Humber Zero (Proposed VPI Development)

Report to Inform Habitats Regulations Assessment

VPI Immingham

Project number: 60668866
REVISION 01

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Quality information

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1. Introduction

Overview

1.1 This report to inform a Habitats Regulations Assessment (HRA) has been prepared on behalf of VPI Immingham LLP (the Applicant) for the Proposed VPI Development. The terms of reference used in this report are consistent with those defined within the main chapters of the ES (Volume 1). References are included, under relevant subject headings, to those chapters, technical appendices and/ or paragraphs within the ES that contain the information required by the competent authority to undertake an "appropriate assessment" under the terms of Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (commonly referred to as the 'Habitats Regulations'). It is designed to serve two key functions:

- to assist the competent authority by making it easier to undertake and consult on a Habitats Regulations Assessment; and
- to ensure that all the relevant information needed for a Habitats Regulations Assessment, which is included within the various chapters of the ES, is summarised (and cross referenced to as appropriate) within one document.

1.2 This report to inform HRA represents Revision 1 having been updated since the original report was issued in February 2023 with the application to North Lincolnshire Council. The updates include additional clarifications and assessment work undertaken in respect of noise and air quality impact pathways, following consultation with Natural England and North Lincolnshire Council.

1.3 The following sections of this report have been updated:

- Section 4 (Baseline Evidence Gathering): further information added into designated features section for Humber Estuary SSSI unit condition assessments relevant to the air quality assessment, in terms of evidencing the saltmarsh habitat types present as receptors.
- Section 5 (Stage 1: Screening for Likely Significant Effects): Construction Noise/ Visual Disturbance to Functionally Linked Land (Rosper Road Pools) – this pathway has been separated into sections for construction visual impacts and construction noise impacts, with the latter pathway now screened as LSE and taken forward to Stage 2: Appropriate Assessment.
- Section 5 (Stage 1: Screening for Likely Significant Effects): Construction Noise/ Visual Disturbance to Functionally Linked Land (Terrestrial Fields) – this pathway has been separated into sections for construction visual impacts and construction noise impacts, with the latter pathway now screened as LSE and taken forward to Stage 2: Appropriate Assessment.
- Section 5 (Stage 1: Screening for Likely Significant Effects): Operational Noise/ Visual Disturbance to Functionally Linked Land (Rosper Road Pools) – this pathway has been separated into sections for operational visual impacts and operational noise impacts. Further clarification has been provided with a comparison of operational noise against the baseline noise monitoring results to inform the no LSE screening conclusion (Section G.3 of Appendix G).
- Section 5 (Stage 1: Screening for Likely Significant Effects): Operational Noise/ Visual Disturbance to Functionally Linked Land (Terrestrial Fields) - this pathway has been separated into sections for operational visual impacts and operational noise impacts. Further clarification has been provided with a comparison of operational noise against the baseline noise monitoring results to inform the no LSE screening conclusion (Section G.3 of Appendix G).
- Section 6 (Stage 2: Appropriate Assessment): Construction Noise Disturbance to Functionally Linked Land (Rosper Road Pools) - further assessment to take into

account a 3dBA threshold change in noise levels from ambient levels for indicating potential disturbance to birds. Additional assessment and noise contour plots provided in Section G.1 of Appendix G.

- Section 6 (Stage 2: Appropriate Assessment): Construction Noise Disturbance to Functionally Linked Land (Terrestrial Fields) - further assessment to take into account a 3dBA threshold change in noise levels from ambient levels for indicating potential disturbance to birds. Additional assessment and noise contour plots provided in Section G.2 of Appendix G.
- Section 6 (Stage 2: Appropriate Assessment): Operational Air Quality – further clarification of habitat types screened into assessment and revision of habitat types based on information provided by Natural England.

The Proposed VPI Development

Description

1.4 As described in ES Chapter 1 (Introduction), the ES relates to two Proposed Developments – the Proposed VPI Development and the Proposed Phillips 66 Development – which together comprise the first phase of the Humber Zero project.

1.5 Although a combined ES has been prepared for the two Proposed Developments it is acknowledged that it is necessary to undertake a separate HRA for each of the Proposed Developments alone as well as in combination (and also in combination with any other relevant plans or projects). This HRA therefore considers the Proposed VPI Development only. A separate HRA document has been prepared for the Proposed Phillips 66 Development, although clearly there is much duplication between the two documents as they are on adjoining plots.

1.6 The Proposed Developments are necessarily located adjacent to the existing activities that are to be decarbonised (namely the Humber Refinery Fluid Catalytic Cracker (FCC) and the VPI Immingham Combined Heat and Power (CHP) Plant), but they are also well situated to connect into either the Viking CCS carbon dioxide (CO_2) gathering network and/or the Humber Low Carbon Pipelines CO_2 gathering network for transport to storage sites under the North Sea. Development Consent Order applications for both of these CO_2 gathering networks are being progressed by Harbour Energy and National Grid respectively and are due to be submitted in mid 2023.

1.7 The Proposed VPI Development will comprise a Post-combustion Carbon Capture (PCC) plant and associated facilities for capturing CO_2 from two of the gas turbines (GT1 and GT2)[1] and two auxiliary boilers at the VPI Immingham CHP Plant.

1.8 The Proposed Phillips 66 Development will comprise a PCC plant and associated facilities for the Fluid Humber Refinery FCC.

1.9 The Proposed VPI Development will include the following components:

- ducting to connect GT1, GT2 and the auxiliary boilers to the PCC plant;
- two PCC units (or 'trains'), each with associated blower, direct contact cooler, absorber, stack, stripper/ regenerator, thermal reclaimer unit and air-cooled heat exchangers;
- a CO_2 vent stack for use during start up, shut down and emergencies only;
- CO_2 compression facility with associated air-cooled heat exchangers;
- oxygen removal and dehydration facilities;
- CO_2 metering and a pipeline connecting the PCC plant and compression facilities to the CO_2 gathering network interface;

[1] The third gas turbine is proposed to be converted to hydrogen firing in future as part of the wider Humber Zero project.

- up to four on-site electrical substations;
- caustic, solvent and other chemical offloading and storage facilities;
- utilities (including chillers, steam generator, hydrogen package and air compressors)
- internal access roads;
- surface water drainage system;
- realignment of the existing ditch (South Killingholme Drain) within the VPI Site;
- construction and maintenance laydown areas; and
- a new site access from Rosper Road.

Need Case

1.10 The need case for the Proposed VPI Development is set out in Chapter 3 (Proposed Developments Description, Need and Alternatives Considered), a summary of which is provided below.

1.11 The need for the Proposed VPI Development is defined by the UK Government's legally binding target to reach net zero by 2050. This is set out in ES Chapter 5 (Policy Context).

1.12 The Humber is the largest industrial cluster in the UK in terms of existing CO_2 emissions, emitting approximately 20 million tonnes of CO_2 per year. The industrial cluster is important for the UK energy security. The Proposed Developments will remove up to 95% of CO_2 emissions (3.8 million tonnes of CO_2 per year) from two of the large industrial processes in the Humber cluster (the Humber Refinery's FCC and the VPI Immingham CHP Plant), representing a 19% reduction in the overall emissions from the Humber industrial cluster.

Alternatives

1.13 The alternatives are described in Section 3.9 of ES Chapter 3 (Proposed Developments, Need and Alternatives Considered) including the reasons for the Applicant to proceed with the Proposed VPI Developments, a summary of which is provided below.

1.14 The consideration of alternatives and design evolution has been undertaken with the aim of developing a PCC plant for the CHP Plant to meet the identified national need for industrial decarbonisation, while avoiding and/ or reducing adverse environmental effects (following the mitigation hierarchy of avoid, reduce and, if possible, remedy), as well as maintaining operational efficiency and cost-effectiveness, and considering other relevant matters such as available land and planning policy.

1.15 The alternative of ceasing operation of the CHP Plant GT1/ GT2/ auxiliary boilers is not considered to be an option given the economic significance of the VPI Immingham CHP Plant which supplies heat and power to the Humber Refinery and the adjacent Lindsey Oil Refinery.

1.16 Available alternative sites were considered, however the nature of the Proposed VPI Development involves retrofitting existing infrastructure with carbon capture technologies, therefore proximity to the existing CHP Plant is a key consideration.

1.17 The location for the Proposed VPI Development was selected for its availability and proximity to the CHP Plant. Land to the north of the CHP Plant is not available as it is already allocated to the potential development of an Open Cycle Gas Turbine (OCGT) Power Station for which a Development Consent Order was granted in 2020. Land to the west comprises the existing refineries, and land to the east is separated by a public highway (Rosper Road). For this reason, alternative sites are not considered appropriate.

1.18 An alternative technology to decarbonise the VPI Immingham CHP Plant would be hydrogen firing. At present there is insufficient hydrogen available for firing the VPI Immingham CHP Plant GT1 and GT2, so carbon capture is the only available option within the project timescales (i.e. completion in 2027). For this reason, alternative technologies are not considered feasible at this stage within the project timescales.

1.19 Alternative design options have been explored for the Proposed VPI Development. Decisions taken regarding the concept design have, where relevant and possible, been informed by environmental appraisal and assessment work and by consultation with stakeholders. These include:

- cooling technology selected to reduce water demand because water resources are already constrained in the region;
- carbon capture technology provider (Shell) selected to deliver the highest carbon capture rate (95%);
- two larger PCC trains selected rather than three smaller PCC trains to reduce landtake; and
- options to connect to either Humber Low Carbon Pipelines and/ or Viking CCS CO_2 transmission network kept open to maintain operational and commercial flexibility.

2. Legislative Framework

2.1 This is a technical report to inform and support the competent authority (North Lincolnshire Council) in its decision making. As part of the decision-making process it is legally necessary to consider whether the Proposed VPI Development is likely to have a significant impact on areas that have been internationally designated for nature conservation purposes (i.e. 'European sites'). This requirement is set out in the Conservation of Habitats and Species Regulations 2017 (as amended) (the 2017 Regulations). The 2017 Regulations apply the precautionary principle[2] to European Sites.

2.2 Over the years, the phrase 'Habitats Regulations Assessment' (HRA) has come into wide currency to describe the overall process set out in the 2017 Regulations, from the screening for Likely Significant Effects (LSEs) through to identification of Imperative Reasons of Overriding Public Interest (IROPI). This has arisen in order to distinguish the overall process from the individual stage of "Appropriate Assessment". Throughout this Report the term HRA is used for the overall process and restricts the use of Appropriate Assessment to the specific stage of that name. Box 1 sets out the legislative basis for HRA.

Conservation of Habitats and Species Regulations 2017 (as amended)

Regulation 63 of the 2017 Regulations states that:

"*A competent authority, before deciding to … give any consent for a plan or project which is likely to have a significant effect on a European site … must make an appropriate assessment of the implications for the plan or project in view of that site's conservation objectives… The competent authority may agree to the plan or project only after having ascertained that it will not adversely affect the integrity of the European site*."

Box 1. The Legislative basis for Appropriate Assessment

2.3 If adverse effects on integrity are identified, mitigation should be considered to avoid those effects or reduce them to an insignificant level. However, where no alternative solution exists, and so an adverse effect on integrity remains, a further assessment should be made of whether the scheme is required for IROPI and whether there are any viable alternatives to delivering the objectives of the scheme without causing harm. If the scheme meets those IROPI and No Alternatives tests, compensatory measures will be required in order to maintain the integrity of the overall network of internationally important sites in the UK, known as the National Site Network (NSN). The HRA methodology is set out in Section 3.

[2] The Precautionary Principle, which is referenced in Article 191 of the Treaty on the Functioning of the European Union, has been defined by the United Nations Educational, Scientific and Cultural Organisation (UNESCO, 2005) as:
"When human activities may lead to morally unacceptable harm [to the environment] that is scientifically plausible but uncertain, actions shall be taken to avoid or diminish that harm. The judgement of plausibility should be grounded in scientific analysis".

3. Assessment Method

Introduction

3.1 The HRA has been carried out with reference to the general EC guidance on HRA[3], general guidance on HRA published by the UK government in July 2019[4] and February 2021[5], and Planning Inspectorate (PINS) Advice Note 10[6] (even though the Proposed VPI Development is not a nationally significant infrastructure project (NSIP)).

3.2 The UK left the EU on 31 January 2020 under the terms set out in the European Union (Withdrawal Agreement) Act 2020 ("the Withdrawal Act"). The Withdrawal Act retains the body of existing EU-derived law within our domestic law, meaning that legislation relating to nature conservation continues to apply within the UK. As such this HRA takes account of relevant EU case law (for instance, the Holohan and People over Wind cases, discussed below).

3.3 Box 2 below sets out the stages of HRA according to PINS Advice Note 10 as that document clearly sets out the HRA process applicable to all plans and projects (not just NSIPs).

3.4 Whilst the HRA decisions must be taken by the competent authority (North Lincolnshire Council), the information needed to undertake the necessary assessments must be provided by the Applicant. This HRA provides the information needed for the competent authority to establish whether there are any LSEs or, where those are found to be present, adverse effects on site integrity from the proposed development.

HRA Stage 1: Screening for Likely Significant Effects (LSEs)

3.5 The objective of HRA Stage 1 LSEs screening stage is to 'screen out' those aspects of the Proposed VPI Development that can, without any detailed appraisal, be concluded not to result in significant adverse effects upon European sites, usually because there is no mechanism for an adverse interaction (i.e. a pathway) with European sites. The remaining aspects (if there are remaining aspects) are then taken forward to Appropriate Assessment. The assessment must consider the potential for effects in-combination with other plans and projects.

3.6 This report has been prepared having regard to all relevant case law relating to the 2017 Regulations, the Habitats Directive and Birds Directive. This includes the ruling by the Court of Justice of the European Union (CJEU) in the case of People Over Wind, Peter Sweetman v Coillte Teoranta (C-323/17).

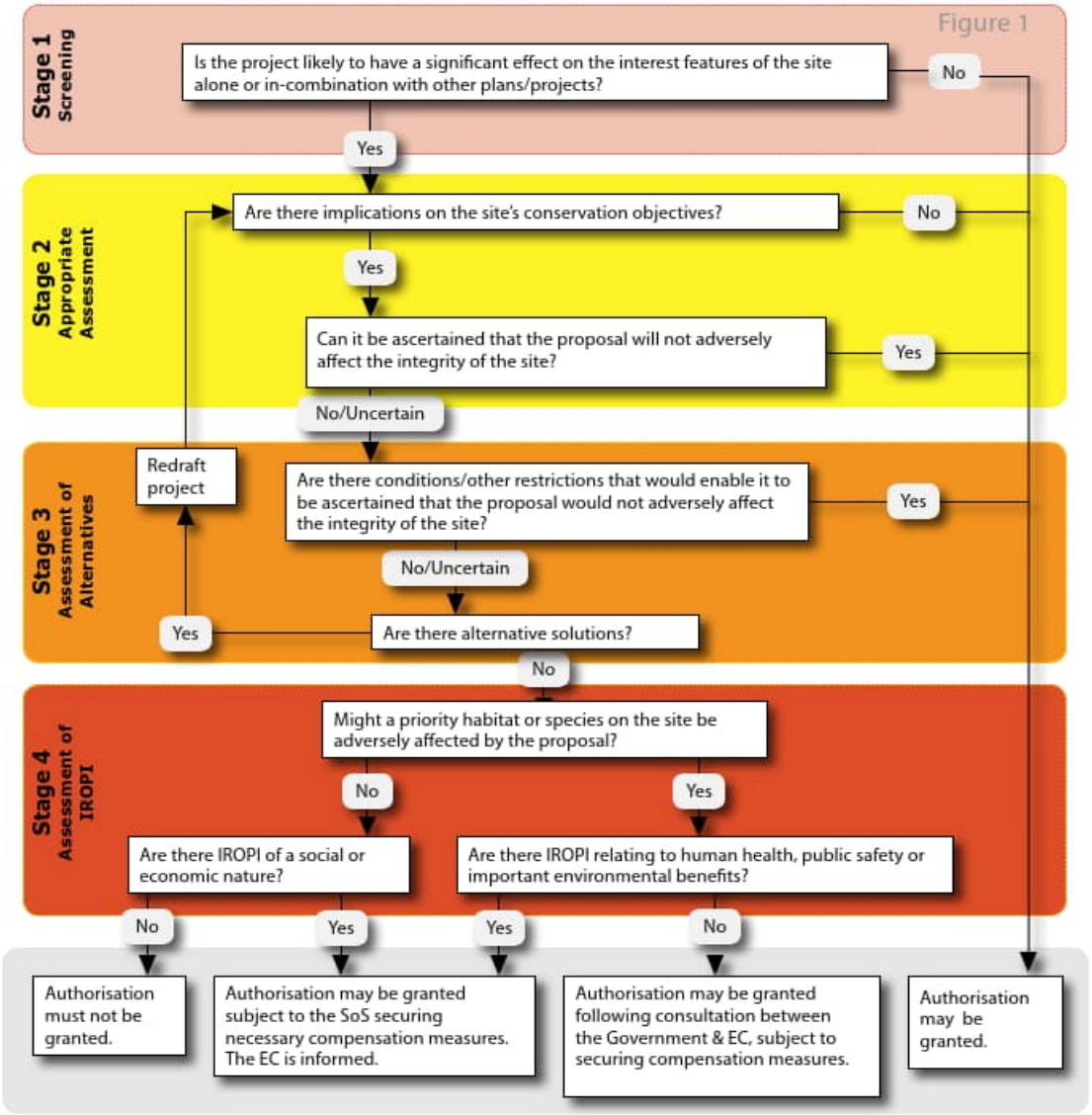
3.7 This case held that "*it is not appropriate, at the screening stage, to take account of the measures intended to avoid or reduce the harmful effects of the plan or project on that site*" (paragraph 40). This establishes that mitigation measures cannot be taken into account at the HRA Stage 1 LSEs screening stage, but they can be taken into account when undertaking an Appropriate Assessment at HRA Stage 2. However, it is important to note that not all mitigation measures are excluded from consideration – only those "*intended to avoid or reduce the harmful effects of the… project on that site*". Mitigation measures which are, for example, intended to avoid effects on a local watercourse outside the European site designated boundary but which outfalls into the European designated site, can be taken into account as the

[3] European Commission. (2001). *Assessment of plans and projects significantly affecting Natura 2000 sites. Methodological guidance on the provisions of Article 6(3) and (4) of the Habitats Directive 92/43/EEC*. Luxembourg: Office of Official Publications of the European Communities.
[4] Ministry of Housing, Communities & Local Government. (July 2019). *Guidance on the use Habitats Regulations Assessment*. Available at: https://www.gov.uk/guidance/appropriate-assessment [Accessed on the 25/04/2022]
[5] Department for Environment, Food & Rural Affairs. (2021, February 24). *How a competent authority must decide if a plan or project proposal that affects a European site can go ahead*. Available at: https://www.gov.uk/guidance/habitats-regulations-assessments-protecting-a-european-site [Accessed on the 25/04/2022]
[6] The Planning Inspectorate. (November 2017). *Advice Note Ten: Habitats Regulations Assessment relevant to nationally significant infrastructure projects*, Version 8. Available at: https://infrastructure.planninginspectorate.gov.uk/legislation-and-advice/advice-notes/advice-note-ten/ [Accessed on the 25/04/2022]

benefit conveyed to the European site is coincidental and the measures would be delivered as part of good practice even if no European sites were present.

3.8 This represents a deviation from the approach usually adopted in the ecological impact assessment (EcIA), which considers embedded mitigation (even those measures that are included to directly avoid or reduce harmful effects on a European designated site) to form a part of the proposed development, and takes these measures into account when assessing the potential impacts on qualifying habitats and species.

3.9 Where mitigation measures are mentioned in this report and taken into account at the screening stage, they are therefore ones which may reduce or avoid harmful effects on certain (local) habitats or species but are not relied on to directly avoid or reduce harmful effects on the European. This includes standard best practice mitigation measures incorporated into the Outline Construction Environmental Management Plan (CEMP) such as management of surface water runoff.



Box 2. Four Stage approach to Habitats Regulations Assessments of Projects.

HRA Stage 2 – Appropriate Assessment

3.10 Where it is determined that a conclusion of 'no LSE' cannot be drawn, the HRA assessment proceeds to the next stage of HRA known as HRA Stage 2 - Appropriate Assessment. Case law has clarified that 'Appropriate Assessment' is not a technical term. In other words, there are no specific technical analyses, or level of detail, that are classified by law as belonging to

Appropriate Assessment rather than the screening for LSEs. The Appropriate Assessment constitutes whatever level of further assessment is required to determine whether an adverse effect on the integrity of a European site would arise as a result of the Proposed Development.

3.11 By virtue of the fact that HRA Stage 2 – Appropriate Assessment follows the screening process, there is an understanding that the analysis will be more detailed than that undertaken at the previous stage. One of the key considerations during HRA Stage 2 - Appropriate Assessment is whether there is available mitigation that would address the potential effect, allowing for a conclusion of no adverse effect on integrity. In practice, HRA Stage 2 – Appropriate Assessment takes any element of the proposed development that could not be excluded as having LSEs following HRA Stage 1 and assesses the potential for an effect in more detail, with a view to concluding whether that element would cause an adverse effect on site integrity for a European site. Adverse effects on a European site's integrity include disruption of the coherent structure and function of the European site(s) and the ability of the site to achieve its Conservation Objectives.

3.12 In 2018 the Holohan ruling was handed down by the European Court of Justice. Among other provisions paragraph 39 of the ruling states that *"As regards other habitat types or species, which are present on the site, but for which that site has not been listed, and with respect to habitat types and species located outside that site, … typical habitats or species must be included in the appropriate assessment, if they are necessary to the conservation of the habitat types and species listed for the protected area"* [emphasis added]. This ruling has been considered in relation to the Proposed VPI Development, particularly with regard to mobile qualifying species in the Humber Estuary SPA / Ramsar.

In Combination Scope

3.13 It is a requirement of Regulation 63(a) of the 2017 Regulations to not only assess the impacts of a development project alone, but also to investigate whether there is a potential for in-combination effects with other projects or plans. In practice, such in-combination assessment is of greatest relevance when an impact pathway relating to a project would otherwise be screened out – not because it is not present – but because its individual contribution is considered not to result in LSEs.

3.14 For the purposes of this HRA, several plans, projects and strategies proposing/ aiming for development have been identified, which may act in-combination with the Proposed VPI Development. These are set out in ES Chapter 18 (Cumulative and Combined Effects) and summarised below:

- PINS (Able Humber Ports Ltd) - Able Marine Energy Park (AMEP);_
- PA/SCO/2022/7 - Enabling works on and adjacent to the Able Marine Energy Park site;
- PA/2021/1525 - Monopile Manufacturing Facility. Land at Able Marine Energy park ;
- PINS (VPI Immingham B Ltd) – VPI Immingham Open Cycle Gas Turbine (OCGT);
- PA/2022/1223 - Land Adjacent to the Westgate Entrance, Port of Immingham;
- Humber Zero - Proposed Phillips 66 Development (sister project to Humber Zero Proposed VPI Development;
- PINS (Chrysaor Production (UK) Limited) – Viking CCS Pipeline;
- PINS (National Grid) - Humber Low Carbon Pipelines
- PINS (C.GEN Killingholme Ltd) - North Killingholme Power Project
- PINS (Associated British Ports) - Immingham Eastern Ro-Ro Terminal
- PINS (Associated British Ports) – Immingham Green Energy Terminal; and
- Gigastack – 100 MW hydrogen electrolyser and associated cable connections.

3.15 These projects were examined for the potential for interactions on the designated features of the Humber Estuary SPA/ SAC/ Ramsar with impacts arising from the Proposed VPI Development, and where necessary were screened into the assessment.

The Rochdale Envelope

3.16 In July 2018, the Planning Inspectorate published Advice Note Nine: Rochdale Envelope (The Planning Inspectorate, 2018), explaining how the principles of the Rochdale Envelope should be used by planning applications for the Environmental Impact Assessment (EIA) process.

3.17 The Rochdale Envelope[7] is applicable where some of the details of a scheme cannot be confirmed when an application is submitted, and flexibility is needed to address uncertainty. Notwithstanding, all significant potential effects of schemes must be properly addressed.

3.18 The Rochdale Envelope encompasses three key principles:

- The assessment should adopt a cautious worst-case approach;
- The level of information assessed should be sufficient to enable the LSEs and/ or adverse effects of a proposed development to be assessed; and
- The allowance for flexibility should not be abused to provide inadequate descriptions of projects.

3.19 This HRA has given due consideration to the Rochdale Envelope. The worst-case (i.e. the potentially most impactful) construction/ decommissioning and operational scenarios have been assessed in relation to impact pathways.

3.20 Throughout this HRA construction impacts and decommissioning impacts on European sites are likely to be very similar in type, magnitude and effect. As such they are treated together.

[7] 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.

4. Baseline Evidence Gathering

Scoping

4.1 There is no guidance that dictates the general physical scope of an HRA document as the potential Zone of Impact (ZoI) is dependent on specific impact pathways. Therefore, in considering the physical scope of the assessment, the assessment has been guided primarily by the identified impact pathways (called the source-pathway-receptor model).

4.2 Briefly defined, impact pathways are routes by which the implementation of a project can lead to an effect upon a European designated site. An example of this would be visual and noise disturbance arising from the construction/ decommissioning work or operational phase associated with a project. If there are sensitive ecological receptors within a nearby European 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 distance-based zones required for assessment.

4.3 For statutory designated nature conservation sites subject to the provisions of the Habitats Regulations, it is usual to consider a search radius of 10 km when examining the potential pathways for air quality impacts on the sites.

4.4 One European designated site has been identified within this radius; this is the Humber Estuary Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site, which is approximately 1.5km east from the nearest component of the Proposed VPI Development. The SAC supports qualifying Annex I habitats that are potentially susceptible to the effects of emissions to air from the Proposed VPI Development. The SPA/ Ramsar supports internationally important assemblages of wintering and passage waterbirds that may be displaced either directly due to noise from construction/ operation reaching intertidal feeding habitats, or indirectly from functionally linked habitats outside the designation boundary.

4.5 Surface water pathways to the designated habitats (and thus the qualifying species they support) have also been considered because the surrounding surface water drainage network, into which surface water from the construction and operation of the Proposed VPI Development will outfall, drains into the Humber Estuary.

Summary of Designated Features

4.6 The Proposed VPI Development will not directly impact any European designated site.

4.7 As summarised above, there are a number of European designations within the potential Zone of Influence (ZoI) of the Proposed VPI Development associated with the Humber Estuary:

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

4.8 A summary of the qualifying features/ habitats of the Humber Estuary SAC/ SPA/ Ramsar is provided in Table 1 below, along with the threats/ pressures on them and potential impact pathways associated with the Proposed VPI Development.

Table 1. Summary of the European sites within a Zone of Influence (ZoI) of 10 km of the Proposed VPI Development[8].

