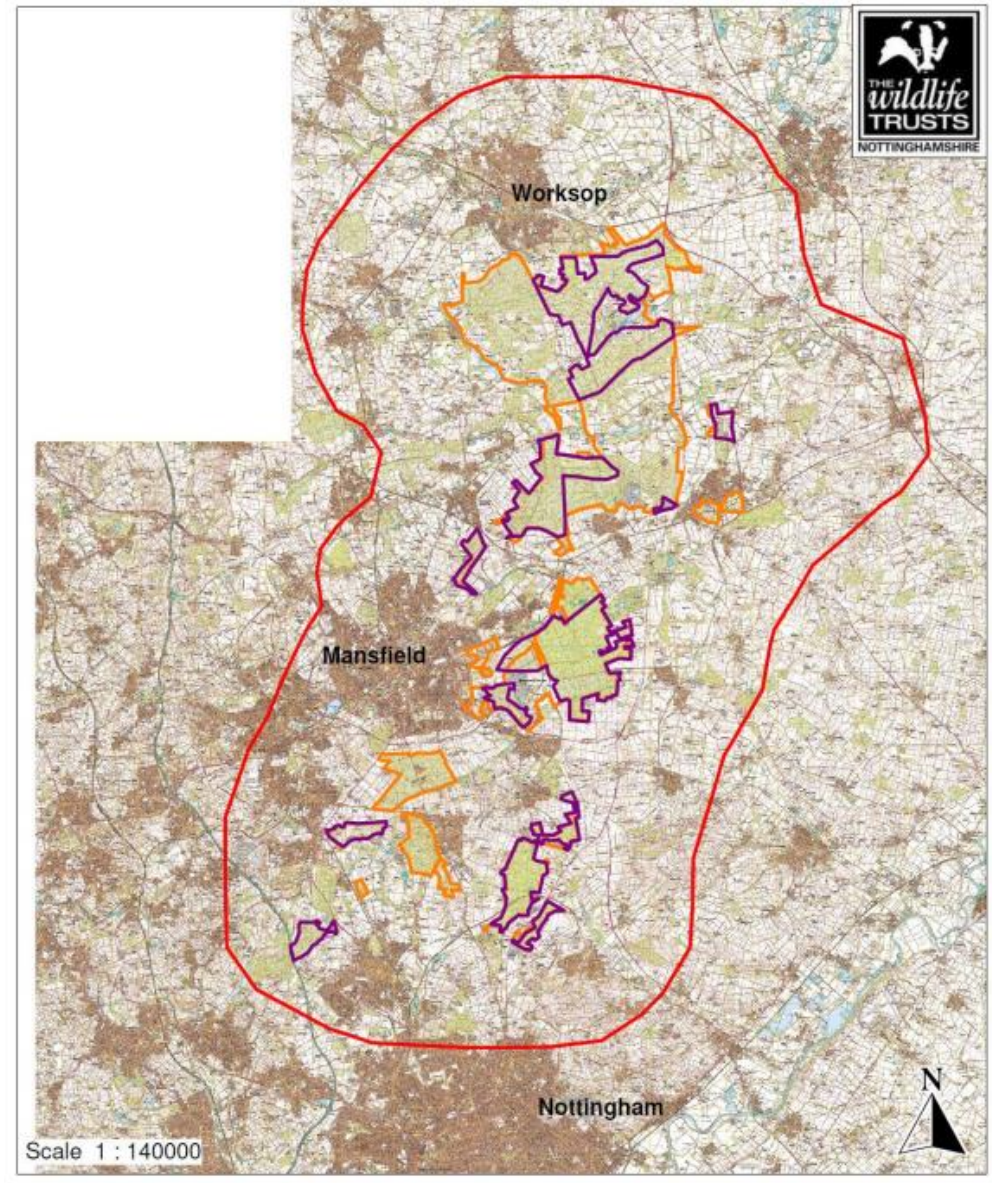
CODE	DESCRIPTION	PAGE NO
A01	Cultivation	65
A02	Modification of cultivation practices	65
A03	Mowing / cutting of grassland	65
A04	Grazing	65
A05	Livestock farming and animal breeding (without grazing)	65
A06	Annual and perennial non-timber crops	65
A07	Use of biocides, hormones and chemicals	65
A08	Fertilisation	65
A10	Restructuring agricultural land holding	65
A11	Agriculture activities not referred to above	65
B01	Forest planting on open ground	65
B02	Forest and Plantation management & use	65
B03	Forest exploitation without replanting or natural regrowth	65
B04	Use of biocides, hormones and chemicals (forestry)	65
B06	Grazing in forests/ woodland	65
B07	Forestry activities not referred to above	65
C01	Mining and quarrying	65
C02	Exploration and extraction of oil or gas	65
C03	Renewable abiotic energy use	65
D01	Roads, paths and railroads	65
D02	Utility and service lines	65
D03	Shipping lanes, ports, marine constructions	65
D04	Airports, flightpaths	65
D05	Improved access to site	65
E01	Urbanised areas, human habitation	65
E02	Industrial or commercial areas	65

CODE	DESCRIPTION	PAGE NO
E03	Discharges	65
E04	Structures, buildings in the landscape	65
E06	Other urbanisation, industrial and similar activities	65
F01	Marine and Freshwater Aquaculture	65
F02	Fishing and harvesting aquatic ressources	65
F03	Hunting and collection of wild animals (terrestrial), including damage caused by game (excessive density), and taking/removal of terrestrial animals (including collection of insects, reptiles, amphibians, birds of prey, etc., trapping, poisoning, poaching, predator control, accidental capture (e.g. due to fishing gear), etc.)	65
F04	Taking / Removal of terrestrial plants, general	65
F05	Illegal taking/ removal of marine fauna	65
F06	Hunting, fishing or collecting activities not referred to above	65
G01	Outdoor sports and leisure activities, recreational activities	65
G02	Sport and leisure structures	65
G03	Interpretative centres	65
G04	Military use and civil unrest	65
G05	Other human intrusions and disturbances	65
H01	Pollution to surface waters (limnic & terrestrial, marine & brackish)	65
H02	Pollution to groundwater (point sources and diffuse sources)	65
H03	Marine water pollution	65
H04	Air pollution, air-borne pollutants	65
H05	Soil pollution and solid waste (excluding discharges)	65
H06	Excess energy	65
H07	Other forms of pollution	65
I01	Invasive non-native species	65
I02	Problematic native species	65
I03	Introduced genetic material, GMO	65
J01	Fire and fire suppression	65
J02	Human induced changes in hydraulic conditions	65
J03	Other ecosystem modifications	65
K01	Abiotic (slow) natural processes	65
K02	Biocenotic evolution, succession	65
K03	Interspecific faunal relations	65
K04	Interspecific floral relations	65
K05	Reduced fecundity/ genetic depression	65
L05	Collapse of terrain, landslide	65
L07	Storm, cyclone	65
L08	Inundation (natural processes)	65
L10	Other natural catastrophes	65
M01	Changes in abiotic conditions	65
M02	Changes in biotic conditions	65
U	Unknown threat or pressure	65
XO	Threats and pressures from outside the Member State	65

5.1 Designation type codes

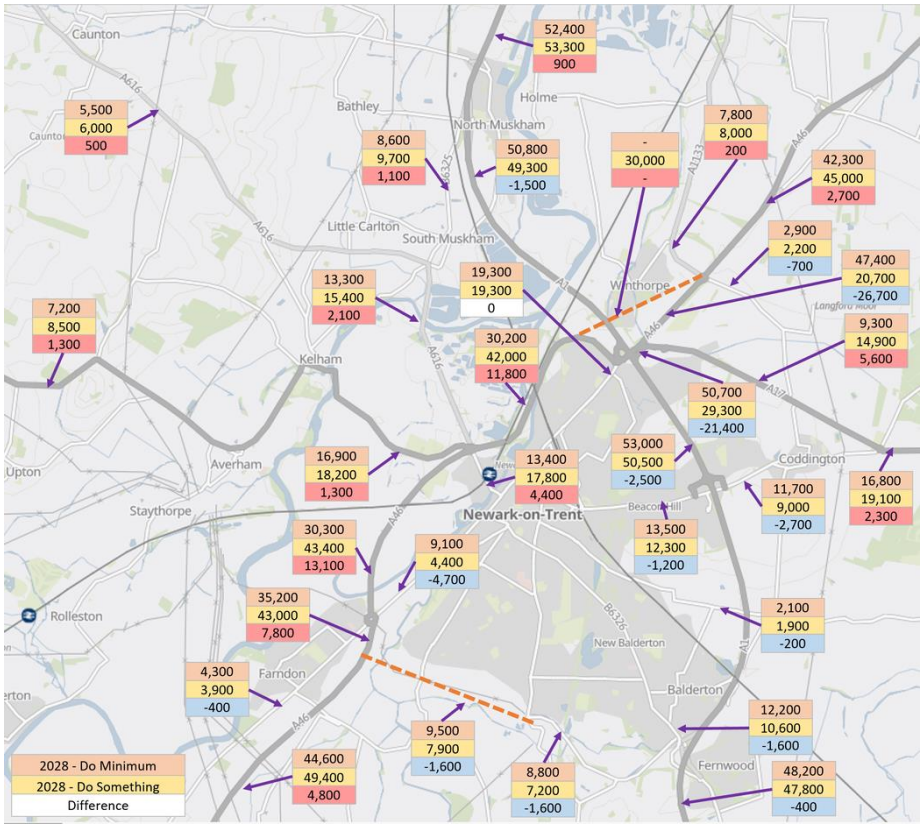
CODE	DESCRIPTION	PAGE NO
UK00	No Protection Status	67
UK01	National Nature Reserve	67
UK04	Site of Special Scientific Interest (GB)	67
UK05	Marine Conservation Zone	67
UK06	Nature Conservation Marine Protected Area	67
UK86	Special Area (Channel Islands)	67
UK98	Area of Special Scientific Interest (NI)	67
IN00	Ramsar Convention site	67
IN08	Special Protection Area	67
IN09	Special Area of Conservation	67

