

The Great Grid Upgrade

North Humber to High Marnham

Preliminary Environmental Information Report

Volume 3: Appendix 8.2 Habitats Regulations
Assessment – Preliminary Stage 1 Report

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nationalgrid

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1. Introduction

1.1 Overview

- 1.1.1 This Habitats Regulations Assessment (HRA) Preliminary Stage 1 Screening report (hereafter to referred to as a HRA Preliminary Stage 1 Report) has been prepared for the Project inclusive of the Proposed Overhead Line and Proposed Substation Works as described in **Chapter 4 Description of the Project**.
- 1.1.2 Over the years, the phrase ‘Habitats Regulations Assessment’ (HRA) has been used to describe the overall process set out in the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 amended the 2017 (Ref 8.2), referred to hereafter as the Habitat Regulations, from the screening for Likely Significant Effect (LSE) through to identification of Imperative Reasons of Overriding Public Interest (IROPI). This has arisen in order to distinguish the overall process from the individual stages of the process. Throughout this HRA Preliminary Stage 1 Report the term HRA is used for the overall process.
- 1.1.3 The HRA process can have up to three stages. However, all stages may not need to be completed depending on the outcome of each step. The HRA assessment processes can be summarised as:
- Screening - to check if the proposal is likely to have a significant effect on a site’s conservation objectives alone or in combination with other plans and projects. If not, it is not necessary to go through the Appropriate Assessment or Derogation stages.
 - Appropriate Assessment - to assess the likely significant effects of the proposal in more detail and identify ways to avoid or minimise any effects.
 - Derogation - to consider if proposals that would have an adverse effect on a European Site qualify for an exemption.
- 1.1.4 The scope and extent of this HRA Preliminary Stage 1 Report has been determined by a combination of the Scoping Opinion (Ref 8.72) adopted by the Planning Inspectorate (PINS) on behalf of the Secretary of State, ongoing engagement with consultees such as Natural England (NE), and professional judgement. Regard has also been given to the Planning Inspectorates (PINS) Nationally Significant Infrastructure Projects: Advice on Habitats Regulations Assessment (Ref 8.1) relevant to nationally significant infrastructure projects.

Need for the Project

- 1.1.5 With growing offshore wind and interconnectors, an anticipated tripling of wind generation connected across the Scottish networks by 2030 and Government’s increased ambition to connect 50 (gigawatts) GW of offshore wind by 2030, north-south power flows are set to increase.
- 1.1.6 The existing electricity transmission network in the Humber and East Midlands region was initially developed in the 1960s and has historically been able to meet demand. However, due to the changes noted above in terms of delivering net zero emissions, the

existing network in the Humber and East Midlands region does not have the capability to reliably and securely transport all the energy that will be connected by 2030, whilst operating to the standards it is required to.

- 1.1.7 The North Humber to High Marnham Project will support the UK's net zero target by reinforcing the electricity transmission network between the north of England and the Midlands and facilitate the connection of planned offshore wind generation and interconnectors with other countries, allowing clean green energy to be carried on the network.
- 1.1.8 The North Humber to High Marnham Project, together with other reinforcements along the East Coast, will help meet future energy requirements. National Grid has considered alternative strategic options to reinforce the network and alternative route corridors, as part of the options appraisal process (see **Chapter 3 Project Need and Alternatives**). The reinforcements are necessary to support the connection of new generation projects in Scotland and the north-east of England in the next decade and beyond.
- 1.1.9 National Grid identified that the existing transmission system would not be sufficient to meet connection demand going forward. Without additional network capability, offshore wind and interconnectors will be constrained off at times of high wind generation and high imports. The operation of the network would become sub-optimal in the long term, less efficient, and more carbon intensive sources of generation would potentially need to be used at those times, hindering progress towards net zero.

Components of the Project

- 1.1.10 The current draft proposals for the Project comprise of the following elements:
- Approximately 90 km of new overhead line between the new Birkhill Wood and High Marnham 400 (kilovolt) kV Substations.
 - Replacement and re-alignment of a section of the existing 400 kV 4ZQ overhead line route between Brantingham and east of Broomfleet.
 - Replacement and re-alignment of a section of the existing 400 kV ZDA overhead line route between Ealand and west of Keadby.
 - A new 400 kV Birkhill Wood substation, with a new permanent access. This is proposed to be a Gas Insulated Switchgear (GIS) substation.
 - Replacement and re-alignment of a section of the existing 400 kV 4ZR route to allow for connection into the new Birkhill Wood substation.
 - A new 400 kV High Marnham substation, with a new permanent access. This is proposed to be an Air Insulated Switchgear (AIS) substation.
 - Replacement and re-alignment of the existing 4ZV and XE 275 kV overhead line routes and existing 400 kV ZDA and ZDF overhead line routes, to allow for connection into the new High Marnham substation.
- 1.1.11 The Project will include other required works, for example, temporary diversions for works on existing overhead line routes, temporary access roads, highway works, temporary works compounds, work sites and ancillary works. The Project will also include utility diversions and drainage works. There would also be land required for mitigation, compensation and enhancement, including biodiversity net gain.

2. Legislative Framework

2.1 Introduction

- 2.1.1 The UK left the European Union (EU) on 31 January 2020 under the terms set out in the European Union (Withdrawal Agreement) Act 2020 (termed the 'Withdrawal Act'). This established a transition period, which ended on 31 December 2020. The Withdrawal Act retains the body of existing EU-derived law within UK domestic law. The Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019 amended the 2017 Habitats Regulations to decouple the 2017 Habitats Regulations from the EU Directives, whilst maintaining the protection and processes related to European sites (here after referred to as 'The Habitats Regulations'). The Habitats Regulations enable the protection of sites that host habitats and species of European Importance.
- 2.1.2 Under Regulation 63 of the Habitat Regulations, as part of the assessment of a development, it is necessary to provide information regarding whether the development is likely to have a 'significant' effect on areas that have been internationally designated for nature conservation purposes to allow the Secretary of State to undertake a Habitat Regulations Assessment.
- 2.1.3 Areas of international importance for nature conservation are Special Areas of Conservation (SAC); designated for their habitats or fauna other than birds), Special Protection Areas (SPA); designated for birds) and Ramsar sites (wetlands of international importance)). They are collectively referred to as Habitats sites or European Sites and form part of a network of protected sites across the UK known as the 'National Site Network'. In line with current practice, this document uses the term 'Habitats sites' to refer to all European sites as well as candidate SACs and proposed SPAs.
- 2.1.4 Should it be found that significant effects are likely, an 'Appropriate Assessment' (AA) should then be carried out in order to further assess those effects. Consent may only be given for a project if, following assessment and consideration of mitigation measures, it is established that an adverse effect on the integrity of a Habitat site can be ruled out either alone or in-combination with other plans or projects.
- 2.1.5 Where an adverse effect on site integrity cannot be ruled out, a project may be able to go ahead through a derogation under the Habitat Regulations. There are three legal tests which must be met and each needs to be passed for a derogation to be granted. It must be demonstrated that there are no alternatives before the assessment can proceed to the next step of derogation assessment. However, where no alternative solution exists and so adverse effect remains, a further assessment should be made of whether a project is required for imperative reasons of overriding public interest (IROPI). If a project meets that IROPI test, compensatory measures will be required.

2.2 Relevant Case Law

- 2.2.1 Although the UK is no longer part of the EU, a series of rulings of the Court of Justice of the European Union (CJEU) are still relevant. This HRA Preliminary Stage 1 Report is in accordance with the principles established through these precedence cases. These rulings, and relevant UK Court rulings, and their implications for this HRA Preliminary

Stage 1 Report are summarised in Table 2.1 Table 2.1 – Case Law relevant to the HRA of the Project and this HRA Preliminary Stage 1 Report is cognisant of these rulings.

Table 2.1 – Case Law relevant to the HRA of the Project

Case	Ruling	Relevance to HRA
People Over Wind and Sweetman v Coillte Teoranta (C-323/17)	The ruling of the CJEU in this case requires that any conclusion of ‘no likely significant effect’ on a Habitats site at the screening stage must be made prior to any consideration of measures to avoid or reduce harm to the Habitats site. The determination of likely significant effects at the screening stage should not, in the opinion of the CJEU, constitute an attempt at detailed technical analyses. This should be conducted as part of the AA.	This ruling clarified that ‘mitigation’ (i.e., measures that are specifically introduced to avoid or reduce a harmful effect on a Habitats site that would otherwise arise) should not be taken into account when forming a view on likely significant effects at the screening stage. Mitigation should instead only be considered at the AA stage. This HRA has been cognisant of that ruling.
Langton (2018 EWHC 2190 (Admin))	High Court ruled that conditions on badger cull licences preventing badger culling near a SPA or at certain times of year should not be classed as mitigation measures as described in the People over Wind ruling. The judge ruled that these licence conditions were properly characterised as “integral features of the project” and could therefore be relied on for the purposes of habitats screening. His reasoning was that it would be "contrary to common sense for Natural England to assume that culling would take place at times and places where the applicants did not propose to do so.	Restrictions on the timing of works which are part of the proponent's proposal can be taken into account in HRA Stage 1 - Screening for Likely Significant Effects.
Waddenzee (C-127/02)	The ruling of the CJEU in this case clarified that AA must be conducted using best scientific knowledge, and that the Competent Authority must be satisfied that there is no reasonable doubt as to the	Adopting the precautionary principle, a ‘likely’ significant effect in this HRA is interpreted as one which is ‘possible’ and cannot be objectively ruled out. The test of significance of effects has been conducted with

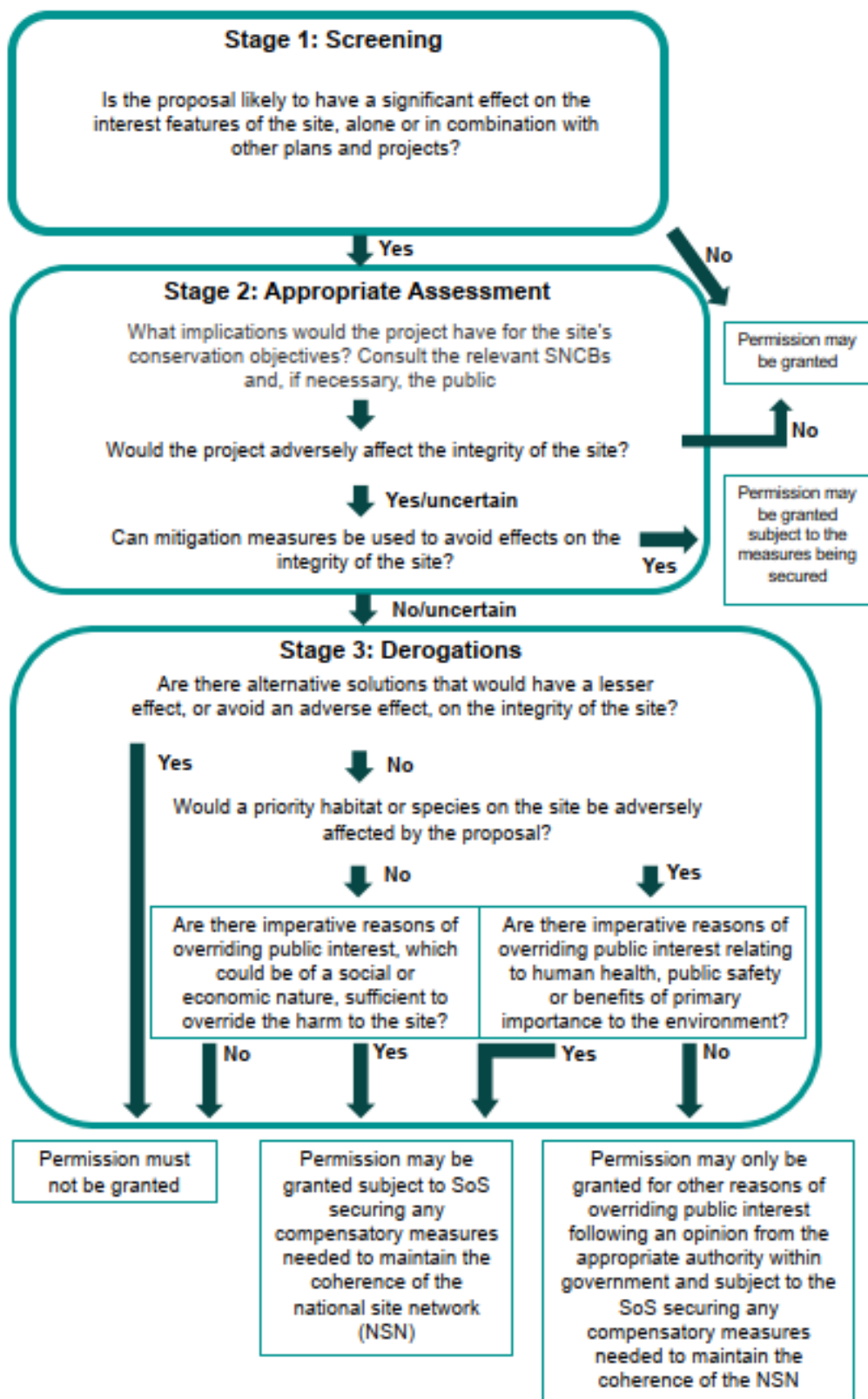
Case	Ruling	Relevance to HRA
	<p>absence of adverse effects on the integrity of a Habitats site.</p> <p>The Waddenzee ruling also provided clarity on the definition of ‘significant effect’, specifically that any effect from a plan or project on the conservation objectives of any Habitats site will be a significant effect.</p>	<p>reference to the conservation objectives of relevant Habitats sites.</p>
<p>Holohan and Others v An Bord Pleanála (C-461/17)</p>	<p>The conclusions of the CJEU in this case were that consideration must be given during AA to:</p> <ul style="list-style-type: none"> • Effects on qualifying habitats and/or species of a SAC or SPA, even when occurring outside of the boundary of a Habitats site, if these are relevant to the site meeting its conservation objectives; and • Effects on non-qualifying habitats and/or species on which the qualifying habitats and/or species depend and which could result in adverse effects on the integrity of the Habitats site. 	<p>This relates to the concept of ‘functionally linked habitat’ (i.e., areas outside of the boundary of a Habitats site which supports its qualifying feature(s)). In addition, consideration must be given to non-qualifying features upon which qualifying habitats and/or species rely. This HRA has taken the use of functionally linked habitats into account in relation to non-breeding birds, fish and otter.</p>
<p>T.C Briels and Others v Minister van Infrastructuur en Milieu (C-521/12)</p>	<p>The ruling of the CJEU in this case determined that compensatory measures cannot be used to support a conclusion of no adverse effect on site integrity.</p>	<p>Compensation can only be considered at the IROPI stage of HRA and not during AA. Compensation must be delivered when AA concludes that there will be adverse effects on site integrity.</p>

3. Assessment Methodology

3.1 Introduction

- 3.1.1 This HRA Preliminary Stage 1 Report has been undertaken with reference to general guidance on HRA published by the UK government in 2021, named Habitats regulation assessments: protecting a European site (Ref 8.71).
- 3.1.2 Note that while Image 3.1 as taken from the Planning Inspectorate’s Advice on Habitat Regulations Assessment (Ref 8.1) shows all the stages of the HRA process, this HRA Preliminary Stage 1 Report only covers Stage 1: Screening for likely significant effects. Where subsequent stages are required, these will be presented in the HRA Report submitted with the application for development consent.
- 3.1.3 Whilst the HRA decisions must be taken by the Competent Authority (the Secretary of State, as advised by the appointed Examining Authority), the information needed to support this decision-making must be provided by the applicant. The information needed for the Competent Authority to establish whether there are any Likely Significant Effects (LSE) from the Project is therefore provided in this HRA Preliminary Stage 1 Report and will be reviewed and updated as appropriate within the HRA submitted with the application for development consent.

Image 3.1 – Three stage approach to HRA of projects



3.2 HRA Stage 1 – Screening for Likely Significant Effects

- 3.2.1 The objective of the LSE test is to assess whether the Project, without any detailed appraisal, is likely to result in a significant effect upon a Habitat site or its qualifying features. Where it is deemed unlikely for the Project to result in LSE upon habitat sites, usually because there is no mechanism for an adverse interaction (i.e. a pathway), these aspects can be ‘screened out’. If the risk of LSE cannot be ruled out alone on the basis of objective scientific evidence, a precautionary approach is applied and remaining aspects are taken forward to an Appropriate Assessment. This stage must also consider the potential for effects ‘in combination’ with other plans and projects.
- 3.2.2 This HRA Preliminary Stage 1 Report has been prepared in accordance with all principles set out in the Habitats Regulations, the Habitats Directive, the Birds Directive and the relevant case law as summarised in Table 2.1 This includes the ruling by the People Over Wind and Sweetman v Coillte Teoranta (C-323/17) (Ref 8.3) As set out in Table 2.1 this establishes that mitigation measures cannot be taken into account at the screening stage, but they can be taken into account in an AA. The effect of this is that the screening stage must be undertaken on a precautionary basis with no regard to mitigation measures.
- 3.2.3 However, this ruling has since been qualified by the UK courts. On 15 August 2018, in the case of Langton (Ref 8.4) as set out in Table 2.1, the High Court ruled that conditions on badger cull licences preventing badger culling near a SPA or at certain times of year should not be classed as mitigation measures as described in the People over Wind ruling. Therefore, restrictions on the timing of works which are part of the proponent's proposal can be taken into account in HRA Stage 1 - Screening for Likely Significant Effects.
- 3.2.4 In addition, the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (Ref 8.5) and the Environmental Permitting (England and Wales) Regulations 2016 (Ref 8.6) make it an offence to pollute watercourses, irrespective of whether they are designated as Habitats sites or not. Therefore, pollution control measures can also be considered at the HRA Preliminary Stage 1.