European site	Approx. distance from Proposed VPI Development	Qualifying species/ habitats	Threats and pressure to site integrity	Potential impact pathways linking to the Proposed VPI Development
Humber Estuary SAC	1.5 km east	**Habitats that are a primary reason for selection of this site**: – Estuaries – Mudflats and sandflats not covered by seawater at low tide **Habitats and species present as a qualifying feature, but not a primary reason for selection of this site**: – Sandbanks which are slightly covered by sea water all the time – Coastal lagoons – Salicornia and other annuals colonizing mud and sand – Atlantic salt meadows (*Glauco-Puccinellietalia maritimae*) – Embryonic shifting dunes – Shifting dunes along the shoreline with *Ammophila arenaria* – Fixed coastal dunes with herbaceous vegetation – Dunes with *Hippopha rhamnoides* – Sea lamprey *Petromyzon marinus* – River lamprey *Lampetra fluviatilis* – Grey seal *Halichoerus grypus*	– Water pollution – Coastal squeeze – Changes in species distributions – Invasive species – Natural changes to site conditions – Public pressure access/ disturbance – Fisheries: fish stocking – Fisheries: commercial pressure marine and estuarine – Direct land take from development	**Construction:** Water pollution (dust and synthetic/ non-synthetic pollutants mobilized in surface runoff) Atmospheric pollution (emissions from construction vehicles, such as Heavy Goods Vehicles (HGVs)) **Operation:** Atmospheric pollution (from plant emissions)
Humber Estuary SPA	1.5 km east	**Article 4.1 qualification - bird species regularly occurring in numbers of 1% or more of the Great Britain populations** <u>Wintering</u>: – Avocet *Recurvirostra avosetta* – Bittern *Botaurus stellaris*	– Problematic native species – Changes in abiotic conditions – Changes in biotic conditions – Abiotic (slow) natural processes – Outdoor sports and leisure activities, recreational activities	**Construction period:** Loss of functionally linked land. Visual and noise disturbance to intertidal feeding habitat within boundary of SPA.

[8] For a full summary of European sites, including an introduction to sites, Ramsar qualifying features and Conservation Objectives, please refer to Appendix B.

European site	Approx. distance from Proposed VPI Development	Qualifying species/ habitats	Threats and pressure to site integrity	Potential impact pathways linking to the Proposed VPI Development
		– Hen harrier *Circus cyaneus* – Golden plover *Pluvialis apricaria* – Bar-tailed godwit *Limosa lapponica* Passage: – Ruff *Philomachus pugnax* Breeding: – Bittern *Botaurus stellaris* – Marsh harrier *Circus aeruginosus* – Avocet *Recurvirostra avosetta* – Little tern *Sternula albifrons* **Article 4.2 qualification - bird species regularly occurring in numbers of 1% or more of the biogeographical populations of migratory species** Wintering: – Shelduck *Tadorna tadorna* – Knot *Calidris canutus* – Dunlin *Calidris alpina* – Black-tailed godwit *Limosa limosa* – Redshank *Tringa totanus* Passage: – Knot – Dunlin – Black-tailed godwit – Redshank **Article 4.2 qualification – used regularly by over 20,000 waterbirds in any season** Area regularly supports 153,934 individual waterbirds[9] (five-year peak mean 1996/97 – 2000/01) in the non-breeding season.		Visual and noise disturbance to terrestrial feeding habitat outside boundary of SPA (functionally linked land) Water pollution (dust and synthetic/ non-synthetic pollutants mobilized in surface runoff) Atmospheric pollution (emissions from construction vehicles, such as HGVs) **Operation:** Atmospheric pollution (from plant emissions) Visual and noise disturbance to intertidal feeding habitat within boundary of SPA. Visual and noise disturbance to terrestrial feeding habitat outside boundary of SPA (functionally linked land) Presence of tall structures in close proximity to terrestrial feeding habitat outside boundary of SPA (functionally linked land)

[9] Waterbirds as defined by the Ramsar Convention

European site	Approx. distance from Proposed VPI Development	Qualifying species/ habitats	Threats and pressure to site integrity	Potential impact pathways linking to the Proposed VPI Development
Humber Estuary Ramsar	1.5 km east	**Criterion 1:** 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. **Criterion 3:** Breeding colony of grey seals (at Donna Nook) Breeding natterjack toad *Bufo calamita* (at Saltfleetby-Theddlethorpe) **Criterion 5:** Supports a waterfowl assemblage of international importance. **Criterion 6:** Supports the following species/ populations occurring at levels of international importance: <u>Wintering</u>: – Shelduck – Golden plover – Red knot – Dunlin – Black-tailed godwit – Bar-tailed godwit – Common redshank **Criterion 8:** Migratory river and sea lamprey	Same as for Humber Estuary SPA	Same as for Humber Estuary SPA

Habitats

4.10 The air quality assessment has scoped in sensitive habitat receptors within the zone of influence of potential changes in air quality resulting from the construction and operation of the Proposed Development. To assist with defining the habitat types present and assigning the relevant Critical Levels/ Loads for pollutants as part of the air quality impact assessment, all relevant publicly available habitats data has been reviewed. This has included previous air quality assessments that are in the public domain for nearby developments including the VPI CCGT, which is in close proximity to the Proposed Development and therefore utilises the same nearest coastal habitat receptors as identified in this assessment.

Pioneer/ low-mid saltmarsh (Air Quality Ecology Receptor OE1e)

4.11 The nearest coastal unit of the Humber Estuary SSSI to the Proposed Development, which overlaps with the Humber Estuary SAC/ SPA/ Ramsar, is Unit 94 (Jetty to North Killingholme Haven). The Natural England condition assessment summary on the MAGIC database defines the main habitat as 'littoral sediment'. This is a large unit covering the stretch of coastline from the oil jetty north to the Able UK terminal at North Killingholme Haven. The unit was evaluated as 'unfavourable-recovering' condition in the most recent condition assessment in 2011, with the saltmarsh habitat within the unit evaluated as 'favourable condition' following a site survey in 2018 (Humber Estuary SSSI - NEFU Saltmarsh Surveys 2018[10]).

4.12 A review of the 'Saltmarsh Extent & Zonation' mapping layer (which has been mapped from aerial photography collected predominantly between 2016 and 2019) identifies that there is a small area of saltmarsh within the southernmost section of the unit (from 'The Lookout' south to the HIT jetty), which is mapped as a mix of 'unclassified' and *Spartina sp*. It is therefore reasonable to conclude that this area of coastal saltmarsh sits somewhere between the pioneer and low-mid saltmarsh habitat communities and is fairly regularly inundated by saltwater. The slightly higher 20 – 30 kg/ N/ ha/ yr Critical Load is therefore applied to this habitat type at receptor OE1e, as it is clearly less vulnerable to the effects of N deposition due to regular tidal inundation.

Upper saltmarsh (Air Quality Ecology Receptor OE2)

4.13 The next nearest coastal unit of the Humber Estuary SSSI to the Proposed Development, which overlaps with the Humber Estuary SAC/ SPA/ Ramsar, is Unit 95 (North Killingholme Haven Saltmarsh). The Natural England condition assessment summary on the MAGIC database defines the main habitat as 'fen, marsh and swamp - lowland'. The unit was evaluated as 'unfavourable-recovering' condition in the most recent condition assessment in 2011, with the saltmarsh evaluated as 'unfavourable' in the 2018 survey due to the loss of Atlantic salt meadow SAC community resulting from erosion.

4.14 A review of the 'Saltmarsh Extent & Zonation' mapping layer indicates that this area is a mix of upper marsh, reedbeds and mid-low saltmarsh habitats, and therefore the lower 10 – 20 kg/ N/ ha/ yr Critical Load for upper saltmarshes is therefore applied to this habitat type at receptor OE2 as it is not subject to 'regular' tidal inundation (typically 100-200 days per year).

Wetland and reedbed (Air Quality Ecology Receptor OE1d)

4.15 This habitat type aligns with receptor OE1d and is located in North Killingholme Haven Pits SSSI Unit 1. The main habitat type is listed as 'inshore sublittoral sediment' and the condition assessment was favourable at the most recent survey in 2018. The condition assessment for this unit indicates that it is meeting its targets for all features, which included the extent of open water (which provides feeding and roosting habitat for SPA/ Ramsar waterbirds, water depth (which is controlled via a water level management plan) and salinity (which is within the target range). The open water areas are managed through regular control of reed/ clubrush, and therefore these habitats are identified as those that could be susceptible to airborne N deposition resulting from the operation of the Proposed Development.

[10] Unpublished Natural England report on coastal saltmarsh surveys undertaken in 2018, which have informed the 2022 site check information published on the MAGIC database for the Humber Estuary SSSI unit condition assessments.

4.16 Within the APIS database, this habitat aligns with the 'fen, marsh, swamp' habitat type, but does not fit particularly well into either the 'valley mires, poor fens and transition mires' habitat type (which specifically excludes reedbed) or ''rich fens' which are a rare and threatened Annex I habitat for which critical loads have been published. However, for the purposes of the impact assessment, the lowest critical load in the 10 – 30 kgN/ha/yr range has been adopted in the screening task as a precaution. This is consistent with the approach in the original assessment, which assigned this habitat type to receptor OE7 (at Rosper Road Pools). Reedbeds are used for pollution mitigation to reduce the impact of nitrogen in aquatic ecosystems, and can therefore be reasonably assumed to be more tolerant to the effects of nitrogen uptake (from either aquatic or airborne sources) than the more species-rich fen habitats for which increased nitrogen can result in reduced species-richness.

Ornithology Data

4.17 Ornithological baseline data to support the HRA have been obtained from a range of sources. This has included both ornithology surveys undertaken specifically for the Proposed VPI Development (including land within and adjacent to the Proposed VPI Development Site (referred to as 'the VPI Site')), as well as a desk-based review of publicly available ornithological data e.g. reports submitted as part of the nearby Able Marine Energy Park (AMEP) scheme and any other relevant planning applications.

4.18 The Humber Estuary 5-year peak mean counts for each of the key species has been summarised in Table 2 below, as this enables the 1% threshold (at which a site/ area may be considered important to that species within the context of the Humber Estuary) to be calculated. These data are presented in the annual Wetland Birds Survey (WeBS) reports published online.

Table 2. Qualifying Species Relevant to North Killingholme Marshes – Humber Estuary 5-year Peak Mean Populations (Wintering)

Species	GB Population	Humber Estuary 5-year Peak Mean Population at SPA Designation 1996/ 97 – 2000/ 01[11]	Humber Estuary 5-year Peak Mean Population[12] 2015/16 – 2019/ 20	1% Threshold Humber Estuary Population	Peak Month in Humber Estuary
Bar-tailed godwit	29,575	2,752	1,561	16	February
Black-tailed godwit	40,798	1,113	4,545	45	September
Curlew	63,067	(assemblage)	2,787	28	January
Dunlin	246,985	22,222	15,954	160	August
Golden plover	145,083	30,709	31,237	312	December
Lapwing	272,630	(assemblage)	16,453	165	December
Oystercatcher	216,625	(assemblage)	5,816	58	October
Pink footed goose[13]	493,416	N/A	14,345	143	October
Redshank	74,939	4,632	2,881	29	September
Shelduck	44,844	4,464	4,515	45	October
Teal	157,059	(assemblage)	3,757	38	October

[11] Humber Estuary SPA citation (August 2007)
[12] Frost, T.M., Calbrade, N.A., Birtles, G.A., Hall, C., Robinson, A.E., Wotton, S.R., Balmer, D.E. and Austin, G.E. 2021. *Waterbirds in the UK 2019/20: The Wetland Bird Survey*. BTO/RSPB/JNCC. Thetford.
[13] Although not a qualifying species for the Humber Estuary SPA/ Ramsar, this species has been included on the basis that Natural England now consider pink-footed goose to be part of the SPA/ Ramsar designated assemblage due to the increases in numbers in this area

Species	GB Population	Humber Estuary 5-year Peak Mean Population at SPA Designation 1996/ 97 – 2000/ 01[11]	Humber Estuary 5-year Peak Mean Population[12] 2015/16 – 2019/ 20	1% Threshold Humber Estuary Population	Peak Month in Humber Estuary
Wigeon	376,708	(assemblage)	2,672	27	February

AMEP Ornithology Data

4.19 Given the large land take associated with the consented AMEP scheme in the North Killingholme Marshes area (some of which was considered functionally linked to the SPA/ Ramsar), and its proximity to other functionally linked land to the south of AMEP, there have been many surveys of the terrestrial fields and North Killingholme Marshes foreshore area over several years associated with this Development Consent Order (DCO) application and associated planning applications. A desk study review of these data was undertaken to provide further insight into the longer-term history of waterbird usage of the North Killingholme Marshes area to support conclusions drawn from surveys undertaken for the Proposed Developments in 2021/ 22.

4.20 A summary of the AMEP reports/ data reviewed is as follows, and the data is presented in Tables 3 and 4 below:

- Able Marine Energy Park: Area K Monopile Factory Habitats Regulations Assessment Report (August 2021) prepared by Ecology Consulting on behalf of Able UK Ltd, which contained the following data:
  - survey data from the Killingholme Fields collected during winter 2020/ 21;
  - breeding bird surveys undertaken at the site during May-August 2021, and specific surveys to determine the current status of marsh harriers and their use of the site;
  - data from previous surveys of the Killingholme Fields undertaken between 2006 and 2011 included in Chapter 11 of the AMEP DCO ES, and during autumn 2016 (Cutts and Hemingway 2017).
- British Trust for Ornithology (BTO) Wetland Bird Survey (WeBS) high tide (core) counts for Killingholme Marshes Foreshore (2014-15 to 2019-20)
- BTO WeBS low tide counts doe Killingholme Marshes Foreshore (November 2011 through to February 2012) - the most recently available low tide counts.
- site-specific surveys of the Killingholme Marshes Foreshore undertaken by JBA (2019) during the 2017-18 autumn and winter. This included:
  - Autumn Passage – autumn migration. Weekly visits between late September and November.
  - Winter - two surveys per month between October to March inclusive.
  - Spring Passage – spring migration. Weekly visits between March to Mid-May inclusive.
- Associated British Ports (ABP) data 2018-19 and 2019-20 - through the tide counts of the Killingholme Marshes Foreshore, twice-monthly from October through to March.
- survey data from the Killingholme Marshes Foreshore collected by Cutts and Hemingway (2021) during winter 2020-21.

Table 3. Summary of AMEP Ornithology Data for North Killingholme Marshes Fields from Desk Study Review

Survey	Survey Period	Species Recorded	Comments
Wintering surveys of North Killingholme Marshes Fields for AMEP DCO	Winter 2006 – 2011	Curlew	Peak of 106 equivalent to 2.4% of the Humber Estuary population at the time.
		Redshank, black-tailed godwit, lapwing, whimbrel, shelduck	Recorded at numbers <1% of the Humber Estuary population
Wintering surveys of North Killingholme Marshes Fields for AMEP DCO	Autumn 2016	Curlew	Peak of 15 in AMEP site indicating reduced numbers when compared to previous surveys, thought likely to be due to longer sward (arable/ improved grassland had reverted to more rank neutral grassland in the absence of agricultural management). Surveys recorded peak of 110 curlew in fields at the Tank Farm to the north of AMEP site, indicating curlew still present in area but preferring other fields.
Wintering surveys of North Killingholme Marshes Fields for AMEP Monopile Facility	December 2020 – May 2021	Curlew	Peak of 45 in site boundary equivalent to 1.6% of Humber Estuary population, indicating land is still functionally linked to the estuary.
		Lapwing, snipe	Recorded in numbers <1% Humber Estuary population
		Teal, mallard, marsh harrier, oystercatcher, redshank	Single or low numbers (<10 birds) recorded

Table 4. Summary of Ornithology Data for North Killingholme Marshes Foreshore from Desk Study Review

Survey	Survey Period	Species Recorded	Comments
North Killingholme Marshes Foreshore WeBS Sector (high tide)	Five year mean peak count 2015/ 16 – 2019/ 20	Black-tailed godwit	Key feeding habitat in the estuary for this species, numbers occurring at 33.5% of Humber Estuary population.
		Shoveler, little ringed plover, moorhen, coot	Species occurring in numbers >10% of the Humber Estuary population
		Mute swan, shelduck, gadwall, mallard, teal, little grebe, grey heron, avocet, lapwing, ringed plover, curlew, bar-tailed godwit, turnstone, dunlin, snipe, redshank	Species occurring in numbers >1% of Humber Estuary population
North Killingholme Marshes Foreshore WeBS Sector (low tide)[14]	2011 – 2012	Black-tailed godwit	Peak counts of 2000 birds in August and September 2012
		Greylag goose, shelduck, mallard, teal, grey heron, little egret, cormorant, moorhen,	Low numbers of these species recorded

[14] Surveys did not cover main wintering period which may explain lower numbers of some species when compared to other WeBS count datasets.

Survey	Survey Period	Species Recorded	Comments
		oystercatcher, avocet, little ringed plover, curlew, redshank, black-headed gull, common tern	
JBA Surveys of North Killingholme Marshes Foreshore	September 2017 – May 2018	Black-tailed godwit, lapwing, dunlin	Most numerous species recorded, in numbers >500 birds.
		Redshank, teal, shelduck, wigeon, curlew	Recorded in numbers >100 birds
ABP Monitoring Surveys North Kilingholme Marshes Foreshore	October 2018 – March 2019	Black-tailed godwit, lapwing, teal	Most numerous species recorded, in numbers >1000 birds
		Avocet, dunlin, redshank	Recorded in numbers >100 birds
	October 2019 – March 2020	Black-tailed godwit, lapwing	Most numerous species recorded, in numbers >1000 birds
		Teal, avocet, dunlin, redshank	Recorded in numbers >100 birds
Able UK Surveys North Killingholme Marshes Foreshore (Cutts and Hemingway)	December 2020 – March 2021	Teal, lapwing, avocet	Higher peak counts of these species than in previous surveys: teal (1466), lapwing (980), avocet (205)
		Black-tailed godwit	Peak of 170 birds is lower than previous surveys (where numbers are usually into the 1000s). However, survey period did not include August and September which are typically when numbers of this species peak at North Killingholme Marshes Foreshore.

Summary of AMEP Ornithology Data

4.21 The North Killingholme Marshes Foreshore is a key location in the estuary for overwintering black-tailed godwit, with huge increases in the peak counts for this species in the Humber Estuary since the site was designated in the early 2000s. The bird count data indicate peak counts for this species at North Killingholme Marshes Foreshore regularly exceed 2000 birds (in August/ September), with large aggregations roosting at high tide in the nearby North Killingholme Haven Pits lagoons (close to Humber Sea Terminal).

4.22 The arable/ pasture fields inland between the estuary and Rosper Road (referred to as North Killingholme Marshes Fields) also provide feeding, roosting and loafing habitat for some SPA/ Ramsar species primarily curlew, with occasional usage by redshank, lapwing and other small wading birds. This area is considered functionally linked land to the SPA/ Ramsar due to the curlew peak counts being >1% of the Humber Estuary population (the threshold at which habitats are considered to be of importance to that species within the estuary context), although many of the fields are small and therefore less favoured by waterbirds.

4.23 The arable/ pasture fields at North Killingholme Marshes Fields have generally seen a decline in bird numbers since the counts originally undertaken for the AMEP scheme in the mid-2000s as they have been progressively taken out of agricultural management (and thus the sward height has increased) and become less suitable for waterbirds. The fields north of Station Road have all been permanently lost to development of the AMEP scheme, which commenced around 6 years ago, for which compensatory wet grassland habitat has been delivered at East Halton Skitter (north of Humber Sea Terminal).

Surveys for the Proposed Developments

4.24 Specific ecological surveys were undertaken by Ecological Services Limited (ESL) for the Proposed Phillips 66 and VPI Developments, and which have informed the baseline for ecological impact assessment and this HRA, and which are presented in ES Chapter 13 (Ecology and Nature Conservation).

4.25 A summary of the ecological surveys relevant to this HRA that were undertaken by ESL is presented below:

- Phase 1 Habitat survey and Preliminary Ecological Appraisal (PEA) of the Proposed Development Sites ('the Sites') in June 2021;
- monthly bird surveys (terrestrial) – two visits per month between October 2021 and March 2022 inclusive covering the period two hours either side of high tide. Survey scope included the VPI Site, Rosper Road Pools and terrestrial fields to the east of Rosper Road that had the potential to be functionally linked to the Humber Estuary SPA/ Ramsar;
- monthly bird surveys (coastal) - two visits per month between October 2021 and March 2022 inclusive covering the period two hours either side of high tide of the section of North Killingholme Marshes (NKM) mudflats closest to the Proposed Developments; and
- breeding bird surveys – six visits of all habitats within and adjacent to the Sites between April and June 2021.

4.26 The Phase 1 Habitat survey undertaken in June 2021 confirmed that the proposed development area for the proposed VPI PCC plant and associated construction laydown area within the VPI Site comprises a mosaic of brownfield land and grassland/ scrub. The northern part of the VPI Site comprises the existing CHP Plant. There is therefore no suitable habitat within the VPI Site for feeding, roosting or loafing wintering/ passage SPA/ Ramsar bird species.

4.27 A summary of the survey results is presented below. Further details on the methods, result and detailed data analysis are provided in ES Chapter 13 (Ecology and Nature Conservation) and is presented as Appendix C (Breeding Birds) and Appendix D (Wintering Birds) to this HRA for completeness.

4.28 The survey area (including field numbers for reference throughout this HRA) is shown in Plate 1 below.

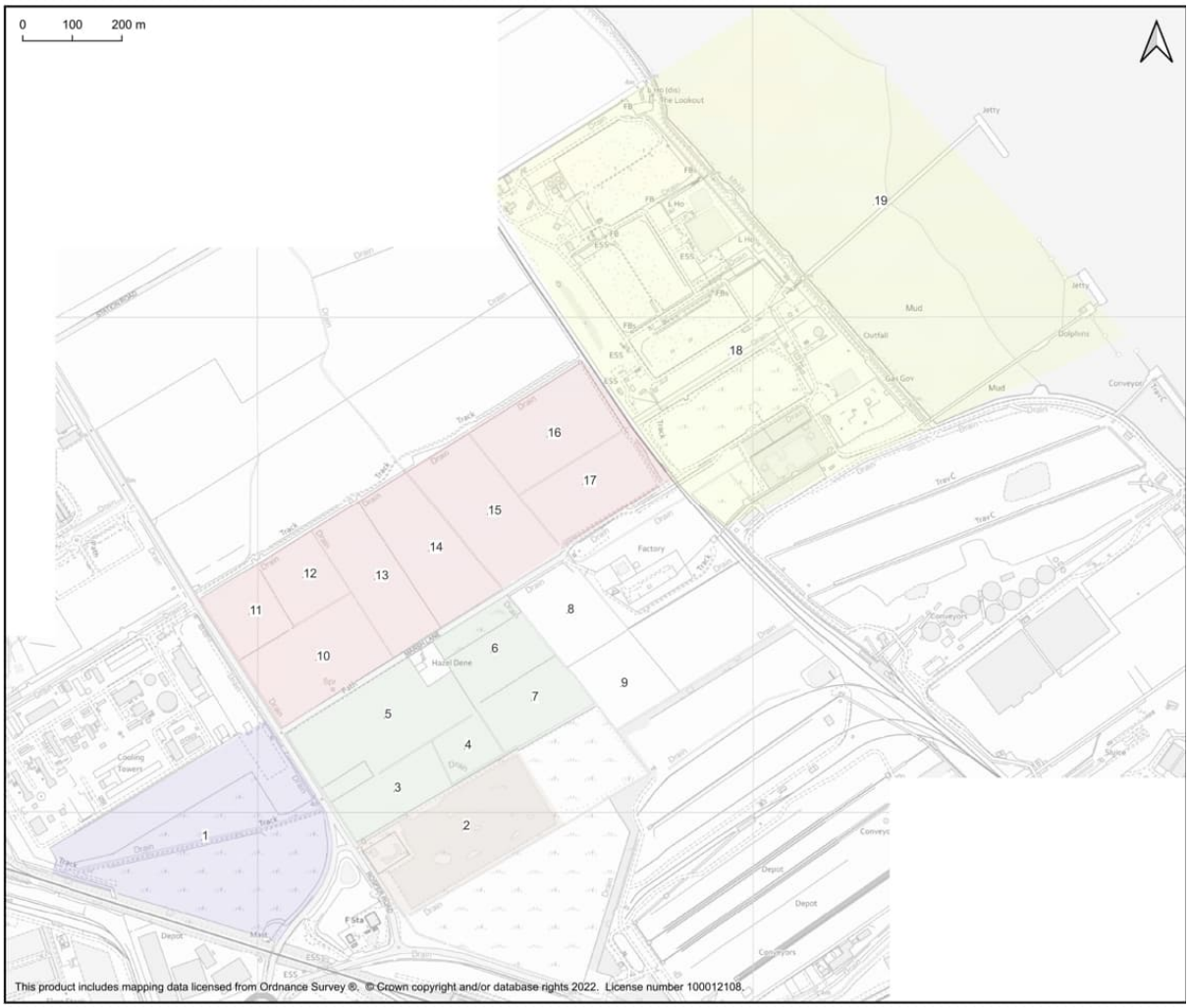


Plate 1: ESL Bird Survey Area 2021 – 2022

SPA/ Ramsar Breeding Birds

4.29 A summary of the survey results is presented in Table C1 in Appendix C. Further details on the method, result and detailed data analysis are provided in ES Chapter 13 (Ecology and Nature Conservation) and presented as Appendix C to this HRA for completeness.

4.30 The Phase 1 Habitat survey undertaken in June 2021 confirmed that the proposed development area for the proposed VPI PCC plant and associated construction laydown area within the VPI Site comprises a mosaic of brownfield land and grassland/ scrub. The northern part of the VPI Site comprises the existing CHP Plant. There is therefore no suitable habitat within the VPI Site for breeding bittern, marsh harrier, avocet or little tern and these species were not recorded within the VPI Site (Field 1) during surveys undertaken during the breeding season in spring/ summer 2021 (see Table C1 in Appendix C). With the exception of avocet (see below), these species are not considered further in this HRA.

4.31 The adjacent Rosper Road Pools Local Wildlife Site (LWS), which is not within the boundary of the Humber Estuary SPA/ Ramsar, was found to support breeding avocet (Area 2). This is a large drainage lagoon with a marginal reed fringe, which is linked to the surrounding network of ditches that outfall into the estuary at the northern end of Immingham Docks. The LWS has had some relatively recent habitat enhancement works (c. 2016) to create small islands specifically for nesting avocet.

4.32 Breeding avocet is a qualifying feature of the Humber Estuary SPA/ Ramsar with 64 breeding pairs in the five-year peak mean 1998 – 2002 that is listed in the 2007 citation (see Appendix A). Although the avocets at Rosper Road Pools are nesting in habitats outside the boundary of the designated site and therefore not part of the SPA/ Ramsar qualifying breeding avocet population, given the proximity and that birds will likely feed on the nearby North Killingholme

Marshes mudflats, it is assumed for the purposes of this HRA that the Pools are functionally linked to the Humber Estuary SPA/ Ramsar for breeding avocet.