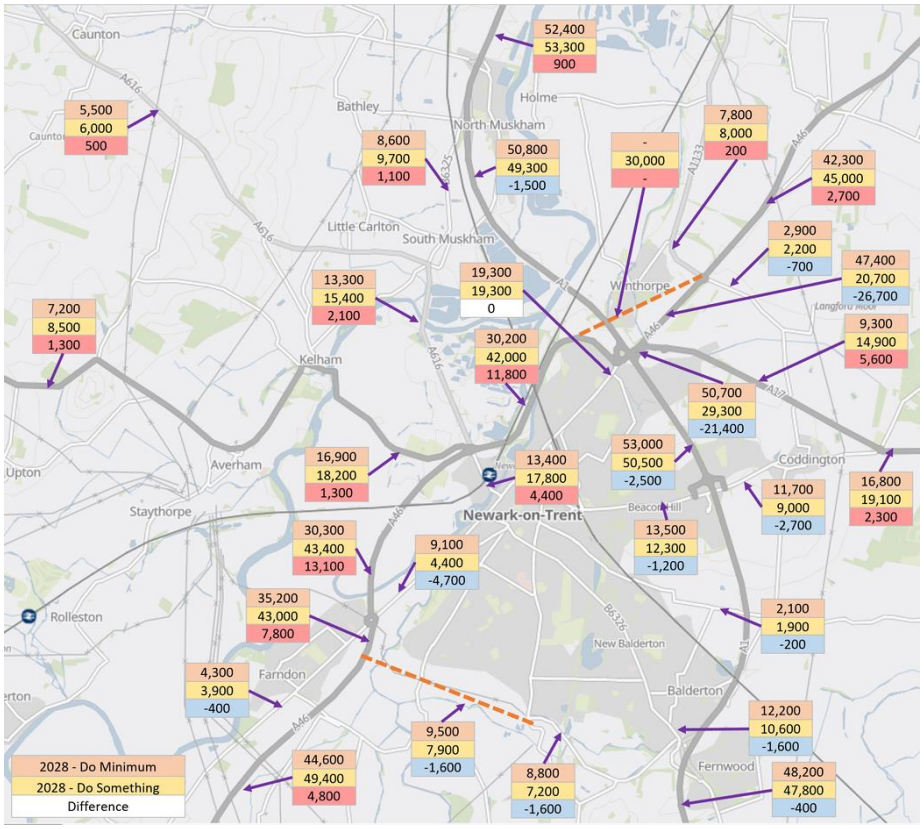
E. Appendix: Indicative Sherwood ppSPA boundary[34]



[34] Natural England (2014) Advice Note to Local Planning Authorities regarding the consideration of likely effects on the breeding population of nightjar and woodlark in the Sherwood Forest region. [online] available at: https://www.mansfield.gov.uk/downloads/file/482/natural-england-s-advice-notes-on-the-sherwood-ppspa-2014 (last accessed July 2023)

F. Appendix: Traffic flow scenarios





G. Fish Escape Passage Technical Note

Figures

Tables

1. Introduction

1.1 The Scheme

The A46 Newark Bypass ("the Scheme") will provide a dual carriageway on the A46 between Farndon and Winthorpe in Nottinghamshire. The section of the A46 that is to be upgraded is approximately 6.5 kilometres (approximately 4 miles) in length. The Scheme comprises on-line widening for the majority of its length between Farndon roundabout and the A1. A new section of offline dual carriageway is proposed between the western and eastern sides of the A1 before the new dual carriageway ties into the existing A46 to the west of Winthorpe roundabout. The widening works include earthwork widening along the existing embankments, and new structures where the route crosses the Nottingham to Lincoln and East Coast Main Line railway lines, River Trent, Brownhills Link and the A1.

1.2 Background

Due to the Scheme's encroachment into the floodplain of the River Trent, the Scheme includes the creation of Floodplain Compensation Areas (FCAs). Two of these are located at Farndon – Farndon East and Farndon West, collectively referred to as the Farndon FCAs. The FCAs have also been designed to provide environmental enhancement, consisting of wetland and floodplain grazing marsh habitat creation in Farndon West FCA and a lake within Farndon East FCA.

Fish escape passage from the Farndon FCAs has been identified as mitigation within the Environmental Statement Chapter 8 Biodiversity (APP-052), Habitats Regulations Assessment (HRA) (APP-185) and Appendix 13.1 Water Framework Directive (WFD) Compliance Assessment (APP-176) for the Scheme as a result of potential entrapment of fish within the Farndon FCAs. The application for the Development Consent Order (DCO) for the Scheme was submitted in April 2024. In August 2024, as part of the DCO examination process, Natural England and the Environment Agency submitted their Relevant Representations for the Scheme.

The Environment Agency's Relevant Representation (RR-020) did not provide a comment about fish escape passages from the Farndon FCAs. Natural England's Relevant Representation (RR-044) considered "*the principle of the proposed mitigation to be appropriate, however, the details of the design are important for their success. The commitment to provide this detailed design in collaboration with the EA is included within the First iteration EMP Table 3-2 (REAC), however, NE consider this commitment must be strengthened."* "*The use of imprecise language"* within the Habitat Regulations Assessment (HRA) that "*the Environment Agency's recommendations regarding the fish escape passage design would be incorporated "where possible""*, introduces "*uncertainty around the implementation of these mitigation measures"*.

The Applicant has brought forward the refinement of the fish escape passage design and produced this Technical Note in response to these comments within the Natural England Relevant Representation (RR-044). The Applicant's response to the remaining Natural England comments within this Relevant Representation (RR-044) are collated in the Applicant's Response to Relevant Representations [REP1-009].

This technical note provides further detail on proposals for the fish escape passage from the Farndon FCAs. It includes optioneering and selection of the preferred option, in order to provide assurance to stakeholders that the proposed mitigation measures have been designed appropriately and can be implemented as part of the Scheme.

1.3 Requirement for FCAs within the Scheme design

FCAs are required to directly replace the floodplain lost through the Scheme's encroachment on the floodplain of the River Trent. The Environmental Statement Appendix 13.2 Flood Risk Assessment (APP-177) (hereafter referred to as the Scheme FRA) presents the case for the FCAs in further detail.

Three FCAs have been identified. These include Farndon East and Farndon West FCAs, collectively known as the Farndon FCAs. The third FCA is known as the Kelham & Averham FCA, however this does not feature in this report due to the infrequency of water conveyance to this site, with the site only being flooded in storm events more severe than the 1 in 30 year event. Therefore, the risk to fish populations due to entrapment within this FCA is considered to be negligible and therefore no mitigation measures are proposed.

The function of the Farndon FCAs is to retain water during a flood event and, afterwards, use natural topography and existing waterways to slowly discharge flood water back into the River Trent downstream of Netherlock Weir. The design replicates the existing function of the floodplain. There is already potential for this flow path to be used by fish in flood events, as well as potential for entrapment of fish, prior to the Scheme's implementation.

The Farndon FCAs have been designed to maximise biodiversity. Approximately 20ha of high-quality wetland habitat is proposed in conjunction with the Farndon West FCA. This will include reedbed, ponds, grazing marshes, new ditch habitats and species rich grassland. Also, within the Farndon East FCA the proposed borrow pit would be retained as a lake of approximately 10ha, surrounded by species rich grassland and tree planting.

1.4 Requirement for fish escape passage

During a flood event, the rise in river level of the River Trent and increase in flow typically occurs progressively over time following heavy rain, allowing fish time to seek more amenable conditions. Young fish that have not fully developed can succumb to displacement downstream during high flow and a range of fish species can become disorientated by discoloured flood water (a result of suspended particles), causing them to be displaced into floodplains.

The Farndon FCAs and concurrent wetland creation (habitat loss compensation) have potential to result in additional entrapment of fish following receding flood waters after a flood event. In general fish species cannot tolerate low oxygen levels, high temperatures and pollution, typical of shallow waterbodies. Therefore, the design of the Farndon East and Farndon West FCAs are to incorporate fish escape passages to mitigate the risk of entrapment of river fish species, including lamprey.

However, in the event that fish remain in the FCAs, the deep ponds have been designed so that they will retain water until the next typical seasonal flooding, to keep temperatures stable and prevent deoxygenation (greatest depth to be at least 2 metres and minimum summer depth to be 0.3 metres). The size, depth and riparian planting of the Farndon FCAs were designed to also reduce mortality of entrapped fish species, from various predatory piscivorous birds and mammals. Environmental Statement Appendix 13.4 Drainage Strategy Report (APP-179) details measures to mitigate adverse impacts of pollution and therefore further reduce mortality of entrapped fish.

The need for fish passage in respect of the Farndon FCAs, as highlighted within Chapter 8 (Biodiversity) of the Environmental Statement, within the HRA and within the WFD Compliance Assessment, is summarised below.

1.4.1 Environmental Statement Chapter 8: Biodiversity

As assessed within Chapter 8 of the Environmental Statement, fish populations along the River Trent are of Regional Importance and a Minor adverse effect on fish species could result from entrapment within the Farndon FCAs in the absence of mitigation. Provision of fish escape passage to provide a means of re-entering surrounding watercourses would reduce this to a 'Neutral' residual effect.

1.4.2 Habitats Regulations Assessment (HRA)

The Humber Estuary Special Area of Conservation (SAC) and Ramsar are located approximately 53 kilometres north of the Scheme and 75kilomtres downstream, along the River Trent, which flows alongside the Scheme. These designated sites support river lamprey (Lampetra fluviatilis) and sea lamprey (*Petromyzon marinus*) as qualifying features. Suitable habitat for lamprey spawning is likely to be present both up- and down-stream of the Scheme, along the River Trent, with lamprey migrating upstream (through the Scheme area) to spawning grounds. Stage 1 of the HRA assessed that there was potential for Likely Significant Effects (LSE) on lamprey due to entrapment within the Farndon FCAs. As mentioned above, due to the infrequency of water conveyance to the Kelham and Averham FCA, with the site only being flooded in storm events more severe than the 1 in 30 year event, the risk to fish populations due to entrapment within this FCA is considered to be negligible. As such, LSE on the SAC/ Ramsar due to lamprey entrapment within the Kelham and Averham FCA are not anticipated. Therefore, no mitigation measures are proposed and the potential for LSE due to lamprey entrapment in this FCA were not taken to the Appropriate Assessment stage of the HRA (APP-185).

Adult lamprey physiology facilitates their migration in winter and early spring when water flows are greater, hiding under stones and vegetation, using their sucking disk with rasping teeth to cling to rocks. Therefore, the likelihood of lamprey being swept up by flood water is considered low, as they would likely take refuge until suitable conditions resumed for their migration. It is considered unlikely that healthy lamprey yet to spawn would be subject to entrapment. As such, whilst it is considered unlikely that adult lamprey would be entrapped in the Farndon FCAs following flood water recedence (incidental individuals only), the Stage 2 appropriate assessment stage of the HRA included the requirement for fish escape passage from the Farndon FCAs to mitigate the remaining uncertainty of the implications for the SAC/ Ramsar in view of that Humber Estuary conservation objectives and to avoid Adverse Effects on the Integrity (AEoI) of the European sites.

The HRA assessed that there is negligible potential for larvae (ammocoetes) to become entrapped in the Farndon FCAs, as high flows during spates are likely to wash eggs and larvae downstream before they would become trapped in the Farndon FCAs. However, there is a minor risk that during flood events they could be held within backwaters within the Order Limits, such as within the Farndon FCAs or Old Trent Dyke. Furthermore, if a future independent development upstream of the Scheme resulted in the disturbance of silt beds/nurseries upstream of Farndon, then the entrapment of these lamprey life stages cannot be ruled out. Though lamprey larvae can tolerate low oxygen tension typical of ponds (due to their physiology), high temperatures and pollution usually occur with low oxygen levels, which are lethal factors.