3.3 In-Combination Scope

- 3.3.1 It is a requirement of the Habitats Regulations that the impacts and effects of any proposed development being assessed are not only considered in isolation but also in combination with other plans and projects that may also have effects on the Habitats site(s) in question.
- 3.3.2 When undertaking this HRA Preliminary Stage 1 assessment it is essential to consider the principal intention behind the legislation, i.e., to ensure that those projects or plans (which when considered in isolation may have minor impacts) are not simply dismissed on that basis but are evaluated for any cumulative contribution they may make to an overall significant effect. In practice, in-combination assessment is therefore of greatest relevance when a project would otherwise be screened out because its individual contribution is inconsequential.
- 3.3.3 The in-combination assessment is discussed further in section 7 of this HRA Preliminary Stage 1 Report.

3.4 The Rochdale Envelope

- 3.4.1 In July 2018, PINS published an update to Advice Note Nine: Rochdale Envelope (Ref 8.7) explaining how the approach and principles of the Rochdale Envelope¹ can be applied on projects subjected to Environmental Impact Assessment (EIA).
- 3.4.2 The Rochdale Envelope is applicable where some of the details of a project have not been confirmed when an application is submitted, and flexibility is sought to address uncertainty. Notwithstanding, all significant potential effects of a project must be properly addressed.
- 3.4.3 It encompasses three key principles:
- The assessment should use a cautious worst-case approach;
 - The level of information assessed should be sufficient to enable the LSE of a project to be assessed; and
 - The allowance for flexibility should not be abused to provide inadequate descriptions of projects.
- 3.4.4 This HRA Preliminary Stage 1 Report has given due consideration to the Rochdale Envelope in the screening process for LSE. The worst-case (i.e., the potentially most impactful) construction, maintenance and operational scenarios have accordingly been assessed in relation to relevant impact pathways.

3.5 Data Used in this Report

- 3.5.1 In this HRA Preliminary Stage 1 Report, the following sources of data have been used:
- Citations for Habitats sites;
 - Conservation Objectives, Site Improvement Plans, and Supplementary Advice on the Conservation Objectives for Habitats sites;
 - Guidance documents for specific impact pathways (referenced in the report where first used); and
 - The Multi-Agency Geographic Information System (MAGIC) website (Ref 8.8).

3.6 Establishing the Zone of Influence

- 3.6.1 There is no pre-defined guidance on the spatial scope of HRA. When seeking to identify relevant Habitats sites, consideration was therefore given primarily to potential impact pathways and the application of the source-pathway-receptor approach, rather than adopting a purely 'zones'-based approach.
- 3.6.2 The source-pathway-receptor model is a standard tool in environmental assessment. In order for an impact to occur, all three elements of this mechanism must be in place. The absence or removal of one of the elements of the mechanism means there is no possibility for an effect to occur. Furthermore, even where an impact is predicted to occur, it may not result in significant effects. It is also important to distinguish between

¹ The Rochdale Envelope arises from two cases: R. v Rochdale MBC ex parte Milne (No.1) and R. v Rochdale MBC ex parte Tew [1999], which are cases that dealt with outline planning applications for a proposed business park in Rochdale.

an 'impact' and an 'effect'. An impact is defined as an action resulting in changes to an ecological feature, while an effect is the outcome to an ecological feature arising from an impact (Ref 8.9). For example, an impact may be the disturbance of a roost of wintering waders as a result of construction activities; the effect would be how the population or conservation status of the species disturbed by the works changes as a consequence.

- 3.6.3 The likely zone of impact, referred to as the likely 'zone of influence' (Zol) of a project, is the geographic extent over which ecological effects are likely to occur. The Zol of a project will vary depending on the specifics of a particular proposal and must be determined on a case-by-case basis with reference to a variety of criteria, including:
- the nature, size/scale and location of the plan or project;
 - the connectivity between the plan or project and Habitats sites, for example through hydrological connections or because of the natural movement of qualifying species;
 - the sensitivity of ecological features under consideration; and
 - the potential for in-combination effects.
- 3.6.4 There is no geographical limit beyond which Habitats sites need not be considered by HRA of a project.
- 3.6.5 The process of determining which (if any) Habitats sites are within the Zol of the Project was therefore a progressive appraisal of the potential for each impact source (construction, maintenance and operation) to affect the qualifying features of such sites.

Potential Sources of Impact

- 3.6.6 A number of potential impacts could arise from the construction, maintenance and operation of a project.
- 3.6.7 A description of each, and their potential relevance to the qualifying features of Habitats sites, is shown in Table 3.1.

Table 3.1 – Potential sources of impacts that could arise from a project

Potential sources of impact	Brief description
Direct loss of habitat	The direct loss of habitat from within the boundary of a Habitats site. This may include the loss of a habitat type which is itself a qualifying feature of a site, or the loss of habitat that is used by qualifying species for commuting, foraging and/or sheltering, which would pose implications for the site conservation objectives.
Loss of functionally linked habitat	The loss of habitat which is outside of the boundary of a Habitats site, but which is critical to its functioning. For example, the loss of habitat outside of an SPA which is used for foraging purposes by qualifying bird species which nest within the SPA.

Potential sources of impact	Brief description
Waterborne pollution	Including, for example, suspended sediment or run-off of water containing other pollutants such as hydrocarbons or chemicals. Effluent discharges would also be included in this category.
Airborne pollution	This encompasses both dust (i.e., particles of sufficiently large size to coat vegetation and interfere with photosynthesis) and atmospheric pollutants that can be toxic to vegetation or contribute to nitrogen deposition and thus eutrophication. The latter mainly constitutes oxides of nitrogen (NO _x) associated with combustion such as vehicle exhausts, and ammonia (NH ₃) associated particularly with industrial processes and agriculture, but also with vehicle exhaust emissions.
Hydrological changes	Impacts which alter the hydrological conditions either within a Habitats site or in an area used by the qualifying features of a Habitats site. For example, reduced flows in a watercourse due to impoundment, or changes to groundwater flows or volumes due to abstraction. These changes can have multiple effects on habitats and species.
Disturbance of qualifying species	This could be physical disturbance, for example, due to the movement of vehicles in proximity to qualifying species, or due to noise and/or vibration. The latter may occur at greater distances. Disturbance could arise either during the construction or operational phase of a project.
Barriers and/or disturbance displacement	Barriers to the movement of qualifying species, which can either be physical (for example, a dam in a river) or physiological (for example, the attraction of migratory fish towards the outflow of a hydro-electric scheme). Disturbance displacement may also occur due to the presence of new infrastructure that interrupt open vistas preferred by some qualifying bird species.
Injury or mortality	The direct injury or mortality of a qualifying species, either during the construction or operation of a new development. For example, birds may suffer injury or mortality when colliding with overhead lines.
Spread of invasive non-native species	Invasive non-native species can have detrimental impacts on native species and habitats. Their spread can occur during construction and operation of a development, and via multiple pathways (for example via watercourses or on the treads of construction machinery).

Potential Impact Pathways

- 3.6.8 Impact pathways are routes by which the implementation of a project or plan can lead to an effect upon a Habitats site. In order for an impact to have an effect on a qualifying feature of a Habitats site, a pathway between the impact source and that feature must exist. An example of this would be visual and noise disturbance arising from the construction work or operational phase associated with a project. If there are sensitive ecological receptors within a nearby Habitats site (e.g., non-breeding overwintering birds), this could alter their foraging and roosting behaviour and potentially affect the site's integrity. For some impact pathways (notably air pollution) there is guidance that sets out the proposed Zol required for assessment. These are discussed below where relevant.

Application of impact pathways for the Project

- 3.6.9 For each of the types of impact which could arise (as set out in Table 3.1) the maximum distance (Zol) at which an effect could occur has been assessed based on the pathway(s) by which such impact(s) could reach a Habitats site or its qualifying feature(s).
- 3.6.10 The Zols are based on published guidance or best available research, wherever possible. For other impact pathways, a professional judgment has been made based on the best available evidence. The adopted ZOLs are set out in Table 3.2.

Table 3.2 – Impact pathway Zone of Influence (Zol)

Impact category	Zone of Influence (Zol)
Direct loss of habitat	Within Habitats site boundary.
Loss of functionally-linked habitat	Depends on the species in question. NatureScot's (formerly Scottish Natural Heritage [SNH]) guidance on 'Assessing Connectivity with Special Protection Areas (SPAs)' (Ref 8.10) suggests that certain species of geese may forage up to 15-20 km from the boundary of SPAs for which they are qualifying features. This is likely to be the largest distance at which functionally-linked habitat may be located from a Habitats site. In some cases they can forage further than this however more generally, functionally-linked habitat is likely to be within a maximum of 10 km distance from Habitats site boundary for most species (though often it is considerably less than this). While acknowledging this likely core range, there can be site specific exceptions and, knowing that pink footed geese range widely across the Humber Estuary and its hinterland, as a precautionary measure a buffer of 30km has been used in order to incorporate SPAs supporting "species with large foraging ranges" (e.g. pink-footed goose) than for other sites.
Waterborne pollution	No set Zol has been used - this relies on there being a hydrological connection to a Habitats site, according to the source-pathway-receptor model.

Impact category	Zone of Influence (Zol)
Airborne pollution	50 m for dust generation (Ref 8.11) however as a precautionary approach 200 m will be used, and 200 m for emissions from road traffic (Ref 8.12).
Hydrological changes	No set Zol has been used - this relies on there being a hydrological connection to a Habitats site, according to the source-pathway-receptor model.
Disturbance of qualifying species	<p>Based on the published guidance referenced below, the following distances were used when considering how far construction and operational activities may disturb qualifying species:</p> <ul style="list-style-type: none"> • non-breeding waterbirds – the Waterbird Disturbance Mitigation Toolkit (Ref 8.13) (Cutts et al, 2003) provides species-specific information on the sensitivity of several bird species which are qualifying features of SPAs. However, it suggests that, in general, disturbance of non-breeding waterbirds can occur up to distances of up to 500 m from construction works although this can be up to 800 m for certain species (Ref 8.14). • breeding birds – 1 km, this being the maximum distance at which Goodship and Furness (2022) (Ref 8.14) consider disturbance could occur on the most sensitive species for which SPAs are designated. • marine mammals, including grey seal <i>Halichoerus grypus</i>, harbour seal <i>Phoca vitulina</i> and harbour porpoise <i>Phocoena phocoena</i> can range over very large distances. For example, a search distance of 135 km from SACs designated for grey seal was used in the HRA of National Planning Framework 4 (NPF4) (AECOM, 2022) (Ref 8.14), and a distance of 50 km for harbour porpoise and harbour seal.
Barriers to movement	<p>Not possible to set a set Zol as it depends on movements of species, which may be very long-distance for those which migrate. Although otter could be impacted by works in watercourses or waterbodies, this species is readily able to navigate overland. There is the potential for the Project to prevent the regular movements, including migration, of qualifying species including birds and fish. The Zol for this impact was therefore taken to be any SAC designated for fish species for which a direct hydrological connection to the Project exists and SPAs supporting migratory bird species.</p>
Injury or mortality	<p>Injury or mortality of qualifying species could occur where works are proposed within a Habitats site boundary. Injury or mortality could also as a result of qualifying species moving between roosts or breeding locations and as they do so interacting with the proposed overhead line. Therefore, the same criteria for 'Direct loss of habitat' and 'Loss of functionally linked habitat' has been applied.</p>
Spread of invasive non-native species	Generally within 100 m, except where hydrological connectivity could result in spread further afield.

4. Relevant Habitats Sites

- 4.1.1 To identify which Habitats sites should be scoped into the HRA Preliminary Stage 1 Report, the Zols set out in Table 3.2 and professional judgment has been used. It can be seen from Table 3.2 that the impacts which could occur over the largest distance (excluding instances where there is a hydrological connection) are the loss of functionally linked habitat used by foraging non-breeding goose species (up to 30 km).
- 4.1.2 There are no standard criteria for determining the ultimate physical scope of a HRA. Rather, the source-pathway-receptor model has been used to determine whether there is any potential pathway connecting the Project to any Habitats sites. Based on the impact pathway Zols set out in Table 3.2, and professional judgement, a search radius of 10 km has been used for SACs and 30 km for SPAs and Ramsars designated for species with large core foraging ranges for this HRA.
- 4.1.3 Additionally, a radius of 30 km has been used for any Habitats site for which bats are a qualifying feature (Ref 8.16). It can be confirmed that, in this case, there are no Habitats sites designated for bats within 30 km of the Project.
- 4.1.4 A 30 km search radius was also used to identify any Habitats sites designated for cetaceans. It can be confirmed that, in this case, there are no Habitats sites designated for cetaceans within 30 km of the Project.
- 4.1.5 Based on the search radii above, all relevant Habitats sites were identified using Geographic Information System data from datasets downloaded from the Joint Nature Conservation Committee (JNCC) (Ref 8.61) and the MAGIC website (Ref 8.8).
- 4.1.6 The following Habitats sites are considered relevant to the Project based on the Zols as set out in Table 3.2, and are shown in Figure A.1, located in Appendix A of this report.
- Humber Estuary SAC (UK0030170);
 - Humber Estuary SPA (UK9006111);
 - Humber Estuary Ramsar (UK11031);
 - Thorne and Hatfield Moors SPA (UK9005171);
 - Thorne Moor SAC (UK0012915);
 - Hatfield Moor SAC (UK0030166);
 - Lower Derwent Valley SPA (UK9006092); and
 - Lower Derwent Valley Ramsar (UK11037).
- 4.1.7 Hornsea Mere SPA is located 17 km from the Project and designated for a nationally important post breeding and moulting population of mute swan *Cygnus olor*; however, as the core foraging range for wintering swans is less than 5 km (Ref 8.10), this Habitat site has been scoped out from further assessment.
- 4.1.8 The Greater Wash SPA lies 22 km from the Project. The SPA is designated for non-breeding red-throated diver *Gavia stellata*, which winters in coastal waters; little gull *Hydrocoloeus minutus*, which also favour marine and intertidal habitats and breeding sandwich tern *Sterna sandvicensis*, common tern *Sterna hirundo* and little tern *Sternula albifrons*, all of which are primarily off-shore feeders. This Habitats site has, therefore, be scoped out from further assessment.

- 4.1.9 There are no SACs designated for grey sea (other than the Humber Estuary SAC which is already scoped in) within 135 km of the Project. There are no SACs designated for harbour porpoise and harbour sea within 50 km of the Project.
- 4.1.10 For each of the Habitats sites identified, the features were established and the conservation objectives for each feature were obtained. Information was also sought to understand the potential vulnerability of the features to any effects that might arise from the Project. This information is presented in Appendix B.

5. Potential Impact Pathways

5.1 Introduction

5.1.1 This section sets out the potential impact pathways with the Habitat sites listed in section 4 above.

5.2 Direct Loss of Habitat

5.2.1 The purpose of the Habitats Regulations is to protect England and Wales Habitats sites, including some of the country's most important habitats and species.

5.2.2 Generally, the temporary (or permanent) loss of designated habitat must be avoided or mitigated, provided that the habitat in question is itself a designated feature or critical for the Habitats site to meet its Conservation Objectives. However, temporary habitat loss within designated site boundaries is permissible where this solely encompasses habitat that is part of the 'site fabric' (Ref 8.36).

5.2.3 Any permanent, irreversible, habitat loss from a Habitats site that involves the loss of qualifying features will be adverse, although to affect the integrity of the SAC (the coherence of its structure and function) the loss must be sufficient to materially impair the achievement of the Habitats site's Conservation Objectives.

5.2.4 Various developments can result in the loss of habitat in Habitats sites, either temporarily or permanently. Temporary habitat loss (e.g., such as that potentially resulting from usage of temporary access tracks and vegetation clearance for visibility splays) is typically reversible. Furthermore, there is the potential for deploying mitigation measures to avoid adverse effects on site integrity. In contrast, the permanent loss of designated habitat will result in a reduction of coverage of a potentially very rare ecosystem, with potential knock-on impacts on dependent qualifying species.