SPA/ Ramsar Wintering Birds (Land East of Rosper Road)

4.33 A summary of the survey results is presented in Table 5 below. Further details on the method, result and detailed data analysis is provided in ES Chapter 13 (Ecology and Nature Conservation) and is presented as Appendix C to this HRA for completeness.

4.34 A plan showing the field numbers included within the survey scope is provided as Plate 1 above.

4.35 Peak counts exceeding the 1% threshold for that species are highlighted in **bold text**.

Table 5. Summary of Wintering Bird Survey Peak Counts and Analysis against Humber Estuary 1% Threshold

Species	Peak Counts																Humber Estuary 1% Threshold
	VPI Site (Field 1)	Area 2 (Rosper Road Pools)	Field 3	Field 5	Field 6	Field 7	Field 8	Field 9	Field 10	Field 13	Field 14	Field 15	Field 16	Field 17	Area 18	Area 19 (NKM Mudflats)	
Bar-tailed godwit		**6**															16
Black-tailed godwit		**480**						2	8						1	35	45
Curlew			1	9	**50**	24		**35**	**74**	15	**38**	**35**	3	2	**79**	**108**	28
Dunlin																**205**	160
Lapwing	4	66						2				1			18	**665**	165
Oystercatcher																2	58
Pink-footed goose[15]							1										143
Redshank		8													**40**	**69**	29
Shelduck		12														28	45
Wigeon		**126**				4										2	27

[15] Although not a qualifying species for the Humber Estuary SPA/ Ramsar, this species has been included on the basis that Natural England now consider pink-footed goose to be part of the SPA/ Ramsar designated assemblage due to the increases in numbers in this area

4.36 The Phase 1 Habitat survey undertaken in June 2021 confirmed that the proposed development area for the proposed VPI PCC plant and associated construction laydown area within the VPI Site comprises a mosaic of brownfield land and grassland/ scrub dominated by coarse grasses including false oat-grass, tufted hair-grass and stands of common reed, club rush and tall ruderal species such as great willowherb, creeping thistle and common nettle. This habitat is sub-optimal for feeding, roosting and loafing wintering/ passage SPA/ Ramsar bird species, as the high sward height and scrub cover reduce the visibility ('scanning distance') for birds to observe ground-based predators. Immediately south of the existing CHP Plant is a large area of bare ground/ open mosaic habitat comprising approximately 4 ha; however this is a relatively narrow band, and it is fairly enclosed on both sides by the existing operational CHP Plant site to the north, and the tall grassland/ scrub area to the south. The unsuitability of this habitat for SPA/ Ramsar birds was reaffirmed by the survey results, which recorded virtually no passage/ wintering waterbird usage with the exception of three counts of one or two individual lapwings in the late winter surveys. It is therefore concluded that the VPI Site is not functionally linked land to the SPA/ Ramsar.

4.37 No Humber Estuary SPA/ Ramsar bird species were recorded in Fields 4, 11 and 12 and therefore these fields are excluded from Table 5.

4.38 Curlew was recorded in some of the terrestrial fields surveyed in numbers regularly exceeding 1% of the Humber Estuary threshold (Fields 6, 9, 10, 14 and 15); this reaffirms the findings of many other surveys conducted in these fields in recent years. In all cases, use of the fields by curlew was sporadic, although the surveys are only a snapshot of the usage across the high tide period and there are likely to be many factors influencing the use of the fields by this species across the passage and wintering period (e.g. localised disturbance, sward height etc.). It is evaluated that the fields are functionally linked land to the Humber Estuary SPA/ Ramsar due to their supporting role in providing feeding, roosting and loafing habitat for curlew across the high tide period. Curlew were recorded in most of the fields surveyed on the east side of Rosper Road, although the smaller fields (3, 4, 11 and 12) were either used by only small numbers or avoided altogether by curlew.

4.39 Redshank was recorded on one visit within the terrestrial fields surveyed with that visit recording a peak count of 40 redshank, which is >1% Humber Estuary threshold for this species, in Area 18 (group of fields/ land within the tank farms adjacent to the estuary). The species was regularly recorded on the North Killingholme Marshes mudflats across the survey period, although does not appear to favour the adjacent terrestrial fields for feeding, roosting and loafing.

4.40 Very small numbers of other SPA/ Ramsar species were recorded in the surveyed fields across the survey period; there were occasional records of single figure numbers of black-tailed godwit, oystercatcher and wigeon. The fields are therefore providing a supporting habitat to the estuary for these species, but as they are present in such low numbers, which are well below the 1% thresholds for each species, it is concluded that the fields are not providing functionally linked land for these species.

4.41 Rosper Road Pools (Area 2) was recorded to support good numbers of black-tailed godwit with several of the monthly counts recording numbers >1% Humber Estuary threshold. Rosper Road Pools also supported good numbers of lapwing, redshank and shelduck (although all counts were <1% Humber Estuary thresholds for these species), as well as wigeon (regular counts >1% Humber Estuary threshold). It is evaluated that this habitat is of importance in supporting the adjacent mudflats as a feeding, loafing and roosting resource for black-tailed godwit and wigeon, and is therefore functionally linked land to the SPA/ Ramsar.

4.42 Surveys of the nearest section of the mudflats at North Killingholme Marshes was undertaken; this survey area coincides with the lower end of WeBS Core Count Killingholme Marshes Sector J. Very few black-tailed godwits were recorded, and this is perhaps surprising given that this area is known to be a key foraging resource for this species in the Humber Estuary. However, as the surveys were undertaken over the high tide period, this would be expected to coincide with the period when black-tailed godwit are roosting elsewhere. Other species recorded at North Killingholme Marshes mudflats also reaffirmed the results of previous survey work, with curlew, lapwing and dunlin present in numbers >1% threshold.

Summary of Surveys for the Proposed Development

4.43 The VPI Site does not support important (within the Humber Estuary context) of feeding, roosting and loafing SPA/ Ramsar waterbirds and it is evaluated that it is not functionally linked to SPA/ Ramsar.

4.44 The surveys undertaken for the Proposed Phillips 66 and VPI Developments reaffirmed the findings of previous surveys in this part of the estuary, with the terrestrial fields supporting numbers of curlew regularly exceeding 1% of the Humber Estuary threshold indicating their importance within the estuary, and thus confirming that they are functionally linked to SPA/ Ramsar. Although some of the fields are small (e.g. Fields 4, 11 and 12) and therefore not favoured by curlew (due to their enclosed nature they do not provide sufficient scanning distances for predators), the overall complex of fields within this part of North Killingholme is clearly providing high tide roosting, loafing and feeding habitat for curlew and can be considered functionally linked land to the SPA/ Ramsar.

4.45 Redshank was the only other species recorded in terrestrial habitats in numbers above the 1% Humber Estuary threshold for the species; this was in Area 18 which incorporated all the habitats around the tank farm immediately adjacent to the mudflats. The Rosper Road fields are clearly not regularly used by redshank, or any other SPA/ Ramsar species in numbers that would be considered important within the Humber Estuary context.

4.46 Most of the terrestrial fields east of Rosper Road supported only small numbers of wintering and passage SPA/ Ramsar birds, likely due to the relatively small and enclosed nature of the fields, which are not favoured by feeding, roosting or loafing birds because they do not offer sufficient visual scanning distances for birds to observe approaching ground-based predators.

4.47 Of the fields closest to the Proposed VPI Development:

- Field 3 – supported curlew on 1 survey visit (peak count of 1 bird);
- Field 5 – supported curlew on 2 survey visits with peak counts <10 birds on both occasions, and no other SPA/ Ramsar birds were recorded;
- Field 10 - supported numbers of curlew >1% threshold on 2 of 3 surveys this species was present, lapwing was recorded on 1 survey visit (peak count of 2 birds) and black-tailed godwit recorded on 1 visit (peak count of 2 birds); and
- Fields 11 and 12 – no SPA/ Ramsar birds were recorded during the surveys.

4.48 Surveys confirmed that Rosper Road Pools provides high tide roosting and loafing habitat for black-tailed godwit, supporting the conclusion that this part of the estuary is a stronghold for this species with the habitats provided by the intertidal mudflats at North Killingholme Marshes, supported by terrestrial habitats close by including Rosper Road Pools and Killingholme Pits Site of Special Scientific Interest (SSSI), which is known to be favoured roost site for black-tailed godwit. The SSSI is approximately 2.7 km north of Rosper Road Pools.

5. Stage 1: Screening for Likely Significant Effects (LSEs)

Identification of Potential Construction Impacts

Potential Construction Impact Pathways Scoped In

5.1 The potential impact pathways by which the Proposed VPI Development could impact the qualifying features of each designated site during construction, and which were scoped into the EcIA, are summarised below:

- visual disturbance to SPA/ Ramsar birds using functionally linked land – disturbance to breeding avocet at Rosper Road Pools, and wintering/ passage waterbirds feeding, roosting and loafing in terrestrial fields east of Rosper Road, and Rosper Road Pools;
- noise disturbance to SPA/ Ramsar birds using functionally linked land – disturbance to breeding avocet at Rosper Road Pools, and wintering/ passage waterbirds feeding, roosting and loafing in terrestrial fields east of Rosper Road, and Rosper Road Pools;
- noise and visual disturbance to SPA/ Ramsar birds within the SPA/ Ramsar – disturbance to wintering/ passage waterbirds feeding, roosting and loafing on intertidal mudflats within the boundary of the designated site; and
- surface water quality – potential pathways for the surface water pollution to the adjacent drainage network, and ultimately to the Humber Estuary SAC/ SPA/ Ramsar into which the surface water drainage flows during the construction phase of the Proposed VPI Development e.g. sedimentation, vehicle fuel spill.

Construction Impact Pathways Scoped Out

5.2 The following impact pathways have been scoped out of the HRA screening based on the conclusions of the EcIA:

- noise/ visual disturbance to breeding bittern, marsh harrier and little tern - there is no suitable habitat for these qualifying species of SPA/ Ramsar breeding birds within the potential zone of influence of noise and visual disturbance arising from the construction of the Proposed VPI Development;
- underwater noise disturbance to SAC/ Ramsar marine mammals and fish – all works are > 1 km from the estuary and over this distance it is reasonable to conclude that there would be no propagation of underwater noise such that the qualifying features could be significantly affected;
- direct loss or physical damage to qualifying habitats or habitats used by qualifying species – as established in the ecological impact assessment accompanying the application, the VPI Site itself is unsuitable as functionally linked land for SPA/ Ramsar birds as it is a mosaic of tall grassland, bare ground and dense/ scattered scrub. Moreover, given the distance between the designations and the Proposed VPI Development there is no pathway that could result in direct habitat loss or direct physical damage to any of the designated habitats. Similarly, there are no groundwater pathways over this distance through which the Proposed VPI Development could give rise to any effects on the groundwater dependent terrestrial ecosystems (GWTEs) of the sites;
- air quality (dust emissions) – given the distance of the designated habitats from the Proposed VPI Development (approximately 1.5 km), they are well outside the zone of influence of fugitive dust emissions from construction, which is approximately 50 m; and
- air quality (emissions from road traffic movements) - the affected roads are >200 m from the Humber Estuary SAC/ Ramsar boundary and therefore this pathway is scoped

out of the Air Quality assessment for road traffic movements in Chapter 6 (Air Quality), in accordance with IAQM guidance[16]..

5.3 The Proposed VPI Development is very close to the consented AMEP 'Mitigation Area A' land, which is on the eastern side of Rosper Road directly opposite the existing VPI Immingham CHP Plant. This habitat was included within the AMEP DCO to mitigate extensive losses of functionally linked land supporting overwintering/ passage waterbirds in numbers >1% of the Humber Estuary populations within the footprint of the AMEP development. However, this mitigation area has subsequently been permitted to be relocated to the Halton Marshes Wet Grassland Mitigation Area in a non-material change to the DCO. The former Mitigation Area A land will now be subject to further development associated with the AMEP scheme as part of a material amendment to the DCO[17]. The Halton Marshes Wet Grassland Mitigation Area, which is north of Able UK's Humber Sea Terminal, has already been created. This habitat is approximately 4.5 km north of the Proposed VPI Development and therefore well outside the zone of influence of any noise/ visual disturbance associated with the Proposed VPI Development. This potential impact pathway is therefore scoped out.

Construction Visual Disturbance to Functionally Linked Land (Rosper Road Pools)

5.4 The Proposed VPI Development is approximately 130 m west of Rosper Road Pools on the western side of Rosper Road and the link road off the A160, which lie between the Pools and the Proposed VPI Development. Although relatively close, the lagoon/ central islands on which the avocets are nesting are visually screened from the Proposed VPI Development construction activities by trees/ shrubs in the north-west corner of the nature reserve and along the western boundary to Rosper Road, and the tall mature hedgerow along the entire northern boundary.

5.5 The nature and scale of the temporary construction activities associated with the Proposed VPI Development are not significantly different from on-going industrial activities within the area surrounding the Rosper Road Pools. This includes temporary construction activities in the AMEP DCO site to the north-east, and the structures associated with the existing VPI Immingham CHP Plant to the immediate north of the proposed VPI carbon capture plant. It is envisaged that the plant, machinery, vehicles and structures used during construction will not result in any material change in the conditions currently surrounding Rosper Road Pools.

5.6 No likely significant visual disturbance effects on breeding avocet or wintering/ passage waterbirds using Rosper Road Pools are predicted as a result of visual impacts during construction. This pathway is therefore screened out of Task 2: Appropriate Assessment.

Construction Noise Disturbance to Functionally Linked Land (Rosper Road Pools)

5.7 Given the proximity of the Proposed VPI Development to Rosper Road Pools and therefore the potential for noise disturbance, Likely Significant Effects cannot be screened out and therefore this pathway is taken forward to Stage 2: Appropriate Assessment.

Construction Visual Disturbance to Functionally Linked Land (Terrestrial Fields)

5.8 The Proposed VPI Development is on the opposite side of Rosper Road to fields used occasionally by numbers of curlew >1% Humber Estuary population threshold and which are considered functionally linked land. Although relatively close, as discussed above in respect of potential disturbance to Rosper Road Pools, the nature and scale of the temporary construction activities associated with the Proposed VPI Development are not significantly different from on-

[16] Institute of Air Quality and Management (IAQM) (2020) *A guide to the assessment of air quality impacts on designate nature conservation sites*. Version 1.1 May 2020. IAQM, London.
[17] Application for AMEP Area K Monopile Facility submitted to North Lincolnshire Council in August 2021 (not yet determined) will partly impact upon the former Mitigation Area A land (Planning Ref: PA/2021/1525)

going industrial activities within the area surrounding Rosper Road Pools. This includes temporary construction activities in the AMEP DCO site to the north-east, and the structures associated with the existing VPI Immingham CHP Plant to the immediate north of the proposed VPI carbon capture plant. It is envisaged that the plant, machinery, vehicles and structures used during construction will not result in any material change in the conditions currently surrounding the Rosper Road Pools. The hedgerows/ scattered trees along the eastern side of Rosper Road also provide some visual screening of traffic/ plant movement along Rosper Road and within the construction site.

5.9 No likely significant effects on SPA/ Ramsar birds in habitats that are functionally linked to the SPA/ Ramsar are predicted as a result of visual impacts during construction. This pathway is therefore screened out of Task 2: Appropriate Assessment.

Construction Noise Disturbance to Functionally Linked Land (Terrestrial Fields)

5.10 Given the proximity of the Proposed VPI Development to functionally linked land east of Rosper Road and therefore the potential for noise disturbance to qualifying species of waterbirds, Likely Significant Effects cannot be screened out and therefore this pathway is taken forward to Stage 2: Appropriate Assessment.

Construction Noise/ Visual Disturbance to Habitats within SPA/ Ramsar Boundary

5.11 The Proposed VPI Development is approximately 1.5 km inland from the nearest intertidal mudflats at North Killingholme Marshes Foreshore. At this distance it is reasonable to conclude there is no potential for direct noise or visual disturbance to waterbirds feeding, roosting and loafing on the mudflats as a result of construction activities.

5.12 There will be no driven impact piling for the construction of the Proposed VPI Development as all piling will be undertaken using a Continuous Flight Auger (CFA) piling rig. The noise modelling undertaken for the Proposed VPI Development confirms that piling noise will have attenuated to within ambient levels at the nearest areas of mudflats at North Killingholme Marshes. It is therefore concluded that there is no potential for noise disturbance to birds feeding, roosting and loafing on the mudflats at North Killingholme marshes.

5.13 No likely significant effects on SPA/ Ramsar birds within the SPA/ Ramsar are predicted as a result of noise and visual impacts during construction. This pathway is therefore screened out of Task 2: Appropriate Assessment.

Construction Surface Water Quality

5.14 There is the potential for pollution/ siltation of Humber Estuary via the surface water drainage network, into which surface water run-off from the Proposed VPI Development will outfall during construction. However, standard environmental measures to control pollution to the drains during construction phase will adequately minimise risk. As this is required for compliance with environmental legislation, and not specifically to mitigate for impacts on the SAC/ SPA/ Ramsar, this can be taken into account at the screening stage. It is therefore concluded that with the embedded measures to control pollution/ siltation during construction, there will be no likely significant effects on Humber Estuary SAC/ SPA/ Ramsar habitats or the species they support. This pathway is therefore screened out of Task 2: Appropriate Assessment.

Identification of Potential Operational Impacts

Potential Operational Impact Pathways Scoped In

5.15 The potential impact pathways by which the Proposed VPI Development could impact the qualifying features of each designated site during operation, and which were scoped into the EcIA are as follows:

- visual disturbance to SPA/ Ramsar birds using functionally linked land – disturbance to breeding avocet at Rosper Road Pools, and wintering/ passage waterbirds feeding, roosting and loafing in terrestrial fields east of Rosper Road, and Rosper Road Pools;
- noise disturbance to SPA/ Ramsar birds using functionally linked land – disturbance to breeding avocet at Rosper Road Pools, and wintering/ passage waterbirds feeding, roosting and loafing in terrestrial fields east of Rosper Road, and Rosper Road Pools;
- noise and visual disturbance to SPA/ Ramsar birds within the SPA/ Ramsar – disturbance to wintering/ passage waterbirds feeding, roosting and loafing on intertidal mudflats within the boundary of the designated site;
- surface water quality – potential pathways for the surface water pollution to the adjacent drainage network, and ultimately to the Humber Estuary SAC/ SPA/ Ramsar into which the surface water drainage flows during the operational phase of the Proposed VPI Development; and
- air quality - potential pathways identified through stack emissions to air (acid, ammonia and nitrogen) during the operational phase of Proposed VPI Development resulting in effects on susceptible habitats within the Humber Estuary SAC/ SPA/ Ramsar.

Operational Impact Pathways Scoped Out

5.16 The following impact pathways have been scoped out of the HRA screening based on the conclusions of the EcIA:

- noise/ visual disturbance to breeding bittern, marsh harrier and little tern - there is no suitable habitat for these qualifying species of SPA/ Ramsar breeding birds within the potential zone of influence of noise and visual disturbance arising from the construction of the Proposed VPI Development;
- air quality impacts on intertidal and subtidal habitats in the SAC/ Ramsar - intertidal habitats are not susceptible to the effects of changes in air quality arising from stack emissions during operation (increased nitrogen, ammonia and acid deposition) because of their regular tidal inundation. Subtidal habitats have similarly been scoped out; and
- air quality impacts due to road traffic movements – the affected roads are >200 m from the Humber Estuary SAC/ Ramsar boundary and in any case the Average Annual Daily Traffic (AADT) flows associated with the operational phase of the Proposed Phillips 66 Development are less than the IAQM threshold (a change of 500 LDV or 100 HDV when outside an AQMA). This pathway is therefore scoped out in accordance with IAQM guidance..

Operational Visual Disturbance to Functionally Linked Land (Rosper Road Pools)

5.17 The Proposed VPI Development is approximately 130 m west of Rosper Road Pools on the western side of Rosper Road and the link road off the A160, which lie between the lagoon and the Proposed VPI Development. Although relatively close, as discussed in respect of construction noise/ visual impacts, the lagoon/ central islands on which the avocets are nesting are visually screened from operational activities by trees/ shrubs in the north-west corner of the nature reserve and along the western boundary to Rosper Road, and the tall mature hedgerow along the entire northern boundary.

5.18 The nature and scale of the operational activities associated with the Proposed VPI Development are not significantly different from on-going industrial activities within the area surrounding Rosper Road Pools. This includes the operation of the existing VPI CHP Plant to the immediate north of the proposed VPI carbon capture plant, the Lindsey Oil Refinery to the north-west and ongoing construction activities within the consented AMEP development area to the north. It is envisaged that the plant, machinery, vehicles and structures used during operation will not result in any material change in the conditions currently surrounding Rosper Road Pools.

5.19 No likely significant effects on breeding avocet or wintering/ passage waterbirds are predicted as a result of visual impacts during operation. This pathway is therefore screened out of Task 2: Appropriate Assessment.

Operational Noise Disturbance to Functionally Linked Land (Rosper Road Pools)

5.20 Noise modelling has been undertaken and is presented in ES Chapter 6 (Noise and Vibration). Noise contour maps for operation are provided in Appendix D. The modelled noise levels at the nearest part of Rosper Road Pools are <60 dB $L_{Aeq,T}$ across the open lagoon habitat. As discussed in respect of operational noise, studies indicate that noise levels >84 dBA typically elicit a flight response in birds and the same research recommends that construction noise levels are kept below 70 dB to avoid excessive disturbance of birds. Given that the modelled operational noise levels are well below 70 dB $L_{Aeq,T}$/ L_{Amax}, it is therefore concluded that nesting avocet at Rosper Road Pools would not be disturbed.

5.21 A noise contour plan has been prepared for the operational phase to show the predicted LAeq at the ecology receptors in Rosper Road Pools (Eco 3 and Eco 4) and is presented as Figure F3.1 in Appendix F. A summary of the predicted changes in LAeq as a result of operation is presented in Table F3.1 in Section F.3 of Appendix F. The modelling demonstrates that there are no predicted exceedances of Natural England's suggested 3 dBA 'rule-of-thumb' change in noise level threshold at Eco 3 and Eco 4 in Rosper Road Pools. Operational noise levels are actually lower than ambient noise levels at Eco 3 and Eco 4 for both the daytime and nighttime scenarios.

5.22 No likely significant effects on breeding avocet or wintering/ passage waterbirds are predicted as a result of noise impacts during operation. This pathway is therefore screened out of Task 2: Appropriate Assessment.

Operational Visual Disturbance to Functionally Linked Land (Terrestrial Fields)

5.23 The nature and scale of the temporary construction activities associated with the Proposed VPI Development are not significantly different from on-going industrial activities within the area surrounding the Rosper Road fields. This includes temporary construction activities in the AMEP DCO site to the north-east, and the structures associated with the existing VPI Immingham CHP Plant to the immediate north of the proposed carbon capture plant, and the Lindsey Oil Refinery to the north-west. It is envisaged that the plant, machinery, vehicles and structures present during operation will not result in any material change in the conditions currently surrounding the Rosper Road fields. The hedgerows/ scattered trees along the eastern side of Rosper Road also provide some visual screening of traffic/ plant movement along Rosper Road and within the operational site.

5.24 It is reasonable to assume that any SPA/ Ramsar waterbirds roosting, loafing and/or foraging in fields on the west side of Rosper Road are habituated to the general industrial nature (and its associated noise and visual impact from vehicle traffic, sirens, railway operations, chimney stacks, pipe racks, buildings etc.) of the surrounding area.

5.25 No likely significant effects on SPA/ Ramsar birds in habitats that are functionally linked to the SPA/ Ramsar are predicted as a result of visual impacts during operation. This pathway is therefore screened out of Task 2: Appropriate Assessment.

Operational Noise Disturbance to Functionally Linked Land (Terrestrial Fields)

5.26 Noise modelling has been undertaken and is presented in ES Chapter 6 (Noise and Vibration). Noise contour maps for operation are provided in Appendix D. The modelled noise levels at the nearest functionally linked land associated with Rosper Road Fields (Field 5) are <60 dB $L_{Aeq,T}$ across the open lagoon habitat. As discussed in respect of operational noise, studies indicate that noise levels >84 dBA typically elicit a flight response in birds and the same research

recommends that construction noise levels are kept below 70 dB to avoid excessive disturbance of birds. Given that the modelled operational noise levels are well below 70 dB $L_{Aeq,T}$/ L_{Amax}, it is therefore concluded that nesting avocet at Rosper Road Pools would not be disturbed.

5.27 Noise contours have been prepared for the operational phase to show the predicted LAeq at the ecology receptors in the functionally linked land (Eco 1 and Eco 2) and are presented as Figure F3.1 in Section F.3 of Appendix F. A summary of the predicted changes in LAeq as a result of operation are presented in Table F3.1 in Section F.3 of Appendix F. The modelling demonstrates that there are no predicted exceedances of Natural England's suggested 3 dBA 'rule-of-thumb' change in noise level threshold at Eco 1 and Eco 2 in the functionally linked land to the east of Rosper Road. A 'with mitigation' scenario has been modelled for the operational phase as this includes noise mitigation measures required for environmental compliance and is not related to ecological mitigation (as no ecological mitigation is required).

5.28 No likely significant effects on breeding avocet or wintering/ passage waterbirds are predicted as a result of noise impacts during operation. This pathway is therefore screened out of Task 2: Appropriate Assessment.

Operational Noise/ Visual Disturbance to Habitats within SPA/ Ramsar Boundary

5.29 The Proposed VPI Development is approximately 1.5 km inland from the nearest intertidal mudflats at North Killingholme Marshes Foreshore. At this distance it is reasonable to conclude there is no potential for direct noise or visual disturbance to waterbirds feeding, roosting and loafing on the mudflats as a result of operational activities.

5.30 No likely significant effects on SPA/ Ramsar birds within the SPA/ Ramsar are predicted as a result of noise and visual impacts during operation. This pathway is therefore screened out of Task 2: Appropriate Assessment.

Operational Surface Water Quality

5.31 There is the potential for pollution of the Humber Estuary via the surface water drainage network, into which surface water run-off from the Proposed VPI Development will outfall during operation. However, standard environmental measures to control pollution to the drains during operation will adequately minimise risk. As this is required for compliance with environmental legislation, and not specifically to mitigate for impacts on the SAC/ SPA/ Ramsar, this can be taken into account at the screening stage. It is therefore concluded that with the embedded measures to control pollution during operation of the Proposed VPI Development, there will be no likely significant effects on Humber Estuary SAC/ SPA/ Ramsar habitats or the species they support.

Operational Air Quality

5.32 Air quality modelling has been undertaken for operational emissions from the Proposed VPI Development and is presented in ES Chapter 6 (Air Quality). The impact of emissions on sensitive ecological receptors are quantified in two ways:

- direct impacts – due to increases in atmospheric pollutant concentrations, which are assessed against defined 'critical levels'; and
- indirect impacts – deposition of acids and nutrient nitrogen to the ground surface, which are assessed against defined 'critical loads'.