1.4.3 Water Framework Directive (WFD) Compliance Assessment

The WFD Compliance Assessment assessed the potential impact on WFD waterbody status as a result of the Scheme. As stated in paragraph 3.2.7, the Scheme includes fish escape passages at the Farndon FCAs to mitigate the risk of fish entrapment as flood water recedes.

The WFD Compliance Assessment concluded that with the identified mitigation measures the Scheme is not anticipated to cause deterioration of the current WFD status of the waterbodies within the study area, nor is it anticipated to prevent any waterbodies within the study area from reaching their target 'Good' status in the future. This is due to the fact that potential impacts resulting from various elements of the Scheme are expected to have only small-scale localised impacts.

2. Farndon FCA fish escape passage – DCO application proposal

2.1 Consultation

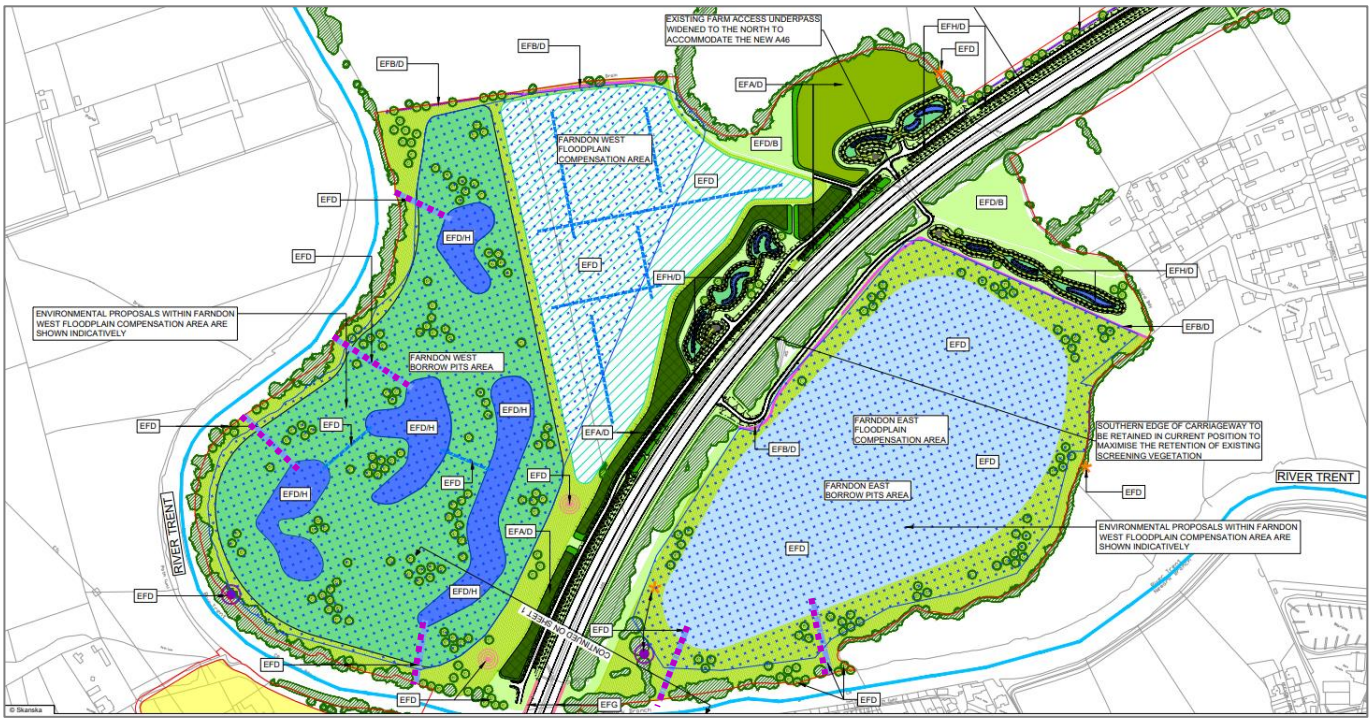
Consultation with Natural England and the Environment Agency was undertaken throughout the evolution of the Scheme design. The Applicant's approach to maximising benefits within the Farndon FCAs was welcomed by both Natural England and the Environment Agency. This comprises provision of approximately 20ha of high-quality wetland habitat in conjunction with the Farndon West FCA, including reedbed, ponds, grazing marshes, new ditch habitats and species rich grassland. Within the Farndon East FCA the proposed borrow pit would be retained as a lake of approximately 10ha, surrounded by species rich grassland and tree planting. Following consultation on the design of the Farndon FCAs, the Environment Agency requested that fish escape passages be provided from the Farndon FCAs. The Environment Agency recommended that the fish escape passages should allow provision of the shortest pathway to facilitate the return of river fish species directly back to the River Trent, with passages to be naturalised, and measure 0.5 metres in width and 0.3 metres in depth.

Following the Environment Agency's advice, the Application currently includes the provision of fish escape passages from the Farndon FCAs (further detail is provided in Section 2.2 of this Technical Note). Indicative locations of this mitigation is detailed within Environmental Statement Figure 2.3 (sheet 2 of 7) (AS-026). It shows connectivity with the River Trent. It was agreed with the Environment Agency that the specific number, location and design of fish escape passages would be finalised during the detailed design stage (as detailed in Chapter 8 (Biodiversity) of the Environmental Statement and paragraph 3.2.7 of the HRA).

2.2 DCO application fish escape passage design

In the absence of industry standard guidance for the design of fish escape passages, the Applicant utilised the Environment Agency's recommendations for fish escape passages to be naturalised, connect directly to the River Trent and measure 0.5 metres in width and 0.3 metres in depth. Provision of these fish escape passages were proposed to be open channels from each of the waterbodies within the Farndon FCAs, through the existing flood bund along the river bank and directly into the River Trent (as shown in pink on Figure 1 below).

Figure 1 Indicative locations of fish escape passages (dashed pink line) from Farndon flood compensation areas to the River Trent, as detailed in the Environmental Masterplan (AS-026).



Source Mott MacDonald, 2024

This direct route would provide a short pathway to the River Trent from the Farndon FCAs and the naturalised fish escape passages would not be at risk of mechanical faults. During design development of the fish escape passages, in response to Natural England's Relevant Representations, a number of issues with the proposed design have been identified. These are explained further below.

The function of the Farndon FCAs is to retain water during a flood event and, afterwards, use the natural topography and existing waterways to slowly discharge flood water back into the River Trent downstream of Netherlock Weir. This proposed drawdown mechanism from the FCAs provides the same conditions as the pre-development baseline, as the Farndon FCAs are already inundated during flood events.

The topography of the Farndon East FCA (northward sloping aspect draining into Old Trent Dyke) would not facilitate flood water to drain southwards directly into the River Trent, thus this fish escape passage option would not be feasible for Farndon East FCA. This fish escape passage design would also require large scale earthworks to reprofile the Farndon West FCA in order for flood water to drain northwest into the River Trent via the proposed open channels. The elevation of open channels low enough to allow drainage of the waterbodies in the Farndon West FCA into the River Trent would result in the River Trent flowing into the Farndon West FCA quicker and earlier than pre-construction baseline (i.e. prior to overtopping the flood bund), potentially resulting in a larger number of fish being carried in flood water into the Farndon West FCA. Channel openings constructed through the existing flood bund would create a weak point for bank erosion, which could require further construction of erosion protection down to the river bed.

A coffer dam would be required for the construction of the channel opening associated with this fish escape passage design, introducing a safety risk to construction personnel working in and around the river, as well as temporarily restricting and altering the flow of the River Trent (a main river and designated WFD waterbody).

The mitigation hierarchy has been applied throughout the Scheme design and, with the exception of the proposed fish passage, has largely avoided in-channel works and construction within the riparian zone of

the River Trent to prevent sediment disturbance, loss or damage to riparian habitat and associated impacts to species.

There would be a risk of blockage from flood debris in the fish escape passage channel opening, which would require ongoing monitoring and maintenance during operation. Safe removal of debris would be restricted to when flood waters recede which could hinder the return of fish back to the river uninjured and thus the efficacy of the fish escape passage design.

This fish escape passage design requires works to be undertaken along the River Trent embankment. This has the potential to disturb the Himalayan balsam (*Impatiens glandulifera)* seed bank within the riverbank and spread Himalayan balsam downstream of the works along the River Trent.

Viability

In undertaking a refinement of the fish escape passage design it is now considered that an open channel connecting the Farndon FCAs through the existing flood bund along the river bank directly into the River Trent is not a viable option. This is because it would render the function of Farndon West FCA redundant due to uncontrolled influx and discharge of flood water. This design would also not mitigate for entrapment of fish species in the Farndon East FCA.

Following this review of the DCO application fish escape passage design at the Farndon FCAs, a number of alternative options have been considered. These are discussed in Section 3 below.

3. Options considered

There is no guidance on the design of fish escape passages. The withdrawn Environment Agency Fish Pass Manual[1] only considers fish passes (not fish escape passages) for the upstream passage of all species of diadromous (sea to freshwater cycle) migratory salmonid species, potadromous (within freshwater) coarse fish species, and other diadromous species such as eels and shad. This manual was reviewed to explore whether any existing fish pass designs could be adapted for the purpose of a fish escape passage, whilst maintaining the existing River Trent bank crest height and the Farndon FCAs flood defence function (storage and discharge functions).

The fish escape passage options considered are detailed below, with justification for the preferred option. Though Options 1 to 3 differ in the engineered solutions to provide this mitigation, the indicative locations of fish escape passages are the same as those proposed in the DCO application (i.e. direct connectivity to the River Trent), as detailed in Figure 1 above. The indicative locations of Option 4 fish escape passages are detailed in section 3.4 below. Option 4 would involve a change to the indicative locations and footprint of fish escape passages compared with those initially considered in the DCO application. However, all fish escape passage options are within the boundary of the Scheme The implications of these changes on the HRA, Environmental Statement and WFD Compliance Assessment are considered in Section 4.

As part of the optioneering process, the advantages and disadvantages of each option were determined against assessment criteria. These are summarised in Table 2, with further detail provided in Sections 3.1 to 3.4. All fish escape passage design options would impact the banks of waterways where Himalayan balsam has been recorded and therefore there is potential to spread this Invasive Non-Native Species (INNS) during construction (as detailed under each option in Section 3 below). In-channel works required

[1] Environment Agency (2010). Environment Agency Fish Pass Manual: Guidance Notes On The Legislation, Selection and Approval Of Fish Passes In England And Wales.

for Options 1 – 3 also have the potential to spread aquatic INNS. The potential for spread of INNS as a result of the fish escape passage design options has been identified and assessed as part of the DCO application. Measures to manage and prevent the spread of INNS from and within the working areas are summarised in the First Iteration Environmental Management Plan (EMP) (APP-184), which will be developed into a Second Iteration EMP to be implemented during construction of the Scheme. Adherence with the Second Iteration Environmental Management Plan is secured by Requirement 3 of the Draft DCO (APP-021). As detailed in the Register of Environmental Actions and Commitments (REAC) table in the First Iteration EMP (APP-184), an INNS Management Plan and Biosecurity Risk Assessment will be produced pre-construction, which will include control measures for Himalayan balsam.