5.2.5 Plans or projects that result in the loss of land from a Habitats site can be approved in certain situations (Ref 8.36), even if the loss is sufficient to result in adverse effects on site integrity, if three tests are met:

- No feasible alternative solutions to the plan or project exist that are less damaging;
- There are IROPI for the plan or project; and
- Compensatory measures are secured to ensure that the overall coherence of the Habitats site network is maintained.

5.2.6 Overall, there is a potential impact pathway with the following Habitats sites within the Zol for direct loss of habitat.

- Humber Estuary SAC; and
- Humber Estuary Ramsar.

5.2.7 This impact pathway is scoped out for Humber Estuary SPA as it is designated for mobile features, as opposed to habitats.

- 5.2.8 This impact pathway is scoped out for Thorne Moor SAC, Thorne and Hatfield Moors SPA and the Lower Derwent Valley SPA/Ramsar on the basis of the distances of these Habitats sites from the Project.

5.3 Loss of Functionally Linked Land (FLL) Habitat

- 5.3.1 While most Habitats sites have been geographically defined to encompass the key features that are necessary for coherence of their structure and function, and the support of their qualifying features, this is not necessarily the case. A diverse array of qualifying species including birds, bats and amphibians are not always confined to the boundary of designated sites.
- 5.3.2 Due to the highly mobile nature of waterfowl, it is inevitable that areas of habitat of crucial importance to the maintenance of their populations are outside the physical limits of the Habitats site for which they are an interest feature. However, this area will still be essential for maintenance of the structure and function of the interest feature for which the site was designated and land use plans that may affect this land should still therefore be subject to further assessment. This has been underlined by a European Court of Justice ruling C-461/17 (paragraphs 37 to 40), known as the Holohan ruling (Ref 8.37) as summarised in Table 2.1 which confirms the need for an AA to consider the implications of a plan or project on habitats and species outside the Habitats site boundary provided that those implications are liable to affect the conservation objectives of the site.
- 5.3.3 There is now an abundance of authoritative examples of HRA cases on plans affecting bird populations, where Natural England recognised the potential importance of functionally linked land (Ref 8.36). For example, bird surveys in relation to Hinkley Point C nuclear power station as set out in Natural England's Report on Functional Linkage: How areas that are functionally linked to European sites have been considered when they may be affected by plans and projects – a review of authoritative decisions (Ref 8.38), established that approximately 25% of the golden plover population in the Somerset Levels and Moors SPA were affected while on functionally linked land, and this required the inclusion of mitigation measures in the relevant plan policy wording (Ref 8.38). Another important case study originates from the Mersey Estuary SPA/Ramsar, where adjacently located functionally linked land had a peak survey count of 108% of the 5-year mean peak population of golden plover. As set out in the Natural England Report on Functional Linkage (Ref 8.38), this finding led to considerable amendments in the Frodsham onshore wind farm proposal to ensure that the site integrity was not adversely affected.
- 5.3.4 With regards to birds, areas of functionally linked land typically provide habitat for foraging or other ecological functions essential for the maintenance of the designated population (e.g. high tide roosts for coastal populations). Functionally linked land may extend up to the maximum foraging distance for the designated bird species. However, the number of birds foraging will tend to decrease further away from the protected site and thus the importance of the land to the maintenance of the designated population will decrease.
- 5.3.5 Natural England has published guidance on Sites of Special Scientific Interest (SSSI) Impact Risk Zones (IRZs) (Ref 8.39) associated with different types of development on various functional groups of birds (see Table 5.1). These IRZs provide a high-level screening tool for assessing the risk of planning applications affecting important habitats outside Habitats site boundaries. The guidance identifies that functionally linked habitats

may extend up to the maximum foraging distances from roost locations, although it also notes that the proportion of designated foraging birds will decrease with distance from the Habitats site. Importantly, the IRZ guidance note does not define the required abundance threshold needed to meet the criterion of functional habitat linkage. However, Natural Resources Wales and Natural England generally advocate that usage of a land parcel by 1% of the qualifying SPA/Ramsar population is needed for that parcel to be defined as ‘functionally linked habitat’, although other factors besides percentage may be relevant.

Table 5.1 – Impact Risk Zones for Functional Groups of Birds

Assemblage	Impact Risk Zone (foraging distance)
Wintering birds (except wintering waders and grazing wildfowl; and wigeon (<i>Anas penelope</i>) and geese)	Up to 500 m.
Dabbling ducks such as teal, mallard and gadwall	Home ranges could extend beyond site boundaries at coastal sites, but less likely to do so at inland water bodies.
Wintering waders (except golden plover and lapwing), brent goose (<i>Branta bernicla</i>) and wigeon	Generally the maximum foraging distance is 500 m although curlew can forage up to 3.5 km (Ref 8.73)
Breeding heathland species, including nightjar and stone curlew	Radiotracking studies have shown that nightjar can forage up to 5 km from breeding grounds (Ref 8.74)
Wintering lapwing and golden plover	<p>Maximum foraging distance is 15-20 km.</p> <p>Golden plover can forage up to 15 km from a roost site within a protected site. Lapwing can also forage similar distances. Both species use lowland farmland in winter, and it is difficult to distinguish between designated populations and those present within the wider environment.</p> <p>Developments affecting functionally linked land more than 10 km from the site are unlikely to impact significantly on designated populations.</p>
Wintering white-fronted goose (<i>Anser albifrons</i>), greylag goose (<i>Anser anser</i>), Bewick's swan (<i>Cygnus columbianus bewickii</i>), whooper swan, pink-footed goose and wintering bean goose (<i>Anser fabalis</i>)	<p>Maximum foraging distance is 10 km although studies have shown that pink-footed geese will fly 20 km from their roosting site to feed.</p> <p>A bespoke functional land IRZ has replaced the individual Birds 6/7 IRZs for sites supporting the following goose and swan species: pink-footed geese, barnacle goose, Bewick's swan, white-fronted goose and whooper swan.</p> <p>The IRZ is based on GIS distribution records of feeding pink-footed geese from a study undertaken for Natural England by the Wildfowl & Wetlands Trust and the results</p>

Assemblage	Impact Risk Zone (foraging distance)
	of work undertaken by the British Trust for Ornithology to identify functionally connected habitat used by barnacle goose, Bewick's swan, white-fronted goose and whooper swan based on Wetland Bird Survey (WeBS) site and BirdTrack data.

5.3.6 The identification of an area as functionally linked habitat is not always a straightforward process. The importance of non-designated land parcels may not be apparent and thus might require the analysis of existing data sources (e.g., Bird Atlases or data from record centres) to be firmly established. In some instances, data may not be available at all, requiring further survey work. Generally, it is reasonable to assume that a site of under 2 ha in size is unlikely to support a large enough population of birds (taking sightlines and other factors into account) to constitute 1% of an SPA/Ramsar population.

5.3.7 Table 5.2 lists the habitat preferences and diet of bird features of the Humber Estuary SPA/Ramsar and Thorne and Hatfield Moors SPA, as per the citations.

Table 5.2 – Habitat preferences and diet of qualifying bird species of the Humber Estuary SPA/Ramsar and Thorne and Hatfield Moors SPA.

Qualifying feature	Habitat preferences ²	Diet
Golden plover	Tundra, wet moor, on migration pasture and estuaries	Invertebrates, especially beetles, earthworms, feeds extensively at night
Ruff	Grassy tundra, lakes, farmland , on migration mudflat	Invertebrates, especially insects, some plant material (especially winter)
Teal	Lakes, marshes, ponds and shallow streams	Omnivorous, mostly seeds in winter, feeds mostly at night in shallow water
Wigeon	Marsh, lakes, open moor, on migration also estuaries	Mostly leaves, shoots, rhizomes, also some seeds
Whimbrel	Tundra, moor, heath, on migration marsh and estuary	Invertebrates and plant material according to availability; rarely probes deeply
Shoveler	Shallow lakes, marsh, reedbed and wet meadow	Omnivorous, esp. small insects, crustaceans, molluscs, seeds; filters particles with sideways sweeping of bill
Pochard	Lakes and slow rivers on migration also estuaries	Mostly plant material, also small animals

² Habitat types or foraging items that are likely to be present within the proposed DCO boundary are marked in bold.

Qualifying feature	Habitat preferences ²	Diet
Avocet	Mudflats, lagoons, sandy beaches	Invertebrates, especially insects, crustaceans, worms, but also small fish; sweeps bill from side to side, prey located by touch
Bittern	Reedbed and marshes	Mostly fish, amphibians, insects but wide variety, mostly in shallow water in or near cover
Hen harrier	Moor, marsh, steppe and fields	Mostly, small birds, nestlings and small rodents
Marsh harrier	Marsh and reedbeds; increasingly nests in arable farmland	Animals from ground, especially in marshy areas, preference for easily caught prey
Little tern	Seacoasts, rivers and lakes	Small fish and invertebrates, often hovers before plunge-diving
Bar-tailed godwit	Coastal tundra, on migration mudflats, flooded fields	Invertebrates, esp insects, molluscs, crustaceans and worms
Dark-bellied brent goose	Tundra, on migration marshes and estuaries	Eelgrass (<i>Zostera</i>), also vegetation by grazing on land or shallow water
Ringed plover	Sandy areas with low vegetation, on migration estuaries	Summer, invertebrates, Winter primarily marine worms, crustaceans and molluscs
Grey plover	Tundra, on migration primarily estuaries and other coastal habitats	Summer, invertebrates, winter primarily marine worms, crustaceans and molluscs
Nightjar	Open habitats such as heathland, moorland, and scrubby forest areas, such as young conifer plantation or recently clear-felled sites.	Invertebrates, including moths, flies and beetles.

5.3.8 Overall, the available baseline information suggests that there is a potential impact pathway with the following Habitats sites within the ZoI for the loss of functionally linked land habitat:

- Humber Estuary SPA;
- Humber Estuary Ramsar; and
- Thorne and Hatfield Moors SPA.

5.3.9 This impact pathway is scoped out for Lower Derwent Valley SAP/ Ramsar as it is beyond the IRZ of all but one of the qualifying species. Whilst it is acknowledged that Bewick's swan may be migrating along the River Ouse to the Lower Derwent Valley SPA/ Ramsar, loss of functionally linked land habitat is not considered to be a significant impact as the birds will be enroute.

- 5.3.10 This impact pathway is scoped out for Thorne Moor SAC and Hatfield Moor SAC as they are designated for non-mobile features. This impact pathway is also screened out for the Humber Estuary SAC as the qualifying mobile features are marine and there will be no loss of marine habitats in relation to the Project.

5.4 Waterborne Pollution

5.4.1 The quality of the water that feeds a Habitats site is an important determinant of the condition of the habitats and species it supports. Poor water quality can have a range of environmental impacts:

- At high levels, toxic chemicals and metals can result in immediate death of aquatic life, and can have detrimental effects even at lower levels, including increased vulnerability to disease and changes in wildlife behaviour.
- Construction activities that involve ground excavations and the stripping of topsoil are associated with a high risk of sediment release in surface runoff. Excessive sedimentation can smother aquatic habitats and plants, increase turbidity and accelerate eutrophication.
- Eutrophication, the enrichment of water with nutrients, increases plant growth and consequently results in oxygen depletion. Algal blooms, which commonly result from eutrophication, increase turbidity and decrease light penetration. The decomposition of organic wastes that often accompanies eutrophication deoxygenates water further, augmenting the oxygen depleting effects of eutrophication. In freshwater ecosystems, plant growth is primarily determined by phosphorus (P) concentrations, which are determined by a wide range of sources, including treated sewage effluent from Wastewater Treatment Works and urban surfaces such as roads.
- Some pesticides, industrial chemicals, and components of sewage effluent are suspected to interfere with the functioning of the endocrine system, possibly having negative effects on the reproduction and development of aquatic life.

5.4.2 Under the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017 (Ref 8.29), it is legally required to maintain and/or improve the ecological and chemical status of the water environment, which includes rivers, lakes, wetlands, groundwater, estuaries and coastal waters. There should be no deterioration or prevention of future improvement in the status of waterbodies. Water Framework Directive (WFD) assessments are directly linked to HRA in that consideration must also be given when undertaking a WFD assessment to the Conservation Objectives of designated sites, including SACs, SPAs and Ramsar sites.

5.4.3 The magnitude of water quality impacts primarily depends on the appropriate treatment of process water and/or surface runoff.

5.4.4 Overall, the available baseline information suggests that there is a potential impact pathway with the following Habitats sites within the Zol for waterborne pollution:

- Humber Estuary SAC;
- Humber Estuary Ramsar; and
- Humber Estuary SPA.

- 5.4.5 This impact pathway is scoped out for the Lower Derwent Valley SPA/Ramsar, as the Project is located approximately 30 km downstream of these sites, therefore there is no impact pathway for waterborne pollution.
- 5.4.6 This impact pathway is scoped out for Thorne Moor SAC and Hatfield Moor SAC. These sites are designated for raised bog habitat which gets all of its water from rainfall, snow and mist (Ref 8.30). As these two SACs make up Thorne and Hatfield Moors SPA, this Habitats site can also be scoped out from this impact pathway.

5.5 Airborne Pollution

Emissions from Road Traffic

- 5.5.1 Construction of the Project has the potential to affect air quality. This is primarily expected due to emissions associated with exhaust emissions from construction vehicles and equipment.
- 5.5.2 The main pollutants of concern for Habitats sites are nitrogen oxides (NO_x), ammonia (NH₃) and sulphur dioxide (SO₂) (see Table 5.3). NH₃ can have a directly toxic effect upon vegetation, particularly at close distances to the source such as near road verges (Ref 8.29). NO_x can also be toxic to vegetation at very high concentrations (far above the annual average Critical Level). Furthermore, high levels of NO_x and NH₃ are likely to increase the total nitrogen (N) deposition, potentially leading to deleterious knock-on effects in recipient ecosystems. An increase in N deposition from the atmosphere is widely known to enhance soil fertility and to lead to eutrophication. This often has adverse effects on plant community composition and the overall quality of semi-natural, nitrogen-limited terrestrial and aquatic habitats (Ref 8.32 and Ref 8.33).

Table 5.3 – Main sources and effects of air pollution on habitats and species (Ref 8.34)

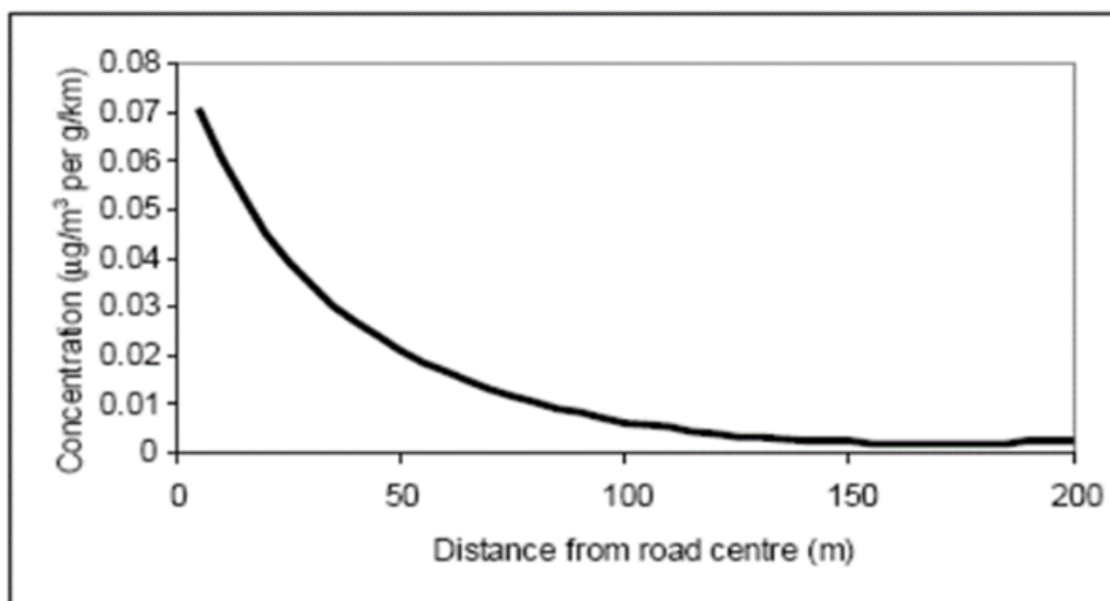
Pollutant	Source	Effects on habitats and species
SO ₂	<p>The main sources of SO₂ are fuel-fired electricity generation, and industrial and domestic fuel combustion. However, total SO₂ emissions in the UK have decreased substantially since the 1980s.</p> <p>Another origin of SO₂ is the shipping industry and high atmospheric concentrations of SO₂ have been documented in busy ports. In future years shipping is likely to become one of the most important contributors to SO₂ emissions in the UK.</p>	<p>Wet and dry deposition of SO₂ acidifies soils and freshwater and may alter the composition of plant and animal communities.</p> <p>The magnitude of impacts depends on levels of deposition, the buffering capacity of soils and the sensitivity of impacted species.</p> <p>However, SO₂ background levels have fallen considerably since the 1970s and are now not regarded as a threat to plant communities. For example, decreases in SO₂ concentrations have been linked to returning lichen species and improved tree health in London.</p>