5.33 The critical levels for the protection of vegetation and ecosystems are defined as "*concentrations of pollutants in the atmosphere above which direct adverse effects on...plants [and] ecosystems...may occur according to present knowledge," and critical loads are defined as "a quantitative estimate of exposure to one or more pollutants below which significant harmful effects on specified sensitive elements of the environment do not occur according to present knowledge*" (Centre for Ecology and Hydrology (CEH) and Air Pollution Information

System (APIS) website (2022). Critical levels and loads are set out in detail in Section 6.2 of ES Chapter 6 (Air Quality).

5.34 The air quality assessment has considered the modelled effects of nitrogen dioxide NO_2 (annual mean/ daily mean), sulphur dioxide SO_2 (annual mean) and ammonia NH_3 (annual mean) emissions from the Proposed VPI Development on the worst impacted designated site receptor. All impacts are considered to be insignificant at the ecological receptors as they do not exceed the 1% screening threshold for Process Contributions (PC). It is therefore concluded that the Proposed VPI Development will result no likely significant effects on the Humber Estuary SAC/ SPA/ Ramsar habitats as a result of changes in air quality due to operational stack emissions for these pollutants, except for annual average nitrogen oxides NOx at the worst-case impacted receptor (Humber Estuary (OE1)). The increase in the annual average NOx PC at this receptor represents +4.7% of the AQAL for the Proposed VPI Development assessment. As **LSEs cannot be excluded** at the screening stage, **this pathway is taken forward for Task 2: Appropriate Assessment**.

6. Stage 2: Appropriate Assessment

Introduction

6.1 Appropriate Assessment is not a technical term, it literally means an assessment that is appropriate to support a conclusion of no adverse effects on the integrity of a European site. In the Stage 1: Likely Significant Effects Screening, reported in Section 5 of this document, the following pathways could not be dismissed as posing no likely significant effect:

- construction noise disturbance to SPA/ Ramsar birds using functionally linked land – disturbance to breeding avocet at Rosper Road Pools, and wintering/ passage waterbirds feeding, roosting and loafing in terrestrial fields east of Rosper Road, and Rosper Road Pools; and
- changes in air quality during operation – the increase in annual average nitrogen oxides NOx PC at the nearest Humber Estuary SAC/ Ramsar receptor exceeds the 1% screening threshold and therefore needs to be examined in further detail in an appropriate assessment.

Construction Noise Disturbance to Functionally Linked Land (Rosper Road Pools)

6.2 A noise impact assessment has been undertaken and is presented in ES Chapter 7: Noise and Vibration (ES Volume I). A potential source-receptor pathway has been identified in the LSE screening task as a result of changes in noise levels during construction that may disturb waterbirds using Rosper Road Pools.

6.3 Noise modelling has been undertaken and is presented in ES Chapter 6 (Noise and Vibration). Noise contour maps are provided in Appendix D. The noisiest activities during construction are associated with the site clearance works (vehicle movements etc.) as there will be no driven impact piling of foundations for the buildings on site; all piling will be done using Continuous Flight Auger (CFA) rigs, which do not produce the 'peaky' noise output that can be disruptive to birds. The modelled noise levels at the nearest part of Rosper Road Pools are in the 60 – 65 dB $L_{Aeq,T}$ range and <60 dB $L_{Aeq,T}$ across the open lagoon habitat. The predicted maximum noise level arising from construction activities on the nearest part of the Proposed VPI Development site to Rosper Road Pools is <60 dB L_{Amax} across the whole of Rosper Road Pools. Studies indicate that noise levels >84 dBA typically elicit a flight response in birds and the same research recommends that construction noise levels are kept below 70 dB to avoid excessive disturbance of birds. Given that the modelled levels are well below 70 dB $L_{Aeq,T}$/ L_{Amax}, it is therefore concluded that nesting avocet and wintering/ passage waterbirds at Rosper Road Pools would not be disturbed.

6.4 Natural England requested that additional assessment work was undertaken to review the predicted changes in construction noise against ambient noise and suggested that a 3 dBA 'rule of thumb' change in noise level compared to ambient noise represented a suitable threshold above which any changes could disturb birds. A 3 dBA increase is a concept used in acoustics and sound engineering to describe a doubling of sound energy using a logarithmic scale. It is therefore not an absolute threshold above which disturbance to birds would occur, but has been applied in this report to inform HRA as a screening threshold above which disturbance to birds may occur, and therefore requires further assessment.

6.5 Baseline noise modelling was undertaken at two locations within Rosper Road Pools (Eco 3 and Eco 4); these locations were chosen to be representative of habitats that supported important numbers of SPA/ Ramsar waterbirds that were considered functionally linked to the Humber Estuary. Further information on the methodology for the baseline noise monitoring and the locations is provided in Section F.1 in Appendix F.

6.6 Noise contours have been prepared for the construction phase to show the predicted LAeq and LAmax at the ecology receptors in Rosper Road Pools. A summary of the predicted changes in

LAeq and LAmax as a result of construction are presented in Table F2.1 in Section F.2 of Appendix F. The modelling demonstrates that there are no predicted exceedances of Natural England's suggested 3 dBA 'rule-of-thumb' change in noise level threshold at Eco 3 and Eco 4 in Rosper Road Pools. Noise contours showing the predicted construction LAmax and LAeq are presented as Figure F2.1 and F2.2.

6.7 It is therefore concluded that the change in noise levels during construction is not at a magnitude that would be expected to cause any disturbance to waterbirds using Rosper Road Pools for breeding, feeding or roosting at any time of year, and therefore there will be no adverse effects on the integrity of the Humber Estuary SPA/ Ramsar.

Construction Noise Disturbance to Functionally Linked Land (Terrestrial Fields)

6.8 Noise modelling has been undertaken and is presented in ES Chapter 7 (Noise and Vibration). The noisiest activities during construction are associated with the site clearance works (vehicle movements etc.) as there will be no driven impact piling of foundations for the buildings on site; all piling will be done using Continuous Flight Auger (CFA) rigs, which do not produce the 'peaky' noise output that can be disruptive to birds. The modelled noise levels at the nearest functionally linked field (Field 5) to the Proposed VPI Development are in the 60 – 65 dB LAeq,T range and <60 dB LAeq,T across the majority of the field. Studies indicate that noise levels >84 dBA typically elicit a flight response in birds and the same research recommends that construction noise levels are kept below 70 dB to avoid excessive disturbance of birds. Given that the modelled levels are well below 70 dB LAeq,T/ LAmax, it is therefore concluded that wintering/ passage waterbirds using terrestrial fields east of Rosper Road would not be disturbed during the construction phase of the Proposed VPI Development. As described above for construction noise impacts at Rosper Road Pools, additional assessment work was undertaken to review the predicted changes in construction noise against ambient noise using the 3 dBA 'rule of thumb' change in noise level threshold suggested by Natural England as a suitable threshold above which any changes could disturb birds. It is not an absolute threshold above which disturbance to birds would occur, but has been applied in this report to inform HRA as a screening threshold above which disturbance to birds may occur, and therefore requires further assessment.

6.9 Baseline noise modelling was undertaken at two locations within functionally linked land to the east of Rosper Road (Eco 1 and Eco 2); these locations were chosen to be representative of habitats that supported important numbers of SPA/ Ramsar waterbirds that were considered functionally linked to the Humber Estuary. Further information on the methodology for the baseline noise monitoring and the locations is provided in Section F.1 in Appendix F.

6.10 Noise contours have been prepared for the construction phase to show the predicted LAeq and LAmax at the ecology receptors in the functionally linked land and are presented as Figure F2.1 and F2.2 in Section F.2 of Appendix F. A summary of the predicted changes in LAeq and LAmax as a result of construction are presented in Table F2.1 in Section F.2 of Appendix F. The modelling demonstrates that there are no predicted exceedances of the suggested 3 dBA 'rule-of-thumb' change in noise level threshold at the ecology receptors. At Eco 1 there is a predicted change of + 3 dBA; however, both the ambient noise levels and construction noise levels at this receptor are below 50 dB LAeq, which is equivalent to the sound of moderate rainfall and below even noise levels arising from normal conversation (60 dBA). It is therefore reasonable to conclude that the effects of construction noise at this location would not result in disturbance to SPA/ Ramsar waterbirds using functionally linked land.

6.11 It is therefore concluded that the change in noise levels during construction is not at a magnitude that would be expected to cause any disturbance to waterbirds using Rosper Road Pools for breeding, feeding or roosting at any time of year, and therefore there will be no adverse effects on the integrity of the Humber Estuary SPA/ Ramsar.

Changes in Air Quality during Operation

6.12 An air quality impact assessment has been undertaken and is presented in ES Chapter 6: Air Quality (ES Volume 1), with a detailed operational phase assessment presented in Appendix 6B (ES Volume II). The magnitude of air quality impacts at sensitive ecological receptors has been quantified through detailed dispersal modelling of the pollutants emitted from the main stack, and has been considered in the context of relevant critical levels and critical loads for designated (and non-designated) ecological sites.

6.13 There are two measures of particular relevance when considering the potential for significant effects on habitats to result from changes in air quality arising from the Proposed VPI Development. The first is the concentration of oxides of nitrogen (known as NOx) in the atmosphere. The main importance is as a source of nitrogen (N), which is then deposited on adjacent habitats either directly (known as dry deposition, including directly onto the plants themselves) or washed out in rainfall (known as wet deposition). The deposited nitrogen can then have a range of effects, primarily growth stimulation or inhibition, but also biochemical and physiological effects such as changes to chlorophyll content. NOx may also have some effects which are un-related to its role in total nitrogen intake (such as the acidity of the gas potentially affecting lipid biosynthesis) but the evidence for these effects is limited and they do not appear to occur until high annual concentrations of NOx are reached.

6.14 The guideline atmospheric concentration of NOx advocated by Government for the protection of vegetation is 30 micrograms per cubic metre (μgm^{-3}), known as the Critical Level (Hall et al. 2006)). This is driven by the role of NOx in N deposition and in particular in growth stimulation and inhibition. If the total NOx concentration in a given area is below the critical level, it is unlikely that N deposition will be an issue, unless there are other sources of nitrogen (e.g. ammonia). If it is above the critical level then local N deposition from NOx could be an issue and should be investigated.

6.15 The second important metric is a direct determination of the rate of the resulting N deposition, which is habitat specific because different habitats have varying tolerance to nitrogen. For many habitats there are measurable effects in the form of published dose-response relationships for N deposition, which do not exist for NOx. Unlike NOx, the N deposition rate below which current evidence suggests that effects should not arise is different for each habitat. The rate (known as the Critical Load) is provided on the UK Air Pollution Information System website (www.apis.ac.uk) and is expressed as a quantity (kilograms) of nitrogen over a given area (hectare) per year (kg N/ha/yr). More recently, there has also been research compiled that investigates N dose-response relationships in a range of habitats (Caporn et al. 2016). The air quality impact assessment has modelled a number of receptors within the Humber Estuary SAC/ SPA/ Ramsar/ SSSI that are sensitive to NOx emissions. The nearest to the Proposed VPI Development is pioneer lower and lower-mid saltmarshes (receptor OE1e in ES Appendix 6B), which is approximately 1.8 km east of the Proposed VPI Development close to 'The Lookout'. At receptor OE1e, the process contribution resulting from the maximum annual mean NOx emissions is 4.4% of the critical level for the Humber Estuary SAC/ SPA/ Ramsar (see revised version of ES Appendix 6B, Table 6B.32 below). This therefore exceeds the threshold at which an adverse effect on the designated habitats (and therefore the species they support) may occur, and indicates that further assessment is required.

6.16 Although ammonia was screened out as a pollutant in the atmosphere, it has been taken into account in the nitrogen deposition calculations. For saltmarsh, the UK Air Pollution Information System (APIS) provides several Critical Load ranges, the appropriateness of which depends on position in the tidal profile. For lower and middle saltmarsh a critical load of 20-30 kg/ha/yr is provided, while for infrequently inundated upper saltmarsh (defined as EUNIS classes MA223 and MA224) a critical load range of 10-20 kgN/ha/yr is provided. Nitrogen inputs have been experimentally demonstrated to have an effect on overall species composition of saltmarsh. However, the Critical Loads on APIS are relatively generic for each habitat type and cover a wide range of deposition rates. They do not (and are not intended to) take other influences (to which the habitat on a given site may be exposed) into consideration.

6.17 Moreover, it is important to note from APIS that the experimental studies which underlie conclusions regarding the sensitivity of saltmarsh have '… *neither used very realistic N doses*

nor input methods i.e. they have relied on a single large application more representative of agricultural discharge', which is far in excess of anything that would be deposited from atmosphere. Therefore, APIS indicates that determining which part of the Critical Load range to use for saltmarsh requires expert judgment. Overall, there is good reason to believe the upper part of the critical load range (30 kgN/ha/yr) may be more appropriate than the lower part (20 kgN/ha/yr) for some saltmarsh communities. However, the more conservative Critical Load of 20 kgN/ha/yr has been applied to receptor OE1e in the assessment as a precaution. This is an appropriately precautionary critical load for lower to middle saltmarsh.

6.18 Generally, nitrogen inputs from the air to saltmarsh are not as important as nitrogen from other sources. Effects of nitrogen deposition from atmosphere are likely to be dominated by much greater impacts from marine or agricultural sources. This is reflected on APIS itself, which states regarding saltmarsh that '*Overall, N deposition* [from atmosphere] *is likely to be of low importance for these systems as the inputs are probably significantly below the large nutrient loadings from river and tidal inputs*'. Another mitigating factor is that the nature of intertidal saltmarsh in the Humber Estuary means that there is daily flushing from tidal incursion. It is reasonable to assume that based on the likely species-composition within SSSI Unit 94 (in which receptor OE1e is located), which is indicative of pioneer/ low-mid saltmarsh, there is regular although not daily tidal inundation. This is likely to further reduce the role of nitrogen from atmosphere in controlling botanical composition. Receptor OE2 is considered to be upper saltmarsh habitat based on the available information on species composition and is therefore less regularly inundated by the tide.

6.19 For all receptors, except OE1e/ OE1d, the predicted annual average NOx concentrations are below 1% of the AQAL and therefore are considered insignificant. It is important to note that the background concentrations already include the existing contribution from the VPI Site, and therefore it is considered that the actual PECs will be below these values. However, for both annual average impacts and daily (24-hour) average impacts, the PEC from NOx at receptor OE1 does not exceed the 100% threshold (71%/ 56% respectively – see Chapter 6 (Air Quality), Appendix 6B: Table 13).

6.20 Following further stakeholder consultation, the air quality assessment has been reviewed and additional information provided in Appendix G. The process contribution values have changed from those presented in Chapter 6 (Air Quality) as there was an error in the deposition calculation for ammonia and amine which has been corrected. An updated extract from ES Appendix 6B, Table 6B.32 relating to the worst affected ecology receptors (i.e. those where N deposition is predicted to exceed the 1% screening threshold) is presented below with a comparison between the previously presented PC/ PEC values and the revised PC/ PEC values.

Revised Table 6B.32: VPI Future Baseline – Nitrogen Deposition

Receptor ID	Most Stringent Critical Load Class for the Site	Background Nitrogen Deposition (kg N/ha/yr)	Lower value of Critical Load Range	PC (kg N/ha/yr)	PC% Critical Load	PEC (kg N/ha/yr)	PEC% Critical Load	Change in PC over VPI Baseline Assessment
Original values presented in ES Chapter 6 (Air Quality)								
OE1d	*Northern wet heath*	*20.44*	*10*	*0.2*	*2.0%*	*20.6*	*206%*	*+1.5%*
OE1e	*Pioneer, low, mid upper saltmarshes*	*20.44*	*20*	*0.4*	*2.1%*	*20.6*	*104%*	*+1.5%*
OE2	*Pioneer, low, mid upper saltmarshes*	*20.44*	*20*	*0.2*	*1.0%*	*20.6*	*103%*	*+0.7%*
Revised Values								
OE1d	**Wetland and reedbed**	**17.0**	**10**	**0.35**	**3.5%**	**17.4**	**174%**	**+ 3.0%**
OE1e	**Pioneer, low, low- mid saltmarshes**	**16.8**	**20**	**0.89**	**4.4%**	**17.7**	**88%**	**+ 3.8%**
OE2	**Upper saltmarshes**	**17.0**	**10**	**0.35**	**3.5%**	**17.4**	**174%**	**+ 3.3%**

6.21 It is therefore assessed that even with the elevation of NOx above the 1% screening threshold at receptor OE1e, when this is examined in greater detail there remains no exceedance of the critical level for saltmarsh. The process contribution from the Proposed Development is small (less than 5% of the critical load or 0.89 kgN/ha/yr), even with the corrected background deposition rates for N deposition, which are now lower than those previously considered in the original air quality impact assessment. Given the regular tidal inundation of this habitat, which reduces the influence of airborne N deposition, the fact that these habitats are in favourable condition, and the fact that the total (PEC) N deposition does not exceed the lower value of the critical load range (and this lower value may be precautionary), it is concluded that this saltmarsh habitat will not be adversely affected by the small increase in N deposition resulting from the operation of the Proposed VPI Development alone.

6.22 At receptor OE2, the process contribution from the operation of the Proposed VPI Development is small (less than 5% of the critical load or 0.35 kgN/ha/yr) As these habitats are not as regularly inundated by the tide, they are more susceptible to the effects of N deposition from airborne sources. However, the process contribution from the operational N deposition affects only a tiny proportion of the overall saltmarsh resource within the Humber Estuary; the area of upper saltmarsh affected at receptor OE2 is less than the total area of the SSSI unit, which is 1.88 ha in total; as a worst case if all of this habitat was upper saltmarsh, it represents approximately 0.3% of all of the estuary saltmarsh (which is approximately 630 ha[18]). There is already high background N deposition at this location, which exceeds the lower critical load of 10 kgN/ha/yr for upper saltmarsh; however, the saltmarsh habitat at this location (within Humber Estuary SSSI Unit 95) is only in unfavourable condition due to coastal erosion. It is therefore reasonable to conclude that the small increases in N deposition at this location would not result in any significant changes to the extent or distribution of saltmarsh within the Humber Estuary such that the conservation objectives would be compromised. At receptor OE1d, the original air quality assessment presented in Chapter 6 of the ES identified this habitat as aligning with 'northern wet heath' based on the habitat description and previous air quality assessments and was screened out as it is not an SAC habitat. Following further stakeholder engagement, this has now been updated to 'wetland and reedbed' habitat, which is more reflective of the habitats present in the SSSI unit. Receptor OE1d at North Killingholme Haven Pits SSSI is outside the boundary of the Humber Estuary SAC/ SPA/ Ramsar but is functionally linked habitat to the SPA/ Ramsar because it supports SPA/ Ramsar waterbirds for feeding, roosting and loafing. However, as discussed above for receptor OE2, the process contribution to N deposition at this location is very small in context with the high background N deposition. The Natural England condition assessment for North Killingholme Haven Pits SSSI Unit 1 (which is the location of receptor OE1d) states that the habitat is in favourable condition as it is meeting its targets for habitats supporting qualifying species of waterbirds, and this is set within the context of the existing high background N deposition. Reedbed habitats are also reasonably assumed to be not particularly susceptible to damage from the small increases in nitrogen uptake predicted during operation of the Proposed Phillips 66 Development in combination with the operation of the Proposed VPI Development (either from airborne or aquatic sources). It is therefore concluded that there will be no changes in the extent or distribution of reedbed habitats supporting qualifying species of waterbirds that are functionally linked to the Humber Estuary SPA/ Ramsar, such that the conservation objectives for the SPA/ Ramsar would be compromised.

6.23 It is therefore concluded that the effects of changes in air quality (arising from nitrogen deposition) from operation of the Proposed VPI Development alone will not result in an adverse effect on the integrity of the Humber Estuary SAC/ SPA/ Ramsar.

[18] Total area of SAC is 36,657.15, of which approximately 630 ha is saltmarsh: saltmarsh-fact-sheet.pdf (humbernature.co.uk)

7. In Combination Effects

Stage 1: Screening for LSEs In Combination with Other Plans or Projects

7.1 The HRA process requires potential effects to be discussed in-combination with other plans and projects. This is to account for cumulative impacts of development plans, where the individual effects of a proposal are screened out due to there being an insufficient magnitude of impact. Ultimately, this approach allows the identification of individually small, but cumulatively material effects with the potential to cause LSEs or adverse effects.

7.2 Although a combined ES has been prepared for the Proposed VPI Development and the Proposed Phillips 66 Development, it has been agreed with stakeholders that a separate HRA will be prepared for each of the Proposed Developments. The Proposed Phillips 66 Development is therefore screened for potential in-combination effects.

7.3 The projects in Table 6 below were considered for in combination effects. However, it was ultimately concluded that no in combination adverse effect on integrity would arise alongside the Proposed VPI Development because the projects, with the exception of the Proposed Phillips 66 Development, will affect different parts of the European sites or functionally linked land and therefore not overlap in impacts, or will not be constructed at the same time, or the Proposed VPI Development will not lead to impacts that would arise from the other projects (such as loss of functionally linked land due to the AMEP development).

Table 6: List of plans and projects that have been appraised as part of the in-combination assessment, including location in relation to the nearest European site and potential for interaction with the Proposed VPI Development.

Project Name (Planning Reference)	Proposal	Proximity to Humber Estuary SAC/ SPA/ Ramsar	Potential In Combination Impact Pathways	Likely Significant Effects in combination with Proposed VPI Development?
PINS (Able Humber Ports Ltd) - Able Marine Energy Park (AMEP) Consented, under construction	New quay, capital dredging and onshore facilities for manufacture, assembly and storage of marine energy installation components.	Partly within	<u>Potential In Combination Loss of Functionally Linked Land</u> Mitigation for the large-scale losses of functionally linked land associated with the AMEP scheme at North Killingholme Marshes has already been delivered north of Humber Sea Terminal, at Halton Marshes Wet Grassland Scheme (HMWGS). The HRA therefore concluded that there would be no adverse effect on integrity of the SPA/ Ramsar. The HMWGS mitigation area is several kilometres north of the Proposed VPI Development and will therefore not be affected by the Proposed VPI Development as it is well outside the zone of influence. There is also no potential for in-combination LSE on functionally linked land east of Rosper Road because the loss of fields within the AMEP site has already been compensated for through habitat creation at HMWGS for Habitats Regulations compliance.	No
			<u>Potential In Combination Noise/ Visual Disturbance During Construction and Operation</u> Site clearance work within the AMEP development boundary has been ongoing for several years, and therefore is part of the baseline conditions that birds within the remaining Rosper Road fields (south of Station Road) will be experiencing. Any birds present in these fields are therefore present within this context, and therefore there is no potential for effects in combination with the Proposed VPI Development.	No
Enabling works on and adjacent to the AMEP site EIA Scoping Request	Enabling works for AMEP	0.2 km	The scoping opinion request letter states that as alternative mitigation land has already been delivered at HMWGS, significant effects on ecology receptors are considered unlikely. It is assumed that the Applicant's HRA will consider all potential pathways for likely significant effects, including noise and visual disturbance during construction and operation. However, as all the land within and surrounding the site has been either developed, or planned/ consented for future development there is a presumption that this area will be lost for SPA/ Ramsar birds (which has	No

Project Name (Planning Reference)	Proposal	Proximity to Humber Estuary SAC/ SPA/ Ramsar	Potential In Combination Impact Pathways	Likely Significant Effects in combination with Proposed VPI Development?
(PA/ SCO/ 2022/7)			driven the creation of the HMWGS), and consequently all SPA/ Ramsar waterbirds will be permanently displaced.	
AMEP Monopile Manufacturing Facility (PA/2021/1525) Awaiting determination	Monopile manufacturing facility approximately 26 ha in extent.	415 m	<u>Potential In Combination Noise/ Visual Disturbance During Construction</u> The HRA screening concluded LSEs as a result of construction noise, and subsequently an appropriate assessment was undertaken. The appropriate assessment concluded that there would be no adverse effect on integrity of the SPA/ Ramsar given that only a small area of functionally linked land would be affected, and that this land supported only very low numbers of curlew (peak count of 7 birds is well below the 1% Humber Estuary population threshold). No other SPA/ Ramsar waterbirds were present in numbers >1% threshold in the surrounding fields, and therefore they were screened out of the assessment.	No
			<u>Potential In Combination Loss of Functionally Linked Land</u> Mitigation for the large-scale losses of functionally linked land associated with the AMEP scheme at North Killingholme Marshes has already been delivered north of Humber Sea Terminal, at Halton Marshes Wet Grassland Scheme (HMWGS). The HRA therefore concluded that there would be no adverse effect on integrity of the SPA/ Ramsar. As discussed above in respect of the AMEP development, the HMWGS mitigation area is several kilometres north of the Proposed VPI Development and will therefore not be affected by the Proposed VPI Development as it is well outside the zone of influence. There is also no potential for in-combination LSE on functionally linked land east of Rosper Road because the majority of the fields (including the monopile facility site) have already been consented for development for Able UK projects (mostly associated with AMEP), and adequate mitigation delivered at HMWGS for Habitats Regulations compliance.	No
			<u>Potential In Combination Noise/ Visual Disturbance During Operation</u>	No

Project Name (Planning Reference)	Proposal	Proximity to Humber Estuary SAC/ SPA/ Ramsar	Potential In Combination Impact Pathways	Likely Significant Effects in combination with Proposed VPI Development?
			The HRA screening concluded no LSE on the SPA/ Ramsar or surrounding functionally linked land due to noise/ visual disturbance during operation because modelled noise levels outside the site <55dB and therefore too low to result in disturbance/ displacement of waterbirds.	
			Potential In Combination Lighting Disturbance During Operation Given the proximity of the site to the SPA/ Ramsar, the HRA screening conclude that this pathway would result in LSE, and therefore an appropriate assessment was undertaken. The appropriate assessment concluded that operational lighting disturbance would result in no adverse effect on integrity of the SPA/ Ramsar. Given the distance of the Proposed Development from the Humber Estuary SPA/ Ramsar, and the physical separation of the site from the functionally linked land east of Rosper Road, it is concluded that there is no potential for in-combination LSE on the SPA/ Ramsar as a result of operational lighting.	No
VPI Immingham Open Cycle Gas Turbine (OGCT) DCO (PINS Reference: EN010097) Consented	New 299 MW power station on land west of Rosper Road approximately 12 ha	1.4 km	Potential In Combination Noise/ Visual Disturbance During Construction Given the proximity of this development to the Proposed VPI Development, noise/ visual disturbance from each development should they be constructed together has been identified as a potential pathway for in-combination effects on waterbirds feeding, roosting and loafing in terrestrial fields on the west side of Rosper Road. The No Significant Effects (NSE) report submitted as part of the DCO has been reviewed for relevant information to inform this in-combination effects assessment. Other than piling, discussed below, none of the other construction activities associated with the construction of the VPI Immingham OGCT will generate noise that would be discernible above the ambient noise environment of the industrial sites surrounding the Rosper Road fields. It is reasonable to conclude that there is no potential for in-combination likely significant effects on waterbirds via this pathway. This pathway is therefore scoped out. Construction of the VPI Immingham OGCT may require the use of piling techniques. The NSE report states that any potential noise or vibration impacts arising from the use of these techniques would be	No