Mitigation for sedimentation has been accounted for in the DCO application as the fish passage proposals included works within the River Trent riparian zone. Fish passage Options 1 - 3 works include works to the River Trent embankment, with in-channel works required, which may result in greater potential for sedimentation. than an option that avoids in-channel works. Although works to the River Trent embankment have been avoided for Option 4, this option would require works to the banks of Old Trent Dyke (although not within the channel).

Navigational rights along the River Trent would be maintained during construction of all the fish escape passage options. The river is wide enough to allow safe access to water users to pass upstream and downstream of the works..

Table 2: Summary of Options Considered: Option 1 – flap valve culvert into the River Trent, Option 2 – water abstraction into the River Trent, such as a siphon fish ladder or Archimedes screw, Option 3 – lamprey ladder into the river Trent, Option 4 – over spill into Old Trent Dyke.

	Assessment Criteria	Option 1	Option 2	Option 3	Option 4 (preferred option)
Advantages	Direct access into River Trent from both Farndon FCAs	N	Y	Y	N
	Mitigation for multispecies (fish)	Y	Y	N	Y
	Farndon FCAs function (flood storage and slow discharge downstream)	N	N	N	Y
	Avoids loss of biodiversity greater than in the DCO application	N	N	N	Y
	Avoids hard engineered solution / utilises a nature-based design	N	N	N	Y
	Navigation of River Trent unaffected during construction	Y	Y	Y	Y
Please note that in the 'Advantages' section a 'Y' is considered positive and marked as green, and a 'N' is considered negative and marked as red.					
Disadvantages	Risk of wetland habitat failure	Y	Y	Y	N
	Disturbance to Himalayan balsam and / or its seed bank	Y	Y	Y	Y
	Disturbance/spread of aquatic INNS	Y	Y	Y	N
	Sediment disturbance and impacts to geomorphology	Y	Y	Y	Y
	Loss or damage to riparian habitats in the River Trent	Y	Y	Y	N
	Temporary disturbance of aquatic wildlife during construction	Y	Y	Y	Y
	Risk of mechanical error	Y	Y	Y	N

	Assessment Criteria	Option 1	Option 2	Option 3	Option 4 (preferred option)
	Risk of flood debris built up/blockage	Y	Y	N	N
	Injury or death of fish during operation	Y	Y	Y	N
	Additional ongoing monitoring and maintenance required	Y	Y	Y	Y
	Temporary restriction and alteration of River Trent flow during construction	Y	Y	Y	N
	Potential to adversely alter flood risk of the River Trent catchment	Y	Y	Y	N
	Safety risk to construction personnel	Y	Y	Y	N
Please note that in the 'Disadvantages' section a 'N' is considered positive and marked as green, and a 'Y' is considered negative and marked as red.					
Viable Option		N	N	N	Y

Source: Mott MacDonald, 2024.

3.1 Option 1

Option 1 Design

Option 1 comprises provision of a fish escape passage in the form of a culvert with a flap valve from each of the waterbodies within the Farndon West FCA, through the existing River Trent flood bund (which forms the river bank) and directly into the River Trent with a flap valve to restrict backflow

The design of this option considered the size of the culvert to ensure the river fish assemblage likely to be entrapped in the Farndon West FCA have a viable pathway to remove them from these waterbodies and return them to river habitat. A minimum pipe diameter of 300 millimetres would allow the safe passage of sea/brown trout (up to 500 millimetres in length) and large coarse fish (>500 millimetres in length)[1]. However, as salmon *Salmo salar* are noted upstream in the River Dove and therefore use the River Trent as a migratory route, a minimum pipe diameter of 500 millimetres would allow for the safe passage of salmon >500 millimetres in length.

Option 1 Advantages

- This design would provide a direct route for fish to return from the Farndon West FCA to the River Trent, whilst the flap valve would prevent in-flood of the river water into the FCA.
- Long culverts are likely to restrict upstream movement of fish. However, the length of the fish passage culvert (approximately 10 metres) through the flood bund is considered to not be a barrier to movement, as this mitigation aims to encourage fish downstream to return to river habitat (rather than facilitate upstream movement).
- Though there will be additional loss of terrestrial and riparian habitat between the Farndon West FCA to the river's edge than currently reported, it is considered to be negligible with a net gain in units still achieved (currently 4.99% net gain in habitat units and 36.93% in river units).
- The flap design has no scrap value so is less attractive for theft.

Option 1 Disadvantages

- The existing topography and that of the Farndon FCAs (northward sloping aspect draining into Old Trent Dyke) would not facilitate flood water to drain southwards through the culvert directly into the River Trent, thus this option would not be feasible for Farndon East FCA.
- During flood events, flood water from the whole Farndon West FCA would discharge through flap valves back into the River Trent upstream of Windmill Viaduct, with potential to alter flood risk to the River Trent catchment.
- This design would also require large scale earthworks to reprofile the Farndon West FCA for flood water to drain northwest into the River Trent, which would also render the proposed wetland creation design unviable.
- In river works could also result in adverse effects including sediment disturbance, impacts to geomorphology, loss or damage to riparian habitats and disturbance of species.
- The flow of the River Trent would also be temporarily restricted by in-river works.
- There would be a risk of blockage of the flap valve from flood debris, which would require ongoing monitoring and maintenance during operation to ensure fish could return back into the river uninjured. Blockages could also force the flap valve to stay open when river levels rise, allowing an influx of water from the River Trent to flood into the Farndon West FCA instead of slowly overspilling the flood bund along the river bank, thus negatively altering flood risk.
- Fish could be injured or killed if the flap valve quickly closes and so mitigation measures would be required in the form of a slow closing flap valve with a fish friendly flap.

- The flap design requires minimal maintenance, although it would still require monitoring and periodic clearance of debris.
- A coffer dam would be required for the construction of a headwall, introducing a safety risk to construction personnel working in and around the river.

Option 1 Viability

A culvert with a flap valve connecting the Farndon West FCA, through the existing flood bund along the riverbank and directly into the River Trent is not a viable option because it would render the function of Farndon West FCA redundant due to uncontrolled discharge of flood water back into the River Trent. There could also be potential influx of river water into the FCA due to blockage of the flap valve. Furthermore, all the flood water from the Farndon West FCA would drain the floodplain upstream of the existing discharge point, increasing the period of time the River Trent is at elevated levels and potentially increase flood risk or the duration of flooding. This design would also not mitigate for entrapment of river fish species in Farndon East FCA as this design is not feasible to implement in this location.

3.2 Option 2

Option 2 Design

Option 2 comprises the provision of a fish escape passage requiring water abstraction, such as a siphon fish ladder or Archimedes screw, to displace fish from the Farndon FCAs over the existing River Trent flood bund and directly into the River Trent.

Water would be abstracted from the River Trent and a 5 millimetre gauge would be required on each abstraction pump to prevent entrainment of small yellow eels (a life stage of the European eel) that have potential to migrate along the River Trent. Water abstraction would require a power supply to a pump station. Sustainable energy sources with above-ground infrastructure were considered unsuitable for this location, due to the high likelihood that, for instance, solar panels would be subject to vandalism or theft. Therefore, a conventional power supply would be proposed, which would require excavation for the pumping stations buried utilities, the foundations for each prefabricated mechanical fish escape passage and construction of an access track to allow for ongoing monitoring and maintenance of pumping stations during operation.

Option 2 Advantages

- This design would provide a direct route for fish to return from the Farndon FCAs to the River Trent and would not alter the influx of flood water from the River Trent into the Farndon FCAs.
- Option 2 would require work along the riverbank which has the potential to disturb the Himalayan balsam seed bank and spread Himalayan balsam downstream of the works along the River Trent. This option also requires in-channel works, which has potential to spread aquatic INNS species, likely to be present within the River Trent. Option 2 proposals are in a similar location to the DCO fish passage proposals and therefore required control measures for Himalayan balsam, and other aquatic INNS, to be included within the the aforementioned INNS Management Plan and Biosecurity Risk Assessment, would not change for Option 2.

Option 2 Disadvantages

- There would be a risk of mechanical faults of pumping stations (blockages from flood debris), which would potentially be inaccessible across the wetland area during times of flooding.

- The required pumping station could be located either at Farndon East or Farndon West FCA. The potential location of the pumping station at Farndon East FCA would be close to the existing A46 and therefore easier to access and provide a power supply to. . The fish escape passage structure would have to be a minimum of 25 metres long to reach into the Farndon East FCA lake at the nearest point to the River Trent. However, due to the topography (northward sloping aspect draining into Old Trent Dyke) the fish escape passage structure would likely be much greater than this (>300 metres) to ensure it would be accessible for fish in the northern area of the lake, whilst flood water receded. The potential location of a pumping station in Farndon West FCA would be on the most northerly pond (lowest elevation where all connected ponds in Farndon West FCA will drain) and the closest point to the River Trent. This will require approximately 1 kilometre of power supply ducting around the wetland and would result in a greater loss of biodiversity than the DCO application proposal.
- Work along the riverbank could also result in adverse effects including sediment disturbance, impacts to geomorphology, loss or damage to riparian habitats and disturbance of species.
- A coffer dam would be required for the construction of the channel opening, introducing a safety risk to construction personnel working in and around the river, and temporarily restricting and altering the flow of the River Trent.
- Water abstraction from the Farndon FCAs may adversely affect their function and could increase the risk of failure of the wetland habitat establishing (created in Farndon West FCA to compensate for habitat loss as part of the Scheme and required to achieve a net gain in river units as part of the BNG assessment). This would result in greater biodiversity loss than detailed in the DCO application.

Option 2 Viability

A fish escape passage requiring water abstraction, such as siphon fish ladder or Archimedes screw, connecting the Farndon FCAs directly to the River Trent over the existing flood bund along the river bank is not a viable option. The required infrastructure, including a pumping station and associated power supply, as well as maintenance access would result in significantly more habitat loss than the DCO proposal, whilst there is also the potential for the function of the FCAs to be adversely affected.

3.3 Option 3

Option 3 Design

Option 3 comprises provision of a single-species fish escape passage in the form of a lamprey ladder, from the Farndon FCAs directly into the River Trent, over the flood bund along the river bank.

Water would be abstracted from the River Trent and a 5 millimetres gauge would be required on the abstraction pump to prevent entrainment of small yellow eels (a life stage of the European eel) that could be migrating along the River Trent. Water abstraction would require a power supply to a pump station. Sustainable energy sources with above-ground infrastructure were considered unsuitable for this location, due to the high likelihood that, for instance, solar panels would be subject to vandalism or theft. Therefore, conventional power supply was considered, which would require excavation for the pumping station utilities, the foundations of mechanical fish escape passages and construction of access tracks to allow for ongoing monitoring and maintenance of the pumping stations during operation.