Pollutant	Source	Effects on habitats and species
Acid deposition	<p>Leads to acidification of soils and freshwater via atmospheric deposition of SO₂, NO_x, NH₃ and hydrochloric acid (HCl). Acid deposition from rain has declined by 85% in the last 20 years, with most of this contributed by lower sulphate levels.</p> <p>Although future trends in SO₂ emissions and subsequent deposition to terrestrial and aquatic ecosystems will continue to decline, increased N emissions may cancel out any gains produced by reduced SO₂ levels.</p>	<p>Gaseous precursors (e.g., SO₂) can cause direct damage to sensitive vegetation, such as lichen, upon deposition.</p> <p>Acid deposition can affect habitats and species through both wet (acid rain) and dry deposition. The effects of acidification include lowering of soil pH, leaf chlorosis, reduced decomposition rates, and compromised reproduction in birds/plants.</p> <p>Not all sites are equally susceptible to acidification. This varies depending on soil type, bed rock geology, weathering rate and buffering capacity. For example, sites with an underlying geology of granite, gneiss and quartz rich rocks tend to be more susceptible.</p>
Ammonia (NH ₃)	<p>Ammonia is a reactive, soluble alkaline gas that is released following decomposition and volatilisation of animal wastes and from some chemical processes and vehicle exhausts. It is a naturally occurring trace gas, but ammonia concentrations are directly related to the distribution of livestock.</p> <p>Ammonia reacts with acid pollutants such as the products of SO₂ and NO_x emissions to produce fine ammonium (NH₄⁺) – containing aerosol. Due to its significantly longer lifetime, NH₄⁺ may be transferred much longer distances (and can therefore be a significant transboundary issue).</p> <p>While ammonia deposition may be estimated from its atmospheric concentration, the deposition rates are strongly influenced by meteorology and ecosystem type.</p>	<p>The negative effect of NH₄⁺ may occur via direct toxicity when uptake exceeds detoxification capacity and via N accumulation.</p> <p>Its main adverse effect is eutrophication, leading to species assemblages that are dominated by fast-growing and tall species. For example, a shift in dominance from heath species (lichens, mosses) to grasses is often seen.</p> <p>As emissions mostly occur at ground level in the rural environment and NH₃ is rapidly deposited, some of the most acute problems of NH₃ deposition are for small relict nature reserves located in intensive agricultural landscapes.</p>
NO _x	<p>Nitrogen oxides are mostly produced in combustion processes. Half of NO_x emissions in the UK derive from motor vehicles, one quarter from power stations</p>	<p>Direct toxicity effects of gaseous nitrates are likely to be important in areas close to the source (e.g., roadside verges). A critical level of NO_x for all vegetation types has</p>

Pollutant	Source	Effects on habitats and species
	and the rest from other industrial and domestic combustion processes.	<p>been set to 30 µg/m³ (micrograms per cubic metre).</p> <p>Deposition of nitrogen compounds (nitrates (NO₃), NO₂ and nitric acid (HNO₃)) contributes to the total N deposition and may lead to both soil and freshwater acidification.</p> <p>In addition, NO_x contributes to the eutrophication of soils and water, altering the species composition of plant communities at the expense of sensitive species.</p>
N deposition	<p>The pollutants that contribute to the total nitrogen deposition derive mainly from oxidized (e.g., NO_x) or reduced (e.g., NH₃) N emissions (described separately above). While oxidized nitrogen mainly originates from major conurbations or highways, reduced nitrogen mostly derives from farming practices.</p> <p>The N pollutants together are a large contributor to acidification (see above).</p>	<p>All plants require nitrogen compounds to grow, but too much overall N is regarded as the major driver of biodiversity change globally.</p> <p>Species-rich plant communities with high proportions of slow-growing perennial species and bryophytes are most at risk from N eutrophication. This is because many semi-natural plants cannot assimilate the surplus N as well as many graminoid (grass) species.</p> <p>N deposition can also increase the risk of damage from abiotic factors e.g., drought and frost.</p>
Ozone (O ₃)	<p>A secondary pollutant generated by photochemical reactions involving NO_x, volatile organic compounds (VOCs) and sunlight. These precursors are mainly released by the combustion of fossil fuels (as discussed above).</p> <p>Increasing anthropogenic emissions of ozone precursors in the UK have led to an increased number of days when ozone levels rise above 40 ppb (parts per billion) ('episodes' or 'smog'). Reducing ozone pollution is believed to require action at international level to reduce levels of the precursors that form ozone.</p>	<p>Concentrations of O₃ above 40 ppb can be toxic to both humans and wildlife and can affect buildings.</p> <p>High O₃ concentrations are widely documented to cause damage to vegetation, including visible leaf damage, reduction in floral biomass, reduction in crop yield (e.g., cereal grains, tomato, potato), reduction in the number of flowers, decrease in forest production and altered species composition in semi-natural plant communities.</p>

- 5.5.3 SO₂ emissions overwhelmingly derive from power stations and industrial processes that require the combustion of coal and oil, as well as shipping (particularly on a local scale). There will be no material release of SO₂ in the construction or operation of the Project. Therefore, this atmospheric pollutant is not considered further in this HRA.
- 5.5.4 NO_x emissions are dominated by the output of vehicle exhausts (more than half of all emissions) and some vehicles also emit NH₃. The main air quality impact of the Project is likely to occur in the construction phase, when construction traffic will lead to the temporary emission of NO_x, NH₃ and, likely, an overall increase in total N deposition. According to the World Health Organisation (WHO), the Critical Level for NO_x for the protection of vegetation is 30 µg m⁻³ (micrograms per cubic metre) and the Critical Level for NH₃ when lower plants are present is 1 µg m⁻³ (Ref 8.31). In addition, ecological studies have determined Critical Loads for atmospheric nitrogen deposition (NO_x combined with NH₃).
- 5.5.5 The Department for Transport's Transport Analysis Guidance (Ref 8.12) states that beyond 200 m, the contribution of vehicle emissions from the roadside to local pollution levels is insignificant (refer to Image 5.1). This is the distance that is used in this HRA to screen for potential atmospheric pollution impacts associated with the Project.

Image 5.1 – Traffic contribution to concentrations of pollutants at different distances from a road



- 5.5.6 Overall, the available baseline information suggests that there is a potential impact pathway with the following Habitats sites within the ZOI for airborne pollution related to traffic emissions:
- Humber Estuary SAC;
 - Humber Estuary SPA; and
 - Humber Estuary Ramsar.
- 5.5.7 This impact pathway is scoped out for Lower Derwent Velley SPA/Ramsar, Thorne and Hatfield Moors SPA, Thorne Moor SAC and Hatfield Moor SAC, as these Habitats sites are all beyond 200 m from a road proposed to be used by construction traffic.

Dust Deposition

5.5.8 Construction activities can generate dust emissions from operating machinery that can cause localised smothering of vegetation or potential health issues in fauna. The effects of dust will depend on the prevailing wind direction, and the transport distance is related to particle size. Dust particle size and chemical composition is important as smaller particles can enter or block stomata and thus interfere with gas exchange, while sufficient coverage may prevent light penetration to the chloroplasts.

5.5.9 Fauna are exposed to air pollutants via three pathways:

- inhalation of gases or small particles;
- ingestion of particles suspended in food or water; or,
- absorption of gases through the skin. It is likely that birds are even more susceptible to gaseous pollutant injury than mammals due to their higher respiratory rates.

5.5.10 For the purposes of screening, according to guidance from the Institute of Air Quality Management (IAQM) (Ref 8.35), with respect to possible effects due to dust:

‘An assessment will normally be required where there is...an ‘ecological receptor’ within: 50 m of the boundary of the site; or 50 m of the route(s) used by construction vehicles on the public highway, up to 250 m from the site entrance(s)’.

However, as a precautionary approach, the potential for dust impacts has been considered up to 200 m from dust-generating activities.

5.5.11 Overall, the available baseline information suggests that there is a potential impact pathway with the following Habitats sites within the ZoI for airborne pollution rated to dust.

- Humber Estuary SAC;
- Humber Estuary SPA; and
- Humber Estuary Ramsar.

This impact pathway is scoped out for Thorne and Hatfield Moors SPA, Thorne Moor SAC, Hatfield Moor SAC and Lower Derwent Valley SPA/Ramsar as these Habitats sites are all beyond 250 m from the Project.

5.6 Hydrological Changes

5.6.1 The water level, its flow rates and the mixing conditions are important determinants of the conditions present within Habitats sites and the state of their qualifying features. Hydrological processes are critical in influencing habitat characteristics in coastal waters, including parameters such as current velocity, water depth, dissolved oxygen (DO) concentrations, salinity and water temperature. In turn these parameters determine the short and long-term viability of plant and animal species, as well as overall ecosystem composition. Changes to the water flow rate within an estuary can be associated with a multitude of knock-on impacts, including substratum loss, smothering and changes in wave exposure.

5.6.2 The unique nature of wetlands combines shallow water and conditions that are ideal for the growth of organisms at the basal level of food webs, which feed many species of

birds, mammals, fish and amphibians. Overwintering, migrating and breeding wetland bird species are particularly reliant on these food sources, as they need to build up enough nutritional reserves to sustain their long migration routes or feed their hatched chicks.

5.6.3 The proliferation of impermeable surfaces increases the volume and speed of surface water runoff. Traditional drainage systems often cannot cope with the volume of runoff, particularly during intense rainfall events, resulting in downstream flooding of ecological receptor sites.

5.6.4 Overall, the available baseline information suggests that there is a potential impact pathway with the following Habitat sites within the ZOI for hydrological change:

- Humber Estuary SAC;
- Humber Estuary SPA; and
- Humber Estuary Ramsar.

5.6.5 This impact pathway is scoped out for the Lower Derwent Valley SPA/Ramsar, as the Project is approximately 30 km downstream.

5.6.6 This impact pathway is scoped out for Thorne Moor SAC and Hatfield Moor SAC. These sites are designated for raised bog habitat which gets its water from rainfall, snow and mist (Ref 8.30). As these two SACs make up Thorne and Hatfield Moors SPA, this Habitats site can also be screened out from this impact pathway.

5.7 Disturbance of Qualifying Species

5.7.1 Development can result in noise or visual disturbance to qualifying species in Habitats sites, during the construction and operational (including maintenance) phases. For example, noise and visual disturbance arising from construction may result in temporary behavioural changes in otter, such as disturbance in holts and displacement from specific stretches of the river. Furthermore, disturbance from construction may result in temporary behavioural changes in qualifying birds (e.g., interruption or cessation foraging, minor and major flight responses). During the operational period, noise emitted from developments may permanently affect site usage of foraging and roosting birds. Disturbance from site usage by operational site staff, road traffic and operational lighting might also arise. Three of the most important factors determining the magnitude of disturbance from proposed developments on ecological receptors are considered to be individual species sensitivity, proximity of the disturbance source and timing/duration of the disturbance.

5.7.2 Both noise and visual stimuli may elicit disturbance responses, potentially affecting the fitness and survival of qualifying birds. Noise is a complex disturbance parameter requiring the consideration of multiple factors, including its non-linear scale, non-additive effect and source-receptor distance. Professional judgement suggests that a high level of noise disturbance constitutes a sudden noise event of over 60 dB (decibels) or prolonged noise of over 72 dB. Bird responses to high noise levels include major flight or the cessation of feeding, both of which might affect the survival of birds, particularly if other stressors are also present (e.g., cold weather, food scarcity).

5.7.3 Generally, research has shown that above noise levels of 84 dB waterfowl show a flight response, while at levels below 55 dB there is no effect on their behaviour (Ref 8.15). Therefore, these two thresholds are considered useful as defining two extremes. Generally, noise is attenuated by 6dB with every doubling of distance from the source.

Impact piling, the noisiest construction activity (approx. 110 dB at 0.67 m from source) will thus reduce to 67-68 dB by 100 m away from the source. This implies that the loudest construction noise should have fallen to below disturbing levels by 100 m, and certainly by 200 m, away from the source even without mitigation. Noise levels from less noisy construction activities, such as Horizontal Direct Drilling (HDD) (approximately 85 dB at source), are expected to dissipate over considerably shorter distances. Note that this is a rule of thumb and does not obviate the need for application-level noise modelling.

- 5.7.4 The following parameters for the assessment of noise disturbance impacts have been identified in discussions with Natural England on other projects³:
- Changes of 3 dB in noise level compared to the pre-construction baseline are perceptible at the receptor (although not necessarily disturbing) and should be screened in for AA;
 - Noise levels below 55 dB are unlikely to be disturbing, regardless of the difference to the baseline;
 - Noise levels between 55 dB and 70 dB may be disturbing depending on the degree of change (for example, a change in noise level of 10 dB represents a doubling in loudness and, therefore, likely to be disturbing), nature of the sound (i.e., L_{Amax} or L_{Aeq}), duration of exposure and extent of habitat impacted; and
 - Noise levels above 70 dB are likely to be disturbing unless qualifying birds are already subject to similarly high noise levels as part of their baseline soundscape.
- 5.7.5 Since it is possible to be confident no disturbance will occur at 55 dB, and 58 dB (being three decibels higher) is the threshold for a difference to be perceptible (rather than disturbing) this has in practice led to agreement on various projects over using a 60 dB contour as the threshold to determine if adverse effects may arise. This is the threshold that is used in this HRA to screen for potential noise disturbance impacts associated with the Project.
- 5.7.6 Generally, visual stimuli are considered to have a higher disturbance potential than noise stimuli as, in most instances, visual stimuli will elicit a disturbance response at much greater distances than noise (Ref 8.16). For example, a flight response is triggered in most species when they are approached to within 150 m across a mudflat. Visual disturbance can be exacerbated by workers moving across open habitats undertaking sudden movements and using large machinery. Several species are particularly sensitive to visual disturbance including curlew (taking flight at 275 m), redshank (at 250 m), shelduck (at 199 m) and bar-tailed godwit (at 163 m) (Ref 8.13).
- 5.7.7 Disturbance on heathland birds is well known from work undertaken within the Thames Basin Heaths and Dorset Heaths SPAs. With respect specifically to European nightjar *Caprimulgus europaeus*, Liley and Clarke (Ref 8.17 and Ref 8.18) found that the density of individuals was directly related to the amount of surrounding development, with sites surrounded by higher levels of development supporting fewer nightjars. The species' breeding success appears to be much higher at less visited sites (Ref 8.19), with path proximity correlating strongly with nest failure, up to 225 m from the path edge.
- 5.7.8 Overall, specific regard will be given to assemblage composition when identifying threshold levels for both visual and noise disturbance. It is likely that different avian

³ Discussions over noise disturbance to SPA/Ramsar took place over several projects, including the Sea Link and Viking CCS Pipeline developments.

species are differently affected by developments, depending on the types of habitat present, spatial requirements of ecological receptor species (e.g. flocking species such as pink-footed goose *Anser brachyrhynchus* require large areas of supporting habitat), species-specific foraging behaviour and individual species sensitivity.

- 5.7.9 Fish can be impacted by underwater sound which can either be impulsive or continuous in nature and can cause a variety of impacts to fish, ranging from severe physical injury (e.g., rupture of the swim bladder), physical damage to the auditory system (e.g., temporary shifts in hearing thresholds) to behavioural changes, such as disruption of migratory behaviours.
- 5.7.10 Fish that rely on acoustic communication may be the most obvious to be affected by anthropogenic noise (Ref 8.20 and Ref 8.21). However, all fish have the capability to hear low-frequency sounds (< 500 Hz) and, consequently, can be disturbed by noisy human activities (Ref 8.22 and Ref 8.23).
- 5.7.11 General effects of noise on aquatic life have been reviewed extensively (Ref 8.24). These reviews highlight a critical need for data on population level effects, including reproduction, as successful reproduction is essential for population viability. For many fish species, the spawning period may be highly sensitive to impacts from noise if individuals gather in dense, localised spawning aggregations (Ref 8.25). A disturbance during spawning may thus hamper a much larger fraction of the population compared to other periods of the year. Additionally, during this critical period, fish may also be most vulnerable to external stressors (Ref 8.26), because fish are often in their poorest body condition during the spawning period (Ref 8.27 and Ref 8.28).
- 5.7.12 Overall, the available baseline information suggests that there is a potential impact pathway with the following Habitats sites within the Zol for disturbance of qualifying species:
- Humber Estuary SAC;
 - Humber Estuary SPA; and
 - Humber Estuary Ramsar.
- 5.7.13 This impact pathway is scoped out for Thorne and Hatfield Moors SPA and the Lower Derwent Valley SPA/ Ramsar as these sites are well beyond the 1 km Zol for noise and visual disturbance impacts described in Table 3.2 (being approximately 2.99 km and 14.44 km away from the draft Order Limits respectively). This impact pathway is also scoped out for Thorne Moor SAC and Hatfield Moor SAC, as both sites are beyond the 1 km Zol and are also designated for non-mobile features i.e., habitats therefore there is no pathway between these sites and this potential impact pathway.