Project Name (Planning Reference)	Proposal	Proximity to Humber Estuary SAC/ SPA/ Ramsar	Potential In Combination Impact Pathways	Likely Significant Effects in combination with Proposed VPI Development?
			controlled through measures to be included in the detailed Construction Environmental Management Plan (CEMP), a draft of which was included as part of the DCO application.	
			Potential In Combination Loss of Functionally Linked Land Habitat within the boundary of the VPI Immingham OCGT scheme and the Proposed VPI Development is not functionally linked to the SPA/ Ramsar.	No
			Potential In Combination Noise/ Visual Disturbance During Operation Noise modelling was carried out for the operational phase of the VPI Immingham OCGT, which predicted that that operational noise levels will have attenuated to below 50dB L_{Aeq} across the majority of the fields west of Rosper Road, with only the most western edge (along the boundary to Rosper Road) experiencing worst case operational noise levels of 57dB L_{Aeq}. The sound levels along the eastern edge of the Rosper Road fields was predicted to be below 40dB L_{Aeq}. These levels are well within the ambient range of noise levels across these fields, which was between 61dB L_{Aeq} and 51dB LAF90 along Rosper Road at the closest point of the field nearest to the Proposed VPI Development, to 48dB L_{Aeq} and 43/46dB L_{AF90} along the eastern edge. The NSE report therefore concluded that operational noise would not result in any increase in the baseline levels experienced by waterbirds that may be using the fields east of Rosper Road.	No
			Potential In Combination Air Quality Impacts During Operation Negligible impacts from construction traffic. Cumulative operational emissions for the OCGT with the operation of the existing VPI Immingham CHP Power Plant were considered at the time of the OCGT DCO application. Given that the Proposed VPI Development only results in negligible increases in pollutant concentrations that will be released from the OCGT, no cumulative impacts are anticipated.	No
		0.7 km	Potential In Combination Loss of Functionally Linked Land	No

Project Name (Planning Reference)	Proposal	Proximity to Humber Estuary SAC/ SPA/ Ramsar	Potential In Combination Impact Pathways	Likely Significant Effects in combination with Proposed VPI Development?
Land Adjacent to the Westgate Entrance, Port of Immingham (PA/2022/1223) Awaiting determination	Port-related storage (including full application for open storage and outline application for buildings) occupying approximately 9 ha		Habitat within the boundary of the Land Adjacent to Westgate Entrance scheme comprised a mosaic of tall grassland and scrub habitat originating from abandoned agricultural land, and was assessed as unsuitable to support loafing, feeding and roosting waterbirds. The land was therefore concluded to be not functionally linked to the SPA/ Ramsar.	
			<u>Potential In Combination Noise/ Visual Disturbance During Construction (Open Storage)</u> Given the proximity of this development to the Proposed VPI Development, noise/ visual disturbance from each development should they be constructed together has been identified as a potential pathway for in-combination effects on waterbirds feeding, roosting and loafing in terrestrial fields on the west side of Rosper Road, and breeding in Rosper Road Pools. The Report to Inform a Habitats Regulations Assessment submitted with the planning application (dated June 2022) has been reviewed for relevant information to inform this in-combination effects assessment. Construction activities associated with the proposed development will generate noise that would be <45 dB in the fields adjacent to the site/ Rosper Road Pools and would therefore not be discernible above the ambient noise environment of the industrial sites surrounding the Rosper Road fields and pool. It is reasonable to conclude that there is no potential for in-combination likely significant effects on waterbirds via this pathway. This pathway is therefore screened out. In terms of visual impacts, the screening assessment concluded that the nature and scale of construction activities would not be significantly different form on-going construction activities in the area. It is reasonable to conclude that there is no potential for in-combination likely significant effects on waterbirds via this pathway. This pathway is therefore screened out.	No
			<u>Potential In Combination Noise/ Visual Disturbance During Construction (With Buildings)</u> Construction piling activities associated with the buildings will generate noise that would be >70 dB L_{Amax} across the entire Rosper Road Pools and >80 dB L_{Amax} over much of the Pools. As this exceeds the general accepted limit of 70 dB above which waterbirds would be expected to be disturbed to such an extent that they took flight, this pathway was concluded to result in **LSE.**	Yes

Project Name (Planning Reference)	Proposal	Proximity to Humber Estuary SAC/ SPA/ Ramsar	Potential In Combination Impact Pathways	Likely Significant Effects in combination with Proposed VPI Development?
			In terms of visual impacts, as for the open storage scenario, the screening assessment concluded that the nature and scale of construction activities would not be significantly different form on-going construction activities in the area. It is reasonable to conclude that there is no potential for in-combination likely significant effects on waterbirds via this pathway. This pathway is therefore screened out.	
			Potential In Combination Noise/ Visual Disturbance During Operation (Open Storage) Noise modelling was carried out for the operational phase of this proposed development, which predicted that that operational noise levels will have attenuated to below 55 dB L_{Amax} across Rosper Road Pools, and therefore it was concluded that there would be no likely significant effects. However, the modelled L_{Amax} noise levels (the peaks of noise caused every time a shipping container makes contact) will exceed 70 dB L_{Amax} over the whole of Rosper Road Pools and exceed 80dB L_{Amax} over some of the Pools. As this exceeds the general accepted limit of 70 dB above which waterbirds would be expected to be disturbed to such an extent that they took flight, this pathway was concluded to result in **LSE.** In terms of visual impacts, the screening assessment concluded that the nature and scale of operational activities would not be significantly different form on-going construction activities in the area. This pathway is therefore screened out. This option included luminaires on masts up to approximately 40 m high across the centre of the site, and up to 30 m high at the northern boundary, and this pathway was therefore concluded to result in **LSE.**	Yes
			Potential In Combination Noise/ Visual Disturbance During Operation (With Buildings) Noise modelling was carried out for the operational phase of this proposed development, which predicted that that operational noise levels will have attenuated to below 55dB L_{Aeq} and 55 dB L_{Amax} across Rosper Road Pools, and therefore it was concluded that there would be no likely significant	No

Project Name (Planning Reference)	Proposal	Proximity to Humber Estuary SAC/ SPA/ Ramsar	Potential In Combination Impact Pathways	Likely Significant Effects in combination with Proposed VPI Development?
			effects. It is reasonable to conclude that there is no potential for in-combination likely significant effects on waterbirds via this pathway. This pathway is therefore screened out. In terms of visual impacts, the screening assessment concluded that the nature and scale of operational activities would not be significantly different form on-going construction activities in the area. Operational lighting impacts were also considered and not predicted to be higher than existing light levels to Rosper Road Pools. It is reasonable to conclude that there is no potential for in-combination likely significant effects on waterbirds via this pathway. This pathway is therefore screened out.	
Humber Zero: Proposed Philips 66 Development Sister project to Humber Zero: VPI Development Submission due at the same time as the Proposed VPI Development	Carbon capture and storage plant with associated infrastructure	1. 7 km	<u>Potential In Combination Loss of Functionally Linked Land</u> Habitat within the boundary of the Proposed Philips 66 Development site ('the Phillips 66 Site') is almost entirely within the operational area of the current plant, and therefore there is no suitable habitat for loafing, feeding and roosting waterbirds. A small part of the Proposed Phillips 66 Development lies within the VPI Site (which is adjacent); however, surveys of this land did not record SPA/ Ramsar birds and it was therefore concluded to be not functionally linked to the SPA/ Ramsar. There is therefore no potential for in-combination losses of functionally linked land.	No
			<u>Potential In Combination Noise/ Visual Disturbance during Construction</u> Noise modelling was carried out for the construction phase of the Proposed Phillips 66 Development, which predicted that that noise levels will have attenuated to below 55dBL_{Aeq} and 55 dB L_{Amax} across Rosper Road Pools and the surrounding terrestrial fields east of Rosper Road, and therefore it was concluded that there would be no likely significant effects. Noise contour plots for the Proposed VPI Development in combination with the Proposed Phillips 66 Development are provided in Appendix E. Further assessment has been undertaken to review the changes in predicted noise levels against the baseline noise levels (see Appendix F), and a 3 dBA 'rule of thumb' in levels change suggested by Natural England to be used as a screening threshold for identifying potential bird disturbance. At one of the locations modelled (Eco 1, in the functionally linked land east of Rosper Road), the increase is predicted to be 5 dBA above ambient (see Table F4.1 in Section F.4 of Appendix F). This pathway is	**Yes**

Project Name (Planning Reference)	Proposal	Proximity to Humber Estuary SAC/ SPA/ Ramsar	Potential In Combination Impact Pathways	Likely Significant Effects in combination with Proposed VPI Development?
			therefore screened into the Stage 2 assessment. No other changes above the 3 dBA threshold are identified at any of the other ecological receptors, and therefore noise impacts at these locations are concluded to result in no likely significant effects on waterbirds. The nature and scale of the temporary construction activities associated with the Proposed Phillips 66 Development are not significantly different from on-going industrial activities within the area surrounding the Rosper Road Pools. This pathway is therefore screened out.	
			Potential In Combination Noise/ Visual Disturbance during Operation Noise modelling was carried out for the operational phase of the Proposed Phillips 66 Development, which predicted that that operational noise levels will have attenuated to below 55dB L_{Aeq} and 55 dB L_{Amax} across Rosper Road Pools and the surrounding terrestrial fields east of Rosper Road. Further assessment has been undertaken to review the changes in predicted noise levels against the baseline noise levels (see Appendix G), and a 3 dBA 'rule of thumb' in levels change suggested by Natural England to be used as a screening threshold for identifying potential bird disturbance. A noise contour map has been prepared to show the predicted LAeq at the ecology receptors for the operation of the Proposed VPI Development in combination with the operation of the Proposed Philips 66 Development (see Figure F4.3 in Section F.4 of Appendix F). For both the daytime and nighttime scenarios at all receptors there are no changes exceeding 3 dBA (see Table F4.2). It is therefore reasonable to conclude that the cumulative effects of operational noise would not result in disturbance to waterbirds, and therefore there would be no likely significant effects on SPA/ Ramsar waterbirds using Rosper Road Pools or functionally linked land resulting from the operation of the Proposed VPI Development in combination with the operation of the Proposed Philips 66 Development. The nature and scale of the operational activities associated with the Proposed Development are not significantly different from on-going industrial activities within the area surrounding the Rosper Road Pools. This pathway is therefore screened out.	No
			Potential In-Combination Air Quality Impacts during Operation	**Yes**

Project Name (Planning Reference)	Proposal	Proximity to Humber Estuary SAC/ SPA/ Ramsar	Potential In Combination Impact Pathways	Likely Significant Effects in combination with Proposed VPI Development?
			An air quality impact assessment has been undertaken, and has modelled the cumulative effects of the two Proposed Developments. Further information on the cumulative assessment work undertaken is presented below.	
PINS (Chrysaor Production (UK) Limited - Viking CCS Pipeline Scoping Report Submitted	New 55 km underground CO_2 pipeline from Immingham to Theddlethorpe	0.2 km	<u>Potential In-Combination Air quality Impacts during Construction and Operation</u> There is the potential for construction activities to overlap, but no significant air quality effects have been identified. No operational emissions are envisaged.	No
			<u>Potential In Combination Loss of Functionally Linked Land</u> The Scoping Report highlights the first 5 km of pipeline at the northern end of the EIA Scoping Boundary (1 km wide corridor adjacent to the VPI Site) as being functionally linked land to the Humber Estuary SPA/ Ramsar, although surveys are still ongoing. The Applicant will need to undertake a cumulative impact assessment for losses of functionally linked land once surveys are complete.	No
PINS (National Grid) - Humber Low Carbon Pipelines	CO_2 and hydrogen transport pipelines across the Humber region	Crosses Humber Estuary	<u>Potential In-Combination Air quality Impacts during Construction and Operation</u> There is the potential for construction activities to overlap, but no significant air quality effects have been identified. No operational emissions are envisaged.	No

Project Name (Planning Reference)	Proposal	Proximity to Humber Estuary SAC/ SPA/ Ramsar	Potential In Combination Impact Pathways	Likely Significant Effects in combination with Proposed VPI Development?
EIA Scoping Report Submitted			Potential In Combination Loss of Functionally Linked Land The Scoping Report identifies a number of route corridor options that would impact functionally linked land to the Humber Estuary SPA/ Ramsar, although surveys are still ongoing. The Applicant will need to undertake a cumulative impact assessment for losses of functionally linked land once surveys are complete. However, due to the distance of the project from the Proposed VPI Development (2.4 km), it is not considered that there is potential for cumulative effects on SPA/ Ramsar birds.	No
PINS (C.GEN Killingholme Ltd) - North Killingholme Power Project Consented	New 470 MW gas-fired power station	Adjacent	Potential In-Combination Air quality Impacts during Construction Potential for construction activities to overlap, but due to distance from the Proposed VPI Development (3.1km), and the Study Area for construction type activities being 350m, there is limited potential for cumulative effects.	No
			Potential In-Combination Air quality Impacts during Operation Operational emissions from the North Killingholme Power Project and the Proposed Developments will be subject to regulation via Environmental Permits and the use of Best Available Techniques for the control of emissions. The North Killingholme Power Project is 3.1km north of the Proposed Developments, and the prevailing wind direction (from the south west) will mean that the location of peak impacts from both developments will not occur in the same location. Significant cumulative impacts are therefore not foreseen. Further assessment work will be undertaken by the Applicant, and will consider potential in-combination effects with the Proposed VPI Development.	No
PINS (Associated British Ports) - Immingham	Roll-on roll off terminal including new jetty	Partly within	Potential In-Combination Air quality Impacts during Construction Potential for construction activities to overlap, but due to distance from the Proposed VPI Development (3.6 km), and the Study Area for construction type activities being 350 m, there is limited potential for cumulative effects.	No

Project Name (Planning Reference)	Proposal	Proximity to Humber Estuary SAC/ SPA/ Ramsar	Potential In Combination Impact Pathways	Likely Significant Effects in combination with Proposed VPI Development?
Eastern Ro-Ro Terminal			Potential In-Combination Air quality Impacts during Operation Emissions from vessels associated with the Ro-Ro Terminal could have the potential to result in cumulative impacts of combustion emissions with the Proposed VPI Development, although no assessment has been carried out to date, as the project is at scoping stage. Further assessment work will be undertaken by the Applicant, and will consider potential in-combination effects with the Proposed VPI Development.	No
PINS (Associated British Ports) - Immingham Green Energy Terminal (IGET) Scoping Report submitted	Green energy terminal including new jetty	Partly within	Potential In-Combination Air quality Impacts during Construction There is the potential for construction activities to overlap, but due to distance from the Proposed VPI Development (3.6 km), and the Study Area for construction type activities being 350 m, there is limited potential for cumulative effects.	No
			Potential In-Combination Air Quality Impacts during Operation Emissions from docked vessels associated with the new jetty could have the potential to result in cumulative impacts of combustion emissions with the Proposed Phillips 66 Development. Further assessment work will be undertaken by the Applicant, and will consider potential in-combination effects with the Proposed VPI Development.	No
Gigastack (PA/SCO/2022/ 13) Scoping Report submitted	100 MW hydrogen electrolyser and underground electrical cable connection to Hornsea Two onshore substation, water discharge	1 km	Potential In Combination Noise/ Visual Disturbance during Construction and Operation The Gigastack project is immediately to the north of Rosper Road Pools, which forms the southern boundary of the site. There is therefore the potential for noise/ visual disturbance to Humber Estuary SPA/ Ramsar waterbirds using Rosper Road Pools, which is identified as functionally linked land to the SPA/ Ramsar. Further assessment work will be undertaken by the Applicant to assess this potential pathway. At this stage a precautionary approach has been taken, and this pathway is scoped in.	Yes

Project Name (Planning Reference)	Proposal	Proximity to Humber Estuary SAC/ SPA/ Ramsar	Potential In Combination Impact Pathways	Likely Significant Effects in combination with Proposed VPI Development?
	and a hydrogen export pipeline to the Humber Estuary		Potential In Combination Loss of Functionally Linked Land The Scoping Report states that analysis of wintering bird survey data for the site is ongoing and will be presented in the ES. However, it is assumed based on the baseline data collected for the Proposed Developments, that the field in which the Gigastack development will be located is functionally linked to the Humber Estuary SPA/ Ramsar. The Applicant will need to undertake a cumulative impact assessment for losses of functionally linked land once the data analysis and impact assessment has been completed. However, given that the Proposed VPI Development will not result in any losses of functionally linked land, there is no potential for in-combination effects.	No
			Potential In Combination Air Quality Effects during Operation The scoping report states that the only continuous process emissions expected from the development are an oxygen vent and small hydrogen vent, with periodic hydrogen venting during maintenance, start up and energy situations. No combustion will take place on the site during hydrogen production. However, further assessment work will be undertaken by the Applicant as necessary, including procession emission modelling (if needed). However, at this stage, the information provided indicates that there would be no operational emissions to air that could adversely affect sensitive habitats. It is therefore unlikely that there will be any potential for operational air quality impacts in combination with the Proposed VPI Development.	No

Stage 2: Appropriate Assessment In Combination with Other Plans or Projects

7.4 The in-combination screening assessment identified the following pathways by which other plans or projects could result in LSE on Humber Estuary SPA/ Ramsar bird populations, and thus which pathways should be screened into appropriate assessment in-combination with the Proposed VPI Development:

- noise/ visual disturbance during construction – Proposed VPI Development in combination with Land Adjacent to Westgate Entrance, Port of Immingham (With Buildings Option) and Gigastack;
- changes in air quality during operation – Proposed VPI Development in combination with Proposed Phillips 66 Development; and
- noise/ visual disturbance during operation – Proposed VPI Development in combination with Land Adjacent to the Westgate Entrance, Port of Immingham (Open Storage Option) and Gigastack.

Construction

Construction Noise/ Visual Disturbance

Proposed VPI Development with Proposed Phillips 66 Development

7.5 A noise contour map has been prepared to show the predicted LAeq and LAmax at the ecology receptors for the construction of the Proposed VPI Development in combination with the construction of the Proposed Phillips 66 Development (assuming overlap of the construction phases) (see Figure F4.1). For all scenarios and all receptors except for the predicted cumulative change in LAeq at receptor Eco 1, there are no changes exceeding 3 dBA (see Table F4.1). At receptor Eco 1 there is a predicted 5 dBA increase in LAeq assuming construction activities proceed at the same time. Although this is higher than the 3 dBA indicated by Natural England as a change in magnitude potentially resulting in disturbance, both the ambient noise levels and cumulative construction noise levels at this receptor are below 50 dB LAeq, which is equivalent to the sound of moderate rainfall and below even noise levels arising from normal conversation (60 dBA). It is therefore reasonable to conclude that the cumulative effects of construction noise at this location would not result in disturbance to waterbirds, and therefore there would be no likely significant effects on SPA/ Ramsar waterbirds using functionally linked land resulting from the construction of the Proposed VPI Development in combination with the Proposed Phillips 66 Development.

Proposed VPI Development with Land Adjacent to the Westgate Entrance, Port of Immingham (With Buildings Option)

7.6 The potential for the construction of Land Adjacent to the Westgate Entrance, Port of Immingham (With Buildings Option) to result in in-combination effects with the Proposed VPI Development on Rosper Road Pools (functionally linked to the Humber Estuary SPA/ Ramsar) was identified at the screening stage. Construction piling activities associated with the 'With Buildings' option for this scheme were modelled to generate noise that would be >70 dB L_{Amax} across the entire Rosper Road Pools and >80 dB L_{Amax} over much of the pools. As this exceeds the general accepted limit of 70 dB above which waterbirds would be expected to be disturbed to such an extent that they took flight, this pathway was concluded to result in likely significant effects for this scheme alone.

7.7 In order to reduce noise levels (L_{Amax}) to below 70 dB across Rosper Road Pools during construction of Phase 2, the HRA identified that it was necessary to introduce mitigation if driven piling is confirmed to be necessary at the detailed design stage. Various mitigation options were proposed to reduce noise levels to acceptable levels across Rosper Road Pools including the use of acoustic barriers, acoustic shrouding around the driving system, resilient material (non-metallic dolly) between the hammer and the pile head/driving helmet and/ or pile driving equipment that partially or fully encloses the hammer and pile. With mitigation in place

mitigation in place to reduce construction noise levels to below 70 dB L_{Amax} no adverse effect on integrity will arise through noise disturbance during building construction in combination with the Proposed Development.

7.8 In terms of visual impacts, the HRA screening assessment for Land Adjacent to Westgate Entrance (With Buildings Option) concluded that the nature and scale of construction activities would not be significantly different from on-going construction activities in the area. It is reasonable to conclude that there is no potential for in-combination likely significant effects on waterbirds via this pathway and this pathway was therefore screened out.

Proposed VPI Development with Gigastack

7.9 Given the proximity of Gigastack to Rosper Road Pools and the potential for simultaneous construction with the Proposed VPI Development, there is potential for in-combination noise/ visual disturbance to Rosper Road Pools (functionally linked to the Humber Estuary SPA/ Ramsar). No detailed assessment of the potential impacts of construction of the Gigastack development has been undertaken at this stage, however, the Gigastack development is much closer to Rosper Road Pools than the Proposed VPI Development and it is therefore reasonable to conclude that there is no potential for additional disturbance to arise from the simultaneous construction of Gigastack with the Proposed VPI Development. However, further assessment will need to be undertaken by the Applicant as part of its HRA and ES.

7.10 In respect of potential noise/ visual disturbance to functionally linked land to the north of Gigastack, as all the remaining land has been either developed, or planned/ consented for future development there is a presumption that this land will be lost for SPA/ Ramsar birds (which has driven the creation of the HMWGS for the various Able UK developments, including AMEP and Enabling Works), and consequently all SPA/ Ramsar waterbirds will be permanently displaced.

Proposed VPI Development with Proposed Phillips 66 Development, Land off Westgate Immingham (Open Storage Option and With Buildings Option) and Viking CCS

7.11 Additional modelling has been undertaken to show the predicted LAeq at the ecology receptors for the construction of the Proposed VPI Development in combination with the Propsoed Phillips 66 Development, the Land off Westgate, Immingham proposed development, which is located immediately south of and adjacent to Rosper Road Pools and receptor Eco 4, and the Viking CCS project, which is located immediately south of the Proposed VPI Development. For the Land off Westgate, Immingham development, two scenarios are considered (open storage and building option), and the modelling has been undertaken with mitigation (9m noise barrier).

7.12 For both the daytime and nighttime scenarios at receptors Eco 1, Eco 3 and Eco 4 there are predicted in-combination construction noise level changes exceeding 3 dBA (see Table F4.3). This is due to the proximity of construction at the Land off Westgate, Immingham site to Rosper Road Pools. This increase would only arise in a situation where all four projects are under construction simultaneously and all projects undertake their noisiest construction activities at the closest point to Rosper Road Pools and the fields to the north simultaneously. Although representing the worst-case scenario, this is unrealistic given that there are as yet no confirmed/ committed construction timescales for the other projects, given that they are yet to be even consented by the relevant planning authorities (North Lincolnshire Council and the Planning Inspectorate). Furthermore, given the inter-dependencies associated with the construction of the Proposed VPI Development and the Viking CCS (which is the pipeline route required to transport the captured carbon from the Proposed VPI Development to a storage facility) the applicants for those developments, once consented, will need to time their construction activities so they are not overlapping by virtue of their partially shared site boundaries.

7.13 However, even assuming the worst-case theoretical scenario described above where all four projects are constructed simultaneously, the cumulative construction noise level increases at Eco 1, Eco 3 and Eco 4 of up to 8 dBA does not result in construction noise levels exceeding 52 dB LAeq at any of these receptors, which to put into context is below noise levels arising from normal conversation (60 dBA). It is therefore reasonable to conclude that the cumulative effects of construction noise on functionally linked land would not result in disturbance to

waterbirds, and there would be no significant adverse effects on the integrity of the Humber Estuary SPA/ Ramsar resulting from construction noise from the Proposed VPI Development in combination with construction noise from the Proposed Phillips 66 Development, Land off Westgate Immingham (Open Storage Option and With Building Option) and Viking CCS.

Operation

Operational Changes in Air Quality

Proposed VPI Development with Proposed Phillips 66 Development

7.14 There are no in-combination exceedances of the 1% Critical Level screening threshold for NOx, SO_2 and ammonia. There is therefore no potential for in-combination effects on designated habitats as a result of these emissions from the two Proposed Developments operating together.

7.15 Acid deposition resulting from the two Proposed Developments operating together is modelled to reduce compared to the baseline, which represents a slight benefit.

7.16 The air quality modelling indicates three places within the Humber Estuary where in-combination contribution from the two Proposed Developments operating together will exceed 1% of the Critical Load for nitrogen deposition (receptors OE1d,OE1e and OE2) (Chapter 6: Appendix 6B, Table 6B.44). In the previous version of this assessment, OE1d was assigned as heathland which was not a designated feature of the Humber Estuary SAC, and it was therefore not considered further.

7.17 However, as set out in Appendix H, this receptor has been revised to wetland and reedbed habitat, which although also not a designated feature of the Humber Estuary SAC, has been included in the assessment on the basis that it provides functionally linked habitat for qualifying species of SPA/ Ramsar in waterbirds. A revised version of ES Chapter 6 Table 6B.44 has been prepared as part of the updated assessment (see below).

Revised Table 6B.44 – In-Combination Future – Nitrogen Deposition at Ecological Receptors

Receptor ID	Most Stringent Critical Load Class for the Site	Background Nitrogen Deposition (kg N/ha/yr)	Lower value of Critical Load Range	PC (kg N/ha/yr)	PC% Critical Load	PEC (kg N/ha/yr)	PEC% Critical Load	Change in PC over VPI Baseline Assessment
Original values presented in ES Chapter 6 (Air Quality)								
OE1d	*Northern wet heath*	*20.44*	*10*	*0.48*	*4.8%*	*20.9*	*209%*	*+2.9%*
OE1e	*Pioneer, low, mid upper saltmarshes*	*20.44*	*20*	*0.97*	*4.8%*	*20.9*	*107%*	*+3.6%*
OE2	*Pioneer, low, mid upper saltmarshes*	*20.44*	*20*	*0.48*	*2.4%*	*20.9*	*105%*	*+1.4%*
Revised Values								
OE1d	**Wetland and reedbed**	**17.0**	**10**	*0.48*	**4.8%**	**17.5**	**175%**	**+2.9%**
OE1e	**Pioneer, low, low- mid saltmarshes**	**16.8**	**20**	*0.97*	**4.8%**	**17.8**	**89%**	**+3.6%**
OE2	**Upper saltmarshes**	**17.0**	**10**	*0.48*	**4.8%**	**17.5**	**175%**	**+2.8%**

7.18 At receptor OE1e and OE2 (saltmarsh) where the Critical Load for this habitat is exceeded and the contribution of the two Proposed Developments (driven primarily by the contribution of the Proposed VPI Development alone) is 4.8% of the critical load. However, paragraph 4.25 of

Natural England guidance[19] indicates that the simple fact that '1% of the Critical Load threshold' is exceeded doesn't necessarily mean an adverse effect on integrity will occur.

