Immingham Onshore Wind

Scoping Report

Client: ABP – Associated British Ports
Reference: C4964 - 1307
Version 1

March 2023

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Checked by	Rob Collin	Date	10/10/2022
Approved by	Cameron Sutherland	Date	13/10/2022

Issue History	Date	Details
V0.3	14/10/2022	Client Issue
V0.4	29/11/2022	ABP/GCR review update
V0.5	24/03/2023	Submission

Table of Contents

1 Introduction

1.1 Overview

This Scoping Request has been prepared by Green Cat Renewables (GCR) on behalf of Associated British Ports (ABP) hereafter referred to as ('ABP' or 'the Applicant'). For the purposes of this Scoping Report, Immingham Onshore Wind Turbines (the Proposed Development) would have up to three turbines with a maximum tip height of up to 150m. Depending on the turbine selected for the final design, the turbines could have a potential generating capacity of up to 6MW, which would give a total capacity of up to 18MW. The Proposed Development would include a number of ancillary elements, such as access tracks, crane hard standings and control building, as well as temporary features such as a construction compound and laydown areas. Further details will be provided within this report.

With a generating capacity of up to 18MW, the Applicant would be seeking permission for the Proposed Development from Local Planning Authority (LPA) (the Council) under the Town and Country Planning Act of 1990. The Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations) would therefore also apply. Schedule 2 of the EIA Regulations lists developments for which the need for an Environmental Impact Assessment (EIA) is determined on a case-by-case basis (i.e. if significant environmental effects are considered likely) using applicable thresholds and the selection criteria presented in Schedule 3. The Proposed Development falls under Schedule 2, being an installation "for the harnessing of wind power for energy production (wind farms)" that "involves the installation of more than 2 turbines" with a hub-height that exceeds 15m. However, the selection criteria in Schedule 3 are not clearly defined and therefore each development must be judged on its own merits in terms of whether or not significant environmental effects are in fact likely. It is expected that the Proposed Development may have some significant effects on the environment by virtue of its nature, therefore an EIA is required to be submitted with the planning application.

1.2 The Applicant

Associated British Ports (ABP) was established in 1981 following the privatisation of the British Transport Docks Board (BTDB). It is the largest ports group in the United Kingdom, owning and operating 21 ports across England, Wales, and Scotland. On the Humber, ABP owns and operates four ports, namely the Ports of Immingham, Hull, Grimsby, and Goole, which together constitute the largest ports complex in the UK.

ABP supports government ambitions to achieving net zero. It has reduced its own CO2 emissions by over 35% since 2014 and invested over £55 million in sustainability measures, which includes the largest commercial rooftop solar array in the UK at the Port of Hull, electric vehicles and cranes across the group and a new fleet of more fuel-efficient pilot boats.

Electricity demand at ABP's ports is expected to increase materially in the coming years due to continuing electrification of existing port activity (both ABP's and its customers) for example cranes, port vehicles and shore power for visiting ships. ABP continues to grow its customer base by attracting additional new port-based customer businesses which would lead to additional electricity demand. Furthermore, the ports are multi-modal transport hubs that have substantial numbers of HGVs, trains and ships visiting. Supporting these logistic operations to shift from fossil fuel use to other energy sources, whether that be electrified, Hydrogen, Ammonia, Methanol or others, is likely to need electricity as an input.

Industrial electricity costs in the UK are substantially higher than the cost of the electrons themselves due to a range of Government and grid related levies and charges. Additionally, at the current time wholesale market prices (for the electrons) are at very high levels due to geopolitical tensions.

To continue decarbonisation efforts and to help control electricity costs for the ports, ABP is proposing to build onshore wind turbines at Grimsby, Immingham, and Hull. The company will continue to invest in additional solar generation at the ports, but onshore wind will make a much more significant contribution to decarbonisation and cost control given the ability to generate 24 hours per day and typically more power in winter than summer. ABP expects this will help secure the viability of the ports for the long term and provide an attractive place for business for existing and new customers, thereby helping to safeguard existing, and hopefully lead to more, local employment at the ports.

1.3 The Agent

Green Cat Renewables Ltd (GCR) has been commissioned by the Applicant to prepare this Scoping Report.

GCR is an environmental and engineering consultancy focused on all aspects of development support, based in Scotland. With a team of 70 staff spread across three offices, the company's multi-disciplinary resource base spans all stages of project delivery from feasibility and concept development through to planning, engineering, project management and operational asset management. While much of the company's experience is within the renewable sector, GCR's emphasis is on supporting farmers, landowners and developers in a wide range of renewable projects. GCR have also developed expertise in helping a range of businesses find sustainable energy solutions to aid economic viability in a climate where energy costs are forecast to continue to rise.

The GCR EIA team brings a diverse skill set that includes planning, environmental and technical expertise, and is comprised of Project Managers, planners, consultants, environmentalists, engineers, acousticians, CAD technicians, GIS technicians, hydrologists and resource analysts.

ABPMer have been appointed to undertake the Ornithology Impact Assessment.

Wold Ecology have been appointed to undertake the Ecology Impact Assessment.

Aviation assessment work will be undertaken by Ian Fletcher of Wind Business Support.

1.4 Purpose of the Scoping Report

The purpose of this Scoping Report is to formally request the opinion of the North Lincolnshire Council as local planning authority (and the bodies they will consult) as to the scope and level of detail of the information to be provided in the Environmental Statement (ES) in accordance with Regulation 15 of the Town and Country Planning (Environmental Impact Assessment) Regulations 2017 (the EIA Regulations). The assessments undertaken, as outlined within this report, as part of the EIA process will be presented in an ES, which will be submitted to the Council in support of a full planning application.

The Scoping Report has been prepared as the initial stage of the EIA process. As outlined in Regulation 15(2) this report includes:

- A description of the location of the Proposed Development, including a plan sufficient to identify the land;
- A brief description of the nature and purpose of the Proposed Development and an explanation of the likely significant effects of the Proposed Development on the environment; and
- Such other information or representations which the Applicant considers may assist the Council (and the consultation bodies) in providing a scoping opinion.

The EIA process must identify and assess, in an appropriate manner, in light of the particular circumstances of the project, the direct and indirect significant effects of the Proposed Development on a number of factors, including the interaction between these factors (Regulation 4(2) and (3)). The factors under the EIA Regulations are:

- Population and human health;
- Biodiversity, and in particular species and habitats protected under Directive 92/43/EEC and Directive 2009/147/EC;
- Land, soil, water, air and climate;
- Material assets, cultural heritage and the landscape.

The purpose of the Scoping Report is to:

- Identify the key areas to be considered as part of the EIA;
- Identify areas which can be scoped out of the EIA, or which do not require to be addressed in greater detail; and
- Review activities which may give rise to potential significant environmental impacts during the lifecycle of the Proposed Development.