5.8 Barriers to Movement

- 5.8.1 Development, including transmission lines, can lead to habitat fragmentation and impede the movement of wildlife. Many species rely on the ability to move throughout the landscape to fulfil their needs for survival or complete their life cycles. Some species move seasonally, following food resources, moving to areas more suitable for raising young, or surviving the winter. New structures can therefore potentially affect the ability of species to move across terrestrial landscapes by adding obstacles, impacting critical stopover sites, and increasing habitat fragmentation. This can have a detrimental impact to many species.

- 5.8.2 Some wildlife, especially birds, need staging or stopover areas to rest and refuel during migrations. Powerlines introduced into migratory flyways of birds impose aerial barriers to flight.
- 5.8.3 Fox *et al.* (2006) (Ref 8.75) highlighted barriers to movement as one of the effects of wind farms on bird populations. The extent to which avoidance is considered an impact depends on the species, the size of the wind farm, the spatial arrangement of the turbines, the type of movement, i.e. local movements between feeding, nesting, and roosting areas, or annual migrations, and the incurred energetic cost. In the extreme, the energetic costs of avoidance behaviour and increased distance travelled would reduce the mass and condition of an individual to the point of adversely affecting breeding success.
- 5.8.4 Overall, the available baseline information suggests that there is a potential impact pathway with the following Habitats sites within the Zol for barriers to the movement of qualifying species:
- Humber Estuary SPA;
 - Humber Estuary Ramsar;
 - Thorne and Hatfield Moors SPA;
 - Lower Derwent Valley SPA; and
 - Lower Derwent Valley Ramsar.
- 5.8.5 These sites are scoped in for further consideration in the HRA to accompany the Development Consent Order (DCO) application.
- 5.8.6 This impact pathway is scoped out for Thorne Moor SAC and Hatfield Moor SAC on the basis that they are designated for non-mobile features and/or non-aerial species. It is also scoped out for the Humber Estuary SAC as no main river channels will be obstructed.

5.9 Injury/Mortality

- 5.9.1 Guidance produced by NatureScot (Ref 8.40) identifies the main sources of potential risk to birds from the presence of transmission overhead lines to be:
- Mortality or injury through collision with transmission lines (including conductors and earth wires) or supporting structures. On power lines, bird collisions are often concentrated along relatively short sections where several factors interact to create a collision problem or 'hotspot'.
 - Mortality through electrocution on transmission lines is unlikely, due to the large air gaps between lived and earthed components.. Birds that perch or nest on steel lattice pylons are therefore unlikely to be electrocuted by causing a short circuit, either by touching two live wires, or a live and an earthed component as, due to the air gap touching two of these components at the same time is highly unlikely.
- 5.9.2 The principal factors affecting the risk of bird mortality through collision and electrocution are:
- Species specific morphology, biology. Birds with larger body sizes and high wing loadings, birds flying in flocks and/or in low light, birds with limited visual capacity, birds distracted while engaged in hunting/breeding behaviours, younger and more inexperienced birds and migrants not familiar with the landscape may all be at

increased collision risk. For example, swans and other large waterfowl are of particular concern for collisions in the UK (Ref 8.41);

- Landscape and topography (e.g., siting of overhead lines near important habitats or flyways) may increase collision risk;
- Weather affecting flight capability or visibility (strong winds / fog / heavy rain) which may force birds to lower their normal flight heights, affect flight control and reduce visibility, and therefore reduce ability to avoid collisions;
- Technical aspects of the transmission line (spacing of conductors, creation of perches); and
- The presence of existing barrier features that already result in changes to bird flight behaviours e.g., an embankment, woodland block, building or existing infrastructure corridor.

5.9.3 Earth wires are thought to be responsible for a much higher rate of collisions than the thicker, often bundled conductor wires. Earth wires are harder for birds to see, being thinner in diameter and typically positioned at the top of the wire array. Birds trying to gain height to avoid the larger more visible conductor wires may fail to see the earth wire.

5.9.4 Overall, there is a potential impact pathway with the following Habitats sites within the Zol for injury or mortality.

- Humber Estuary SPA;
- Humber Estuary Ramsar;
- Thorne and Hatfield Moors SPA;
- Lower Derwent Valley SPA; and
- Lower Derwent Valley Ramsar.

5.9.5 These sites are scoped in for further consideration in the HRA to accompany the DCO application.

5.9.6 This impact pathway is scoped out for the Humber Estuary SAC, Thorne Moor SAC and Hatfield Moor SAC on the basis that they are designated for non-mobile features and/or non-aerial species.

5.10 Spread of Invasive Non-Native Species (INNS)

5.10.1 An 'invasive species' is a species that is: 1) non-native (or alien) to the ecosystem under consideration; and 2) whose introduction causes or is likely to cause economic or environmental harm, or harm to human health. They can be introduced to an area by, for example, ship ballast water, accidental release, and most often, by people. Invasive species can lead to the extinction of native plants and animals, destroy biodiversity, and permanently alter habitats. Any construction project can introduce INNS if inadequate biosecurity protocols are followed, particularly when working in the riverine environment.

5.10.2 Overall, the available baseline information suggests that there is a potential impact pathway with the following Habitats sites within the Zol spread of INNS.

- Humber Estuary SAC;
- Humber Estuary SPA; and
- Humber Estuary Ramsar.

5.10.3 This impact pathway is scoped out for Thorne and Hatfield Moors SPA, Thorne Moor SAC, Hatfield Moor SAC and Lower Derwent Valley SPA/Ramsar on the basis that they are all a significantly greater distance away from the Project than the 100 m buffer identified in Table 3.2.

5.11 Summary

5.11.1 Based on the outcomes of the scoping and data gathering exercise, Table 5.4 presents the Habitats sites, potential impact pathways and proximity to the Project (as indicated in Table 3.1 and Table 3.2) that were considered relevant to this HRA.

Table 5.4 – Relevant Habitats Sites and Associated Potential Impact Pathways

Habitats site	Approximate distance from draft Order Limits	Potential Impact Pathways
Humber Estuary SAC	Within	<ul style="list-style-type: none"> • Direct loss of habitat • Waterborne pollution • Airborne pollution (from both emissions from road traffic and dust deposition) • Hydrological changes • Disturbance of qualifying species - fish⁴ • Spread of invasive non-native species
Humber Estuary SPA	Within	<ul style="list-style-type: none"> • Loss of functionally linked land habitat • Waterborne pollution • Airborne pollution (from both emissions from road traffic and dust deposition) • Hydrological changes • Disturbance of qualifying species • Barriers to movement • Injury/mortality • Spread of invasive non-native species
Humber Ramsar	Within	<ul style="list-style-type: none"> • Direct loss of habitat • Loss of functionally linked land habitat • Waterborne pollution • Airborne pollution (from both emissions from road traffic and dust deposition) • Hydrological changes • Disturbance of qualifying species • Barriers to movement

⁴ While noise and visual disturbance to qualifying fish is considered, the Project will not result in the permanent loss of freshwater and bankside habitat. Therefore, permanent habitat loss in relation to this qualifying feature is not considered.

Habitats site	Approximate distance from draft Order Limits	Potential Impact Pathways
Thorne and Hatfield Moors SPA	2.70 km west	<ul style="list-style-type: none"> • Injury/mortality • Spread of invasive non-native species
Thorne Moor SAC	2.70 km west	<ul style="list-style-type: none"> • Loss of functionally linked land habitat • Barriers to movement • Injury or mortality (collision risk)
Hatfield Moor SAC	5.73 km west	No pathways have been identified with this Habitat site
Lower Derwent Valley SPA	13.59 km north-west	<ul style="list-style-type: none"> • Barriers to movement • Injury or mortality (collision risk)
Lower Derwent Valley Ramsar	13.59 km north-west	<ul style="list-style-type: none"> • Barriers to movement • Injury or mortality (collision risk)

6. HRA Stage 1 – Screening for Likely Significant Effects (LSEs)

6.1 Introduction

- 6.1.1 This section evaluates whether the Project will result in LSEs on the qualifying features of those Habitat sites where a potential impact pathways has been identified.
- 6.1.2 In line with case law (People Over Wind and Sweetman v Coillte Teoranta (C-323/17)), consideration cannot be given at this stage to specific mitigation measures designed to avoid significant effects on a Habitats site. However, as discussed in section 3.2, standard good practice works methods which would be adopted by the Project, regardless of the presence of Habitats sites, would include the implementation of pollution prevention measures following Department for Environment, Food & Rural Affairs (Defra) and Environment Agency (EA) guidance for pollution prevention (Ref 8.42). Furthermore, under the Wildlife and Countryside Act 1981 (the 'WCA'), it is an offence in England to cause any animal or plant to spread or grow in the wild outside of its native range.
- 6.1.3 Appropriate biosecurity measures will therefore also be implemented during works carried out during the construction maintenance and operational phases to prevent the spread of invasive non-native species.
- 6.1.4 The test of LSEs in this section is necessarily a high-level appraisal, with a precautionary approach adopted when reaching a conclusion. For those impacts for which LSEs cannot be 'screened out', further appraisal at the AA stage of the HRA of the Project will be documented as part of the HRA which will be submitted with the application for development consent.
- 6.1.5 The design life of the Project is at least 80 years but with regular maintenance is likely to extend further. At the time that decommissioning would take place, the regulatory framework, good industry practices and the future baseline could have altered. At the point where the Project requires decommissioning, National Grid would consider and implement an appropriate decommissioning strategy taking account of good industry practice, its obligations to landowners under the relevant agreements and all relevant statutory requirements. As such, decommissioning is excluded from the HRA.

6.2 Construction

- 6.2.1 The potential for LSEs considered in this section are determined by the nature of the Project, the Zols and discussion with stakeholders such as Natural England. They are: direct habitat loss, loss of functionally linked land habitat, waterborne pollution, atmospheric pollution, hydrological changes air quality, disturbance of qualifying species and injury and mortality.

Direct Habitat Loss

- 6.2.2 A potential impact pathway from direct habitat loss has been identified on the following Habitat sites:
- Humber Estuary SAC; and
 - Humber Estuary Ramsar
- 6.2.3 Most SACs are designated for habitats of international conservation importance, many of which have been subject to encroachment from development and gradual loss. Therefore, the SACOs for most Habitats sites include a target to maintain or restore the extent of qualifying habitats to achieve favourable conservation status. Any construction activities associated with the temporary and/or permanent loss of designated habitat, by definition, would result in LSEs on a SAC. The Project could result in direct habitat loss of the following sites associated with temporary working areas which are proposed to be located within the boundary of these designated sites.
- Humber Estuary SAC; and
 - Humber Estuary Ramsar.
- 6.2.4 The Phase 1 Habitat surveys carried out between February and July 2024 identifies that the proposed temporary working areas overlap with 'saltmarsh', which is considered to be qualifying habitat. The SAC and Ramsar are also designated for mudflats and sandflats not covered by seawater at low tide.
- 6.2.5 The temporary working areas are included within the Project to facilitate flexibility in the methodology to be employed for stringing the conductors over the River Ouse. Should a boat be required these temporary working areas would facilitate the installation of temporary pontoons to allow safe access and egress. The methodology for conductor stringing over the River Ouse has not been confirmed, this will continue to be developed and reported in the application for development consent including justification for any flexibility required. Should it be confirmed a boat is not required these proposed temporary working areas would be removed from the Project and the screening for LSEs associated with direct habitat loss reviewed.
- 6.2.6 At this stage, therefore, **LSEs on the Humber Estuary SAC/Ramsar due to direct habitat loss during construction cannot be screened out. This will be reviewed and outputs of the screening and AA (where required) reported in the HRA which will accompany the application for development consent.**

Loss of Functionally Linked Land Habitat

- 6.2.7 A potential impact pathway from loss of functionally linked land habitat has been identified on the following Habitat sites:
- Humber Estuary SPA;
 - Humber Estuary Ramsar; and
 - Thorne and Hatfield Moors SPA.
- 6.2.8 Construction of the Project will require temporary land-take for access tracks, construction compounds and working areas.

- 6.2.9 As set out in **Chapter 8 Ecology** and **Chapter 9 Ornithology** much of the land within the draft Order Limits comprises predominantly arable land which is suitable for use by several qualifying SPA species of the Humber Estuary SPA/Ramsar and the Thorne and Hatfield Moors SPA.
- 6.2.10 It should be noted that as consultation and further baseline data gathering continues it may be possible to screen out Thorne and Hatfield Moors SPA. **However, at this stage LSEs on the Humber Estuary SPA /Ramsar and Thorne and Hatfield Moors SPA due to loss of functionally linked land habitat during construction cannot be screened out. This will be reviewed and outputs of the screening and AA (where required) reported in the HRA which will accompany the application for development consent.**

Waterborne Pollution

- 6.2.11 A potential impact pathway from waterborne pollution has been identified on the following Habitat sites:
- Humber Estuary SAC;
 - Humber Estuary SPA; and
 - Humber Estuary Ramsar.
- 6.2.12 The SIP (Ref 8.47) for the Humber Estuary SAC/SPA (which is equally relevant to the Ramsar) identifies water pollution as a threat to the integrity of the site due to an annual Dissolved Oxygen (DO) sag in the tidal River Ouse which *'...may cause a barrier to sea lamprey when they are migrating through the area during the summer months; however, there is currently not enough evidence available to draw accurate conclusions of the impact of the DO sag so further research is necessary.'* There is also concern around pollutants leaching from Capper Pass, a former aluminium smelting plant.
- 6.2.13 Direct water quality impacts on qualifying waterfowl and waders in the Humber Estuary SPA/Ramsar are unlikely. Water pollution impacts on birds are primarily mediated indirectly through impacts on foraging resources. For example, sedimentation of the riverbed can decrease interstitial flows, reducing oxygen availability for sediment-dwelling invertebrates and, potentially, the pool of foraging resources to non-breeding birds. Furthermore, most bird species are visual predators, meaning they must visually locate their prey in the riverbed and/or water column.
- 6.2.14 Two of the most important factors influencing the likelihood of potential water quality impacts of developments are the presence of a hydrological connection with and flow-path distance to, Habitats sites. The Project crosses the River Ouse at the point at which it is designated as the Humber Estuary SAC, SPA and Ramsar, therefore there is a hydrological connection pathway for potential waterborne pollution impacts. Furthermore, the draft Order Limits are permeated by a large number of agricultural ditches and drains, which may carry significant volumes of water at times. As a precautionary measure and in line with PINS' Advice Note Nine: Rochdale Envelope (Ref 8.48), it is assumed that these drains and ditches have hydrological connectivity with the Humber Estuary SAC/SPA/Ramsar.
- 6.2.15 Due to the geographic proximity of the Project to the Humber Estuary SAC/SPA/Ramsar, the corresponding flow-path distances are also short (particularly in relation to the River Ouse crossing). Therefore, there are potential flow paths between the Project and the Habitats sites.

- 6.2.16 National Grid has embedded measures into the design of the Project to avoid or reduce significant effects that may otherwise be experienced during construction of the Project. Measures of relevance to screening for LSEs in relation to waterborne pollution:
- Utilising existing watercourse crossing points as far as practicable;
 - Large or sensitive watercourses, for example those designated as main river, and those with Water Framework Directive (WFD) status, will be crossed by the temporary haul road using temporary clear span bridges; and
 - Application of appropriate stand-off distances⁵ to watercourses to avoid direct effects where practicable.
- 6.2.17 Further embedded design measures will be developed as the Project design evolves.
- 6.2.18 Control and management measures, comprising management activities and techniques, will be implemented during construction of the Project to limit effects through adherence to good site practices and achieving legal compliance.
- 6.2.19 A Draft Outline Code of Construction Practice (CoCP) is provided in **Appendix 4.1 Draft Outline CoCP**. Measures contained in the draft outline CoCP relevant to the control and management of impacts that could affect the water environment include, but are not limited to, the following:
- GG0: The Project will be run in compliance with all relevant legislation, consents and permits including the limitations and requirements set out in the DCO
 - GG03: The following environmental management plans will be produced prior to construction.
 - Code of Construction Practice (CoCP);
 - Register of Environmental Actions and Commitments (REAC);
 - Construction Traffic Management Plan (CTMP);
 - Soil Management Plan (SMP);
 - Public Rights of Way Management Plan;
 - Materials and Waste Management Plan (MWMP);
 - Noise and Vibration Management Plan;
 - Landscape and Ecology Management Plan (LEMP) including an Outline Landscape Maintenance and Management Plan; and
 - Archaeological Written Scheme of Investigation (WSI).
 - GG04: The CoCP shall include measures to manage dust, waste, water, noise, vibration and soil during construction. The contractor(s) shall undertake site inspections to check conformance to the Management Plans.
 - GG15: Fuels, oils and chemicals will be stored responsibly, away from sensitive water receptors. Where practicable, they will be stored >15 m from watercourses, ponds and groundwater dependent terrestrial ecosystems. Where it is not practicable to maintain a >15 m distance, additional measures will be identified. All

⁵ 'Stand-off distances' refers to a buffer between the proposed infrastructure and associated construction works and a receptor such as a watercourse

refuelling, soiling and greasing of construction plant and equipment will take place above drip trays and also away from drains as far as is reasonably practicable. Vehicles and plant will not be left unattended during refuelling. Appropriate spill kits will be made easily accessible for these activities. Potential hazardous materials used during construction will be safely and securely stored including use of secondary containment where appropriate. Stored flammable liquids such as diesel will be protected either by double walled tanks or stored in a bunded area with a capacity of 110% of the maximum stored volume. Spill kits will be located nearby.