Option 3 Advantages

- This design would not adversely affect the influx of flood water from the River Trent into the Farndon FCAs.
- The use of pegs rather than bristles along the lamprey ladder would prevent built-up of flood debris and reduce the cost of monitoring and maintenance.

Option 3 Disadvantages

- This design only mitigates the risk of sea and river lamprey entrapment within Farndon FCA waterbodies, and not other river fish species.
- Water abstraction from Farndon FCAs would render their function redundant (flood storage and slow discharge downstream) and would increase the risk of failure of the wetland habitat, created in Farndon West FCA to achieve a net gain in river units. Instead, water would have to be abstracted from the River Trent and a 5 millimetres gauge would be required on the abstraction pump to prevent entrainment of small yellow eels (a life stage of the European eel) that could be migrating along the River Trent. Water abstraction would require a power supply to a pump station.
- Sustainable energy sources with above-ground infrastructure were considered unsuitable for this location, due to the high likelihood that, for instance, solar panels would be subject to vandalism or theft. Therefore, conventional power supply was considered, which would require excavation for the pumping station utilities, the foundations of a mechanical fish escape passage and construction of an access track to allow for ongoing monitoring and maintenance of the pumping station during operation.
- There would be a risk of mechanical faults of pumping stations (blockages from flood debris), though this would be less than for Option 1 and Option 2. The pumping stations would potentially be inaccessible across the wetland area during times of flooding, therefore there may be periods where the fish escape passage cannot function until access has been regained for maintenance work to be undertaken.
- The required pumping station could be located either at Farndon East or Farndon West FCA. The potential location of the pumping station at Farndon East FCA would be close to the existing A46 and therefore easier to access and provide a power supply to. The fish escape passage structure would have to be a minimum of 25 metres long to reach into the Farndon East FCA lake at the nearest point to the River Trent. However, due to the topography (northward sloping aspect draining into Old Trent Dyke) the fish escape passage structure would likely be much greater than this (>300 metres) to ensure it would be accessible for fish in the northern area of the lake, whilst flood water receded. The potential location of a pumping station in Farndon West FCA would be on the most northerly pond (lowest elevation where all connected ponds in Farndon West FCA will drain) and the closest point to the River Trent. This will would require approximately 1 kilometre of power supply ducting around the wetland and would result in a greater loss of biodiversity than the DCO application proposal.
- Work along the riverbank could also result in adverse effects including sediment disturbance, impacts to geomorphology, loss or damage to riparian habitats and disturbance of species.
  A coffer dam would be required for the construction of the channel opening, introducing a safety risk to construction personnel working in and around the river, and temporarily restricting and altering the flow of the River Trent.
- Water abstraction from the Farndon FCAs may adversely affect their function and could increase the risk of failure of the wetland habitat establishing (created in Farndon West FCA to compensate for habitat loss as part of the Scheme and required to achieve a net gain in river units as part of the BNG assessment). This would result in greater biodiversity loss than detailed in the DCO application.

Option 3 Viability

A fish escape passage in the form of a lamprey ladder is considered insufficient as it does not mitigate the risk of entrapment of other river fish species across the Farndon FCAs. In addition, a lamprey ladder requiring water abstraction is not a viable option. The required infrastructure, including a pumping station and associated power supply, as well as maintenance access would result in significantly more habitat loss than the DCO proposal, whilst there is also the potential for the function of the FCAs to be adversely affected.

3.4 Option 4 (Preferred Option)

Option 4 Design

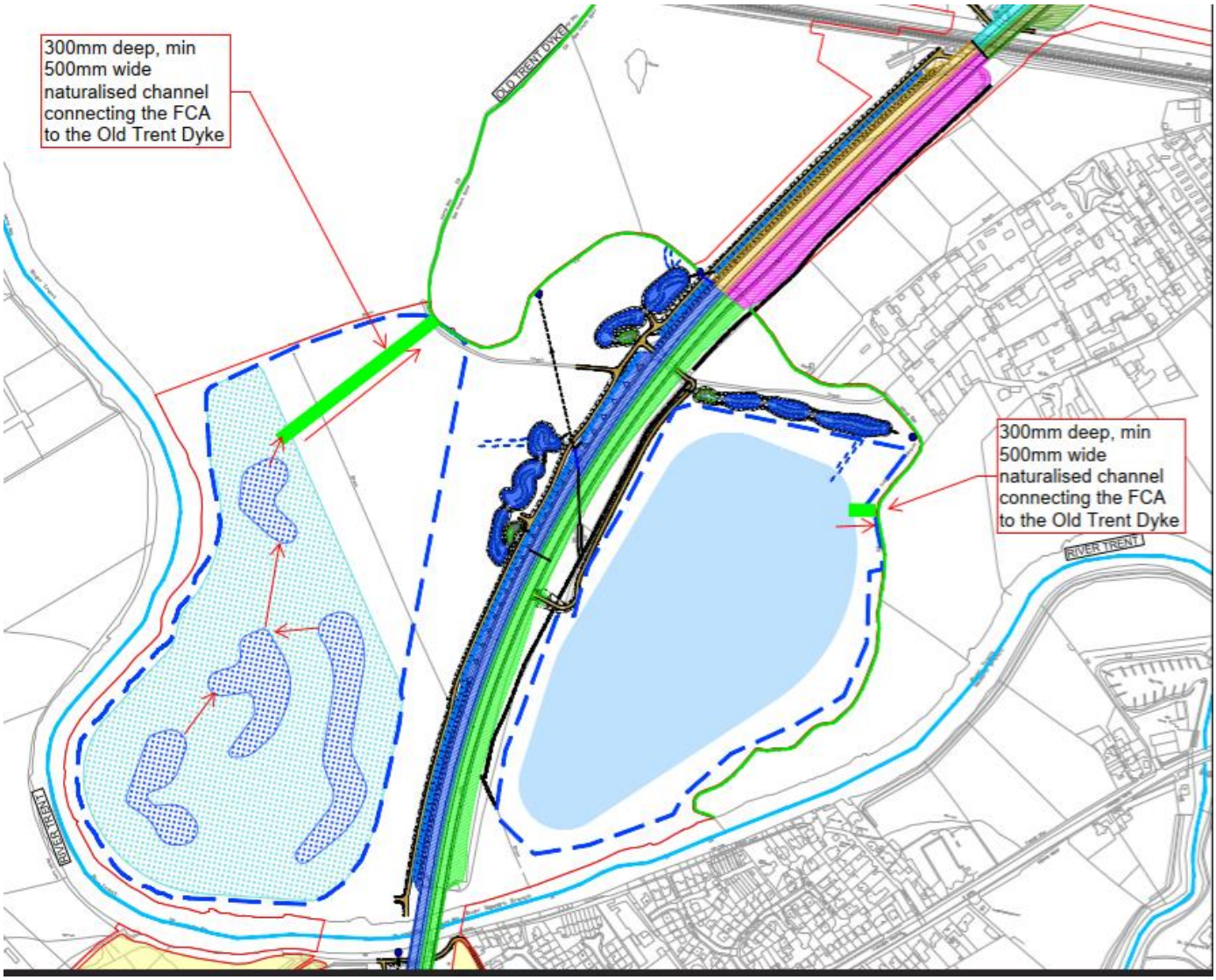
Option 4 comprises provision of two fish escape passages from the north of each FCA, as overspill open channels, into Old Trent Dyke. The design would seek a short route for dispersal of fish into Old Trent Dyke whilst prioritising the point of confluence downstream. For example, the fish escape passage would connect Farndon East FCA to Old Trent Dyke along its northeast perimeter (as detailed in below). The specific locations and length of the fish escape passages connecting the Farndon FCAs to Old Trent Dyke will be finalised during detailed design.

Old Trent Dyke diverges before passes northwards under Kelham Road and south eastwards under the A46 carriageway. The southern branch finishes at the flood bund west of residential houses, southwest of Cattlemarket junction. During flooding events, this branch of Old Trent Dyke will hold more water and therefore more fish displaced from the Farndon FCAs. However, as flood water levels recede, it is considered likely that fish will be displaced towards the northern branch of Old Trent Dyke which will discharge into the River Trent downstream of Netherlock Wier.

There are four culverts along the northern branch of Old Trent Dyke, none of which comprise of flood gates, flap valves or bars (as detailed in Figure 3 below). Design of this option considered the size of these culverts and flow rates to ensure the river fish assemblage likely to be entrapped in the Farndon FCAs would have a viable pathway to escape from the Farndon FCA waterbodies and return them to river habitat.

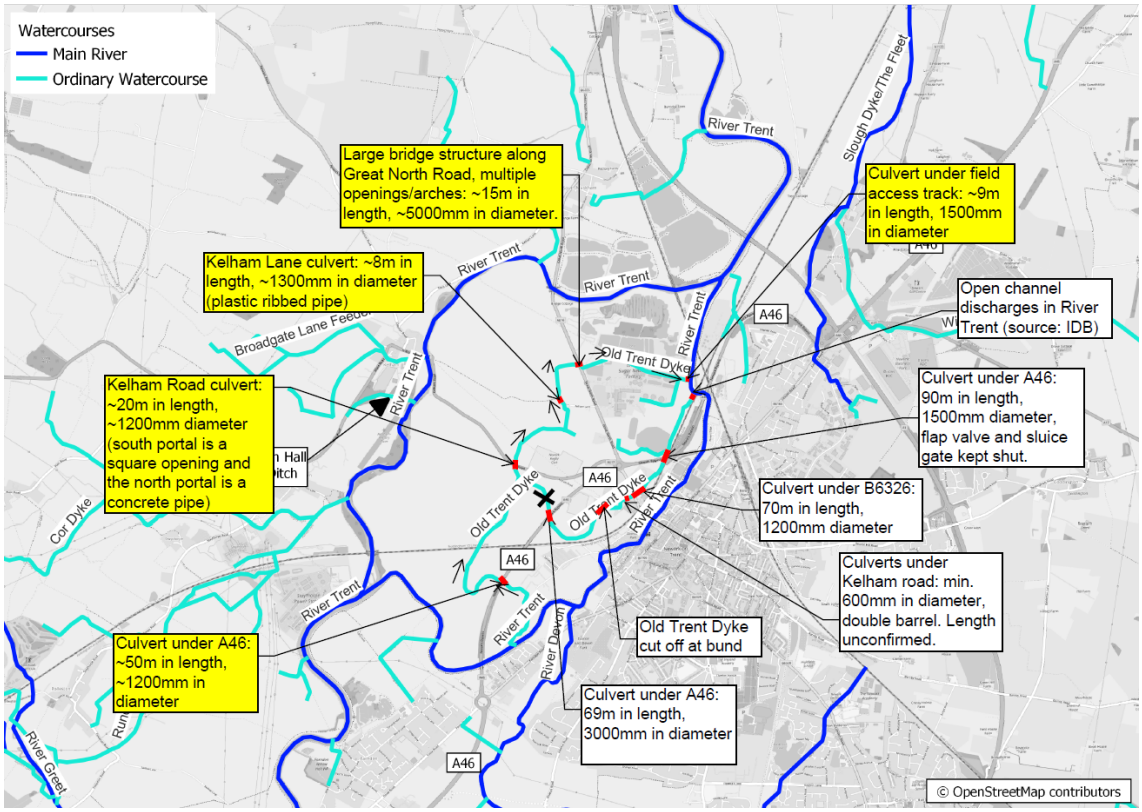
Small sections of bramble scrub over growing the channel along the northern branch of Old Trent Dyke may impede the passage of small numbers of larger fish during elevated water levels, where flood debris could accumulate, narrowing the passage. The Internal Drainage Board (IDB) maintains Old Trent Dyke and its culverts, and will continue to do so during operation of this Scheme. Whilst the current density of vegetation overgrowing this watercourse is considered to not prevent fish being discharged into the River Trent in receding flood water, it must be noted that the maintenance of Old Trent Dyke must be upheld by the IDB to ensure the success of the fish escape passage within the DCO Order Limits. As the Scheme will not increase the number or species of fish caught in flood water and displaced into Old Trent Dyke in comparison to pre-construction baseline, there will be no change to the risk to any fish present in Old Trent Dyke from these maintenance activities. Furthermore, access to Old Trent Dyke is limited by flooding of adjacent land and therefore, once flood water has receded, it is considered that riverine fish species will have been displaced back into the River Trent, further reducing the likelihood of impacts to riverine fish from management of Old Trent Dyke by the IDB.