This Scoping Report outlines the proposed approach to the assessment of environmental impacts and the proposed ES content, for approval with the Council and other statutory consultees.

The Applicant has appointed an EIA project team to provide relevant assessment, advice and reporting to support the delivery of the EIA. The appointed team have the necessary experience and qualifications to carry out the assessments.

1.5 Consultation

Consultation forms an integral part of the EIA process. All application and pre-application consultation activity will comply with the statutory requirements and have regard to the advice on meaningful community engagement.

The Scoping Report also includes questions to consultees to promote positive, focussed early consultation in the EIA process.

2 Project Description

2.1 Introduction

The applicant is proposing to construct, operate and decommission up to three wind turbines within land at Immingham Port. The site location and indicative layout are provided in the following figures that accompany this report:

- **Figure 2.1: Site Location**
- **Figure 2.2: Site Layout**

2.2 The Site

The Application Site, hereafter referred to as 'the Site' is located wholly within the Applicants landholding at Immingham Port. The Site is located on the southern bank of the Humber Estuary to the north of the settlement of Immingham. The port is served by the M180/A180, which links the port to the M18 and M1.

The port area consists mostly of made ground, utilised in the most part for storage associated with the freight operations at the port, as well as other bulk storage and industrial facilities utilising sheds and buildings throughout the estate.

2.3 Proposed Development and Associated Infrastructure

The Proposed Development is anticipated to comprise of up to three wind turbines with a maximum blade tip of up to 150m. At this stage of the design process, the turbine height is designed to fit with the surrounding area and other workings associated with the port. The Site Boundary (**Figure 2.1: Site Location**) defines the area within which planning permission will be sought and will contain all aspects of the Proposed Development requiring express consent.

A detailed design process, taking account of key technical, environmental, and economic constraints, has been undertaken and will continue throughout the EIA process as required. The constraints exercise has allowed the development of the site layout (**Figure 2.2: Site Layout**).

In addition to the wind turbines, the Proposed Development is anticipated to include the following ancillary components and associated infrastructure:

- Crane hard standings and laydown area adjacent to each wind turbine;
- Turbine foundations;
- New and upgraded access tracks, passing places and turning heads;
- Temporary construction compound.
- Power cables linking the wind turbines laid in trenches underground, including cable markers;
- A control building including substation, parking, and a small storage compound;
- Drainage works; and
- Health and Safety and other directional signage.

2.4 Construction

The construction period for the Proposed Development is expected to last approximately 12 to 18 months. Construction activities will include:

- Enabling works to facilitate site deliveries;
- Construction of permanent on-site access tracks;
- Construction of secure site compound including welfare facilities;
- Construction of crane hard standings;
- Construction of wind turbine foundations;
- Wind turbine delivery and erection;
- Installation of cabling, communication, and earthing arrays;
- Construction of substation;
- Commissioning of development; and
- Reinstatement and site restoration works, as required.

The construction works would broadly follow the order as outlined above, however to reduce the construction time, a number of these activities may be carried out concurrently. A full construction plan including any phasing will be produced post consent.

2.5 Operation and Maintenance

Following the commissioning of the Proposed Development, the temporary construction elements, such as cranes and other plant will be removed from Site. Reinstatement works will be undertaken where appropriate and in line with planning conditions.

During operation, the Site will be visited at regular intervals by approved technicians to undertake maintenance and to ensure the safe operation throughout the lifetime of the Proposed Development. These visits will be undertaken utilising standard road vehicles, there will be no requirement for the specialist vehicles utilised during the construction phase to visit site under normal circumstances.

2.6 Grid Connection

The primary reason for developing the wind turbines is to supply green electricity to the port using the port electrical network. There may be some export of power to grid at peak wind generation periods therefore ABP will seek a grid connection agreement. Subject to discussions with the Distribution Network Owner it is anticipated that the existing infrastructure at the connection point between the port and Distribution Network will be utilised for this. The grid connection will not form part of the planning application for the turbines.

2.7 Decommissioning

Decommissioning effects are not generally considered in detail at this stage. It is proposed that a decommissioning plan will be agreed with the Council and relevant consultees in line with planning conditions. The decommissioning of the Site will broadly involve similar works as the construction phase and include reinstatement of the Site as agreed with the Council.

3 EIA Methodology

3.1 Introduction

EIA is a statutory process governed by UK and European law. It is a means of drawing together in a systematic way, an assessment of the likely significant environmental effects arising from a Proposed Development. In England, the relevant regulations are provided in the *Town and Country Planning (Environmental Impact Assessment) Regulations 2017.*

This section presents an overview of the methodology to be utilised for the production of the ES. It outlines the methodology for the identification and evaluation of potential likely significant environmental effects and also presents the methodology for the identification and evaluation of potential cumulative and any inter-related impacts.

To ensure that the information is presented in a structured and consistent way in each topic, the assessments will be presented broadly as outlined below;

- Introduction: Identifies key objectives and issues;
- Guidance: summarises the relevant policy and guidance documents used to inform the assessment;
- Methodology: summarises the methods used in undertaking the assessment work;
- Baseline: summarises the existing situation;
- Assessment of Predicted Impacts and Effects: identification and assessment of the predicted effects (both positive and negative) associated with the construction, operation and decommissioning of the development;
- Mitigation: a summary of measures envisaged to avoid, reduce or remedy predicted negative effects of the development;
- Summary of Predicted Impacts and Effects: summary of the impacts and effects predicted and proposed mitigation measures; and
- Conclusions: summary of the conclusions of the assessment.

The Scoping Report sets out the key environmental topics which will be considered during the EIA process. Within the Scoping Report it is proposed to scope these assessment areas either 'in' or 'out' of further assessment as part of the EIA process. These key topics and the assessments and whether they require to be scoped into or out of the EIA assessment is outlined in the table in **Chapter 16 Summary of Effects.**

3.2 Assessment Methodology

The individual methodologies for assessing each EIA topic area will be described in more detail in each of the individual chapters of the ES. The following sections briefly outline the overarching assessment methodology to be undertaken.

3.2.1 Baseline

A review of the current environmental conditions will be undertaken to determine the appropriate baseline for assessment. In the majority of assessments, this will involve the following:

- Definition of an appropriate study area, based on guidance and best practice;
- A review of currently available information relating to the study area;
- Identification of likely or potential impacts;

- Outline further data/survey/monitoring required to obtain relevant information if required to support assessment; and
- Review information to ensure sufficient data is available to provide a robust assessment.

Schedule 4 of the EIA Regs requires an outline of the likely evolution of the baseline in the absence of the Proposed Development. This will also be addressed in the ES.