- GG16: Runoff across the site will be controlled through a variety of methods including header drains, buffer zones around watercourses, on-site ditches, silt traps and bunding. There will be no intentional discharge of site runoff to ditches, watercourses, drains or sewers without appropriate treatment and agreement of the appropriate authority (except in the case of an emergency).
- GG17: Wash down of vehicles and equipment will take place in designated areas, for example within construction compounds and intermittently along construction access roads. Wash water will be prevented from passing untreated into watercourses and groundwater. Appropriate measures will include use of sediment traps.

6.2.20 Furthermore, the severity of potential construction and operational water quality impacts is partially determined by the distance between development sites and ecological receptor sites. In this instance, the Project crosses the Humber Estuary SAC/SPA/Ramsar however, as an estuary, there would be a huge dilution effect on any pollution. This impact pathway can therefore be screened out for the Humber Estuary SAC/SPA/Ramsar.

6.2.21 The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (Ref 8.5) and the Environmental Permitting (England and Wales) Regulations 2016 (Ref 8.6) make it an offence to pollute watercourses, irrespective of whether they are Habitats sites or connect to Habitats sites. Therefore, the Project has a duty of care to the water environment and produce and implement plans and procedures to prevent discharge from works entering surface, groundwater, wetlands or coastal waters.

6.2.22 Taking into account the design and control and management measures set out above, it is considered that the Project can be constructed in a way to prevent pollution to the water environment to ensure no adverse effects from water pollution on any Habitats site. LSEs can therefore be screened out for all Habitats sites through waterborne pollution.

Airborne Pollution

6.2.23 A potential impact pathway from airborne pollution has been identified on the following Habitat sites:

- Humber Estuary SAC;
- Humber Estuary SPA; and
- Humber Estuary Ramsar.

6.2.24 Traffic exhaust emissions contribute oxides of nitrogen and (from petrol exhausts) ammonia. These are pollutants but also contribute to nitrogen deposition (and thus acid deposition). Nitrogen deposition is a form of fertilisation that can change vegetation

structure and species composition. Guidance from the Institute of Air Quality Management (Ref 8.51) and Natural England (Ref 8.52) identify that traffic exhaust emissions can affect ecological sites within 200 m of the source. At this stage, whilst the preliminary primary access routes for construction and traffic volumes have been identified, further analysis is required to confirm whether there is the potential for LSEs with any of the sites listed above, this will be set out in the HRA which will accompany the application for development consent.

- 6.2.25 Operating machinery and techniques employed during the construction of the Project have the potential to increase local dust levels with knock-on effects on ecological receptors. Dust deposition is of particular concern for plants, due to its direct interference with gaseous exchange by blocking stomata. In addition, any dust suspended in the water column of aquatic habitats may also affect the turbidity, temperature and other water quality parameters. This can trigger changes in aquatic community composition and also affect the ability of bird species to feed, many of which are visual foragers.
- 6.2.26 **At this stage, therefore, LSEs on the Humber Estuary SAC/SPA/Ramsar due to airborne pollution cannot be screened out. This will be reviewed and outputs of the screening and AA (where required) reported in the HRA which will accompany the application for development consent.** At that time consideration will also be given to the fact that any impact will be temporary, whereas the critical load system for assessing nitrogen deposition impacts is based on an assumption of decades of exposure.

Hydrological Change

- 6.2.27 A potential impact pathway from hydrological change has been identified on the following Habitat sites:
- Humber Estuary SAC;
 - Humber Estuary SPA; and
 - Humber Estuary Ramsar.
- 6.2.28 Abiotic conditions in the Humber Estuary SAC/SPA/Ramsar depend on a complex interplay of freshwater and seawater input. For example, the volume of freshwater input influences the salinity of estuarine habitats, with knock-on implications for plant and invertebrate community composition.
- 6.2.29 The Project could have the following potential impacts on hydrological change:
- Meeting the potable water supply requirements for site staff and construction processes may result in the drawdown of local water levels;
 - Potential effects on groundwater levels, quality and flows from dewatering activities to reduce groundwater levels for trenchless crossings associated with third party works;
 - Connection of aquifer units creating potential pathways due to excavations at trenchless crossing locations; and
 - Construction working areas and access tracks introducing a temporary net increase in impermeable surfaces, with the potential to increase runoff rates.

- 6.2.30 With regards to potable water the Project is situated in the supply area of Yorkshire Water, Anglian Water and Severn Trent Water, all of which have a statutory obligation to deliver potable water to new developments without negatively impacting the environment (including Habitats sites).
- 6.2.31 Overall, since no additional water supplies beyond existing consents and licensed volumes will be required to meet the potable water demand, there is no potential for the Project to result in LSEs on the Humber Estuary SAC/SPA/Ramsar regarding water supply in the construction phase.
- 6.2.32 Dewatering during construction at trenchless crossings has the potential to affect groundwater due to the reduction in groundwater levels, and also affect groundwater quality and groundwater flows, which could have a potential impact on surrounding sensitive receptors, such as groundwater abstractions and lead to significant effects. The location of trenchless crossings and therefore the requirement for and location of potential dewatering as part of the Project has not currently been confirmed.
- 6.2.33 Once the requirement for and potential locations of any dewatering is known, a groundwater risk assessment will be undertaken to assess the potential impacts and effects on groundwater and identified groundwater receptors. The groundwater risk assessment will identify where additional hydrogeological risk assessment is likely to be required once detailed design is complete, to determine any mitigation that may be required. In addition, as per commitment GH07 in **Appendix 4.1 Draft Outline Code of Construction Practice** temporary dewatering would be undertaken in accordance with Environment Agency guidance and if required the appropriate permits/licences would be obtained.
- 6.2.34 At trenchless crossing locations, and where piling is required, there is the potential for connection of aquifers that are currently separated by aquitards/aquicludes (a geological formation of low(er) permeability).
- 6.2.35 However, further groundwater risk assessment, and if required, localised hydrogeological risk assessment (in accordance with GH09 of **Appendix 4.1 Draft Outline Code of Construction Practice**) will be undertaken to identify any potential effects in relation to proposed construction methods and dewatering, and identify any additional mitigation required. In addition, commitment GH02 of **Appendix 4.1 Draft Outline Code of Construction Practice** secures the requirement for provision of a foundation works risk assessment which would be undertaken once the proposed foundation solutions and trenchless crossing technique is known. The foundation works risk assessment would be undertaken in accordance with Environment Agency guidance and determine any mitigation required, such that significant effects are considered unlikely.
- 6.2.36 There is potential for increased volumes and rates of surface runoff from temporary and/or permanent impermeable surfaces within the proposed Project, such as compacted access tracks and watercourse crossings. While the risk of material hydrological effects from each individual surface is likely to be small, the cumulative increase in runoff from all surfaces is considered here as a precautionary measure.
- 6.2.37 Any works with the potential to affect the floodplain or flow regime of a main river would be subject to consent under the Environmental Permitting (England and Wales) Regulations 2017 (Ref 8.49). Similarly, works with potential to impede land drainage or the flow regime of any ordinary watercourse would be subject to consent under the Land Drainage Act 1991 (Ref 8.50).

6.2.38 Therefore, the construction period on every project must have a duty of care to the water environment and produce and implement plans and procedures to prevent discharge from works entering surface, groundwater, wetlands or coastal waters. Control and management measures, comprising management activities and techniques, will be implemented during construction of the Project to limit effects through adherence to good site practices and achieving legal compliance. An Outline CoCP is provided in **Appendix 4.1 Draft Outline CoCP**. Measures contained in the outline CoCP relevant to the control and management of impacts that could affect the water environment include, but are not limited to, the following:

- W01; and
- W06.

6.2.39 As such, it is considered that new infrastructure can be constructed in a way to prevent hydrological changes to the water environment to ensure no adverse effects from hydrological changes on any Habitats site. LSE can therefore be screened out for all Habitats sites through this impact pathway.

Disturbance of Qualifying Species

6.2.40 A potential impact pathway from disturbance to qualifying species has been identified on the following Habitat sites:

- Humber Estuary SAC;
- Humber Estuary SPA; and
- Humber Estuary Ramsar.

6.2.41 A range of construction activities will be required for the Project, which will involve the presence of site staff and usage of heavy machinery within the draft Order Limit. These activities have the potential to result in noise and visual disturbance to sensitive ecological receptors, both within Habitats sites and functionally linked habitats outside Habitats site boundaries. Disturbance is highlighted as a key threat to the Conservation Objectives of the Humber Estuary SPA/Ramsar in its SIP and SACO. Most of the disturbance elements can be introduced or exacerbated by construction activities, carried out in proximity to key foraging or roosting habitats of SPA/Ramsar bird species.

6.2.42 The draft Order Limits comprises extensive tracts of agricultural land which lie within the maximum foraging ranges of some of the qualifying species in Humber Estuary SPA/Ramsar. There are also areas of reed-bed at the proposed River Ouse crossing point, which may support qualifying species such as breeding bittern.

6.2.43 Disturbance from visual intrusion such as lighting is also likely to be most relevant if the works are immediately adjacent to an SPA. Temporary construction lighting is likely to be an issue if the works result in the introduction of lighting within close proximity to a part of the Habitat site which is currently unlit. The draft Order Limits crosses directly over the Humber Estuary SPA/Ramsar therefore, there is the potential for visual intrusion.

6.2.44 LSEs of the Project on the Humber Estuary SPA/Ramsar regarding disturbance to qualifying species during construction cannot be screened out. **This will be reviewed and outputs of the screening and AA (where required) reported in the HRA which will accompany the application for development consent.**

- 6.2.45 The HRA to be submitted with the application for development consent will be informed by noise monitoring data and modelling of the average (L_{Aeq}) and, where appropriate, maximum (L_{Amax}) construction noise levels for the noisiest activities.
- 6.2.46 The Humber Estuary SAC is designated for a range of aquatic and/or semi-aquatic species, including sea lamprey *Petromyzon marinus*, river lamprey *Lampetra fluviatilis* and grey seal *Halichoerus grypus*.
- 6.2.47 Grey seals spend most of their time out at sea feeding on fish and are less likely than common seals *Phoca vitulina* to enter rivers (Ref 8.45). Although they do spend most of their time out at sea, they return to land to rest and are often seen 'hailed out' on beaches. One of the main haul out sites for grey seals in the east of the UK is at Donna Nook, which is part of the Humber Estuary SAC (Ref 8.46), which lies approximately 58.8 km downstream of the draft Order Limits. As such, grey seal is not considered further in this HRA report.
- 6.2.48 Both lamprey species are anadromous and expected to use the entire continuum of watercourses from the Humber Estuary to the upper reaches of the River Derwent. Qualifying fish from the Humber Estuary SAC can be impacted by underwater sound which can either be impulsive or continuous in nature and can cause a variety of impacts to fish, ranging from severe physical injury (e.g., rupture of the swim bladder), physical damage to the auditory system (e.g., temporary shifts in hearing thresholds) to behavioural changes, such as disruption of migratory behaviours. All lamprey species lack swim bladders and are considered to be low hearing sensitivity fish. Generally, they are less susceptible to barotrauma because they detect particle motion rather than sound pressure. It is feasible that the Project will involve in-river works, which are considered to have the largest potential for altering the underwater soundscape therefore LSEs of the Project on the Humber Estuary SAC regarding noise and visual disturbance in the construction period cannot be excluded. **At this stage, therefore, LSEs on the Humber Estuary SAC due to noise and visual disturbance cannot be screened out. This will be reviewed and outputs of the screening and AA (where required) reported in the HRA which will accompany the application for development consent.**

Barriers to Movement

- 6.2.49 A potential impact pathway from barriers to movement to qualifying species has been identified on the following Habitat sites:
- Humber Estuary SPA;
 - Humber Estuary Ramsar;
 - Thorne and Hatfield Moors SPA;
 - Lower Derwent Valley SPA; and
 - Lower Derwent Valley Ramsar.
- 6.2.50 This pathway is associated with the proposed operational infrastructure⁶ and therefore LSEs can therefore be screened out for all Habitats sites through this impact pathway during construction.

⁶ Whilst the permanent infrastructure will be in place towards the end of the construction phase this has been assessed under operation.

Injury/Mortality

- 6.2.51 A potential impact pathway from injury/mortality to qualifying species has been identified on the following Habitat sites:
- Humber Estuary SPA;
 - Humber Estuary Ramsar;
 - Thorne and Hatfield Moors SPA;
 - Lower Derwent Valley SPA; and
 - Lower Derwent Valley Ramsar.
- 6.2.52 This pathway is associated with the proposed operational infrastructure⁷ and therefore LSE can therefore be screened out for all Habitats sites through this impact pathway during construction.

Spread of INNS

- 6.2.53 A potential impact pathway from spread of invasive species has been identified on the following Habitat sites:
- Humber Estuary SAC;
 - Humber Estuary SPA; and
 - Humber Estuary Ramsar.
- 6.2.54 There are several legislative instruments relating to INNS. The purpose of this legislation is to prevent and reduce the negative economic and environmental impacts of these species. Key legislation identifies species for which mitigation is required, specifically:
- Species listed in Schedule 9 of the WCA (Ref 8.53); and
 - Species of special concern and Schedule 2 species as per the Invasive Alien Species (Enforcement and Permitting) Order 2019 (as amended) (IASO) (Ref 8.54).
- 6.2.55 Taken together, the relevant legislation makes it an offence to plant, or otherwise cause to grow (including allowing to spread) listed species in the wild. If transported off-site, there is a duty of care with regards to the disposal of any part of the plant that may facilitate establishment in the wild and cause environmental harm (as per the Environmental Protection Act 1990 (Ref 8.55)).
- 6.2.56 While it is not illegal to have any of the identified INNS on a property, even when growing on managed land, the spread of Schedule 9 WCA (Ref 8.53) species should be kept under control such that the species is not having an appreciable adverse impact on habitats and their native biodiversity.

⁷ Whilst the permanent infrastructure will be in place towards the end of the construction phase this has been assessed under operation

6.2.57 Therefore, appropriate biosecurity measures will be implemented during works carried out during construction of the Project to prevent the spread of INNS, irrespective of whether there are Habitats sites in the vicinity. Overall, LSEs can be therefore screened out during construction from this impact pathway.

6.3 Operational Phase

Direct loss of Habitat

6.3.1 A potential impact pathway from direct habitat loss has been identified on the following Habitat sites:

- Humber Estuary SAC; and
- Humber Estuary Ramsar.

6.3.2 Direct loss of habitat is associated with temporary construction effects; therefore LSE can therefore be screened out for all Habitats sites through this impact pathway during operation.

Loss of Functionally Linked Land Habitat

6.3.3 A potential impact pathway from loss of functionally linked land habitat has been identified on the following Habitat sites:

- Humber Estuary SPA;
- Humber Estuary Ramsar; and
- Thorne and Hatfield Moors SPA.

6.3.4 The Humber Estuary SPA/Ramsar and Thorne & Hatfield Moors SPA are designated for mobile, breeding and non-breeding bird species. These species, to varying degrees, will forage or roost beyond their respective designated site boundaries.

6.3.5 The draft Order Limits cross the Humber Estuary SPA/Ramsar placing it within the core foraging ranges for some of the qualifying species. This implies that some of the habitats within the could be regularly used by significant proportions of the relevant qualifying populations.

6.3.6 The SACO for the Thorne & Hatfield Moors SPA (Ref 8.56) indicates that the location of feeding areas supporting nightjar is often poorly understood. However, monitoring at other Habitats sites suggests that nightjar focus on particularly rich feeding sites, often avoiding superficially similar habitats closer to their breeding sites. Tagging studies of nightjar in the SPA indicate that birds typically forage within 3 km of the SPA boundary, with only few individuals travelling further off-site (up to 5 km). At its closest, the SPA lies approximately 2.7 km from the proposed draft Order Limits which is within the typical 3 km range discussed above. Foraging nightjars have not been detected during the nightjar surveys undertaken for the Project as described in **Appendix 9.1 Baseline Ornithology Report**. As nightjar has not been detected, the Project is located close to the extent of the typical foraging range for this species and permanent habitat loss during operation is limited to the pylon footprints LSE can therefore be screened out for Thorne & Hatfield Moors SPA in relation to this impact pathway during operation.