7.19 For saltmarsh, the UK Air Pollution Information System (APIS) provides a Critical Load range of 20-30 kg/ha/yr and nitrogen inputs have been experimentally demonstrated to have an effect on overall species composition of saltmarsh. However, the Critical Loads on APIS are relatively generic for each habitat type and cover a wide range of deposition rates. They do not (and are not intended to) take other influences (to which the habitat on a given site may be exposed) into consideration.

7.20 Moreover, it is important to note from APIS that the experimental studies which underlie conclusions regarding the sensitivity of saltmarsh have "… *neither used very realistic N doses nor input methods i.e. they have relied on a single large application more representative of agricultural discharge"*, which is far in excess of anything that would be deposited from atmosphere. Therefore, APIS indicates that determining which part of the critical load range to use for saltmarsh requires expert judgment. Overall, there is good reason to believe the upper part of the critical load range (30 kgN/ha/yr) may be more appropriate than the lower part (20 kgN/ha/yr) for some saltmarsh communities.

7.21 Generally, nitrogen inputs from the air are not as important as nitrogen from other sources. Effects of nitrogen deposition from atmosphere are likely to be dominated by much greater impacts from marine or agricultural sources. This is reflected on APIS itself, which states regarding saltmarsh that "*Overall, N deposition [from atmosphere] is likely to be of low importance for these systems as the inputs are probably significantly below the large nutrient loadings from river and tidal inputs"*. Another mitigating factor is that the nature of intertidal saltmarsh in the Humber estuary means that there is daily flushing from tidal incursion. This is likely to further reduce the role of nitrogen from atmosphere in controlling botanical composition.

7.22 It is therefore assessed that even with the in-combination elevation of nitrogen deposition above the 1% screening threshold, the Process Contribution (PC) from the two Proposed Developments is insignificant at 0.97 kg N/ ha/ yr (OE1e) and 0.48 kg/N/ha/yr (OE2) compared to a Predicted Environmental Concentration (PEC) of 17.8 kg N/ ha/ yr, (OE1e) amd 17.5 kgN/ha/yr (OE2). At receptor OE1e, the PEC is towards the lower end of the critical load range for pioneer, low and low-mid saltmarsh. At receptor OE2 the high background N deposition is already exceeding the lower critical load for upper saltmarsh habitat; however, based on the condition assessment for Unit 95 of the Humber Estuary SSSI (in which OE2 is located) the saltmarsh habitat is in unfavourable condition only due to coastal erosion. The very small N deposition contribution resulting from the operational emissions to air of the Proposed VPI Development in combination with the Proposed Phillips 66 development would therefore not reasonably be expected to result in any changes to the extent or distribution of this habitat within the Humber Estuary such that the conservation objectives would be compromised.

7.23 Receptor OE1d (wetland and reedbed) at North Killingholme Haven Pits SSSI is outside the boundary of the Humber Estuary SAC/ SPA/ Ramsar but is functionally linked habitat to the SPA/ Ramsar because it supports SPA/ Ramsar waterbirds for feeding, roosting and loafing. However, as discussed above for receptor OE2, the process contribution to N deposition at this location is very small in context with the high background N deposition. The Natural England condition assessment for North Killingholme Haven Pits SSSI Unit 1 (which is the location of receptor OE1d) states that the habitat is in favourable condition as it is meeting its targets for habitats supporting qualifying species of waterbirds, and this is set within the context of the existing high background N deposition. Reedbed habitats are also reasonably assumed to be not particularly susceptible to damage from the small increases in nitrogen uptake predicted during operation of the Proposed VPI Development in combination with the operation of the Proposed Phillips 66 Development (either from airborne or aquatic sources). It is therefore concluded that there will be no changes in the extent or distribution of reedbed habitats supporting qualifying species of waterbirds that are functionally linked to the Humber Estuary SPA/ Ramsar, such that the conservation objectives for the SPA/ Ramsar would be compromised.

[19] http://publications.naturalengland.org.uk/publication/4720542048845824

7.24 It is therefore concluded that the in-combination effects of changes in air quality (arising from nitrogen deposition) from operation of the Proposed VPI Development with the Proposed Phillips 66 Development will not result in an adverse effect on the integrity of the Humber Estuary SAC/ SPA/ Ramsar.

Operational Noise/ Visual Disturbance Proposed VPI Development with Land Adjacent to the Westgate Entrance, Port of Immingham (Open Storage Option)

7.25 The potential for the operation of Land Adjacent to the Westgate Entrance, Port of Immingham (Open Storage option) to result in in-combination effects with the Proposed VPI Development on Rosper Road Pools (functionally linked to the Humber Estuary SPA/ Ramsar) was identified at the screening stage. Operational activities associated with the 'Open Storage' option for this scheme were modelled to be >80dB L_{Amax} at Rosper Road Pools.

7.26 In order to reduce noise levels (L_{Amax}) to below 70dB across Rosper Road Pools, the HRA identified that it was necessary to introduce a row of unused containers stacked lengthways along the northern boundary (i.e. the boundary with Rosper Road Pools) to create a barrier c. 9 m high, slightly above his being the maximum height to which containers would be stacked during storage. This will also serve an additional purpose of visually screening Rosper Road Pools from the operational works at the Land Adjacent to Westgate Entrance but would not be high enough or close enough to cast significant shade on the Pools.

7.27 With this mitigation in place operational noise levels in an open site would be below 45 dB L_{Aeq} and below 70 dB L_{Amax} (with noise levels over most of the pools being below 60 dB). With this mitigation in place, it is considered that no adverse effect on integrity will arise through noise disturbance during operation in combination with the Proposed VPI Development.

Proposed VPI Development with Gigastack

7.1 Given the proximity of Gigastack to Rosper Road Pools and the potential for simultaneous operation with the Proposed VPI Development, there is potential for in-combination noise/ visual disturbance to Rosper Road Pools (functionally linked to the Humber Estuary SPA/ Ramsar). No detailed assessment of the potential impacts of the operational phase of the Gigastack development has been undertaken at this stage, however, the Gigastack development is much closer to Rosper Road Pools than the Proposed VPI Development and it is therefore reasonable to conclude that there is no potential for additional disturbance to arise from the simultaneous operation of the Proposed VPI Development with Gigastack. However, further assessment will need to be undertaken by the Applicant as part of its HRA and ES.

7.2 In respect of potential noise/ visual disturbance to functionally linked land to the north of Gigastack, as all the remaining land has been either developed, or planned/ consented for future development there is a presumption that this land will be lost for SPA/ Ramsar birds (which has driven the creation of the HMWGS for the various Able UK developments, including AMEP and Enabling Works), and consequently all SPA/ Ramsar waterbirds will be permanently displaced.

8. Conclusion

8.1 Appropriate Assessment is an assessment that is appropriate to support a conclusion of no adverse effects on the integrity of a European site. In the Test of Likely Significant Effects reported in Section 5 (project alone) and Section 7 (in combination with other plans or projects) of this document, the following impacts could not be dismissed as posing no likely significant effect either alone or in combination with other plans or projects:

- changes in air quality during operation – the increase in annual average nitrogen oxides NOx PC at the nearest Humber Estuary SAC/ Ramsar receptor exceeded the 1% screening threshold;
- in combination noise/ visual disturbance during construction – Proposed VPI Development in combination with Proposed Phillips 66 Development;
- in combination noise/ visual disturbance during construction – Proposed VPI Development in combination with the Proposed Phillips 66 Development and Land Adjacent to Westgate Entrance, Port of Immingham (With Buildings Option) and Gigastack;
- in combination changes in air quality during operation – Proposed VPI Development in combination with Proposed Phillips 66 Development;
- in combination noise/ visual disturbance during construction – Proposed VPI Development in combination with Proposed Phillips 66 Development, Land Adjacent to Westgate Entrance, Port of Immingham (Open Storage Option and With Buildings Option) and Viking CCS; and
- in combination noise/ visual disturbance during operation - Proposed VPI Development in combination with and Land Adjacent to the Westgate Entrance, Port of Immingham (Open Storage Option) and Gigastack.

8.2 The appropriate assessment has taken into account the various mitigation measures proposed for addressing impacts from the Proposed VPI Development and mitigation proposed to address noise/ visual disturbance to Rosper Road Pools during construction (With Buildings Option) and operation (Open Storage Option) of the Land Adjacent to the Westgate Entrance, Port of Immingham proposed development. No information on proposed mitigation (or compensation, if needed) for the Gigastack development is currently available, and therefore a precautionary approach to the screening and appropriate assessment of Gigastack in combination with the Proposed VPI Development has been undertaken.

8.3 With mitigation, the appropriate assessment has concluded that there would be no adverse effects on the integrity of the Humber Estuary SPA/ SAC/ Ramsar, either alone or in combination with other plans or projects.

Appendix A Designated Site Citations

Information Sheet on Ramsar Wetlands (RIS)

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

Notes for compilers:

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

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

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

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

FOR OFFICE USE ONLY.

DD MM YY

Designation date | Site Reference Number

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

2. Date this sheet was completed/updated:

Designated: 31 August 2007

3. Country:

UK (England)

4. Name of the Ramsar site:

Humber Estuary

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

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

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

a) Site boundary and area:

The boundary has been extended

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

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

7. Map of site included:

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

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

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

b) Describe briefly the type of boundary delineation applied:

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

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

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

8. Geographical coordinates (latitude/longitude):

053 32 59 N 000 00 03 E

9. General location:

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

Nearest town/city: Kingston-upon-Hull

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

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

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

Min. -13
Max. 10
Mean No information available

12. General overview of the site:

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

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

13. Ramsar Criteria:

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

1, 3, 5, 6, 8

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

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

Ramsar criterion 1

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

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

Ramsar criterion 3

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

Ramsar criterion 5

Assemblages of international importance:

153,934 waterfowl, non-breeding season

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

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

Eurasian golden plover, *Pluvialis apricaria*

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

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

(5 year peak mean 1996-2000)

Red knot, *Calidris canutus*

islandica subspecies

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

(5 year peak mean 1996-2000)

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

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

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

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

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

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

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

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

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

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

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

Ramsar criterion 5

Assemblages of international importance:

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

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

Qualifying Species/populations (as identified at designation):

Species with peak counts in spring/autumn:

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

Species with peak counts in winter:

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

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

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

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

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

a) biogeographic region:

Atlantic

b) biogeographic regionalisation scheme (include reference citation):

Council Directive 92/43/EEC

16. Physical features of the site:

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

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

General description of the Physical Features:

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

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

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

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

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

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17. Physical features of the catchment area:

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

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

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

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

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

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

18. Hydrological values:

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

Sediment trapping

19. Wetland types:

Marine/coastal wetland

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

20. General ecological features:

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

Description

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

Ecosystem services

Aesthetic

Education

Food

Recreation

Storm/wave protection

21. Noteworthy flora:

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

None reported

22. Noteworthy fauna:

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

Birds

Species Information

Species Information

Birds

Species currently occurring at levels of national importance:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

23. Social and cultural values:

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

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

Sport fishing
Sport hunting
Tourism
Transportation/navigation

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

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

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

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

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

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

24. Land tenure/ownership:

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

25. Current land (including water) use:

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

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

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

Explanation of reporting category:

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

NA = Not Applicable because no factors have been reported.

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

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

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

Is the site subject to adverse ecological change? YES

27. Conservation measures taken:

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

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

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

28. Conservation measures proposed but not yet implemented:

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

No information available

29. Current scientific research and facilities:

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

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

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

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

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

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

31. Current recreation and tourism:

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

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

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

Walking/Horse riding: throughout

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

Non-commercial samphire collection

Wildfowling

Tourist amusements: Cleethorpes.

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

32. Jurisdiction:

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

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

33. Management authority:

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

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

34. Bibliographical references:

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

Site-relevant references

Site-relevant references

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EC Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora

Citation for Special Area of Conservation (SAC)

Name:	Humber Estuary
Unitary Authority/County:	City of Kingston upon Hull, East Riding of Yorkshire, Lincolnshire, North East Lincolnshire, North Lincolnshire
SAC status:	Designated on 10 December 2009
Grid reference:	TA345110
SAC EU code:	UK0030170
Area (ha):	36657.15
Component SSSI:	Humber Estuary

Site description:
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.

The Humber is a muddy, macro-tidal estuary, fed by a number of rivers including the Rivers Ouse, Trent and Hull. Suspended sediment concentrations are high, and are derived from a variety of sources, including marine sediments and eroding boulder clay along the Holderness coast. This is the northernmost of the English east coast estuaries whose structure and function is intimately linked with soft eroding shorelines. The extensive mud and sand flats support a range of benthic communities, which in turn are an important feeding resource for birds and fish. Wave exposed sandy shores are found in the outer/open coast areas of the estuary. These change to the more moderately exposed sandy shores and then to sheltered muddy shores within the main body of the estuary and up into the tidal rivers.

Habitats within the Humber Estuary include **Atlantic salt meadows** and a range of sand dune types in the outer estuary, together with **Sandbanks which are slightly covered by sea water all the time**, extensive intertidal mudflats, ***Salicornia* and other annuals colonising mud and sand**, and **Coastal lagoons**. As salinity declines upstream, reedbeds and brackish saltmarsh communities fringe the estuary. These are best-represented at the confluence of the Rivers Ouse and Trent at Blacktoft Sands.

Upstream from the Humber Bridge, the navigation channel undergoes major shifts from north to south banks, for reasons that have yet to be fully explained. This section of the estuary is also noteworthy for extensive mud and sand bars, which in places form semi-permanent islands. The sand dunes are features of the outer estuary on both the north and south banks particularly on Spurn peninsula and along the Lincolnshire coast south of Cleethorpes. Examples of both **Fixed dunes with herbaceous vegetation (`grey dunes`)** and **Shifting dunes along the shoreline with *Ammophila arenaria* (`white dunes)** occur on both banks of the estuary and along the coast. Native sea buckthorn **Dunes with *Hippophae rhamnoides*** also occurs on both sides of the estuary.

Significant fish species include **river lamprey** *Lampetra fluviatilis* and **sea lamprey** *Petromyzon marinus* which breed in the River Derwent, a tributary of the River Ouse. **Grey seals** *Halichoerus grypus* come ashore in autumn to form breeding colonies on the sandy shores of the south bank at Donna Nook.

Qualifying habitats: The site is designated 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')

Qualifying species: 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*

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

This citation relates to a site entered in the Register of European Sites for Great Britain.
Register reference number: UK0030170
Date of registration:10 December 2009

Signed: S G Hopkinson

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

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

Name: Humber Estuary

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

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

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

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

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

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

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

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

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

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

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

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

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

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

Signed:

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

Appendix B Conservation Objectives

Site	Conservation Objectives
Humber Estuary SAC	Ensure that the integrity of the qualifying natural habitat 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 the 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.
Humber Estuary SPA	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 qualifying features • the supporting processes on which the habitats of the qualifying features rely • the populations of each of the qualifying features, and • the distribution of the qualifying features within the site.
Humber Estuary Ramsar	Not specifically listed. Assumed as for Humber Estuary SAC and SPA.

Appendix C Bird Survey Results

C.1 Breeding Birds

Method

A breeding bird survey was undertaken using an adapted Common Bird Census (CBC) methodology, which was scaled down to six visits during the 2022 breeding bird season for each of the survey areas. These bird surveys were undertaken between April and June 2022. This was considered adequate to provide a good indication of the breeding bird ornithological baseline for the purposes of an assessment of ornithological impacts.

The surveys involved recording all the birds observed, their locations and activity/ behaviour. Contacts with birds (by song, call or sighting) were marked on the survey map using BTO species codes and standard behaviour notation[20].

Surveys were carried out during the mornings in suitable weather conditions (unrestricted visibility, winds less than Beaufort 5 and not in continuous rain). Afternoons, when bird activity usually drops significantly, were avoided as much as possible; however, some flexibility was allowed to accommodate surveys around periods of bad weather at the surveyor's discretion.

The survey maps were analysed to determine breeding activity for species of conservation concern and/ or protected species according to the following categories:

- possible breeding (Po) – species present during the survey period in possible nesting habitat, but with no indication of breeding. Presumed passage migrants are not included.
- probable breeding (Pr) – observations of one or more of the following activities during the survey period:
  - singing male heard, or breeding calls heard.
  - pair observed in suitable nesting habitat during the survey period.
  - display or courtship.
  - birds visiting a probable nest site.
  - birds seen to be carrying nesting material.
- confirmed breeding (Co) – observations of any one or more of the following activities during the survey period:
  - agitated behaviour or anxiety calls from adults suggesting a nest or young close by.
  - distraction display or injury feigning from adults.
  - a nest has obviously been used or eggshells found.
  - adults seen carrying food for young.
  - adults seen carrying faecal sac away from nest site.
  - nest with eggs.
  - nest with young or downy young in the case of waders, game birds etc.
  - recently fledged young.
  - soliciting calls from young birds.
- non-breeding (Nb) – species present during the survey period however the habitat type within the survey area is unsuitable for the particular species (for example passage migrants).

[20] https://www.bto.org/sites/default/files/u10/downloads/taking-part/species_codes.pdf).

Results

No SPA/ Ramsar waterbirds were recorded breeding within the VPI Site boundary during surveys undertaken in 2022.

A summary of the species recorded as confirmed, probably or possibly breeding within the VPI Site is provided in Table C1 below.

Table C1: Numbers of confirmed, probable or possible breeding birds recorded on VPI Site during the 2022 breeding bird surveys

Species	Survey dates						Likely no. of pairs
	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6	
	11/04/'22	22/04/'22	09/05/'22	25/05/'22	08/06/'22	20/06/'22	
Mallard**	0	4	1	0	0	0	1
Kestrel**	1	0	0	1	1	0	0
Little egret	0	0	0	0	1	0	0
Sparrow hawk**	0	0	0	1	0	0	0
Pheasant	1	1	0	2	2	3	1
LITTLE RINGED PLOVER	0	2	1	1	0	0	1
Lapwing*	3	4	4	3	2	3	2
Snipe**	5	2	0	0	0	0	0
Woodpigeon**	3	2	2	1	0	7	2-3
Stock dove**	2	0	0	0	0	0	0
Skylark*	0	0	2	0	1	2	1-2
Meadow pipit**	2	0	0	1	0	0	1?
Chaffinch	0	1	0	1	0	0	0
Pied wagtail	1	1	1	1	0	1	1
Grey wagtail**	1	0	0	0	0	0	0
Wren**	9	4	5	9	7	8	6-8
Dunnock**	4	1	3	3	2	1	1-2
Robin	1	0	0	1	1	0	1
Wheatear**	0	1	0	0	0	0	0
Blackbird	2	1	0	1	0	3	1-2
Song thrush*	0	1	0	1	0	0	1?
Blackcap	1	0	1	0	1	1	1
Lesser whitethroat	0	0	0	1	0	2	1

Species	Survey dates						Likely no. of pairs
	Visit 1	Visit 2	Visit 3	Visit 4	Visit 5	Visit 6	
	11/04/'22	22/04/'22	09/05/'22	25/05/'22	08/06/'22	20/06/'22	
Whitethroat**	0	1	5	3	2	5	2
Chiffchaff	4	1	1	1	0	0	1
Reed warbler	0	0	1	0	0	1	1
Sedge warbler**	0	3	5	6	3	5	2-3
Long-tailed tit	0	2	0	3	0	0	1?
Great tit	3	0	0	0	0	2	0
Blue tit	2	0	0	0	0	0	0
Carrion Crow	1	3	1	2	1	0	1?
Magpie	0	0	1	2	2	1	1
Goldfinch	1	6	0	0	0	3	1
Linnet*	4	5	4	5	3	7	2-3
Bullfinch*	0	0	0	0	2	0	0
Reed bunting**	2	5	4	3	1	2	2

KEY: Species names shown in bold are Section 41 Species of Principal Importance. Those in capitals are birds on Schedule-1 of the Wildlife and Countryside Act. Red List species shown with * and Amber List species with ** (Birds of Conservation Concern, 2015).

C.2 Wintering and Passage Birds

Methods

The following surveys were undertaken in the Survey Areas shown on Plate 1:

- Monthly bird surveys (terrestrial) – two visits per month between October 2021 and March 2022 inclusive covering the period two hours either side of high tide. Survey scope included the VPI Site, Rosper Road Pools and terrestrial fields to the east of Rosper Road that had the potential to be functionally linked to the Humber Estuary SPA/ Ramsar. And
- Monthly bird surveys (coastal) - two visits per month between October 2021 and March 2022 inclusive covering the period two hours either side of high tide of the section of North Killingholme Marshes (NKM) mudflats closest to the Proposed VPI Development.

Table C2: Wintering/ Passage Waterbird Survey Dates

Survey Number	Date	Weather (temperature, cloud cover, windspeed, wind direction)	Tide Times (height)
1	15.10.21	8-12°C 3/8 F1-2 NW	LT 08:38 (2.45m) HT 15:08 (5.85m)
2	29.10.21	13°C 6/8 F6 SE	LT 06:06 (2.8m) HT 12:39 (5.39m)
3	12.11.21	11°C 8/8 F4-5 SSW	HT 12:22 (5.85m) LT 18:09 (2.99m)
4	26.11.21	6°C 4/8 F2-3 WSW	HT 09:52 (5.84m) LT 15:50 (2.66m)

5	03.12.21	3°C 7/8 F2 SSE	LT 10:58 (1.07m) HT 17:02 (7.16m)
6	17.12.21	4°C F0-1 NNW	LT 10:48 (1.78m) HT 16:59 (6.65m)
7	07.01.22	2°C 3/8 F3-4 WSW	HT 09:22 (6.78m) LT 15:18 (1.73m)
8	27.01.22	11°C 1-7/8 F6-7 WNW	LT 06:41 (2.12m) HT 13:00 (5.86m)
9	11.02.22	1°C 1/8 F1 SW	LT 07:24 (2.87m) HT 14:04 (5.48m)
10	25.02.22	7°C 1/8 F3-4 WNW	LT 06:06 (2.39m) HT 12:20 (5.69m)
11	11.03.22	11°C 3/8 F6 SE	LT 05:15 (2.8m) HT 11:27 (5.38m)
12	30.03.22	4°C 8/8 F4-5 NE/E Light Rain	HT 05:59 (6.76m) LT 11:51 (1.62m)

Results

The raw data from the wintering and passage waterbird surveys is provided in Tables C3 to C18 below. Counts are provided per survey and per field for completeness, with records split into feeding, roosting and loafing behaviour by SPA/ Ramsar species where this was able to be determined by the surveyor. Non-SPA/ Ramsar species are excluded from the results tables, as these are not relevant to the assessment. Peak counts as presented in Table 5 in Section 4 of this HRA are derived from the highest number of each individual species recorded across the survey period on any survey visit, to provide an indication of the overall importance of each field/ area to SPA/ Ramsar waterbirds.

No SPA/ Ramsar waterbirds were recorded in Fields 4, 11 and 12 and therefore these fields are excluded from the results tables.