3.2.2 Assessment of Impacts

The Applicant has appointed a competent team of EIA specialists who will undertake the required assessments using available data, new data (if required), professional and expert judgement.

The methods for predicting the nature and magnitude of any potential impacts vary dependent on the subject area. Quantitative methods of assessment can predict values that can be compared against published thresholds and indicative criteria in Government guidance and standards. Where it is not possible to use a quantitative method, a qualitative assessment method will be utilised, relying on the experience and professional judgement of the technical specialist.

The potential significant effects of the Proposed Development must be considered in relation to the characteristics of development and the location of development, with regard to the impact of development on the factors specified in Regulation 4(2), taking into account:

- The magnitude and special extent of the impact (for example, geographical area and size of the population likely to be affected);
- The nature of the impact;
- The intensity and complexity of the impact;
- The probability of the impact;
- The expected onset, duration, frequency and reversibility of the impact;
- Cumulative impacts with the impact of the other existing and/or approved development; and
- The possibility of effectively reducing the impact.

Table 3.1 Illustrates how the criteria will be applied to ascertain the level of significance of a potential impact.

Table 3.1: Significance of Effect Matrix

Sensitivity	Magnitude of Change			
	High	Medium	Low	Negligible
High	Major	Major/Moderate	Moderate	Moderate/Minor
Medium	Major/Moderate	Moderate	Moderate/Minor	Minor
Low	Moderate	Moderate/Minor	Minor	Minor
Key:		Potentially Significant in the context of the EIA Regulations		
		Not Significant		

3.3 Mitigation and Monitoring

The aim of the EIA is to avoid, reduce and offset any significant adverse environmental effects arising from the Proposed Development.

Where possible, reasonable steps will be taken during the design process to avoid the creation of significant adverse impacts. Where these cannot be avoided completely, appropriate mitigation will be proposed to reduce the impacts.

Each technical chapter will detail the measures proposed to mitigate identified significant adverse effects. Within the ES a schedule of mitigation will be provided including the requirement for any ongoing monitoring, where appropriate.

3.4 Conclusion and Residual Effects

The conclusion will summarise the key findings of the assessment and outline any residual effects which remain following the assessment, appropriate mitigation process and the level of residual effects.

3.5 Assumptions and Limitations

The EIA process is designed to enable informed decision making based on the best available information about the environmental implications of the Proposed Development. However, there will always be some uncertainty in the scale and nature of the predicted environmental effects due to the level of detailed information available at the time of the assessment.

Each technical chapter will make clear any assumptions made as part of the assessment process while setting out the limitation encountered whilst undertaking the assessment and subsequent reporting.

3.6 Structure and Content of the Environmental Statement

It is expected that the Environmental Statement (ES) will be structured as below:

1. Landscape and Visual Impact Assessment (LVIA)
2. Cultural Heritage
3. Noise
4. Hydrology and Hydrogeology
5. Ecology
6. Ornithology
7. Traffic and Transport
8. Shadow Flicker
9. Aviation and Radar
10. Telecommunications
11. Climate Change
12. Summary of Effects.

- Landscape and Visual Impact Assessment Figures
- Planning Drawings and Technical Figures
- Non-Technical Summary

4 Planning and Legislative Context

4.1 Introduction

This chapter summarises the key legislation, policy and guidance that the Proposed Development would be assessed against by the Planning Authority. These documents have been considered when proposing the scope of the forthcoming Environmental Statement as part of the planning application submission. The documents mentioned do not form an exhaustive list and will be expanded to suit.

4.2 Legislative Context

4.2.1 Planning and Compulsory Purchase Act 2004

The Planning and Compulsory Purchase Act 2004 includes provisions for Regional Spatial Strategies and the formation of Regional Planning Bodies, the replacement of Local Plans and Structure Plans with Local Development Documents. It refines the plan making process including a duty to exercise Planning Authorities functions with the objective of contributing to the achievement of sustainable development.

With regards to development control the Act provides for local permitted development rights by way of local development orders, provides that the Secretary of State can make development orders and regulations for the procedure for making planning applications, new enforcement powers to serve temporary stop notices, requires consultation responses to be provided within specified times and other various amendments, such as removing Crown immunity to the planning system.

4.2.2 The Planning Act 2008

The Planning Act 2008 is the primary legislation that sets out the legal framework for planning decisions in England for Nationally Significant Infrastructure Projects (NSIP) and the setting up of the now superseded Infrastructure Planning Commission. The Planning Act 2008 is supported by a range of regulations.

The Proposed Development is not considered an NSIP, so the pertinent parts of the Act appear to be in Part 9 which includes for changes to the development plan, powers for local planning authorities to decline to determine subsequent planning applications, removal of the right to compensation in some circumstances, express powers for local planning authorities to make non-material changes to planning permissions. It includes provisions for the Secretary of State to make provisions on certain procedures. The Act includes changes to fees and a power to create fees for planning appeals.

4.2.3 The Town and Country Planning (Environmental Impact Assessment) Regulations 2017

These regulations apply the amended EU directive Environmental Impact Assessment Directive to the planning system in England. The Act provides the procedures relating to the application planning permission, the screening process, preparation of environmental statements, publicity and procedures for decision making.

4.2.4 Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017, transpose the Water Framework Directive 2000/60/EC with the goal of consolidating the previous regulations and providing detail and transparency. The WFD introduced a comprehensive river basin management planning system to protect and improve the ecological and chemical health of our rivers, lakes, estuaries, coastal waters and groundwater.

4.2.5 Others

Other legislative context is provided by topic specific legislation such as:

- Ancient Monuments and Archaeological Areas Act 1979
- Planning (Listed Buildings and Conservation Areas) Act 1990
- Environmental Permitting (England and Wales) Regulations 2016
- Bathing Water Regulations 2013
- Flood and Water Management Act 2010
- Land Drainage Act 1991
- Conservation of Habitats and Species Regulations 2017
- Convention on the Conservation of European Wildlife and Natural Habitats 1979
- Countryside and Rights of Way Act 2000
- Environmental Protection Act 1990
- Hedgerow Regulations 1997
- Natural Environment and Rural Communities Act 2006
- Salmon and Freshwater Fisheries Act 1975
- The Protection of Badgers Act 1992
- Wildlife and Countryside Act 1981 (as amended)
- The Habitats Regulations 2017
- Climate Change Act 2008

4.3 Policy Context

4.3.1 National Policy Statements

These are produced by the UK Government in relation to energy, transport, water, wastewater, and waste. The statements detail the objectives that the UK Government seeks for NSIPs.