Figure 2 Option 4 indicative locations of fish escape passages from Farndon flood compensation areas into Old Trent Dyke.



Source: Mott MacDonald, 2024

Figure 3 Existing culverts along Old Trent Dyke. Yellow boxes indicate culverts providing connectivity between the Farndon flood compensation areas and the River Trent



Source Mott MacDonald, 2024

Option 4 Advantages

- This design would minimise the need for earthworks to reprofile the Farndon FCAs, as receding flood water would naturally flow northwards to Old Trent Dyke, as it does after existing flood events.
- The design utilises an existing waterway (Old Trent Dyke) where fish caught in flood water would naturally be displaced into and re-enter the River Trent downstream of Netherlock Weir. It should be noted that the Old Trent Dyke is the current route that fish re-enter the River Trent, following overtopping of the River Trent embankment in these locations.
- The size of existing culverts along Old Trent Dyke are of a sufficient size to allow the potential fish assemblages likely to inhabit the River Trent to pass safely between the Farndon FCAs to the River Trent. The smallest culvert along the northern branch of Old Trent Dyke measures 1.2 metres diameter and approximately 20 metres in length, under Kelham Road. This will allow for the safe passage of sea/brown trout up to 500 millimetres in length, large coarse fish and salmon >500 millimetres in length.
- This option would provide sufficient water depth for fish to safely pass when flood waters recede through discharge to Old Trent Dyke. If fish were to travel with (and at the same speed as) the flow of the dyke during a flood event, the estimated travel time for fish along the dyke is approximately 7 hours. This is not significantly different to the duration it would take fish to travel along Old Trent Dyke into the River Trent pre-construction.
- Long culverts are considered to restrict upstream movement of fish, culvert length is not considered a barrier to movement as the mitigation aims to encourage fish downstream to return to river habitat (rather than facilitate upstream movement).

- This design would not compromise the function of the Farndon FCAs i.e. no adverse effects to influx of water from the River Trent into the Farndon FCAs, retention of flood water within the Farndon FCAs and discharge of flood water from the Farndon FCAs back into the River Trent.
- There would be no risk of mechanical faults to the fish escape passage proposed. Given that the channels would be open, there would be a relatively low risk of blockages and thus failure of the proposed mitigation for fish entrapment.
- This design would provide proportionate mitigation for the potential entrapment of multi-species river fish within both the Farndon West FCA and the Farndon East FCA, and therefore can be delivered as part of the Scheme design.
- No additional maintenance will be required along Old Trent Dyke. The IDB will continue the existing maintenance along this waterway which includes grass and hedge cutting, weed/debris removal where necessary and access allows, and, less frequently, tree works when inhibiting access. Ongoing monitoring and maintenance of fish escape passages will be part of the Landscape and Environmental Management Plan (LEMP) for the Farndon FCAs. The LEMP will set out the management required to ensure the scheme landscape planting establishes, matures and fulfils its intended functions as set out in the Environmental Statement. The maintenance of Old Trent Dyke, undertaken by the IDB, and the fish escape passages will ensure a viable pathway for river fish (including lamprey) to return to the River Trent is maintained during operation.
- No in-channel works are required for Option 4 and therefore there is less chance of spreading aquatic INNS than the DCO proposals or Options 1 – 3.

<u>Option 4 Disadvantages</u>

- This design would not provide the most direct pathway in terms of the shortest distance to displace fish from the Farndon FCAs to the River Trent (hard engineering would be required for this, in line with Options 1 to 3). Instead, Option 4 utilises the existing natural habitat of Old Trent Dyke, a pathway which fish currently navigate to return to the River Trent in receding floodwaters (as detailed in Option 4 Advantages above). Species such as river lamprey stop feeding when they enter freshwater to begin their migration upstream to spawning sites, after which, all adult lamprey species die after spawning. There is a risk that the excess energy spent migrating to spawning habitat due to being directed along Old Trent Dyke, rather than the River Trent, would mean that some individuals may not reach their spawning ground before dying. However, as described in section 1.3.2, there is a low risk of lamprey entrapment in the FCAs due to their physiology and therefore fish escape passage into Old Trent Dyke is a contingency plan to mitigate uncertainty around impacts to lamprey due to entrapment.
- Construction of fish escape passages along Old Trent Dyke could also result in adverse effects including sediment disturbance, loss or damage to riparian habitats and disturbance of species. Mitigation of these impacts have been accounted for during construction works to extend culverts, however this design option introduces a new location for these impact pathways as the fish escape passage at Farndon East FCA is upstream of the existing culvert extension works.
- It is likely that individual fish (including lamprey) caught in flood water within the Farndon FCAs would have exerted their energy migrating and have already spawned, resulting in a natural cause of death. The likelihood of healthy adult lamprey being entrapped in the Farndon FCA prior to spawning is considered to be low and the fish escape passage provides these fish a route back to the River Trent to continue their natural lifecycle. There is no coarse fish or lamprey mortality data for the River Trent, so it cannot be ascertained during post-construction monitoring of the Scheme whether any dead fish observed

within the Order Limits or downstream of the Scheme during operation would be a result of the natural lifecycle of the species or other factors. Therefore, it is considered not proportionate to undertake such future surveys and analysis of any lamprey carcasses post-construction.

Option 4 Viability

Creation of fish escape passages into Old Trent Dyke is the most viable option as the mitigation is proportionate to the impact of entrapment and can be utilised by multiple river species in both Farndon FCAs.

4. Implications for the DCO application assessments

4.1 Habitat Regulations Assessment

Stage 1 of the HRA identified that in the absence of mitigation, entrapment or isolation of lamprey individuals within the Farndon FCAs during periods of flooding is possible. River and sea lamprey are qualifying features of the Humber Estuary SAC and Ramsar and therefore this impact pathway could give rise to LSE on the European sites.

At the Stage 2 of the HRA, Appropriate Assessment, in order to mitigate for potential adverse effects, fish escape passages were proposed within both the newly created Farndon East FCA and Farndon West FCA (due to the creation of deep pools at this site). For lamprey (during times of migration or breeding) and any other fish which may enter the Farndon East FCA or Farndon West FCA during flood events, these passages would provide a direct escape route back to the River Trent and prevent/reduce the risk of entrapment. The HRA stated that the fish escape passage design would incorporate the Environment Agency's recommendation of a naturalised shape and measure a minimum of 0.5 metres wide and 0.3 metres deep, where possible. The specific number, location and design of fish escape passages would be finalised during detailed design.

The preferred option for fish escape passage (Option 4) deviates slightly from what was detailed within the HRA. The proposed fish escape passage would be into Old Trent Dyke, rather than directly into the River Trent (as stated in the HRA). This means that it would take additional time for lamprey to return to the River Trent (approximately 7 hours provided they travel with (and at the same speed as) the flow of the dyke during a flood event). However, as it is considered unlikely that adult lamprey would be entrapped in the Farndon FCAs following flood water recedence (incidental individuals only) and the requirement for fish escape passage from the Farndon FCAs is to mitigate the remaining uncertainty of the implications for the SAC/ Ramsar, the Option 4 proposals are considered suitable to mitigate the assessed risk.

The refinement of the fish escape passage design reported in this technical note does not result in a change to the HRA, which concludes the integrity of the European Site, Humber Estuary SAC and Ramsar, will not be adversely affected by the Scheme following implementation of mitigation measures.

4.2 Water Framework Directive Assessment

The Old Trent Dyke is an ordinary watercourse located within the catchment of the 'Trent from Soar to The Beck (GB104028053110)' WFD waterbody. The WFD Compliance Assessment (APP-176) assesses the potential impact on the waterbody WFD status as a result of the proposed tie-in of the Farndon East FCA and Farndon West FCA into the Old Trent Dyke. In summary, the following potential impacts were identified:

- Construction activities along the watercourse have the potential to introduce contaminants, INNS, and mobilise sediment within the watercourse. However, providing mitigation measures (such as, best practice pollution measures including a pollution prevention plan and emergency response procedures) are implemented, impacts on the water quality within the catchment would be short-term and localised.
- Operationally, it is not anticipated for there to be a change in overall water volume within the catchment as a whole as the receding floodwater originating from the 'Trent from Soar to The Beck' will discharge downstream back into the same catchment, via the Old Trent Dyke.

The incorporation of fish escape passages from the ponds within Farndon East FCA and Farndon West FCA into the Old Trent Dyke would not require additional in-channel works than those already assessed. As the Old Trent Dyke is located within the 'Trent from Soar to The Beck (GB104028053110)' WFD waterbody, the movement of fish within the Old Trent Dyke rather than directly into the River Trent as a result of receding floodwater would not be considered a deterioration in the biological status of the overall waterbody.

The refinement of the fish passage design reported in this technical note does not result in a change in the conclusions of the WFD Compliance Assessment.

4.3 Environmental Statement

4.3.1 Chapter 8: Biodiversity

In terms of impacts to riparian habitats and associated protected and notable species, Chapter 8 of the Environmental Statement included the following:

The Scheme crosses the River Trent twice along the existing A46 carriageway: Windmill Viaduct and Nether Lock Viaduct. Several smaller watercourses are culverted under the existing A46 carriageway, these include Old Trent Dyke, The Fleet, Winthorpe Beck and an unnamed watercourse which passes under the railway line adjacent to Severn Trent Water Ltd. sewage works. Riparian habitats were scoped out of the assessment as a stand-alone habitat.

The Old Trent Dyke is a Local Wildlife Site (LWS), designated for its botanical interest and water beetle and bug interest: a species rich aquatic community in a secondary channel of the River Trent. A total of approximately 40 metres of Old Trent Dyke LWS will be culverted where the western carriageway embankment widens (including to facilitate maintenance track and drainage design) and would account for a permanent loss of 1% of the LWS's total length. A Slight Adverse effect is anticipated during construction due to habitat loss and a Slight Adverse effect during operation due to potential air quality effects.