Table C3: Field 1 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (loafing)											
	1	2	3	4	5	6	7	8	9	10	11	12
Lapwing	0	0	0	0	0	0	0	0	0	0	1	4
Species	**Visit number (roosting)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Lapwing	0	0	0	0	0	0	0	0	0	1	0	0
Species	**Visit number (undetermined)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Lapwing	0	0	0	0	0	0	0	0	0	0	2	0

Table C4: Area 2 – Rosper Road Pools - Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Lapwing	0	0	0	0	0	0	0	0	17	47	11	21
Redshank	0	0	0	0	0	0	0	3	8	0	8	8
Black-tailed godwit	353	0	0	0	0	2	5	34	37	70	38	68
Shelduck	0	0	0	0	0	0	0	12	0	8	2	4
Wigeon	0	0	0	0	11	0	0	42	0	0	0	0
Gadwall	0	0	0	0	94	30	0	18	0	0	0	0
Pintail	0	0	0	0	0	7	0	0	0	0	0	0
Species	**Visit number (loafing)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Lapwing	0	0	0	0	0	0	1	16	0	66	55	0
Black-tailed godwit	0	0	0	0	0	0	0	0	0	80	133	123
Bar-tailed godwit	0	0	0	0	1	0	0	0	0	0	6	0
Black-headed gull	0	0	0	0	0	0	0	0	12	0	0	0
Shelduck	0	0	0	0	0	0	0	0	0	1	2	0
Wigeon	0	0	0	0	0	0	0	0	7	0	0	0
Gadwall	0	0	0	0	18	16	8	0	0	0	0	0
Pintail	0	0	0	0	0	0	0	6	0	4	0	0
Species	**Visit number (roosting)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Redshank	0	0	0	2	0	0	0	0	0	0	0	0
Lapwing	0	0	0	0	0	0	0	0	46	7	2	0
Species	**Visit number (undetermined)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Redshank	0	0	0	0	2	0	0	0	0	0	0	0
Lapwing	0	0	0	0	0	0	0	0	0	0	2	0
Black-tailed godwit	480	40	79	0	0	0	0	0	0	0	0	0
Gadwall	0	0	0	32	0	0	0	0	0	0	0	0
Pintail	4	2	2	1	0	0	0	0	0	0	0	0

Shelduck	2	0	0	0	0	0	0	0	0	0	0	0
Wigeon	92	126	0	26	11	42	0	42	7	0	0	0

Table C5: Field 3 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (loafing)											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	0	1	0	0	0	0

Table C6: Field 5 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	0	0	0	9	0	0
Species	**Visit number (loafing)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	0	0	0	0	7	0

Table C7: Field 6 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	0	0	0	50	0	0
Species	**Visit number (loafing)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	0	0	0	0	9	1

Table C8: Field 7 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (loafing)											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	6	0	0	24	4	0
Wigeon	0	0	0	0	0	0	0	4	0	0	0	0

Table C9: Field 8 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Pink-footed goose	0	0	0	0	1	0	0	0	0	0	0	0

Table C10: Field 9 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	18	0	0	0	0	0	0	0
Black-tailed godwit	0	0	0	0	2	0	0	0	0	0	0	0
Species	**Visit number (loafing)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	31	0	0	35	0	0
Lapwing	0	0	0	0	0	0	0	0	0	0	0	2

Table C11: Field 10 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	0	17	64	0	74	0
Black-tailed godwit	0	0	0	0	0	0	0	0	0	0	8	0

Table C12: Field 13 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	0	0	15	0	0	0

Table C13: Field 14 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	0	0	38	0	28	0

Table C14: Field 15 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	2	35	0	0	0	0	0	4
Lapwing	0	0	0	0	0	0	0	0	0	0	0	1

Table C15: Field 16 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	0	0	0	0	3	0

Table C16: Field 17 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	0	0	0	0	2	0

Table C17: Area 18 – Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	26	8	31	0	11	1	12	39	1	0	2	0
Redshank	0	0	0	0	0	0	0	0	1	0	0	0
Species	**Visit number (loafing)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	12	0	0	0	0	0	0	0	0	0	0
Species	**Visit number (roosting)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	0	0	0	0	79	34	0	0	0	0
Redshank	0	0	0	0	0	0	0	0	40	0	0	0
Lapwing	0	18	0	6	0	0	0	0	0	0	0	0
Black-tailed godwit	0	1	0	0	0	0	0	0	0	0	0	0
Species	**Visit number (undetermined)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	0	0	12	0	0	0	0	0	0	0	0	0

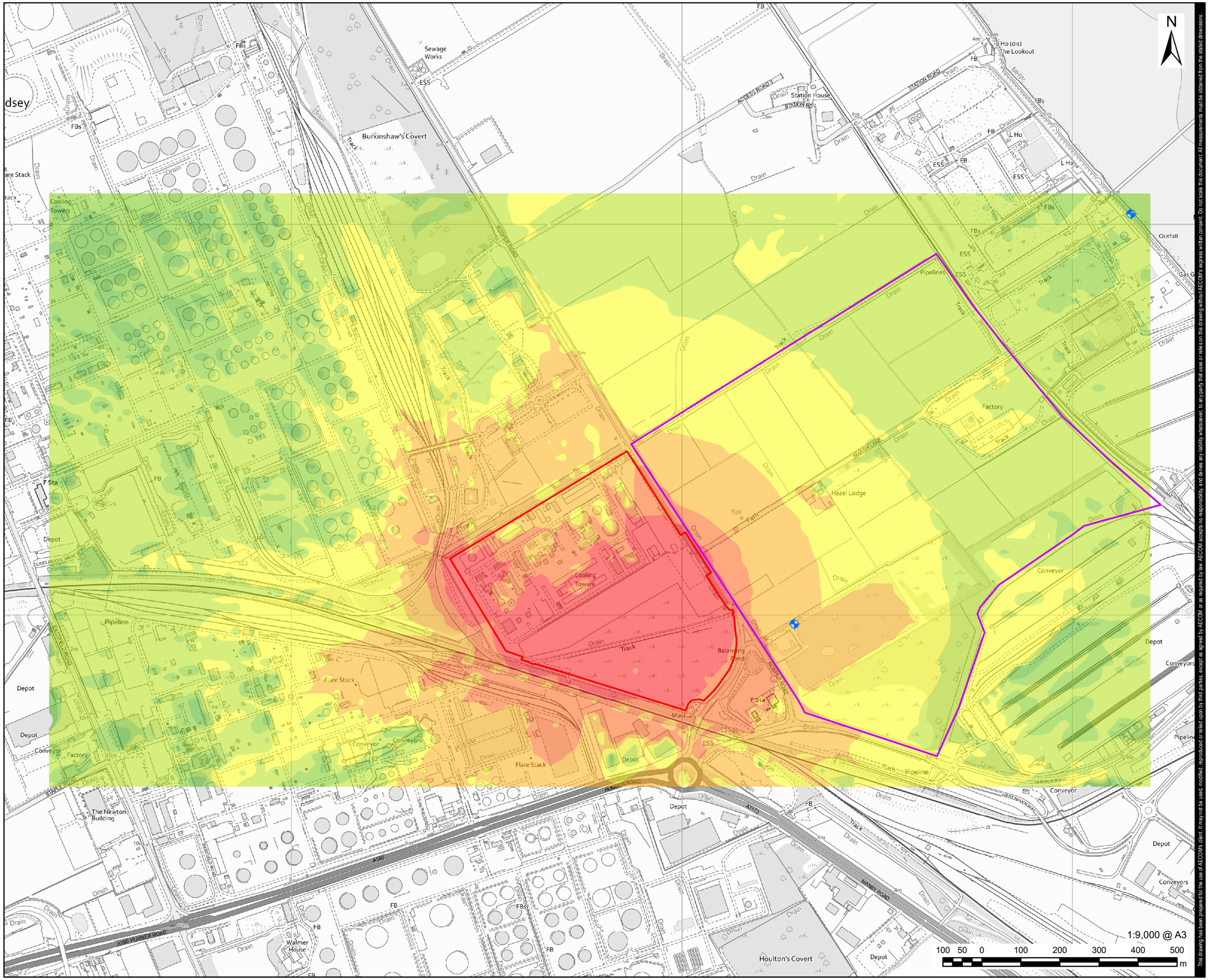
Table C18: Area 19 – North Killingholme Marshes Mudflats - Winter 2021/ 22 Survey Peak Counts

Species	Visit number (feeding)											
	1	2	3	4	5	6	7	8	9	10	11	12
Dunlin	0	0	0	0	0	105	12	125	136	6	0	0
Curlew	1	7	0	0	0	2	8	50	9	14	2	5
Redshank	0	0	0	3	8	6	67	52	69	69	8	0
Lapwing	0	0	0	0	176	0	0	0	1	0	0	0
Oystercatcher	0	0	0	1	0	0	0	0	0	0	2	0
Black-tailed godwit	0	0	0	0	0	0	35	18	1	0	0	0
Shelduck	0	2	0	8	0	0	0	0	7	28	0	13
Species	**Visit number (loafing)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Curlew	1	0	0	0	0	0	0	0	0	5	3	0
Shelduck	0	0	0	0	0	0	4	0	2	0	0	0
Wigeon	0	0	0	0	0	0	2	0	0	0	0	0
Species	**Visit number (roosting)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Dunlin	0	0	0	205	120	0	0	0	0	0	0	0
Curlew	0	0	0	32	18	8	0	68	48	108	76	3
Redshank	0	0	0	0	0	0	0	6	0	8	2	2
Lapwing	1	0	0	38	0	85	0	665	260	90	0	0
Black-tailed godwit	0	0	0	0	0	0	0	11	0	10	0	0
Shelduck	0	0	0	0	0	0	0	0	2	17	4	15
Species	**Visit number (undetermined)**											
	1	2	3	4	5	6	7	8	9	10	11	12
Dunlin	0	0	0	0	311	0	0	0	0	0	0	0
Curlew	0	0	38	7	3	0	7	0	0	0	0	0
Lapwing	0	0	2	2	5	0	0	0	0	0	0	0
Shelduck	0	0	0	0	3	0	0	0	0	0	0	0

Appendix D Noise Modelling Contour Plots (Proposed VPI Development Alone)

Revision: 1 Drawn: ER Checked: LC Approved: KC Date: 2023-02-10

Filename: \\na.aecomnet.com\fs\EMEA\Leeds-UKLDS2\Legacy\UKLDS2PFPSW001\WIP\LE_Projects\Newprojek\60668866 - Humber Zero\900_CAD_GIS\02_Maps\HRA\VPIntHZ_HRA_D2_Daytime_Noise_Levels_VPI_20230210_ER_v1.mxd



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LEGEND

- VPI Site
- Ecological Receptor (Point)
- Ecological Receptor (Area)

Noise Levels dB(A)

- <40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- >65

NOTES

Noise model source: SoundPLAN v8.2

ISSUE PURPOSE

FINAL

PROJECT NUMBER

60668866

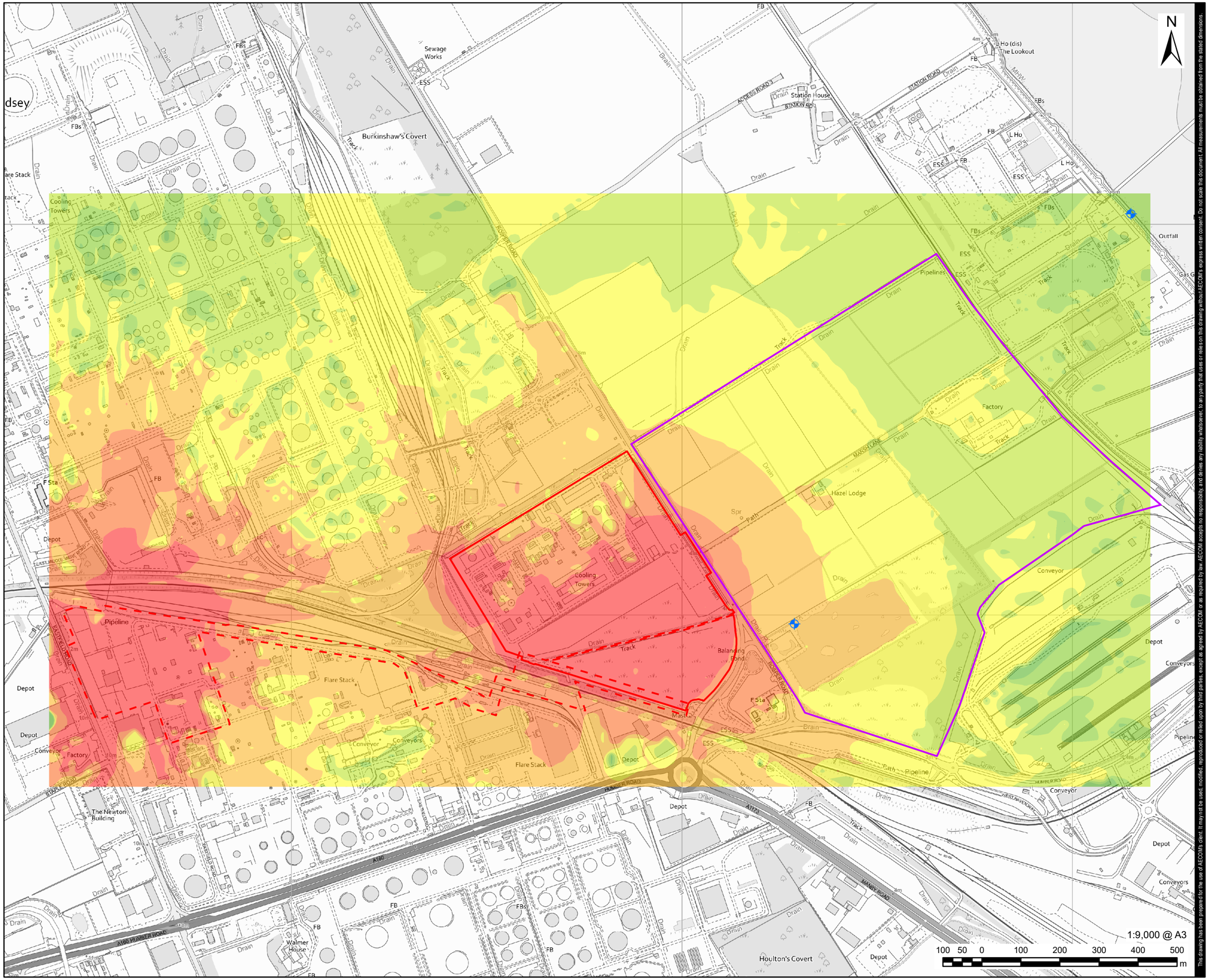
FIGURE TITLE

Predicted Construction Noise Levels (L_{Aeq}) from the VPI Site at Noise Sensitive Receptors, Height Above

FIGURE NUMBER

Figure D2

Appendix E Noise Modelling Contour Plots (In Combination with Proposed Phillips 66 Development)



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PROJECT

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LEGEND

- Phillips 66 Site
- VPI Site
- Ecological Receptor (Point)
- Ecological Receptor (Area)

Noise Levels dB(A)

- <40
- 40 - 45
- 45 - 50
- 50 - 55
- 55 - 60
- 60 - 65
- >65

NOTES

Noise model source: SoundPLAN v8.2

ISSUE PURPOSE

FINAL

PROJECT NUMBER

60668866

FIGURE TITLE

Predicted Construction Noise Levels (L_{Aeq}) from the Phillips 66 and VPI Site at Noise Sensitive Receptors, Height Above Ground 0.5m

FIGURE NUMBER

Figure D3

Filename: \\na.aecomnet.com\fs\EMEA\Leeds-UKLDS2\Legacy\UKLDS2PFPSW001\WIP\LE_Projects\Newprojekt\60668866 - Humber Zero\900_CAD_GIS\02_Maps\HRA\VPIntHZ_HRA_D3_Daytime_Noise_Levels_Combined_20230210_ER_v1.mxd Revision: 1 Drawn: ER Checked: LC Approved: KC Date: 2023-02-10

Appendix F Additional Noise Assessment

F.1 Baseline Noise Monitoring and Modelling

Locations

Baseline noise monitoring was undertaken at the locations shown below (Figure F1.1) to gather more information on the current baseline noise conditions at Rosper Road Pools and fields to the north, which are used by Humber Estuary SSSI/ SPA/ SAC/ Ramsar site birds. These locations were chosen by the noise and ecology teams to be representative of key areas within Rosper Road Pools and nearby fields where waterbirds would be likely to present, to enable a comparison of the changes in noise levels during construction and operation of the proposed Humber Zero developments. Location Eco 4 was purposefully located towards the central part of Rosper Road Pools as this is where the avocet nesting islands are.

Figure F1.1 – Baseline Noise Monitoring Locations

Methodology

The methodology for baseline noise monitoring is set out in Chapter 7 (Noise and Vibration). The existing baseline sound climate in the vicinity of the Proposed Humber Zero Developments is dominated by sound from the industrial/ commercial operations at the Phillips 66 Humber Refinery and VPI Immingham CHP Plant and other nearby industrial operations as well as rail noise and road traffic noise from A160 and other local roads.

Sound level monitoring was undertaken to the requirements of BS 7445 1: 2003 ‘Description and measurement of environmental noise. Guide to quantities and procedures’ (BSI, 2003), in particular regarding instrumentation and monitoring methodology.

All measurements were taken at approximately 1.5 m above ground level, and were positioned at least 3.5 m from any reflecting surface, other than the ground (i.e. free-field measurements). Each sound level meter was set to log the LAF10, LAeq, LAF90 and LAFmax parameters.

A summary of the dates, times and equipment used in the baseline noise modelling at receptors Eco1, Eco2 , Eco3 and Eco 4 is set out below.

Location	Co-ordinates	Date Monitored	Monitoring times (day)	Monitoring times (night)	Equipment Used
Ecology 1	53.64341, -0.22531	24/08/2023	11:39 - 12:41	23:05 - 23:35	Sound level meter Rion NL-52 (Serial No: 00386762) Calibrator: Rion NC-74 (Serial No: 34425539)
Ecology 2	53.63925, -0.23245	24/08/2023	12:56 - 13:56	23:47 - 00:18	Sound level meter Rion NL-52 (Serial No: 00386762) Calibrator: Rion NC-74 (Serial No: 34425539)
Ecology 3	53.6373, -0.22405	24/08/2023 (day) 25/08/2023 (night)	15:09 - 16:09	00:28 - 00:58	Sound level meter Rion NL-52 (Serial No: 00386762) Calibrator: Rion NC-74 (Serial No: 34425539)
Ecology 4	53.63531, -0.22481	24/08/2023 (day) 25/08/2023 (night)	16:15 - 17:15	01:03 - 01:33	Sound level meter Rion NL-52(Serial No: 00386762) Calibrator: Rion NC-74 (Serial No: 34425539)

Noise Modelling Assumptions

Table 7B.2 in Appendix 7B of ES Chapter 7 (Noise and Vibration) identifies the assumptions made in the modelling work in respect of the type of construction plant and associated sound power levels (from “British Standard BS 5228: Code of practice for noise and vibration control on construction and open sites”) for the Proposed Development. This is provided below for information.

Extracted from ES Appendix 7B - Table 7B.2: Indicative construction plant and associated sound power levels (LAw) used for the Proposed VPI Development.Plant Item	Source (BS 5228 table and row reference)	Number in Operation	% On-time	Sound power level L_{Aw} dB
Enabling and Earthworks				

Extracted from ES Appendix 7B - Table 7B.2: Indicative construction plant and associated sound power levels (LAw) used for the Proposed VPI Development.Plant Item	Source (BS 5228 table and row reference)	Number in Operation	% On-time	Sound power level L_{Aw} dB
Compressors	C.3.19	2	100	106
Hand Held Pneumatic Breaker	C.1.6	2	100	114
Dump Truck (tipping fill)	C.2.30	1	100	107
Dump Truck (pass-by)	C.2.31	2	100	118
Lorry (delivery and collection)	C.2.34	2	100	111
Tracked Excavator	C.3.23	3	100	101
Concrete Mixer Truck	C.4.20	3	100	113
Wheeled Mobile Telescopic Crane	C.4.38	1	100	106
Tower Crane	C.4.48	1	100	104
Lorry with Lifting Boom	C.4.53	1	100	105
Road Sweeper	C.4.90	1	100	104
Angle Grinder	C.4.93	1	100	108
Electric Water Pump	C.11.3	1	100	97
Foundations				
Compressors	C.3.19		100	106
Dump Truck (tipping fill)	C.2.30	2	100	110
Dump Truck (pass-by)	C.2.31	1	100	115
Lorry (delivery and collection)	C.2.34	2	100	111
CFA Piling Rig	C.3.21	2	100	110
Hand-Held Welder (welding piles)	C.3.31	3	100	106
Generator for Welding	C.3.32	3	100	106
Tracked Excavator	C.3.23	1	100	96
Concrete Mixer Truck	C.4.20	1	100	108
Truck Mounted Concrete Pump and Boom Arm	C.4.29	1	100	108
Wheeled Mobile Telescopic Crane	C.4.38	1	100	106
Tower Crane	C.4.48	1	100	104

Extracted from ES Appendix 7B - Table 7B.2: Indicative construction plant and associated sound power levels (LAw) used for the Proposed VPI Development.Plant Item	Source (BS 5228 table and row reference)	Number in Operation	% On-time	Sound power level L_{Aw} dB
Road Sweeper	C.4.90	1	100	104
Angle Grinder	C.4.93	1	100	108
Electric Water Pump	C.11.3	1	100	97
Concrete Vibrating Pokers	C.4.34	2	40	96
Concrete Pump	C.3.26	1	90	103
Mechanical and Electrical				
Compressors	C.3.19	3	100	108
Lorry (delivery and collection)	C.2.34	5	100	115
Wheeled Mobile Telescopic Crane	C.4.38	2	100	109
Tower Crane	C.4.48	1	100	104
Lorry with Lifting Boom	C.4.53	1	100	105
Lifting Platform	C.4.57	1	100	95
Fork Lift Truck	C.4.62	1	100	94
Mini Tracked Excavator	C.4.67	1	100	102
Electric Core Drill (Drilling Concrete)	C.4.69	1	100	113
Concrete Floor Cutter	C.4.73	1	100	112
Hand-Held Circular Saw (Cutting Paving Slabs)	C.4.73	1	100	112
Road Sweeper	C.4.90	2	100	107
Angle Grinder	C.4.93	1	100	108
Hand-Held Cordless Nail Gun	C.4.95	1	100	101
Electric Water Pump	C.11.3	1	100	97
Gas cutter (for cutting steel)	C.1.18	1	4	93

F.2 Construction Phase Assessment

Noise contours have been prepared for the construction phase to show the predicted LAeq and LAmax at the ecology receptors. A summary of the predicted changes in LAeq and LAmax as a result of construction are presented in Table F2.1 below. The modelling demonstrates that there are no predicted exceedances of Natural England's suggested 3 dBA 'rule-of-thumb' change in noise level threshold at the ecology receptors.

Table F2.1: Predicted Construction Noise Changes at Ecology Receptors (Proposed VPI Development)

Receptor Location	LAeq (Figure F2.1)			LAmax (Figure F2.2)		
	Ambient	Construction	Increase above ambient	Ambient	Construction	Increase above ambient
Daytime						
Eco 1	44	47	+3	60	20	No change
Eco 2	73	53	No change	93	29	No change
Eco 3	51	52	+1	69	28	No change
Eco 4	53	52	No change	70	28	No change
Nighttime						
Eco 1	48	47	No change	46	20	No change
Eco 2	64	53	No change	59	29	No change
Eco 3	50	52	+2	49	28	No change
Eco 4	52	52	No change	50	28	No change

Figure F2.1 – Proposed VPI Development Construction (alone) LAeq

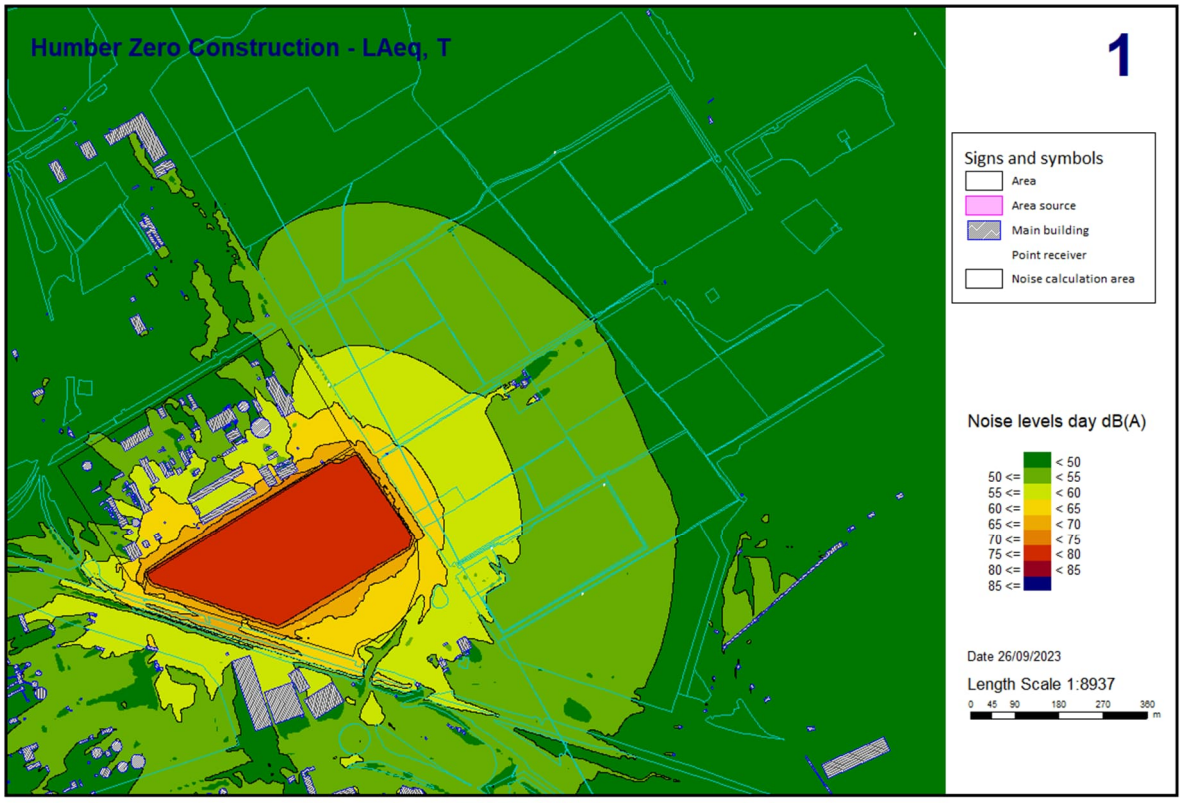
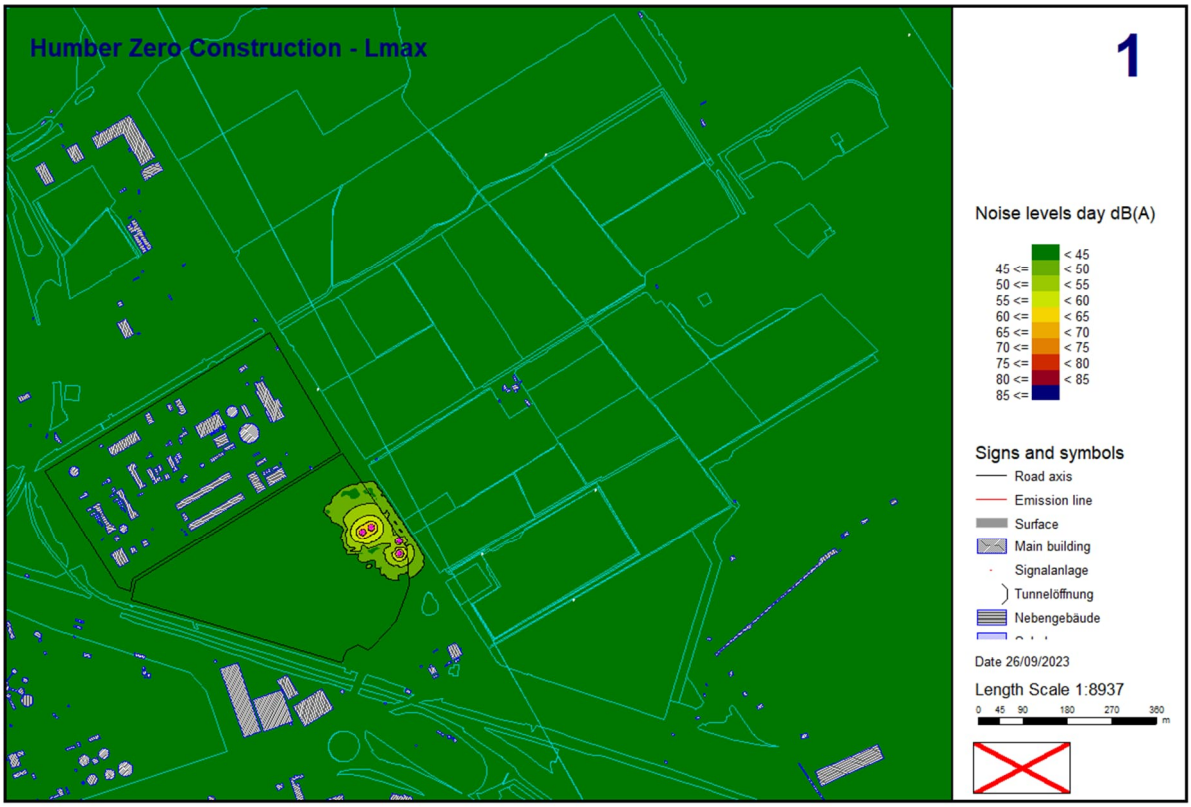


Figure F2.2 – Proposed VPI Development Construction (alone) LAmax


Humber Zero Construction - Lmax
1
Noise levels day dB(A)
< 45
45 <= < 50
50 <= < 55
55 <= < 60
60 <= < 65
65 <= < 70
70 <= < 75
75 <= < 80
80 <= < 85
85 <=
Signs and symbols
Road axis
Emission line
Surface
Main building
Signalanlage
Tunnelöffnung
Nebengebäude
Date 26/09/2023
Length Scale 1:8937
0 45 90 180 270 360
m

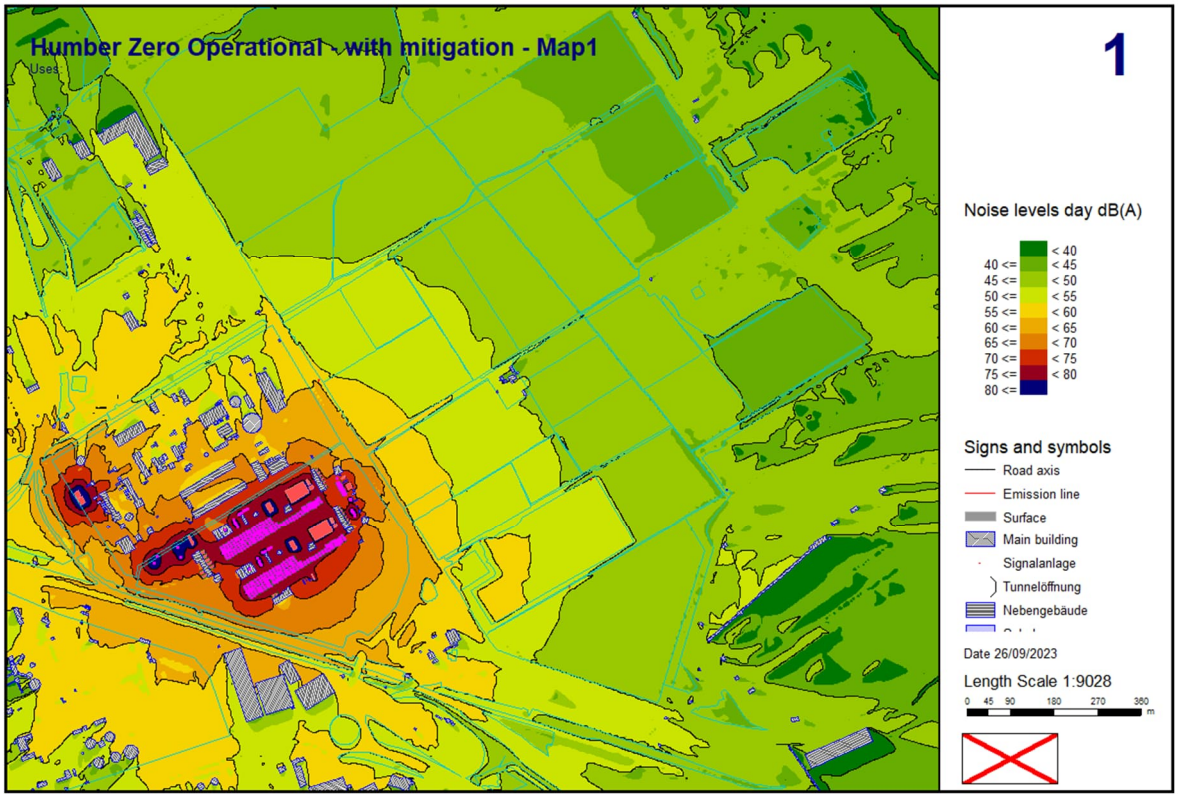
F.3 Operational Phase Assessment

A noise contour has been prepared for the operational phase to show the predicted LAeq at the ecology receptors. A summary of the predicted changes in LAeq as a result of operation are presented in Table F3.1 below. The modelling demonstrates that there are no predicted exceedances of Natural England's suggested 3 dBA 'rule-of-thumb' threshold at the ecology receptors. A 'with mitigation' scenario has been modelled for the operational phase as this includes noise mitigation measures required to mitigate impacts on residential (human) receptors and is not related to ecological mitigation (as no ecological mitigation is required).