4.3.2 National Planning and Policy Framework (NPPF)

The National Planning and Policy Framework (NPPF) was updated in July 2021 and a further update to the documents is under consultation. NPPF sets out the UK Government's planning policies for England and how these should be applied.

4.3.3 Planning Practice Guidance

4.3.4 Development Plan

When assessing the acceptability of development proposals, planning legislation requires the planning authority to make decisions in accordance with policies in the adopted development plan for an area. The Development Plan consists of the North Lincolnshire Local Development Framework.

4.3.4.1 North Lincolnshire Local Development Framework

The North Lincolnshire Local Development Framework consists of the Core Strategy 2011 and a range of supporting documents. The Core Strategy sets out the long term spatial planning framework for the Council area out to 2026. The strategy has a strong focus on the principles of sustainable development. On climate change, Strategic Objective 6 outlines that the wider framework will support actions to tackle climate change through the encouragement of sustainable development.

Key policies within the Core Strategy that should be considered in the forthcoming planning application include:

- CS2: Delivering more sustainable development
- CS6: Historic environment
- CS11: Provision and distribution of employment land
- CS12: South Humber bank strategic employment site – a broad location
- CS16: North Lincolnshire's landscape, greenspace and waterscape
- CS17: Biodiversity
- CS18: Sustainable resource use and climate change
- CS19: Flood risk

4.3.4.2 North East Lincolnshire Local Plan

The study area is located entirely within North East Lincolnshire's administrative area and therefore the North East Lincolnshire Local Plan 2013 to 2032[1] (NELLP) applies. The NELLP sets out the Council's vision and strategy for the Borough until 2032. The plan was adopted in 2018 and sets out policies and allocates land for specific uses including housing, employment and retail. It also sets out the criteria for planning applications and guides the decision-making process.

Key policies relevant to the Proposed Development within the NELLP include:

- Policy 1 Employment land supply
- Policy 5 Development boundaries
- Policy 22 Good design in new developments
- Policy 31 Renewable and low carbon infrastructure
- Policy 32 Energy and low carbon living
- Policy 33 Flood Risk
- Policy 34 Water management
- Policy 35 Telecommunications
- Policy 39 Conserving and enhancing the historic environment
- Policy 41 Biodiversity and Geodiversity
- Policy 42 Landscape
-

4.3.4.3 Others

Other policy context is provided by topic specific policy documents as noted in each of the chapters in this Scoping Opinion Request.

[1] North East Lincolnshire Local Plan 2013 to 2032 (Accessed 03/10/2022)

4.3.5 Guidance

Guidance and policy that the Planning Authority may consider as part of the determination of forthcoming planning application, includes:

- Planning for Renewable Energy Development 2011[2]
- Low Carbon and Renewable Energy Capacity in Yorkshire and Humber Study (2011)
- Landscape Character Assessment (2015)
- The Glasgow Climate Pact – COP26
- UK Government supplementary guidance for Renewable and Low Carbon Energy

4.4 Key Questions for Council and Consultees

- **Q4/1:** Can the Council and Consultees identify any key material policy or guidance documents that have not been mentioned above?

[2] https://www.northlincs.gov.uk/wp-content/uploads/2018/11/Planning-for-Renewable-Energy-Development-SPD-Adopted.pdf (accessed Feb 2023)

5 Landscape and Visual

5.1 Introduction

The Proposed Development will consist of up to three wind turbines of no more than 150m in height, and ancillary infrastructure, with their location shown in **Figure 5.1**. The Proposed Development has the potential to have a direct impact on the physical characteristics of the landscape as well as indirect impacts through its strong visual presence, specifically of the wind turbines, on the character of the landscape and other visual receptors in the area. The Proposed Development also has the potential to have a cumulative impact over the landscape and visual resource when seen in conjunction with other similar developments.

5.2 Policy, Legislation and Guidance

The methodology for the Landscape and Visual Impact Assessment (LVIA) and the Cumulative Landscape and Visual Impact Assessment (CLVIA) will be undertaken in accordance with the methodology set out below which conforms to, *The Guidelines for Landscape and Visual Impact Assessment*, Third Edition (Landscape Institute and IEMA, 2013). Additional guidance would be taken from the following publications:

- North East Lincolnshire Landscape Character Assessment, North East Lincolnshire Council, February 2010;
- North Lincolnshire Landscape Character Assessment, North Lincolnshire Council, December 2020;
- West Lindsey Landscape Character Assessment, West Lindsey District Council, August 1999;
- East Lindsey District Landscape Character Assessment, ECUS, July 2009;
- East Riding of Yorkshire Landscape Character Assessment, AECOM, 2018;
- Siting and Designing Wind farms in the Landscape, NatureScot, Version 3a, August 2017;
- Visual Representation of Wind Farms, NatureScot, Version 2.2, February 2017;
- Spatial Planning for Onshore Wind Turbines –Natural Heritage Considerations; NatureScot, June 2015;
- Landscape Character Assessment: Guidance for England and Scotland (Countryside Agency and NatureScot publication, produced by the University of Sheffield and Landuse Consultants), 2002;
- Residential Visual Amenity Assessment, Technical Guidance Note 2/19, Landscape Institute, March 2019; and
- Assessing the Cumulative Impacts of Onshore Wind Energy Developments, NatureScot Version 3, March 2012.

5.3 Landscape Capacity

The Proposed Development is situated within *Humber Estuary Regional Character Area (RCA)*, as seen in **Figure 5.2**, this is further defined locally as the Humber Estuary Industrial Landscape Character Area (LCA) within the North Lincolnshire Landscape Character Assessment. The character assessment provides the following description for the regional landscape:

> The Humber Estuary is an expansive, flat and low-lying landscape in which agriculture, industrial/urban and semi-natural habitat land uses combine to provide local variety in an otherwise simple, sometimes bleak landscape. The estuary itself can sometimes present a somewhat sombre appearance, particularly at low tide when extensive areas of mudflat are exposed. In contrast, at high tide the estuary has a brighter, more attractive coastal feel. The dynamics of tides, changing weather, bird life and visible activity on the estuary sometimes combine to create a vibrant scene. However,

> in many areas views of the water are blocked by flood alleviation berms and the estuary's presence is perceived only through the more subtle influences such as the taste and smell of salt-laden air.[3]

Within this regional landscape, the Proposed Development is within the locally identified Industrial LCA, which is seen in Figure 5.3 and is described by the character assessment:

> The topography of the land is low lying and flat but gently undulates over the 10m and 20m contour lines as it extends to the west.
>
> The area has been heavily developed for industry from the 1960's onwards with now only remnant pockets of flat open farmland, woodland and naturalised coastal habitats interspersed amongst the dominant industrial infrastructure.[4]

While there is no specific Landscape Capacity Study relating to the acceptability of turbines in this landscape, the presence of existing vertical manmade structures and in a landscape described as visually intrusive, are indicative of some base level of capacity for this type and scale of development. Wind turbines should be able to be accommodated into the landscape without detrimental effects on its character, scale or setting, given the existing character.