- 6.3.7 **At this stage, LSEs of the Project on the Humber Estuary SPA/Ramsar regarding the potential loss of functionally linked habitat in the operational phase cannot be screened out. This will be reviewed and outputs of the screening and AA (where required) reported in the HRA which will accompany the application for development consent.**

Waterborne Pollution

- 6.3.8 A potential impact pathway from waterborne pollution has been identified on the following Habitat sites:
- Humber Estuary SAC;
 - Humber Estuary SPA; and
 - Humber Estuary Ramsar.
- 6.3.9 The Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (Ref 8.5) and the Environmental Permitting (England and Wales) Regulations 2016 (Ref 8.6) make it an offence to pollute watercourses, irrespective of whether they are Habitats sites or connect to Habitats sites.
- 6.3.10 Therefore, during maintenance, National Grid has a duty of care to the water environment and produce and implement plans and procedures to prevent discharge from works entering surface, groundwater, wetlands or coastal waters. This is usually undertaken in the form of an Environmental Management Plan (EMP) which includes measures for the protection of ground and surface waters, pollution prevention measures and an emergency response plan for pollution events.
- 6.3.11 As such, it is considered that maintenance of the new infrastructure (where required) can be designed in a way to prevent pollution to the water environment to ensure no adverse effects from water pollution on any Habitats site. LSE can therefore be screened out for all Habitats sites through this impact pathway.

Airborne Pollution

- 6.3.12 A potential impact pathway from airborne pollution has been identified on the following Habitat sites:
- Humber Estuary SAC;
 - Humber Estuary SPA; and
 - Humber Estuary Ramsar.
- 6.3.13 The only source of traffic exhaust emissions anticipated during the operational phase will be those associated with vehicles used for routine maintenance, which will be significantly less than those used during construction.
- 6.3.14 It is expected that it will be possible to screen out the need to assess traffic emissions using recognised screening criteria, as stated in the Land-Use Planning & Development Control: Planning for Air Quality guidance (Ref 8.76). Table 6.2 of this said guidance includes a list of '*indicative criteria to proceed to an air quality assessment*', two of which are '*a change of light duty vehicle (LDV) of more than 500 Annual Average Daily Traffic (AADT)*' and '*a change of heavy duty vehicle (HDV) of more than 100 AADT*'.

- 6.3.15 On the basis that the volume of operational traffic will be significantly lower than the volume of construction traffic and will be below criteria mentioned above, LSE can be screened out for all Habitats sites through this impact pathway.

Hydrological Change

- 6.3.16 A potential impact pathway from hydrological change has been identified on the following Habitat sites:
- Humber Estuary SAC;
 - Humber Estuary SPA; and
 - Humber Estuary Ramsar.
- 6.3.17 The sensitivity of the Humber Estuary SAC/SPA/Ramsar to hydrological changes is described in paragraphs 6.2.12 - 6.2.14 and applies equally to the operational phase.
- 6.3.18 One of the main hydrological risks associated with the operational phase of the Project are increased runoff rates/volumes from impermeable surfaces. However, the Environmental Damage (Prevention and Remediation) (England) Regulations 2015 (Ref 8.5) and the Environmental Permitting (England and Wales) Regulations 2016 (Ref 8.6) make it an offence to pollute watercourses, irrespective of whether they are Habitats sites or connect to Habitats sites.
- 6.3.19 Therefore, during maintenance, National Grid has a duty of care to the water environment and produce and implement plans and procedures to prevent discharge from works entering surface, groundwater, wetlands or coastal waters. This is usually undertaken in the form of an EMP which includes measures for the protection of ground and surface waters, pollution prevention measures and an emergency response plan for pollution events.
- 6.3.20 As such, it is concluded that the Project will not result in LSEs on the Humber Estuary SAC/SPA/Ramsar regarding operational impacts on hydrology.
- 6.3.21 During the operational phase, there will be no residential requirement for potable water. Since no additional water supplies beyond existing consents will be required to meet the water demand in the operational phase, there is no potential for the Project to reduce water supply to the Humber Estuary SAC/SPA/Ramsar in the operational phase and LSE is screened out.

Disturbance of Qualifying Species

- 6.3.22 A potential impact pathway from disturbance to qualifying species has been identified on the following Habitat sites:
- Humber Estuary SAC;
 - Humber Estuary SPA; and
 - Humber Estuary Ramsar.
- 6.3.23 Once the Project is operational there will be no requirement for day-to-day presence of people, and the infrastructure does not produce sounds that would result in disturbance of birds. The only potential for disturbance would therefore be during maintenance. It is impossible to forecast exactly when maintenance crews may need to visit parts of the site, or how often. However, maintenance visits are likely to be infrequent and for short

periods and will be much smaller in scale than construction. Given the area is an active agricultural landscape, with tractors, agricultural workers and other mobile plant present as a matter of course, it is considered that maintenance crews and activities would not constitute a material change to this background level of activity. LSE on all Habitats sites are therefore screened out from this impact pathway.

Barriers to Movement

6.3.24 A potential impact pathway in the form of barriers to the movement of qualifying species has been identified on the following Habitat sites:

- Humber Estuary SPA;
- Humber Estuary Ramsar;
- Thorne and Hatfield Moors SPA;
- Lower Derwent Valley SPA; and
- Lower Derwent Valley Ramsar.

6.3.25 As discussed in section 5.8, new structures can therefore potentially affect the ability of species to move across terrestrial landscapes by adding obstacles, impacting critical stopover sites, and increasing habitat fragmentation. Fragmentation of important migratory bird habitat has been identified as potentially one of the largest individual threats to migratory birds (Ref 8.77).

6.3.26 The Humber Estuary SPA/ Ramsar and Lower Derwent Valley SPA/ Ramsar are designated for migratory bird species. **At this stage, therefore, LSEs on the Humber Estuary SPA/Ramsar and Lower Derwent Valley SPA/Ramsar due to barriers to movement cannot be screened out. This will be reviewed and outputs of the screening and AA (where required) reported in the HRA which will accompany the application for development consent.**

6.3.27 Since 2023, a suite of ornithological surveys have been undertaken along the length of the draft Order Limits. The HRA which will accompany the application for development consent will be based upon the data collected from these extensive surveys and further survey work when complete.

6.3.28 Thorne and Hatfield Moors SPA is designated for supporting a breeding population of nightjar and lies 2.70 km from the draft Order Limits. The ability of the feature to safely and successfully move between feeding and nesting areas using flight-lines and movement routes is critical to their breeding success and to adult fitness and survival. This applies within the site boundary and where birds regularly move to and from off-site habitat where this is relevant. The foraging range of nightjar is known to extend up to several kilometres from their nest sites (Ref 8.77).

6.3.29 Ongoing baseline surveys have been monitoring potentially suitable habitat for foraging nightjar that intersects the draft Order Limits and their environs within 5 km of the SPA between June - July 2022 and June – July 2024 (see **Chapter 9 Ornithology**). No nightjars were observed therefore LSEs on Thorne and Hatfield SPA has been screened out for this impact pathway. This will be reviewed as part of the HRA which will accompany the application for development consent, dependant on the requirement for further monitoring surveys.

Injury/Mortality

- 6.3.30 A potential impact pathway from injury/mortality has been identified on the following Habitat sites:
- Humber Estuary SPA;
 - Humber Estuary Ramsar;
 - Thorne and Hatfield Moors SPA;
 - Lower Derwent Valley SPA; and
 - Lower Derwent Valley Ramsar.
- 6.3.31 The draft Order Limits and proposed overhead line cross the Humber Estuary SPA and Ramsar, it is also feasible that migratory birds, such as Bewick's swan, are travelling along the River Ouse to the Lower Derwent Valley SPA/ Ramsar.
- 6.3.32 The main sources of potential risk to birds from the presence of transmission overhead lines are:
- Mortality or injury through collision with transmission lines (including conductors and earth wires) or supporting structures; and
 - Mortality through electrocution on transmission lines or supporting structures.
- 6.3.33 The principal factors affecting the risk of bird mortality through collision and electrocution are:
- Species specific morphology, biology and vision;
 - Landscape and topography (e.g., siting of overhead lines near important habitats or flyways);
 - Weather affecting flight capability or visibility (strong winds/fog/heavy rain);
 - Technical aspects of the transmission line (spacing of conductors, creation of perches); and
 - The presence of existing barrier features that already result in changes to bird flight behaviours e.g., an embankment, woodland block, building or existing infrastructure corridor.
- 6.3.34 Earth wires are thought to be responsible for a much higher rate of collisions than the thicker, often bundled conductor wires. Earth wires are harder for birds to see, being thinner in diameter and typically positioned at the top of the wire array. Birds trying to gain height to avoid the larger more visible conductor wires may fail to see earth wire.
- 6.3.35 At this stage, there is insufficient information available to screen out collision risk/mortality as an impact pathway. **Therefore, LSEs of the Project on the Lower Derwent Valley SPA/ Ramsar and Humber Estuary SPA/Ramsar regarding the potential for collision risk/ mortality in the operational phase cannot be screened out. This will be reviewed and outputs of the screening and AA (where required) reported in the HRA which will accompany the application for development consent.**

- 6.3.36 Since 2023, a suite of ornithological surveys have been undertaken along the length of the draft Order Limits. Cumulative survey effort, at all vantage points, of nearly 1,500 hours up to the end of September 2024 yielded no observations of bird collisions with the existing overhead lines. The HRA which will accompany the application for development consent will be based upon the data collected from these extensive surveys and further survey work when complete.
- 6.3.37 As discussed in paragraph 6.3.27, ongoing baseline surveys been monitoring potentially suitable habitat for foraging nightjar that intersects the draft Order Limits and their environs within 5 km of the SPA between June - July 2022 and June – July 2024 (Volume 1: **Chapter 9 Ornithology**). No nightjars were observed therefore it is feasible to screen out LSEs on Thorne and Hatfield SPA. This will be reviewed as part of the HRA which will accompany the application for development consent, dependant on the requirement for further monitoring surveys. That aside, the collision risk of nightjar is likely to be negligible as this species is of a small size and more manoeuvrable than larger species such as geese and swans.

7. In-Combination Assessment

7.1 Introduction

7.1.1 Whilst there is no legal definition of what constitutes a ‘plan’ or ‘project’ for the purposes of the Habitats Regulations, Planning Inspectorate Advice on Habitat Regulations Assessment (Ref 8.71) advises that the following (but not limited to) should be considered for the HRA in-combination assessment:

- Projects that are under construction;
- Permitted application or applications not yet developed;
- Submitted application or applications not yet decided;
- Refused plans or projects subject to appeal but not yet decided;
- 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).

7.1.2 A ‘short list’ of developments with the potential for in-combination effects will be compiled. The in-combination assessment will be carried out as part of the HRA that will accompany the DCO application.

8. Conclusion

8.1.1 A preliminary test of the LSEs has been undertaken and reported within this Preliminary Stage 1 HRA Screenings Report, as the Project is still being developed and surveys are ongoing.

8.1.2 Impact pathways that have been considered are:

- Construction:
 - Direct habitat loss;
 - Loss of functionally linked land habitat;
 - Waterborne pollution;
 - Airborne pollution;
 - Hydrological change;
 - Disturbance of qualifying species; and
 - Spread of INNS.
- Operation
 - Loss of functionally linked land habitat;
 - Waterborne pollution;
 - Airborne pollution;
 - Hydrological change;
 - Disturbance of qualifying species;
 - Barriers to movement; and
 - Collision risk/ mortality.

8.1.3 In summary, at this preliminary stage it has not been possible to screen out LSEs for the following sites and impact pathways during construction:

- Direct loss of habitat on the Humber Estuary SAC/SPA and Ramsar;
- Loss of functionally linked land habitat on the Humber Estuary SPA/Ramsar and Thorne and Hatfield Moors SPA;
- Airborne pollution on the Humber Estuary SAC/SPA and Ramsar; and
- Disturbance to qualifying species of the Humber Estuary SAC/SPA and Ramsar.

8.1.4 At this preliminary stage it has not been possible to screen out LSEs for the following sites and impact pathways during operation:

- Loss of functionally linked land habitat on the Humber Estuary SPA/Ramsar;
- Barriers to movement on the Humber Estuary SPA/Ramsar, and the Lower Derwent Valley SPA/Ramsar; and
- Collision/mortality on interest features of the Humber Estuary SPA/Ramsar, and the Lower Derwent Valley SPA/Ramsar.

In-Combination

8.1.5 A 'short list' of developments with the potential for in-combination effects will be compiled. The in-combination assessment will form part of the HRA submitted in the DCO application.

9. References

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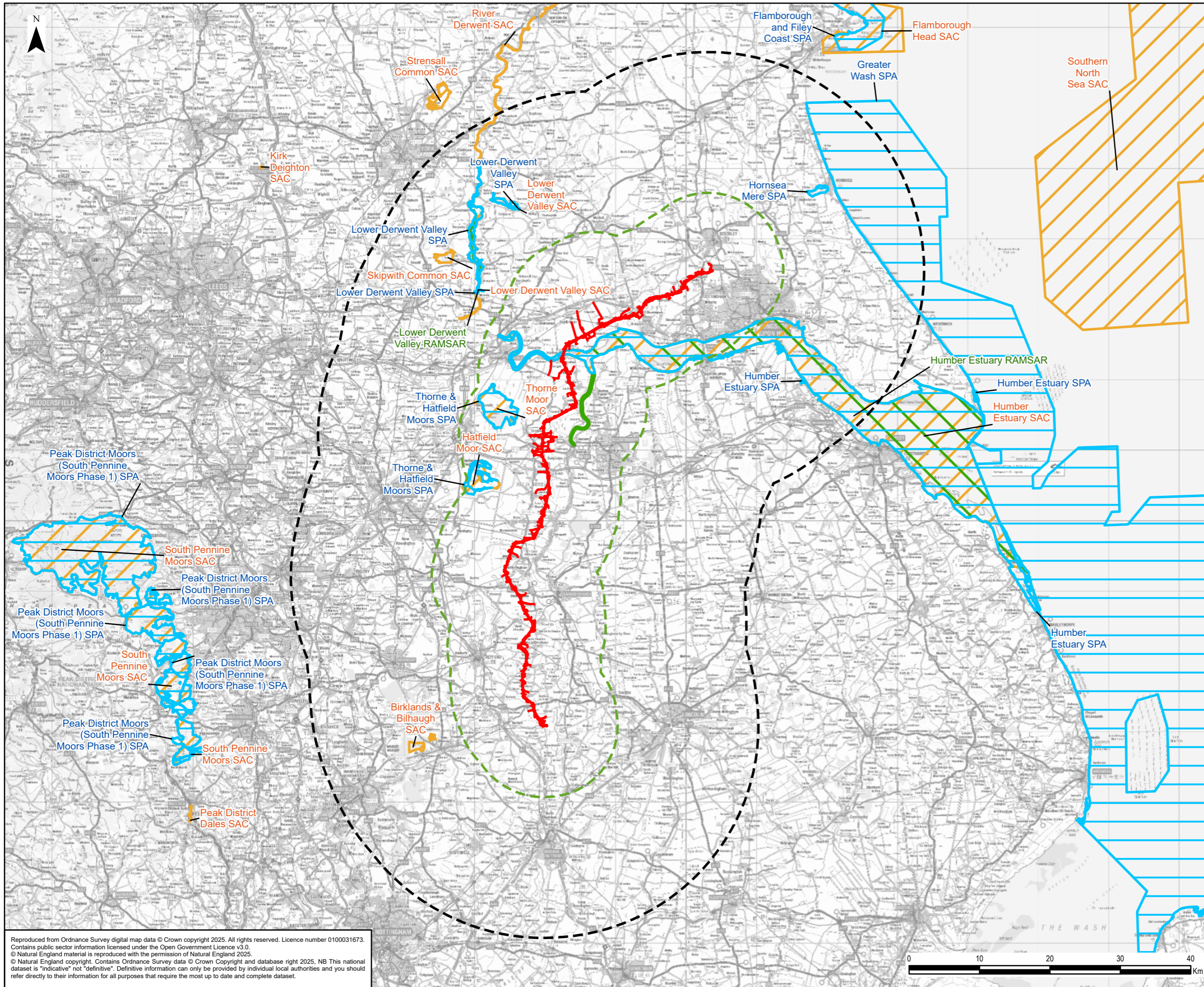
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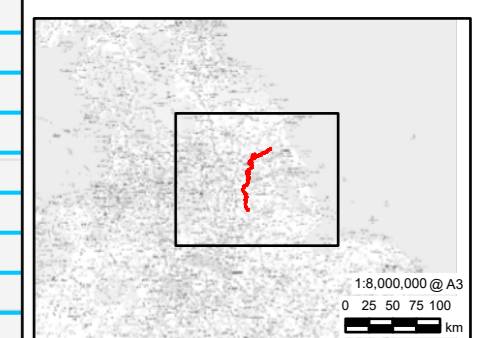
Appendix A

Figure A.1 - Draft Order Limits in Relation to Habitats Sites



Legend

- Draft Order Limits
- Study Area 10 km
- Study Area 30 km
- Ramsar Site
- Special Protection Area (SPA)
- Special Area of Conservation (SAC)



0	2/4/2025	HRA SCREENING REPORT	ID	JG	CC
Rev	Date	Description	GIS	Chk	App

nationalgrid

Scheme: NORTH HUMBER TO HIGH MARNHAM

Document Title: DRAFT ORDER LIMITS IN RELATION TO HABITAT SITES

Creator:	Date:	Checker:	Date:	Approver:	Date:
ID	2/4/2025	JG	2/4/2025	CC	2/4/2025
Document Ref:	Scale:	Format:	Sheets:	Rev:	
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Appendix B

Habitats Sites Details

Humber Estuary SAC

Introduction

The Humber is the second largest coastal plain Estuary in the UK, and the largest coastal plain estuary on the east coast of Britain. 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. The range of salinity, substrate and exposure to wave action influences the estuarine habitats and the range of species that utilise them; these include a breeding bird assemblage, winter and passage waterfowl, river and sea lamprey, grey seals, vascular plants and invertebrates.