Table F3.1: Predicted Operational Noise Changes at Ecology Receptors (Proposed VPI Development)

Receptor Location	**LAeq (Figure F3.1)**		
	Ambient	**Operation**	**Increase above ambient**
Daytime			
Eco 1	44	46	+2
Eco 2	73	55	No change
Eco 3	51	50	No change
Eco 4	53	50	No change
Nighttime			
Eco 1	48	46	No change
Eco 2	64	55	No change
Eco 3	50	50	No change
Eco 4	52	50	No change

Figure F3.1 – Proposed VPI Development Operation (alone) LAeq



F.4 In Combination Assessment

Proposed VPI Development Construction In Combination with Proposed Phillips 66 Development Construction

A noise contour map has been prepared to show the predicted LAeq and LAmax at the ecology receptors for the construction of the Proposed VPI Development in combination with the Proposed Phillips 66 Development (assuming overlap of the construction phases) (see Figure F4.1). For all scenarios and all receptors except for the predicted cumulative change in LAeq at receptor Eco 1, there are no changes exceeding 3 dBA (see Table F4.1). At receptor Eco 1 there is a predicted 5 dBA increase in LAeq assuming construction activities proceed at the same time. Although this is higher than the 3 dBA indicated by Natural England as a change in magnitude potentially resulting in disturbance, both the ambient noise levels and cumulative construction noise levels at this receptor are below 50 dB LAeq, which is equivalent to the sound of moderate rainfall and below even noise levels arising from normal conversation (60 dBA). It is therefore reasonable to conclude that the cumulative effects of construction noise at this location would not result in disturbance to waterbirds, and therefore there would be no likely significant effects on SPA/ Ramsar waterbirds using functionally linked land resulting from the construction of the Proposed VPI Development in combination with the Proposed Phillips 66 Development.

Table F4.1 – Predicted Construction Noise Changes – Proposed VPI Development in combination with Proposed Phillips 66 Development

Receptor Location	LAeq (Figure F4.1)			LAmax (Figure F4.2)		
	Ambient	Construction	Increase above ambient	Ambient	Construction	Increase above ambient
Daytime						
Eco 1	44	49	+5	60	21	No change
Eco 2	73	53	No change	93	29	No change
Eco 3	51	52	+1	69	28	No change
Eco 4	53	53	No change	70	28	No change
Nighttime						
Eco 1	48	49	+1	46	21	No change
Eco 2	64	53	No change	59	29	No change
Eco 3	50	52	+2	49	28	No change
Eco 4	52	53	+1	50	28	No change

Figure F4.1 – Proposed VPI Development Construction in combination with Proposed Phillips 66 Development Construction (LAeq)

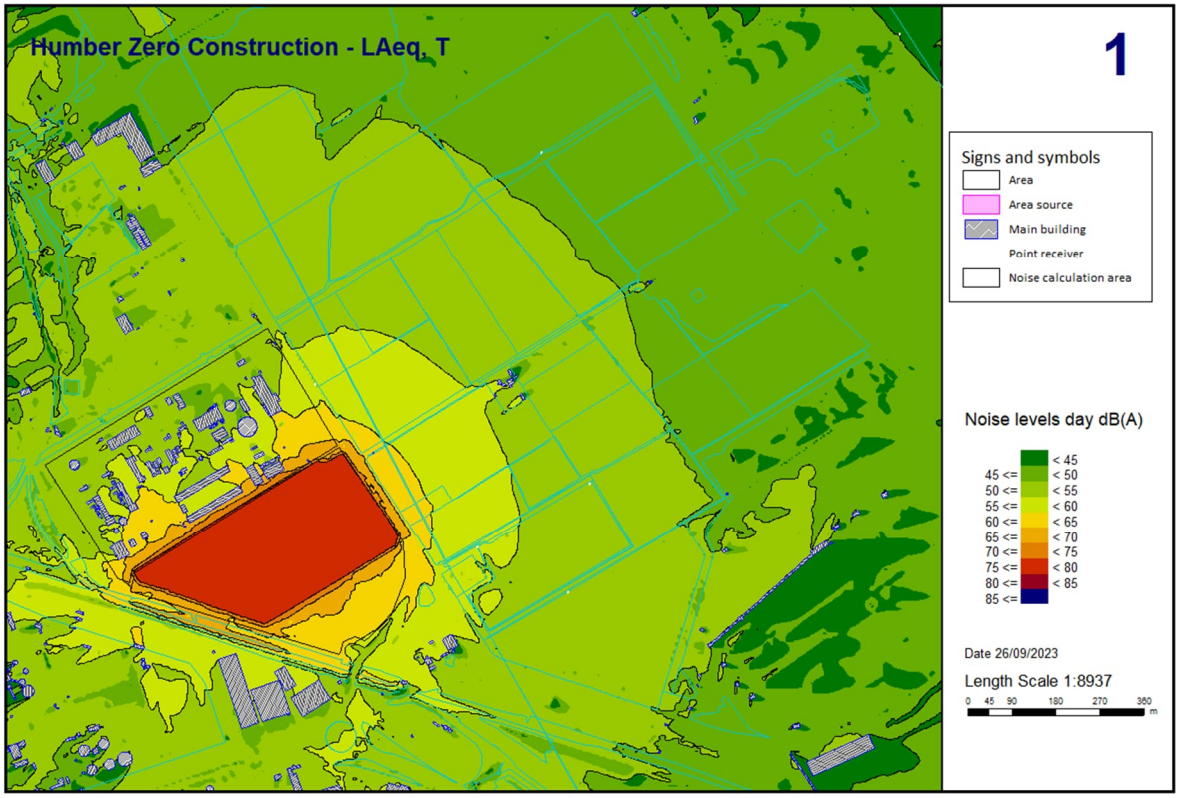
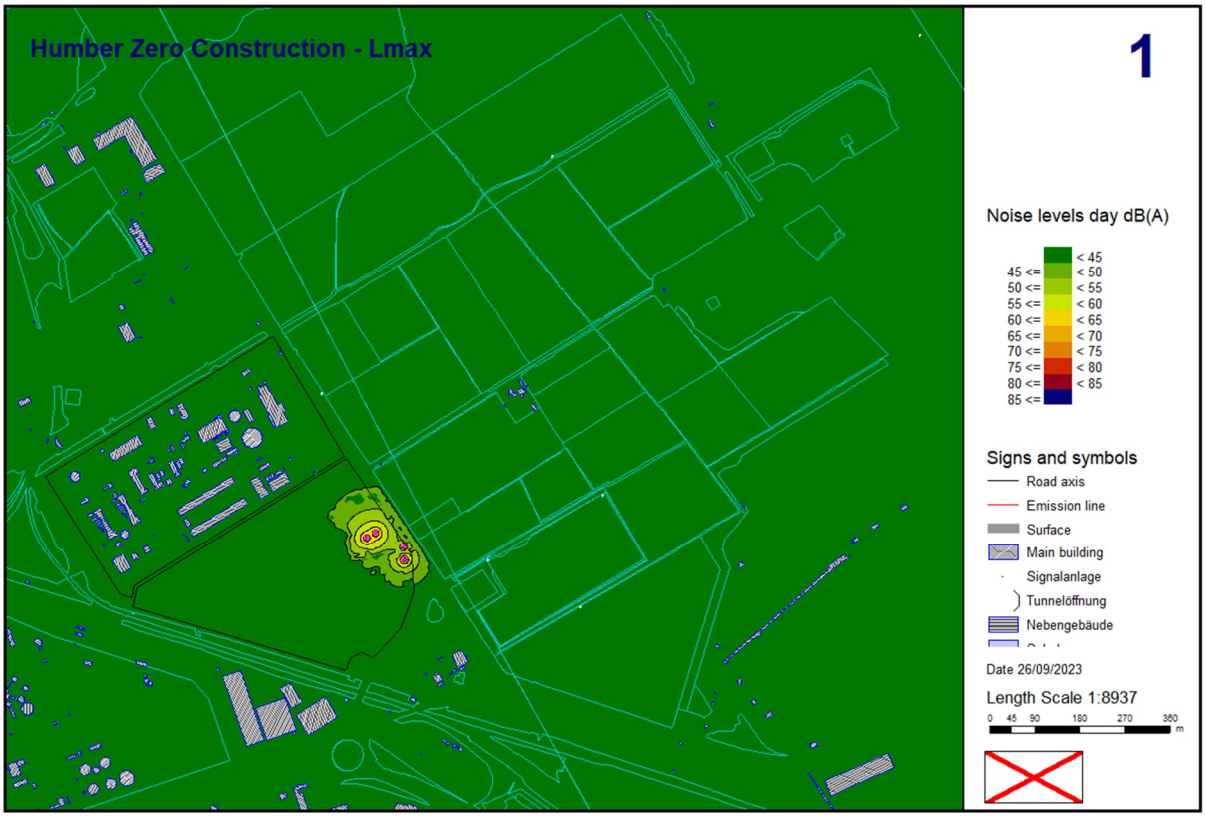


Figure F4.2 – Proposed VPI Development Construction in combination with Proposed Phillips 66 Development Construction (LAmax)



Proposed VPI Development Operation in combination with Proposed Phillips 66 Development Operation

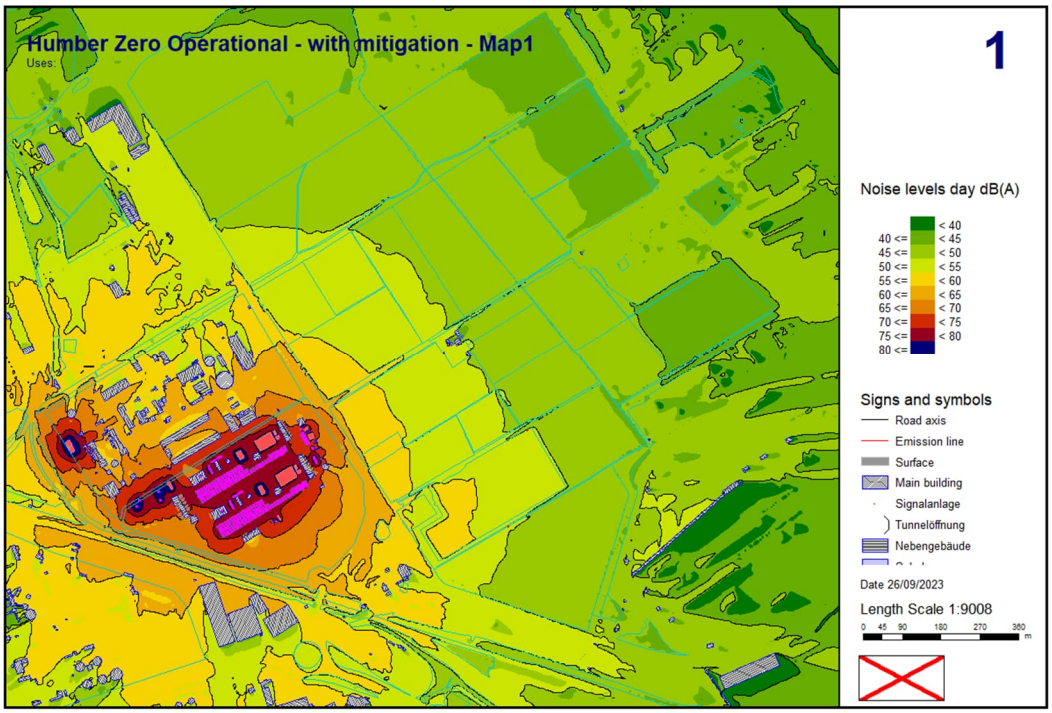
A noise contour map has been prepared to show the predicted LAeq at the ecology receptors for the operation of the Proposed VPI Development in combination with the Proposed Phillips 66 Development (see Figure F4.3). For both the daytime and nighttime scenarios at all receptors there are no changes exceeding 3 dBA (see Table F4.2). It is therefore reasonable to conclude that the cumulative effects of operational noise would not result in disturbance to waterbirds, and therefore there would be no likely significant effects on SPA/ Ramsar waterbirds using functionally linked land resulting from the operation of the Proposed VPI Development in combination with the Proposed Phillips 66 Development.

Table F4.2 – Predicted Operational Noise Changes – Proposed VPI Development in combination with Proposed Phillips 66 Development

Receptor Location	LAeq (Figure F4.3)		
	Ambient	**Cumulative Operation**	**Cumulative Increase above ambient**
Daytime			
Eco 1	44	46	+2 dBA
Eco 2	73	60	No change
Eco 3	51	50	No change
Eco 4	53	51	No change
Nighttime			
Eco 1	48	46	No change

Eco 2	64	60	No change
Eco 3	50	50	No change
Eco 4	52	51	No change

Figure F4.3 – Proposed VPI Development Operation with Proposed Phillips 66 Development Operation (LAeq)



Proposed VPI Development Construction In Combination with Construction of Proposed Phillps 66 Development, Land off Westgate, Immingham and Viking CCS

Additional modelling has been undertaken to show the predicted LAeq at the ecology receptors for the construction of the Proposed VPI Development in combination with the Proposed Phillips 66 Development, the Land off Westgate, Immingham proposed development, which is located immediately south of and adjacent to Rosper Road Pools and receptor Eco 4, and the Viking CCS project, which is located immediately south of the Proposed VPI Development. For the Land off Westgate, Immingham development, two scenarios are considered (open storage and building option), and the modelling has been undertaken with mitigation (9m noise barrier).

For both the daytime and nighttime scenarios at receptors Eco 1, Eco 3 and Eco 4 there are predicted in-combination construction noise level changes exceeding 3 dBA (see Table F4.3). This is due to the proximity of construction at the Land off Westgate, Immingham site to Rosper Road Pools.

Table F4.3 – Predicted Construction Noise Changes – Proposed VPI Development in combination with Proposed Phillips 66 Development, Land off Westgate, Immingham and Viking CCS

Receptor Location	LAeq: VPI in combination with Phillips 66, Land off Westgate, Immingham (Open Storage Option) and Viking CCS			LAeq: VPI in combination with Phililps 66, Land off Westgate, Immingham (Building Option) and Viking CCS		
	Ambient	Construction	Increase above ambient	Ambient	Construction	Increase above ambient
Daytime						
Eco 1	44	52	+8	44	52	+8
Eco 2	73	58	No change	73	58	No change
Eco 3	51	56	+5	51	56	+5
Eco 4	53	58	+5	53	58	+5
Nighttime						
Eco 1	48	52	+4	48	52	+4
Eco 2	64	58	No change	64	58	No change
Eco 3	50	56	+6	50	56	+6
Eco 4	52	58	+6	52	58	+6

Proposed VPI Development Operation in combination with Operation of Proposed Phillips 66 Development, Land off Westgate, Immingham and Viking CCS

Additional modelling has been undertaken to show the predicted LAeq at the ecology receptors for the operation of the Proposed Phillips 66 Development in combination the Land off Westgate, Immingham proposed development, which is located immediately south of and adjacent to Rosper Road Pools and receptor Eco 4.

For both the daytime and nighttime scenarios at all ecology receptors there are no predicted operational noise level changes exceeding 3 dBA with either development scenario (see Table F4.4). It is therefore reasonable to conclude that the cumulative effects of operational noise would not result in disturbance to waterbirds, and therefore there would be no likely significant effects on SPA/ Ramsar waterbirds using functionally linked land resulting from the operation of the Proposed VPI Development in combination with the Proposed Phillips 66 Development, Land off Westgate, Immingham and Viking CCS.

Table F4.4 – Predicted Operational Noise Changes – Proposed VPI Development in combination with Proposed Phillips 66 Development, Land off Westgate, Immingham and Viking CCS

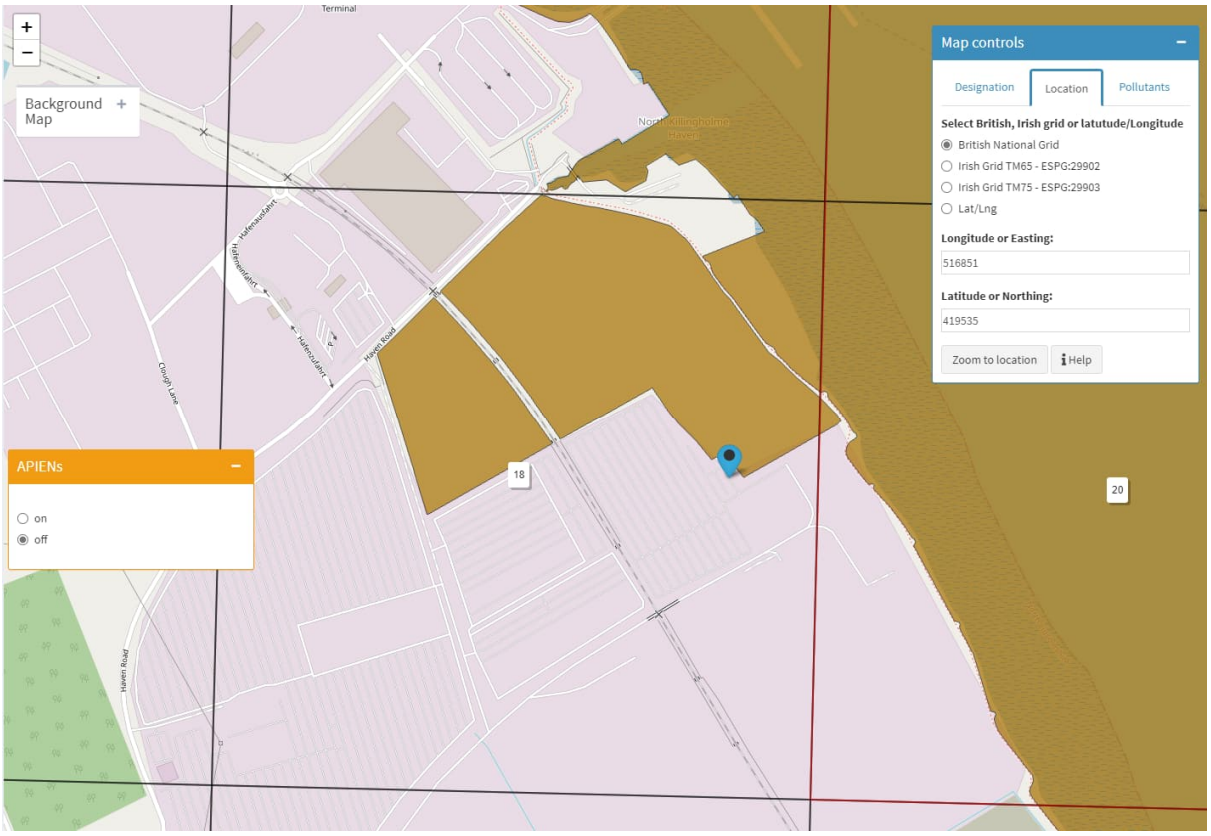
Receptor Location	LAeq: Phillps 66 in combination with VPI, Land off Westgate, Immingham (Open Storage Option) and Viking CCS			LAeq: Phililps 66 in combination with VPI, Land off Westgate, Immingham (Building Option) and Viking CCS		
	Ambient	Operation	Increase above ambient	Ambient	Operation	Increase above ambient
Daytime						
Eco 1	44	46	+2	44	46	+2
Eco 2	73	60	No change	73	60	No change
Eco 3	51	50	No change	51	50	No change
Eco 4	53	52	No change	53	52	No change
Nighttime						
Eco 1	48	46	No change	48	46	No change
Eco 2	64	60	No change	64	60	No change
Eco 3	50	50	No change	50	50	No change
Eco 4	52	52	No change	52	52	No change

Appendix G Additional Air Quality Information

Selection of Ecological Receptors

The ecological receptors were selected based on the screening distances associated with the Environmental Agency's Risk Assessment methodology, based on SPAs, SACs and SSSIs within 15km for "large emitters" and 2 km for LNR, LWS and SINCs.

The grid references provided for the receptors, and therefore the point where the impact has been assessed, was taken to be the closest point each receptor to the point of release, taking into consideration the prevailing wind direction from the southwest. The location of the grid reference (516851, 419535) provided for the OE2 Receptor (North Killingholme Haven Pits) is shown on the figure (taken from a screenshot of the APIS web GIS) below to be slightly outside of the southern boundary of the site, however it is not considered that this would affect the conclusions of the assessment carried out and is more likely to over-estimate the impacts at the worst case point of the receptor given that it is slightly closer to the point source that the boundary of the receptor.



Information on the habitats present at the selected receptor sites was based on the information available on the Air Pollution and Information Service (APIS) website and were correct at the time that the assessment was carried out. In addition, these were consistent with information provided for the planning application submitted to North Lincolnshire Council for the VPI Energy Park A in 2018 and the DCO application for the VPI OCGT in 2019, both of which have been consented.

Further clarification on the receptor sites identified within the Humber Estuary SAC/ SPA/ Ramsar for assessment within ES Chapter 6 (Air Quality) has been requested by Natural England and is provided in a modified version of Table 6B.11 that is presented in Chapter 6. Habitat types for receptor OE1d and OE2 have been updated following further consultation with Natural England.

Table G.1 – Further Clarification on Ecological Receptor Sites used in Air Quality Modelling

Receptor I.D.	Ecology Site	Habitat Type and Location	Grid Reference x, y	Comments
OE1a	Humber Estuary	Coastal stable dunes grasslands - acid type – Cleethorpes	531500, 408013	The coastal stable dunes (acid type) at Cleethorpes are the closest of this habitat type to the Proposed VPI Development within the potential zone of influence of changes in air quality.
OE1b		Coastal stable dunes grasslands - calcareous type – Spurn Point	539700, 411020	The coastal stable dunes (calcareous type) at Spurn Point are the closest of this habitat type to the Proposed VPI Development within the potential zone of influence of changes in air quality.
OE1c		Shifting coastal dunes – Saltfeet	544956, 394570	The coastal shifting dunes at Saltfleet are the closest of this habitat type to the Proposed Phillips 66 Development within the potential zone of influence of changes in air quality.
OE1d		Wetland and reedbed – North Killingholme Pits	516851, 419535	The Defra Priority Habitat Inventory shows North Killingholme Haven Pits as saline lagoon and deciduous woodland; and this habitat was therefore aligned to the 'northern wet heath' habitat type in the original air quality assessment (which adopted the same approach as other air quality assessments undertaken for nearby projects). However, this has now been updated to wetland and reedbed habitat type based on further information provided by Natural England. Although not a qualifying habitat of the Humber Estuary SAC designation, the habitat supports important numbers of SPA/ Ramsar birds and was therefore scoped into the assessment as a precaution.
OE1e		Pioneer, low, mid upper saltmarshes	517353, 419059	This was the closest location of this habitat type to the Proposed VPI Development; the assessment considered a number of locations supporting this habitat type up and down the coast of this location, and the worst affected location was used in the assessment work.
OE1f		Low and medium altitude hay meadows	513431, 423906	Although this is not a qualifying habitat of the Humber Estuary designation, the SPA results on APIS list this habitat as important for curlew, ruff and golden plover and this is why it was included within the AQ modelling,
OE2	North Killingholme Haven Pits SSSI	Upper saltmarsh	516851, 419535	The AQ assessment originally aligned this habitat to the 'Atlantic upper-mid and mid-low salt marshes' habitat feature that is shown on the APIS website as being sensitive to nitrogen at this location. However, this has now been updated following further consultation with Natural England and is considered as 'upper saltmarsh' based on the habitats present. The more conservative Critical Load for N deposition is therefore applied.

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