5.4 Methodology

5.4.1 Defining the Study Area

An overall study area of 45km radius from the site centre is proposed based on relevant guidance and experience. The study area has been further defined for each part of the assessment process as follows:

Landscape and Visual Impact Assessment (LVIA) – the study area will be restricted to the application site, access routes, and the potential Zone of Theoretical Visibility (ZTV) from where there may be a view of the Proposed Development at up to 45km distance from the outer most parts of the development. The main focus of the assessment with respect of landscape and visual receptors will be 10-15km which would be the distance most likely to experience significant effects as a result of the Proposed Development and is informed with reference to the findings of field survey and viewpoint analysis, as well as professional experience from previous assessments.

Cumulative Landscape and Visual Impact Assessment (CLVIA) – will consider existing wind energy developments, proposals that have permissions, and those that are currently the subject of undetermined applications within a Search Area of 45km radius of the site centre. Those operational turbines will form part of the LVIA baseline for the assessment. Given the nature of the development and the port location it is not considered that other man made vertical features will need to be included in the cumulative assessment. It is likely that only some of these will have the potential to contribute to a significant cumulative effect. Many of these developments can be scoped out of the assessment at this stage due to the lack of combined visibility or distance from the proposed site such that they would not contribute to significant cumulative effects. This will ensure that the cumulative assessment remains focussed on the schemes that have the greatest potential to give rise to significant cumulative effects.

Turbines over 20 km away are highly unlikely to give rise to significant cumulative effects. It is also considered proportionate to scope out all turbines under 50m, and turbines under 80m beyond 10 km distance from the site. The cumulative impact assessment will therefore focus primarily on those schemes within approximately 20km of the Proposed Development. Table 5.1 below lists those developments to be included within the scope of the cumulative assessment, while Figure 5.4 illustrates all developments inside 45km.

[3] North East Lincolnshire Landscape Character Assessment, North East Lincolnshire Council, February 2010
[4] North Lincolnshire Landscape Character Assessment, North Lincolnshire Council, February 2020

Table 5.1 - Summary of wind energy projects within Cumulative Study Area

Development Name	Scale of Project (Single turbine, Cluster or Wind farm)	Distance to Project (approx. in km)
Operational Projects		
Far Marsh	Wind Cluster	5.8km
Pyewipe Farm	Wind Cluster	5.9km
Hull Waste Water Treatment	Single Turbine	11.8km
The Limes (East Riding)	Wind Cluster	12.2km
Burton Pidsea	Wind Cluster	12.6km
Barton Vale Farm	Single Turbine	13.2km
Roos	Wind Farm	13.5km
Woodhouse Farm	Single Turbine	13.9km
Aunt Bessie's	Single Turbine	14.9km
Poplar Farm	Single Turbine	14.9km
Carr Farm	Single Turbine	15.1km
Tedder Hill	Wind Cluster	15.7km
West Farm (Weeton)	Wind Cluster	16.5km
Bishopthorpe Farm	Single Turbine	17.0km
Northwold Farm	Single Turbine	17.0km
Southfield Farm	Single Turbine	17.1km
Croda Chemicals	Single Turbine	17.1km
Newton Marsh Treatment	Single Turbine	17.3km
White House Farm	Single Turbine	17.3km
Out Newton	Wind Farm	18.2km
Z Cars Limited	Single Turbine	19.2km
Consented Projects		
Ashcourt Concrete	Single Turbine	15.5km

All of the above developments listed in **Table 5.1** will be included on any wirelines and Cumulative Zone of Theoretical Visibility (CZTVs) will be run for the most appropriate of these in conjunction with the Proposed Development.

5.4.2 Zone of Theoretical Visibility

A Zone of Theoretical Visibility (ZTV) was calculated using the ReSoft© WindFarm computer software to produce areas of potential visibility of any part of the proposed wind turbines calculated to blade tip and hub height. The ZTV however, does not take account of built development and vegetation, which can significantly reduce the area and extent of actual visibility in the field and as such provides the limits of the visual assessment study area.

Figure 5.5 illustrates the ZTV for blade tip height of 150m at a scale of 1:350,000 at A3.

5.4.3 Baseline Landscape and Visual Resource

This part of the LVIA will refer to the existing landscape character, quality or condition and value of the landscape and landscape elements on the site and within the surrounding area, as well as general trends in landscape change across the study area. A brief description of the existing landscape character and land use of the area will be included which references settlements, transport routes, vegetation cover, as well as landscape planning designations, local landmarks, and tourist destinations.

5.4.4 Assessing Landscape Effects

Landscape Effects are defined by the Landscape Institute as "*changes to landscape elements, characteristics, character, and qualities of the landscape as a result of development*". The potential landscape effects, occurring during the construction and operation period, may therefore include, but are not restricted to, the following:

- Changes to landscape elements: the addition of new elements or the removal of trees, vegetation, and buildings and other characteristic elements of the landscape character type;
- Changes to landscape quality: degradation or erosion of landscape elements and patterns, particularly those that form characteristic elements of landscape character types;
- Changes to landscape character: landscape character may be affected through the incremental effect on characteristic elements, landscape patterns and qualities and the cumulative addition of new features, the magnitude of which is sufficient to alter the overall landscape character type of a particular area; and
- Cumulative landscape effects: where more than one wind farm may lead to a potential landscape effect.

The Proposed Development may have a direct (physical) effect on the landscape as well as an indirect effect or effect perceived from outwith the landscape character area. Landscape effects will be assessed by considering the sensitivity of the landscape against the degree of change posed by the development. The sensitivity of the landscape to the Proposed Development is based on factors such as its quality and value and is defined as high, medium or low. Examples of landscape sensitivity and criteria are described below:

> High Sensitivity – This would primarily be rare landscapes, or landscapes which have been afforded either a national or local designation such as National Parks, National Scenic Areas or Areas of Landscape Significance. These landscapes can be fairly dramatic in terms of scale and may feature a number of attractive landscape features, including mature woodland, intricate gorges and river valleys, prominent summits or features of cultural heritage. Man-made features or modifications to the landscape will be minimal and the landscape may have a wild or remote feeling to it;
>
> Medium Sensitivity – This would include landscapes which are still relatively attractive and generally rural but do contain some manmade elements. It may be landscapes which have been modified to accommodate farming practices and landscapes which include more prominent settlement pattern and road networks. These landscapes may also contain woodland including plantation forestry and shelterbelts; and
>
> Low Sensitivity – This would only be reserved for landscapes which may be deemed unattractive due to heavy modification and prominent man-made features, such as industrial units.