In terms of protected and notable species associated with riparian habitat, the following has been included in the Environmental Statement:

- Aquatic invertebrate assemblages present are considered to be of county importance. This is primarily due to the designation of the River Trent – Kelham LWS and Old Trent Dyke LWS for water beetle interest, with the latter site also of interest for aquatic true bugs (*Hemiptera*). A Slight Adverse effect is anticipated during construction and a Neutral effect during operation.
- Otter (*Lutra lutra*) are present along the River Trent, with evidence of this species also recorded along Old Trent Dyke. The otter population present is assessed to be of county importance. A Slight Adverse effect is anticipated due to construction and operational disturbance.
- Grass snakes (*Natrix natrix*) were recorded within the draft order limits and may be present along the banks of Old Trent Dyke. In the absence of population size class survey data, a precautionary

approach was taken and the reptile population present was considered to be of up to county importance. A Slight Adverse effect was anticipated during construction due to the permanent loss of suitable habitat, which is not considered to affect the integrity of the reptile population. However, once compensation planting has established, there will be a Slight Beneficial effect .

- Water vole (*Arvicola amphibius*) were recorded along Old Trent Dyke, with the population assessed as being of county level importance. A Slight Adverse effect is anticipated during construction and a Neutral effect during operation.
- Breeding and wintering bird assemblages were recorded within the DCO Order Limits, collectively assessed as of County importance. With mitigation measures in place, there would be a Slight Adverse effect on wintering and breeding birds due to construction disturbance and a Neutral effect during operation.
- Fish populations along the River Trent are of Regional Importance and a Slight Adverse effect on these species is anticipated due to construction disturbance and a Slight Adverse effect during operation due to entrapment within the Farndon FCAs in the absence of mitigation. Provision of fish escape passage to provide a means of re-entering surrounding watercourses would reduce this to a 'Neutral' residual effect.

The assessment within Environmental Statement Appendix 8.14 Biodiversity Net Gain Technical Report (APP-159) determined that a 1:1.5 ratio for habitat creation is required (approximately 60 metres) to compensate for the culverting of approximately 40 metres of Old Trent Dyke LWS. Two compensatory ditches comprising a total length of approximately 100 metres will connect three ponds in Farndon West FCA. They will retain water year-round during typical seasonal fluctuations in water levels and, where possible, shelves, shallow edges or variation in the bank steepness will be created. This will provide a range of conditions to diversify emergent, submerged and floating-leaved plants to establish, achieving an ecological benefit for protected species including bats, birds, invertebrate (aquatic and terrestrial) and reptiles.

The proposed fish escape passages (Option 4) comprise two naturalised channels, 0.5 metres wide and 0.3 metres deep, excavated into the banks of Old Trent Dyke. This will result in a minor increase in works during construction to riparian habitat along this watercourse compared with what was assessed in the Environmental Statement, which included culverting of 40 metres of the dyke. However, the proposed fish escape passages within Old Trent Dyke would be in place of the fish escape passages from the River Trent initially assessed in the DCO application, which were of a comparable size. Therefore, there are no additional adverse effects on riparian habitats compared to those reported in the Environmental Statement. Overall, Option 4 would provide greater benefit in terms of increased habitat planting compared with Option 1 (which requires reprofiling of Farndon West FCA, rendering the proposed wetland habitat creation area unviable) and reduced habitat loss compared with Options 2 and 3 (which require additional infrastructure within the proposed wetland area). Once works are complete, riparian vegetation would be planted or allowed to establish along these channels and therefore, there would be no adverse effect on habitats or designated sites during operation. The assessment of effects to protected and notable species, as described within the Environmental Statement is also not affected by the refinement of the fish escape passage design.

The refinement of the fish passage design reported in this technical note will does not result in a change to the impact assessment on biodiversity as reported in the Environment Statement Chapter 8.

4.3.2 Chapter 13: Road Drainage and Water Environment

The Old Trent Dyke was identified as an ordinary watercourse and assigned a sensitivity/importance value of 'Medium' in line with DMRB LA113 guidance. Chapter 13 assessed the potential impact on the Old Trent

Dyke as a result of the proposed tie-in of the Farndon East FCA and Farndon West FCA into the Old Trent Dyke. In summary, the following potential impacts were identified:

- Where construction activities would be adjacent to, within, or over waterbodies, there is a potential for direct adverse effects on water quality due to the mobilisation of sediment and contaminants (such as suspended soils, fuel, oil, concrete liquors, and hydrocarbons) through surface water run-off. Construction activities also have the potential to disturb and release excess sediment and suspended solids which could contaminate surface water run-off.
- There is a potential for construction activities to alter flow paths of surface water through changes in topography, and/or earthworks, and diversion of run-off.
- Construction activities within the watercourse associated with the culvert extension have the potential to introduce INNS to the watercourse.
- FCAs have been incorporated within the design to compensate for the construction of the road embankments, where this embankment would result in a reduction in volume of the floodplain at existing elevations. In the event of flooding, receding floodwater at Farndon East FCA and Farndon West FCA will flow into the Old Trent Dyke. The Old Trent Dyke flows into the River Trent downstream, therefore, this minimal redirection of surface water (limited to a flooding event) is not anticipated to change the resultant volume of water within the River Trent. Given the nature and purpose of the FCAs, these assets are not considered to have any operational effects on the identified surface waterbodies.

Option 4 will tie Farndon East FCA and Farndon West FCA into the Old Trent Dyke watercourse using open channels. No headwalls will be constructed along the Old Trent Dyke watercourse, instead the open channels will be excavated and vegetated to tie in with the Old Trent Dyke bank profile to allow flood water to recede.

The incorporation of fish escape passages from the ponds within Farndon East FCA and Farndon West FCA would not require additional in-channel works or result in additional impacts than those already assessed. As mentioned in Section 5.2, the design of the fish escape passages would not result in a change in the conclusions within the WFD Compliance Assessment, and therefore the input from this assessment would not change the conclusions of Chapter 13 of the Environmental Statement.

5. Conclusion

The creation and function of the Farndon FCAs is imperative to the delivery of the Scheme to provide flood mitigation measures. The delivery of fish escape passages is also required as part of the Scheme to mitigate for the potential entrapment of fish species within the Farndon FCAs. However, the delivery of fish escape passages from the Farndon FCAs are spatially and topographically constrained. The mitigation hierarchy has been applied throughout the design evolution and multidiscipline impact assessments have been undertaken to ensure the delivery of fish escape passages do not result in a significant effect at the detriment of other flood water receptors. Out of the fish escape passage design options considered and assessed, as detailed above, Option 4 is considered the viable passage option. The provision of fish escape passages into Old Trent Dyke provides a viable pathway for river fish species to return to the River Trent and is the design considered proportional to the magnitude of impact, with the least adverse impacts across all disciplines assessed.

H. The Environment Agency's response following a review of the Fish Escape Passage Technical Note and Applicant's Response to Comments

Ms Sarah Buckwell - Environmental & Sustainability Consultant
Mott Macdonald LTD

Our ref: XA/2024/100195/01-L01
Your ref: TR010065

Date: 11 November 2024

Dear Ms Buckwell

FARNDON FCA FISH ESCAPE PASSAGES TECHNICAL NOTE REVIEW (RELEVANT REPRESENTATIONS)

A46 Newark Bypass 'Farndon FCA Fish Escape Passages' Technical Note – Environment Agency comments

This document sets out Environment Agency's comments on the Farndon Flood Compensation Area (FCA) Fish Escape Passages Technical Note (Rev P01, 15th October 2024). This follows a meeting attended by Natural England, the Environment Agency and the A46 Newark Bypass project team on 21st October 2024.

Sections	ENVIRONMENT AGENCY COMMENTS
4.3.1.6	*"Once works are complete, riparian vegetation would be planted or allowed to establish along these channels and therefore, there would be no adverse effect on habitats or designated sites during operation."* Will the increased vegetation cause the channel to block for fish passage? We have noted that no maintenance commitment has been identified.
5.1.1.1	The Environment Agency acknowledges that albeit option 4 provides a viable option, direct connection to the river through the FCA embankment would be the most beneficial for the fish. This would give a much shorter return to the river, provide refuge from increased flow events in winter and refuge for larval stages in spring. This could greatly benefit local fish populations.

Yours sincerely

Munashe Mavunga

Planning Advisor

Table 2 The Applicant's responses to the Environment Agency's comments on the Fish Escape Passage Technical Note

Fish Escape Passage Technical Note		
Environment Agency comments received: 11/11/2024		
Sections	Comment	Response
4.3.1.6	"Once works are complete, riparian vegetation would be planted or allowed to establish along these channels and therefore, there would be no adverse effect on habitats or designated sites during operation." Will the increased vegetation cause the channel to block for fish passage? We have noted that no maintenance commitment has been identified.	Ongoing monitoring and maintenance of fish escape passages will be part of the Landscape and Environmental Management Plan (LEMP) for the Farndon Flood Compensation Areas (FCA), as detailed in Appendix G (Fish Escape Passage Technical Note) of the updated Habitats Regulations Assessment submitted at Deadline 3 of the examination. As set out in commitment B11 of the First Iteration Environmental Management Plan [REP2-010], maintenance should be undertaken in accordance with the Series 3000 Landscape and Ecology specification appendices and the LEMP (to be produced as part of the Second Iteration Environmental Management Plan) to ensure the successful establishment of essential mitigation and continued growth of new plant stock to ensure mitigation planting meets its objectives as presented in Figure 2.3 (Environmental Masterplan) of the Environmental Statement Figures [AS-026]. This will be secured by requirements 6 (landscaping) and 12 (detailed design) of Schedule 2 of the draft Development Consent Order [REP2-002]. Commitment RDWE 10 of the First Iteration Environmental Management Plan [REP2-010], states the FCAs will require maintenance for the lifetime of the Scheme however at this stage maintenance details are not known. These details will be defined at the next stage of design.
5.1.1.1	The Environment Agency acknowledges that albeit option 4 provides a viable option, direct connection to the river through the FCA embankment would be the most beneficial for the fish. This would give a much	The function of the combined fish escape passages and overspill channels in the Farndon FCAs is imperative to the delivery of the Scheme to provide flood mitigation measures and to mitigate for the potential entrapment of fish species within the Farndon FCAs. Unlike Options 1 to 3, Option 4 does not have

	shorter return to the river, provide refuge from increased flow events in winter and refuge for larval stages in spring. This could greatly benefit local fish populations.	potential to adversely alter flood risk of the River Trent catchment. As reported in Appendix G (Fish Escape Passage Technical Note) of the updated Habitats Regulations Assessment submitted at Deadline 3 of the examination, the Applicant considers Option 4 proportional to the magnitude of impact, with the least adverse impacts across all disciplines assessed (following implementation of the mitigation hierarchy to first avoid and then reduce potential impacts).