Conservation Objectives (Ref 8.57)

With regard to the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

- Ensure that the integrity of the site is maintained or restored as appropriate, and ensure that the site contributes to achieving the Favourable Conservation Status of its Qualifying Features, by maintaining or restoring:
 - The extent and distribution of qualifying natural habitats and habitats of qualifying species
 - The structure and function (including typical species) of qualifying natural habitats
 - The structure and function of the habitats of qualifying species
 - The supporting processes on which qualifying natural habitats and habitats of qualifying species rely
 - The populations of qualifying species, and
 - The distribution of qualifying species within the site.

Qualifying Features (Ref 8.57)

The site qualifies under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:

- Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*)
- Coastal lagoons*
- Dunes with *Hippophae rhamnoides*
- Embryonic shifting dunes
- Estuaries
- Mudflats and sandflats not covered by seawater at low tide
- Fixed dunes with herbaceous vegetation ('grey dunes')*
- *Salicornia* and other annuals colonising mud and sand

- Sandbanks which are slightly covered by sea water all the time
- Shifting dunes along the shoreline with *Ammophila arenaria* ('white dunes')

Annex I priority habitats are denoted by an asterisk (*).

The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following species listed in Annex II:

- Grey seal *Halichoerus grypus*
- River lamprey *Lampetra fluviatilis*
- Sea lamprey *Petromyzon marinus*

Environmental Vulnerabilities

The Natural England Site Improvement Plan (SIP108) (Ref 8.47) identifies the following threats and pressures linked to the site:

- Water pollution
- Coastal squeeze
- Changes in species distributions
- Undergrazing
- Invasive species
- Natural changes to site conditions
- Public access/ disturbance
- Fisheries: commercial marine and estuarine
- Direct land take from development
- Air pollution: impact of atmospheric nitrogen deposition
- Direct impact from third party

The 2023 Supplementary Advice to the Conservation Objectives (SACO) (Ref 8.58) goes into more detail on these vulnerabilities.

Humber Estuary SPA/ Ramsar

Introduction

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*.

Conservation Objectives (Ref 8.59)

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change:

- 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.

Qualifying Features

The site qualifies as an SPA (Ref 8.59) 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:

- Avocet *Recurvirostra avosetta* (wintering and breeding)
- Bittern *Botaurus stellaris* (wintering and breeding)
- Hen harrier *Circus cyaneus* (wintering)
- Golden plover *Pluvialis apricaria* (wintering)
- Bar-tailed godwit *Limosa lapponica* (wintering)
- Ruff *Philomachus pugnax* (passage)
- Marsh harrier *Circus aeruginosus* (breeding)
- Little tern *Sterna albifrons* (breeding)

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:

- Shelduck *Tadorna tadorna* (wintering)
- Knot *Calidris canutus* (wintering and passage)
- Dunlin *Calidris alpina* (wintering and passage)
- Black-tailed godwit *Limosa limosa* (wintering and passage)
- Redshank *Tringa tetanus* (wintering and passage)

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:

- Assemblage qualification;
 - In the non-breeding season, the area regularly supports 153,934 individual waterbirds, 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*.

Natural England recommends focusing on what are referred to as the ‘main component species’ of the assemblage (Ref 8.60). The assemblage qualification is therefore subject to change as species’ populations change. It should be noted that species listed on the citation under the assemblage features, whose populations have fallen to less than 1% of the national population, retain their status as a main component species and should be considered when assessing the impacts of a project or plan on the Humber Estuary SPA.

Natural England advises that the main component species of the Humber Estuary SPA non-breeding waterbird assemblage include (as of June 2023):

- Species listed individually under the assemblage feature on the SPA citation:
 - Avocet *Recurvirostra avosetta* (non-breeding)
 - Bar-tailed godwit *Limosa lapponica* (non-breeding)
 - Bittern *Botaurus stellaris* (non-breeding)
 - Black-tailed godwit *Limosa limosa islandica* (non-breeding)¹
 - Brent goose *Branta bernicla* (non-breeding)¹
 - Curlew *N. arquata* (non-breeding)¹
 - Dunlin *Calidris alpina alpina* (non-breeding)¹
 - Golden plover, *Pluvialis apricaria* (non-breeding)¹
 - Goldeneye *Bucephala clangula* (non-breeding)
 - Greenshank *T. nebularia* (non-breeding)
 - Grey plover *P. squatarola* (non-breeding)
 - Knot, *Calidris canutus* (non-breeding)
 - Lapwing *Vanellus vanellus* (non-breeding)¹
 - Mallard *Anas platyrhynchos* (non-breeding)¹
 - Oystercatcher *Haematopus ostralegus* (non-breeding)
 - Pochard *Aythya farina* (non-breeding)
 - Redshank *Tringa totanus* (non-breeding)¹
 - Ringed plover *Charadrius hiaticula* (non-breeding)
 - Ruff *Philomachus pugnax* (non-breeding)¹
 - Sanderling *Calidris alba* (non-breeding)
 - Scaup *Aythya marila* (non-breeding)
 - Shelduck *Tadorna tadorna* (non-breeding)¹
 - Teal *Anas crecca* (non-breeding)¹
 - Turnstone *Arenaria interpres* (non-breeding)

- Whimbrel *Numenius phaeopus* (non-breeding)¹
- Wigeon, *Anas Penelope* (non-breeding)

And:

- Species which are not listed on the SPA citation but occur at site levels of more than 1% of the national population according to the most recent Humber Estuary Wetland Bird Survey (WeBS) 5-year average count:
 - Green sandpiper *Tringa ochropus* (non-breeding)
 - Greylag goose *Anser anser* (non-breeding)¹
 - Little egret *Egretta garzetta* (non-breeding)¹
 - Pink-footed goose *Anser brachyrhynchus* (non-breeding)¹
 - Shoveler *Anas clypeata* (non-breeding)
 - Crane *Grus grus* (non-breeding)¹

Natural England also specify the need to consider potential impacts on species which are not considered to be non-breeding waterbirds but are listed on the citation qualifying under article 4.1 and 4.2 of the Directive. These include:

- Hen harrier *Circus cyaneus* (non-breeding)¹
- Marsh harrier *Circus aeruginosus* (breeding)¹
- Little tern *Sterna albifrons* (breeding)
- Avocet *Recurvirostra avosetta* (breeding)
- Bittern *Botaurus stellaris* (breeding)

The species marked ¹ **in bold text** are known to use off-site supporting habitat / functionally linked land (FLL) (e.g. arable farmland, grassland/pasture, and/or non-estuarine waterbodies) in the non-breeding season and may therefore be the most relevant for assessing potential impacts of a proposed plan/project on birds using FLL associated with the Humber Estuary SPA.

The site qualifies as a Ramsar site for the following reasons (Ref 8.61):

- 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.
- 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.
- Ramsar criterion 6 - species/populations occurring at levels of international importance:
 - Golden plover, *Pluvialis apricaria altifrons* subspecies (passage and wintering)
 - Knot *Calidris canutus islandica* subspecies (passage and wintering)

- Dunlin *Calidris alpina alpina* subspecies (passage and wintering))
- Black-tailed godwit *Limosa limosa islandica* subspecies (passage and wintering))
- Redshank *Tringa tetanus brittanica* subspecies (passage and wintering)
- Shelduck *Tadorna tadorna* (breeding)
- Bar-tailed godwit *Limosa lapponica lapponica* subspecies (wintering)
- 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.

Environmental Vulnerabilities

The Natural England Site Improvement Plan (SIP108) (Ref 8.47) identifies the following threats and pressures linked to the site:

- Water pollution
- Coastal squeeze
- Changes in species distributions
- Undergrazing
- Invasive species
- Natural changes to site conditions
- Public access/ disturbance
- Fisheries: fish stocking
- Direct land take from development
- Shooting/ scaring
- Direct impact from third party
- Inappropriate scrub control

The 2023 Supplementary Advice to the Conservation Objectives (SACO) (Ref 8.62) goes into more detail on these vulnerabilities.

The Information Sheet on Ramsar Wetlands (RIS) (Ref 8.61) identifies the following factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

- Disturbance to vegetation through cutting / clearing - reedbeds being cut and cleared on margins of pits associated with angling;
- Vegetation succession - lack of reedbed management leading to scrub encroachment;
- Water diversion for irrigation/domestic/industrial use - abstraction causes reduced freshwater input;
- Overfishing - substantial lamprey by-catch in eel nets in River Ouse;
- Pollution: agricultural fertilisers - reduced dissolved oxygen in River Ouse is a barrier to fish migration;

- Recreational/tourism disturbance (unspecified) - particularly illegal access by motorised recreational vehicles and craft; and
- Other factor - coastal squeeze causing loss of intertidal habitats and saltmarsh due to sea level rise and fixed defences.

Thorne & Hatfield Moors SPA

Introduction

The site is an extensive lowland raised bog and encompasses both Thorne Moor SAC and Hatfield Moor SAC, which are described below.

Conservation Objectives

With regard to the SPA (Ref 8.63) and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

- 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.

Qualifying Features

The site qualifies as an SPA (Ref 8.64) under article 4.1 of the Directive (79/409/EEC) as it is used regularly by 1% or more of the Great Britain population of a species listed in Annex 1 in any season:

- Nightjar *Caprimulgus europaeus* (breeding)

Environmental Vulnerabilities

The Natural England Site Improvement Plan (SIP246) (Ref 8.65) identifies the following threats and pressures linked to the site:

- Public access/ disturbance
- Planning permission: general

Thorne Moor SAC

Introduction

Thorne Moor is England's largest area of raised bog, lying a few kilometres from the smaller Hatfield Moors, both within the former floodplain of the rivers feeding the Humber estuary (Humberhead Levels), and includes the sub-components Goole Moors and Crowle Moors.

Although management has increased the proportion of active raised bog at Thorne Moors, the inclusion of Goole Moors, where peat-extraction has now ceased, means that the site is still predominantly degraded raised bog. The restored secondary surface is rich in species of bogmosses *Sphagnum* spp., common and hare's-tail cottongrasses *Eriophorum angustifolium* and *E. vaginatum*, heather *Calluna vulgaris*, cross-leaved heath *Erica tetralix*, round-leaved sundew *Drosera rotundifolia*, cranberry *Vaccinium oxycoccos* and bog-rosemary *Andromeda polifolia*.

Conservation Objectives (Ref 8.66)

With regard to the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

- 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
 - The structure and function (including typical species) of qualifying natural habitats, and
 - The supporting processes on which qualifying natural habitats rely.

Qualifying Features

The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:

- Degraded raised bogs still capable of natural regeneration

Environmental Vulnerabilities

The Natural England Site Improvement Plan (SIP246) (Ref 8.65) identifies the following threats and pressures linked to the site:

- Drainage
- Inappropriate scrub control
- Air pollution: impact of atmospheric nitrogen
- Peat extraction
- Invasive species

The 2019 Supplementary Advice to the Conservation Objectives (SACO) (Ref 8.66) goes into more detail on these vulnerabilities.

Hatfield Moor SAC

Introduction

Hatfield Moors is a remnant of an extensive lowland raised bog which once occupied the Humberhead levels. Hatfield is unique in having developed directly upon nutrient deficient gravels without an initial reed-swamp phase. Much of the bog has been cut for peat yet a restricted representative flora and fauna persists within a mosaic of mire and dry heath habitats beneath birch scrub. The mire communities are dominated by cottongrasses *Eriophorum vaginatum* and *E. angustifolium*, cross-leaved heath *Erica tetralix* and bogmosses *Sphagnum*

spp., but include locally rare species such as cranberry *Vaccinium oxycoccus*, bog myrtle *Myrica gale* and bog rosemary *Andromeda polifolia*.

Conservation Objectives (Ref 8.68)

With regard to the natural habitats and/or species for which the site has been designated (the 'Qualifying Features' listed below), and subject to natural change;

- 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
 - The structure and function (including typical species) of qualifying natural habitats, and
 - The supporting processes on which qualifying natural habitats rely.

Qualifying Features

The site is designated under article 4(4) of the Directive (92/43/EEC) as it hosts the following habitats listed in Annex I:

- Degraded raised bogs still capable of natural regeneration

Environmental Vulnerabilities

The Natural England Site Improvement Plan (SIP246) (Ref 8.65) identifies the following threats and pressures linked to the site:

- Drainage
- Inappropriate scrub control
- Air pollution: impact of atmospheric nitrogen
- Peat extraction
- Invasive species

The 2019 Supplementary Advice to the Conservation Objectives (SACO) (Ref 8.67) goes into more detail on these vulnerabilities.

Lower Derwent Valley SPA/Ramsar

Introduction

The Lower Derwent Valley covers an area of 1,089.4 hectares (ha), draining a catchment of some 1,362 km² before entering the Humber system. It consists of extensive areas of traditionally managed species rich, alluvial flood-meadow, of a kind now highly restricted in the UK.

Conservation Objectives

With regard to the SPA (Ref 8.69) and the individual species and/or assemblage of species for which the site has been classified (the 'Qualifying Features' listed below), and subject to natural change;

- 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.

Qualifying Features (Ref 8.70)

The site qualifies as an SPA under Article 4.1 of the Directive (79/409/EEC) by regularly supporting nationally important winter numbers of the following Annex I species:

- Bewick's swan *Cygnus columbianus*
- Golden plover *Pluvialis apricaria*
- Ruff *Philomachus pugnax*

The site also qualifies under Article 4.1 of the Directive (79/409/EEC) for holding a mean peak number of 100⁸ ruff during spring migration.

The site qualifies under Article 4.2 of the Directive (79/409/EEC) by regularly supporting a breeding population of 50⁹ pairs of shoveler *Anas clypeata*.

The site also qualifies under Article 4.2 of the Directive (79/409/EEC) as an area of international importance to waterfowl by regularly supporting over 20,00 waterfowl in winter, including: teal *Anas crecca* and wigeon *Anas penelope*.

The site also supports nationally important numbers of the flowing migratory species: shoveler, pochard *Aythya farina*, whimbrel *Numenius phaeopus* and ruff.

The site qualifies as a Ramsar site for the following reasons (Ref 8.61):

- Ramsar criterion 1 - the site represents one of the most important examples of traditionally managed species-rich alluvial flood meadow habitat remaining in the UK. The river and flood meadows play a substantial role in the hydrological and ecological functioning of the Humber Basin.
- Ramsar criterion 2 - the site has a rich assemblage of wetland invertebrates including 16 species of dragonfly and damselfly, 15 British Red Data Book wetland invertebrates as well as a leafhopper, *Cicadula ornate* for which Lower Derwent Valley is the only known site in Great Britain.
- Ramsar criterion 4 - the site qualifies as a staging post for passage birds in spring. Of particular note are the nationally important numbers of ruff, *Philomachus pugnax* and whimbrel, *Numenius phaeopus*.
- Ramsar criterion 5 - assemblages of international importance:

⁸ At the time of designation in 1993

⁹ At the time of designation in 1993

- Species with peak counts in winter: 31942 waterfowl¹⁰
- Ramsar criterion 6 - species/populations occurring at levels of international importance:
 - Qualifying Species/populations (as identified at designation) - Species with peak counts in winter:
 - i. Wigeon *Anas penelope*
 - ii. Teal *Anas crecca*

Environmental Vulnerabilities

The Natural England Site Improvement Plan (SIP058) (Ref 8.43) identifies the following threats and pressures linked to the site:

- Hydrological changes
- Drainage
- Public access/ disturbance
- Invasive species
- Undergrazing
- Inappropriate scrub control

The 2022 Supplementary Advice to the Conservation Objectives (SACO) (Ref 8.44) goes into more detail on these vulnerabilities.

The RIS (Ref 8.61) identifies the following factors (past, present or potential) adversely affecting the site's ecological character, including changes in land (including water) use and development projects:

- Water diversion for irrigation/domestic/industrial use
- Reservoir/barrage/dam impact: flooding

¹⁰ At the time of designation

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