The magnitude or degree of change considers the scale and extent of the Proposed Development, which may include the loss or addition of particular features, and changes to landscape quality, and character. Magnitude can be defined as high, medium, low or negligible, examples of magnitude are shown below:

> High Magnitude – This would be a major change to baseline conditions, where the character of the landscape may be altered from its existing state into a landscape with wind farms;
>
> Medium Magnitude – This would be a noticeable change in the baseline condition but not necessarily one which would be enough to alter the character of the landscape and will generally diminish with distance;

Low Magnitude – This would be a minor change to the baseline conditions where the development would be readily missed by a casual viewer and any character of the landscape would remain intact; and

Negligible Magnitude – This would be a change which would be difficult to notice and the baseline conditions are likely to remain almost as they were.

The level of effect is determined by the combination of sensitivity and magnitude of change as shown in Table 5.2.

Table 5.2 - Magnitude and Sensitivity Matrix for assessing Overall Level of Effect

Sensitivity	Magnitude of Change			
	High	**Medium**	**Low**	**Negligible**
High	Major	Major/Moderate	Moderate	Moderate/Minor
Medium	Major/Moderate	Moderate	Moderate/Minor	Minor
Low	Moderate	Moderate/Minor	Minor	Minor
Key:		Significant in terms of the EIA Regulations		
		Not Significant		

The significance of any identified landscape or visual effect will be assessed in terms of Major, Major/Moderate, Moderate, Moderate/Minor or Minor. These categories have been based on combining viewer or landscape sensitivity and predicted magnitude of change. The matrices should not be used as a prescriptive tool but will allow for the exercise of professional judgement.

Any effects that are classified as Major or Major/Moderate, will be considered to be equivalent to likely significant effects referred to in the EIA Regulations. Careful consideration will also be given to Moderate effects to test whether (in the professional opinion of the landscape architect) they are significant in EIA terms or not. In all cases, whether an effect is significant or not will be confirmed within the assessment.

5.4.5 Assessing Visual Effects

Visual effects are recognised by the Landscape Institute as a subset of landscape effects and are concerned wholly with the effect of the development on views, and the general visual amenity. The visual effects are identified for different receptors (people) who will experience the view at their places of residence, during recreational activities, at work, or when travelling through the area. These may include:

- Visual effect: a change to an existing view, views or wider visual amenity as a result of development or the loss of particular landscape elements or features already present in the view; and
- Cumulative visual effects: the cumulative or incremental visibility of similar types of development may combine to have a cumulative visual effect. Either:
  - Simultaneously - where a number of developments may be viewed from a single fixed viewpoint simultaneously within the viewer's field of view without moving;
  - Successively - where a number of developments may be viewed from a single viewpoint successively by turning around at a viewpoint, to view in other directions; and
  - Sequentially - where a number of developments may be viewed sequentially or repeatedly from a range of locations when travelling along a route.

The general principles adopted for the assessment of visual effects were taken from *The Guidelines for Landscape and Visual Impact Assessment* Third Edition, produced by the Landscape Institute, 2013. This guidance outlines the approach to define the 'sensitivity' for a given view and a 'magnitude of change' that would be caused by the

development in question over its lifetime. A matrix in the Guidance is then used to assess the overall 'level of effect'. This matrix is the same format as used to understand landscape effects and can be seen in **Table 5.2**. Examples of visual sensitivity are highlighted below:

High Sensitivity – These include residential receptors, such as views from individual properties or views from within settlements. Views from both recreational locations, such as hill summits, long distance footpaths, cycle paths and tourist locations such as castles and visitor centres are also considered to be of high sensitivity;

Medium Sensitivity – This would include most other visual receptors such as views from roads, other areas of landscape which would not be classed as recreational areas and views from areas within settlements which would not be considered residential; and

Low Sensitivity – This would cover views experienced by people at work and views where the existing view is already dominated by significant man-made features.

In the context of the Proposed Development, the effects during operation are always direct and long term. Effects may also be non-cumulative or cumulative. None of the visual effects relating to the Proposed Development have been considered positive in order to present a worst-case view of any effects.

5.4.6 Viewpoint Analysis Method

Viewpoint analysis is used to assist the LVIA from selected viewpoints within the study area. The purpose of this is to assess both the level of visual impact for particular receptors and to help guide the assessment of the overall effect on visual amenity and landscape character. The assessment involves visiting the viewpoint location in good weather and viewing wireframes and photomontages prepared for each viewpoint location. Illustrated turbines always face the viewer to give a worst-case impression of the development under consideration. The viewpoints have primarily been selected to meet the following criteria:

- A balance of viewpoints to the north, south, east and west;
- A range of near middle and distance views of the Proposed Development;
- A proportion representing areas known locally where people use the landscape, such as prominent hill tops or footpaths; and
- A proportion representing designated areas.

It is proposed that 14 viewpoints will cover the above criteria as well as representing views from the most relevant visual receptors. **Table 5.3** below details the proposed viewpoints and they are shown on **Figure 5.5**.

Table 5.3 - Summary of locations selected for Viewpoint Assessment

Viewpoint	Reason for Inclusion or Exclusion of Location	Distance
VP1 Immingham North	View is representative of views experienced by the closest residents on the northern edges of the settlement of Immingham.	1.7km
VP2 Immingham South	View is representative of views experienced by the residents of the wider Immingham area.	2.9km
VP3 Killingholme	View is representative of views experienced by residents of Killingholme.	3.4km
VP4 Stallingborough	View is representative of views experienced by residents of Stallingborough.	6.1km

Viewpoint	Reason for Inclusion or Exclusion of Location	Distance
VP5 PRoW on Grimsby Coast	View is representative of views experienced by walkers walking between Grimsby and Immingham on the Public Right of Way.	7.7km
VP6 Stone Creek	View is representative of views experienced from across the estuary on the Holderness Peninsula.	5.7km
VP7 Keelby	View is representative of views experienced by residents of Keelby.	6.9km
VP8 East Halton	View is representative of views experienced by residents of East Halton.	5.1km
VP9 Fort Paull	View is representative of views experienced by visitors to Fort Paull as well as illustrating the impact on the historic feature here.	9.3km
VP10 Barrow Upon Humber	View is representative of views experienced by residents of Barrow Upon Humber.	12.0km
VP11 NCR1 over the A180	View is representative of views experienced by both road users on the A180 and cyclists on the National Cycle Route 1.	11.9km
VP12 Lincolnshire Wolds AONB	View is representative of views experienced by visitors to the AONB and impacts on the character of the AONB.	14.3km
VP13 Hull Waterfront	View is representative of views experienced by residents of Hull and of views along the Humber estuary.	13.0km
VP14 Spurn Head	View is representative of views experienced by visitors to Spurn Head and the impact on ferries passing through the Mouth of the Humber.	22.8km

5.4.7 Methodology for Production of Visualisations

All these locations will be photographed with a full frame digital Single Lens Reflex (SLR) camera set to produce photographs equivalent to that of a manual 35 mm SLR camera with a fixed 50 mm focal length lens. In accordance with *Scottish Natural Heritage, Visual Representation of Wind Farms February 2017,* panoramic images will be produced from these photographs to record a 53.5° panorama which will be extracted from this. In addition to this, a viewpoint pack will also be produced; the single frame images will be for use at the viewpoint location. These images will be prepared from the same baseline photography as the panorama images. The single frame images will be produced at 75mm (extracted from the original 50mm photographs). The wider 360° of each view will also be taken into account, particularly for any hill summit viewpoints.