I. Natural England's response following a review of the Fish Escape Passage Technical Note and Applicant's Response to Comments

A46 Newark Bypass 'Farndon FCA Fish Escape Passages' Technical Note – Natural England Comments

This document sets out Natural England's comments on the Farndon Flood Compensation Area (FCA) Fish Escape Passages Technical Note (Rev P01, 15th October 2024). This follows a meeting attended by Natural England, the Environment Agency and the A46 Newark Bypass project team on 21st October 2024.

Para.	Natural England comment
2.1.1.1	The fish escape passages discussed throughout the technical note appear relatively small (0.5 m width and 0.3 m depth). This may cause fish difficulty in actively identifying the escape passage route, given the relatively large flood plain area. Natural England queries whether there is scope to widen and deepen the channels.
2.2.1.2	Natural England welcomes the approach for the fish passages to be naturalised routes and requests that all future design iterations adopt this approach.
3.5.1.1	The technical note states that Option 4 (preferred option) includes two fish escape passages as overspill open channels. Natural England assumes the overspills would require the use of stop logs to ensure that water only passes through the escape channel at certain depths [project team to confirm]. Similar to the comment above for 2.1.1.1, fish would need to actively identify the escape channel and actively choose to pass via the spillover, exposing them to predation risk, and thus the fish may not pass downstream into Old Trent Dyke. Natural England queries whether there is scope for the fish escape routes to be fully open (i.e. no stop logs leading to an overspill).
3.5.1.4	Internal Drainage Board (IDB) management of Old Trent Dyke will involve annual dredging to remove debris and vegetation from the channel. There is a risk that any fish still present within Old Trent Dyke could be scooped out in digger buckets and dumped on the banks in the debris pile.
3.5.1.4	Natural England queries whether there is evidence from studies or other sources to support the following statement: "*It should be noted that the Old Trent Dyke is the current route that fish re-enter the River Trent, following overtopping of the River Trent embankment in these locations*".
3.5.1.4	Natural England queries whether there would there be scope to undertake future surveys and analysis of any lamprey carcasses within the flood plain to determine if they have spawned or not. This is in relation to the following statement: "*It is likely that individual fish (including lamprey) caught in flood water within the Farndon FCAs would have exerted their energy migrating and have already spawned, resulting in a natural cause of death. There is no coarse*

	fish or lamprey mortality data for the River Trent, so it cannot be ascertained during monitoring post-construction of the Scheme whether dead fish observed within the Order Limits or downstream of the Scheme during operation would be a result of the natural lifecycle of the species or other factors".

Table 1 The Applicant's responses to the Natural England's comments on the Fish Escape Passage Technical Note

Fish Escape Passage Technical Note		
Natural England comments received: 30/10/2024		
Paragraph	Comment	Response
2.1.1.1	The fish escape passages discussed throughout the technical note appear relatively small (0.5 m width and 0.3 m depth). This may cause fish difficulty in actively identifying the escape passage route, given the relatively large flood plain area. Natural England queries whether there is scope to widen and deepen the channels.	Following existing flood events, the baseline (pre-construction) topography of the Farndon FCA (northward sloping aspect) results in receding flood water naturally draining into Old Trent Dyke. The flood water would follow a similar pathway into Old Trent Dyke post-construction, with the difference being that water would naturally be drawn towards the overspills due to its dimensions and therefore passively drawdown fish (functioning as fish escape passages during flood water recedence). The Farndon East and Farndon West FCA waterbodies were designed within riparian planting and to be a minimum summer depth of 0.3 metres to maintain stable temperatures to reduce the risk of killing low numbers (i.e. individuals) of residual fish species, once the Farndon East and Farndon West FCA water levels drop below the depth of the overspills. The dimensions of the fish escape passage were recommended by the Environment Agency following consultation on criteria to incorporate into the design of the Farndon FCAs. The fish escape passages also function as overspill channels, maintaining the water depth of Old Trent Dyke. Overspill channels cannot be deepened, as this continuous open connectivity would facilitate an influx of water from Old Trent Dyke into the Farndon FCAs and change the drainage of surrounding farmland. The overspill channel design (shown indicatively within Figure 2.3 (Environmental Masterplan) of the Environmental Statement Figures [AS-023]) were submitted as part of the DCO application, with the design refined to include within the Fish Escape Passage Technical Note) will maintain the natural flow of Old Trent Dyke northwards and therefore avoid adversely affecting the aquatic ecology along the Dyke. As

		mentioned above, the dimensions of the fish escape passages will draw water towards and through them when the Farndon FCAs are of a depth for water to overspill in the channel. Therefore, fish will be passively drawn to the fish escape passages with the flow of water. Wider overspill channels would result in a lower flow velocity and therefore reduce passive drawdown of fish to the fish escape passage, with greater reliance on fish actively identifying the fish escape passage. Furthermore, water depths discharging through wider overspill channels would be shallower for a greater duration (in comparison to the proposed design), with potential to increase the risk of predation to fish being displaced through the fish escape passage, and would therefore narrow the window for safe passage of fish in greater water depths.
2.2.1.2	Natural England welcomes the approach for the fish passages to be naturalised routes and requests that all future design iterations adopt this approach.	The Applicant confirms that further iterations of the fish escape passage design into Old Trent Dyke will be naturalised in nature (i.e. natural shaped instead of v-shaped and planted instead of comprising a hard engineered surface). The Applicant confirms that Natural England will be added as a consultee on the Second Iteration Environmental Management Plan which is secured by Requirement 3 of the draft Development Consent Order [REP2-002], including provision of future iterations of the fish escape passage design, as detailed in the Statement of Common Ground with Natural England [REP1-026].
3.5.1.1	The technical note states that Option 4 (preferred option) includes two fish escape passages as overspill open channels. Natural England assumes the overspills would require the use of stop logs to ensure that water only passes through the escape channel at certain depths [project team to confirm]. Similar to the comment above for 2.1.1.1, fish would need to actively identify the escape channel and actively choose to pass via the spillover, exposing	Stop logs would not be required as the overspill channels are of a height that will provide connectivity with Old Trent Dyke when flood water recedes, whilst maintaining a minimum summer depth of 0.3 metres in the Farndon FCAs (outside of flooding events). This design also facilitates the overspill to work in reverse, whereby water from the Old Trent Dyke can overspill into Farndon FCAs preventing unwanted flooding of adjacent land outside of the Farndon FCAs, as detailed in Appendix 13.4 (Drainage Strategy Report) of the Environmental Statement Appendices [APP-179]. In the absence of overspills between the Farndon FCAs and Old Trent Dyke (i.e. if the bottom of open

	them to predation risk, and thus the fish may not pass downstream into Old Trent Dyke. Natural England queries whether there is scope for the fish escape routes to be fully open (i.e. no stop logs leading to an overspill).	channels were the same depth as the Farndon FCAs and the Old Trent Dyke), water from Old Trent Dyke would flood into the Farndon FCAs outside of flooding events, changing the water retention of the dyke from pre-construction baseline. During a flood event, the depth of water in the Farndon FCAs will result in overtopping of Old Trent Dyke banks, as per pre-construction baseline. Fish will initially be transported in slowly receding flood water over the banks of Old Trent Dyke downstream. When the flood water in the Farndon FCAs drops below the height of Old Trent Dyke banks, the flow velocity of water passing through the overspill channels will passively draw down fish towards the overspill channels (doubling as fish escape passages), and downstream as sufficient water depths would continue to be sustained along Old Trent Dyke during this time. When the water levels of the Farndon FCAs drop below the overspill channel basin, Old Trent Dyke will hold water as per existing pre-construction baseline, which is inconsistent along the length of Old Trent Dyke. Predation risk is considered to be reduced with provision of deeper water for longer periods, as provided by Option 4 (preferred option), along vegetated overspill channels (compared to wide, shallower overspills) and riparian planting in the Farndon FCAs to provide fish refuge.
3.5.1.4	Internal Drainage Board (IDB) management of Old Trent Dyke will involve annual dredging to remove debris and vegetation from the channel. There is a risk that any fish still present within Old Trent Dyke could be scooped out in digger buckets and dumped on the banks in the debris pile.	The management of Old Trent Dyke will be the same as pre-construction (undertaken by the IDB outside of the Order Limits). As the Scheme will not increase the number or species of fish caught in flood water and displaced into Old Trent Dyke in comparison to pre-construction baseline, there will be no change to the risk to any fish present in Old Trent Dyke from these maintenance activities. Furthermore, access to Old Trent Dyke is limited by flooding of adjacent land and therefore, once flood water has receded, it is considered that riverine fish species will have been displaced back into the River Trent, further reducing the likelihood of impacts to riverine fish from management of Old Trent Dyke by the IDB.

3.5.1.4	Natural England queries whether there is evidence from studies or other sources to support the following statement: “It should be noted that the Old Trent Dyke is the current route that fish re-enter the River Trent, following overtopping of the River Trent embankment in these locations”.	The Scheme flood modelling shows no other viable options for river fish species to re-enter the River Trent. All surveys undertaken (commencing winter 2022 until autumn 2024 inclusive, representative of two seasons) to inform the Environmental Statement recorded no evidence of mass strandings of river fish species in terrestrial habitat, no evidence of fish carcass build-up in Old Trent Dyke and no evidence of large fish populations in Old Trent Dyke (to be expected if fish species could not disperse downstream), following recedence of existing flood water.
3.5.1.4	Natural England queries whether there would there be scope to undertake future surveys and analysis of any lamprey carcasses within the flood plain to determine if they have spawned or not. This is in relation to the following statement: “It is likely that individual fish (including lamprey) caught in flood water within the Farndon FCAs would have exerted their energy migrating and have already spawned, resulting in a natural cause of death. There is no coarse fish or lamprey mortality data for the River Trent, so it cannot be ascertained during monitoring post-construction of the Scheme whether dead fish observed within the Order Limits or downstream of the Scheme during operation would be a result of the natural lifecycle of the species or other factors”.	This statement refers to the de-minimis level impact detailed in the Applicant's Response to Relevant Representation [REP1-009]. In summary, most adult river lamprey found in fresh water are either migrating upstream to spawn or are dying after spawning (natural cause of death) and due to their physiology, they would likely take refuge until suitable conditions allow them to resume their migration and therefore it is considered unlikely these adult lamprey would be entrapped in the Farndon FCAs following flood water recedence. The low risk of entrapment of adult lamprey has been concluded by assuming a precautionary approach that incidental individuals of lamprey are naturally dying as part of their life cycle and not as a result of the Scheme. The likelihood of healthy adult lamprey being entrapped in the Farndon FCA prior to spawning is considered to be low and the fish escape passage provides these fish a route back to the River Trent to continue their natural lifecycle. In the absence of pre-construction baseline lamprey carcasses data confirming whether they have spawned or not, comparison cannot be made to post-construction analysis to deduce the contribution of the Scheme to this outcome. Therefore, it is considered not proportionate to undertake such analysis post-construction.