Each view will be illustrated using a panoramic photograph, a wireline and, in some cases, a photomontage. Wirelines and photomontages will be produced using ReSoft© WindFarm software and utilising 50m² Ordnance Survey Digital Terrain Mapping (DTM) height data covering the study area.

5.4.8 Visual assessment of Settlements and Residential Properties

It is proposed that all settlements within 15km of the Proposed Development will be assessed with regards to the level of visual impact the development will have on them. While the study area is 45km, it is unlikely that there would be any significant visual impact on settlements beyond 15km and as such, it is proposed that all settlements beyond 15km are scoped out of the LVIA. The assessment will include the settlements of Immingham, Stallingborough, Grimsby, Healing, Killingholme, Hull and Barrow Upon Humber some of which will have photomontages produced to accompany the assessment, where appropriate. The sensitivity for each of the settlements is considered to be high in accordance with Guidelines for Landscape and Visual Impact Assessment, 2013.

5.4.9 Visual Assessment of Main Transport Routes

A route assessment will be undertaken which will explore the visual impact of the Proposed Development on views experienced by road users along major transport routes in the area and assumes that the viewer would be travelling at typical speed for the road conditions. It also includes assessment of any National Cycle Routes, Long Distance Footpaths and locally valued footpaths which fall within the study area. This part of the assessment will be considered cumulatively along with all other wind energy development within the study area. It is proposed that significant effects may occur from the following routes:

- A180 between Brigg and Grimsby; and
- Public Bridleway 36 between Skitter Ness and Grimsby.

It is not thought that there will be significant effects from any other routes within the 45km study area and will be scoped out of the assessment.

5.4.10 Cumulative Landscape Visual Assessment

In addition to the Landscape Institute methodology for LVIA, the cumulative landscape and visual assessment (CLVIA) has considered the guidance from Scottish Natural Heritage's *Assessing the Cumulative Impact of Onshore Wind Energy Developments,* Scottish Natural Heritage, March 2012. The CLVIA is however, not a substitute for individual wind farm landscape and visual impact assessment.

5.4.11 Predicting Cumulative Landscape Effects

The assessment will consider the extent to which the Proposed Development, in combination with others, may change landscape character through either incremental effect on characteristic elements, landscape patterns and quality, or by the overall cumulative addition of new features. Identified cumulative landscape effects are described in relation to each individual Landscape Character Area and for any designated landscape areas that exist within the study area.

5.4.12 Predicting Cumulative Visual Effects

The assessment of cumulative visual effects involves reference to the cumulative visibility ZTV maps and the cumulative viewpoint analysis. Cumulative visibility maps are analysed to identify the residential and recreational locations and travel routes where cumulative visual effects on receptors (people) may occur as a result of the Proposed Development. Table 5.1 lists the projects proposed to be included as part of the cumulative assessment.

With potential receptor locations identified, cumulative effects on individual receptor groups are then explored through viewpoint analysis, which involves site visits informed by wireline illustrations that include other wind developments. Travel routes are driven to assess the visibility of different wind developments and inform the assessment of sequential cumulative effects that may occur along a route or journey.

5.4.13 Cumulative Viewpoint Analysis

Each viewpoint will be assessed cumulatively in order to understand whether or not the Proposed Development introduces a cumulative impact on the view from that location. All visible operational, consented and undetermined planning applications for wind energy projects are considered along with the proposed Immingham turbines and a level of cumulative magnitude is assigned. The level and significance of cumulative visual effects is determined in the same manner as the main LVIA, using the previous matrix shown in Table 5.2.

5.5 Baseline

5.5.1 Landscape Character

The Site is located within the Humber Estuary National Character Area (NCA), which runs along either side of the Humber on the east coast, encompassing the settlements of Hull, Immingham and Grimsby. A detailed assessment of both the direct and indirect impacts on this NCA will be an important part of the LVIA. In addition to this the site is characterised locally within the *North Lincolnshire Landscape Character Assessment*, 2020 as being within the Industrial LCA. The 45km study area also contains a number of other NCAs and LCAs, detailed in Table 5.4 below and illustrated in Figures 5.2 and 5.3.

Table 5.4 – Potential impact on Landscape Character Types

LCTs included in final assessment	LCTs scoped out due to lack of visibility
North East Lincolnshire Landscape Character Assessment	
Ai - Industrial	Biii - Flat Open Farmland
Aii - Flat Open Farmland	Biv - Sloping Farmland
Bi - Open Farmland	Ci - High Farmland
Bii - Wooded Open Farmland	
North Lincolnshire Landscape Character Assessment	
36 - Humber Estuary (Industrial)	28 - Lincolnshire Wolds
32 - Lincolnshire Drift	24 - Vale of Ancholme
East Riding of Yorkshire Landscape Character Assessment	
17A - Hedon, Preston and Bilton Farmland	21B - Sunk Island
19D - Central Holderness Open Farmland	21C - South Patrington, Ottringham and Keyingham Farmland
19E - Burtwick to Withernsea Farmland	21D - Paull Farmland
20B - Hornsea to Withernsea Coast	
West Lindsey Landscape Character Assessment	
9 - Lincolnshire Clay Vale	12 - North West Wolds Escarpment
10 - The Kelseys	14 - Wolds Estate
11 - Heathland Belt	13 - Lincolnshire Wolds
East Lindsey Landscape Character Assessment	
G1 - Wolds Farmland	J1 - Coastal Outmarsh
I1 - Middle Marsh	

The LCTs beyond 20km are not predicted to have any significant impacts caused by the Proposed Development and it is suggested that these be **scoped out** of the final LVIA, as the turbines will typically appear as minor features in distant landscapes from these further away LCTs. An assessment of the indirect effects of the development on

the remaining LCTs will be carried out as there is potential for significant indirect effects due to the Proposed Development.

5.5.2 Landscape Designations

The site is not designated either nationally or locally, and as such it will have no direct impacts on any landscape designations. Due to the visual impact of the wind turbines there may be indirect impacts on the setting and character of any designated landscapes within the 45km study area. Those landscapes are listed in Table 5.5 below and are shown in Figures 5.6.

Table 5.5 - Potential impact on designated landscapes

Designations included in final assessment	Designations scoped out due to lack of visibility
Lincolnshire Wolds AONB	People's Registered Park and Garden
West Lindsey Area of Great Landscape Value	East Park Registered Park and Garden
North Lincolnshire Area of Special Historic Landscape Interest	Pearson Registered Park and Garden
East Riding of Yorkshire Important Landscape Area	Burton Constable Registered Park and Garden
Brocklesby Registered Park and Garden	Thwaite Hall Registered Park and Garden

An assessment of each of these landscapes which is predicted to have visibility of the turbines will be undertaken as part of the LVIA with photomontages from some of the closer designated landscapes. Any Registered Parks and Gardens beyond 20km will have limited impacts given the combination of distance and screening from vegetation, and, as such, will be scoped out of the LVIA.

5.6 Summary

The Proposed Development may give rise to some significant effects in terms of both direct and indirect impacts on the landscape character. It may also have significant effects on visual receptors, including residents, road users, walkers and visitors to the area. As such, a detailed assessment will be undertaken through a LVIA, which will include accompanying maps and visualisations.

5.7 Key Questions for Council and Consultees:

- Q5/1 Do the Council and consultees agree with the proposed methodology?
- Q5/2 Do the Council and consultees agree with the scope of the viewpoint assessment, identified in Table 5.3.
- Q5/3 Do the Council and consultees agree with the methodology and scope of the cumulative assessment and are the Council aware of any additional projects not listed in Table 5.1.
- Q5/4 Could the Council indicate if any of the projects listed in Table 5.1 are required to have a CZTV produced?
- Q5/5 Are the Council or consultees aware of any further guidance or policy documents not mentioned within the report that are relevant to the assessment?
- Q5/6 Which Public Rights of Way do the Council wish to be considered as part of the assessment?

6 Cultural Heritage and Archaeology

6.1 Introduction

Cultural heritage is represented by a wide range of features, both above and below ground, which result from past human use of the landscape. These include standing buildings, many of which are still in use; sub-surface archaeological remains and artefact scatters; industrial remains; earthwork monuments and landscape features such as field boundaries. The aim of this study is to identify elements of archaeological and cultural heritage value that may be directly impacted upon by the Proposed Development at Immingham Port, as well as indirectly affecting their setting.

It is noted that the port and wider estate was subject to substantial civil engineering works when originally built in the 19th century and then during subsequent update/refurbishment/redevelopment work. The port areas have undergone considerable excavation and reclamation work in intertidal areas so any archaeological remains predating the port's existence are extremely unlikely due to that extensive disturbance. Similarly repeated redevelopment of the terrestrial estate (and indeed continuous maintenance dredging within dock basin areas) would have periodically removed subsequent archaeological deposits. Paleoenvironmental remains may well still reside in extremely deep layers, but these would only be exposed to relatively minor disturbance from the proposed development and limited to the pile footprints for individual turbines.

6.2 Legislation, Policy and Guidance

The following statutory, national and local legislation, policy and guidance for assessing the potential impact of renewable energy developments on cultural heritage features will be considered:

6.2.1 Legislation

National legislation relating to the planning and protection of cultural heritage assets includes:

- *The Town and Country Planning Act (Environmental Impact Assessment) Regulations,* UK Government, 2017;
- *Ancient Monuments and Archaeological Areas Act 1979*, UK Government, 1979; and
- *Planning (Listed Buildings and Conservation Areas) Act 1990*, UK Government, 1990.

6.2.2 Policy

National and local planning policy relating to the Proposed Development site includes:

- *UNESCO Convention Concerning the Protection of the World Cultural and National Heritage 1972,* UNESCO World Heritage Convention, 1972;
- *The National Planning Policy Framework,* UK Government, 2012 (Revised 2021);
- *North Lincolnshire Local Plan – Policy HE1 Conservation Areas,* North Lincolnshire Council, May 2003;
- *North Lincolnshire Local Plan – Policy HE5 Development Affecting Listed Buildings,* North Lincolnshire Council, May 2003;
- *North Lincolnshire Local Plan – Policy HE8 Ancient Monuments,* North Lincolnshire Council, May 2003;
- *North Lincolnshire Local Plan – Policy HE9 Archaeological Evaluation,* North Lincolnshire Council, May 2003; and

- *North Lincolnshire Local Plan – Policy LC13 Parks, Gardens and Landscapes of Special Historic Interest,* North Lincolnshire Council, May 2003.[5]

- *North East Lincolnshire Council Local Plan – Policy 31 Renewable and Low Carbon Infrastructure,* North East Lincolnshire Council, 2018;
- *North East Lincolnshire Council Local Plan – Policy 32 Energy and Low Carbon Living,* North East Lincolnshire Council, 2018;
- *North East Lincolnshire Council Local Plan – Policy 39 Conserving and Enhancing Historic Environment,* North East Lincolnshire Council, 2018;

6.2.3 Guidance

In addition to the above legislation and policy, a number of guidance documents have been produced relating to assessment and protection of cultural heritage assets.

- *The National Planning Policy Framework Guidance – Historic Environment,* UK Government, 2014 (Revised 2019);
- *The Setting of Heritage Assets – Historic Environment Good Practice Advice in Planning 3,* Historic England, 2017;
- *Historic England Advice Note 1 – Conservation Areas,* Historic England, 2019;
- *Historic England Advice Note 10 – Listed Buildings and Curtilage,* Historic England, 2018;
- *Historic England Advice Note 15 – Commercial Renewable Energy Development and the Historic Environment,* Historic England, 2021;
- *North East Lincolnshire Council Wind Energy Supplementary Planning Document,* North East Lincolnshire Council/Engie, June 2019; and
- *North Lincolnshire Local Plan Supplementary Planning Guidance – Wind Energy Development,* North Lincolnshire Council, May 2003.

6.3 Assessment Methodology

In the preparation of this assessment, a range of historical and technical data was collected and analysed. This includes a review of all potential features that fall under the umbrella term of cultural heritage, such as historic buildings and landscapes, in addition to purely archaeological factors.. The following sources were consulted:

- Historic Environment Record (HER) via www.heritagegateway.org.uk;
- North East Lincolnshire Council Historic Environment Record via https://maps.nelincs.gov.uk/mynelincs2.aspx;
- Historic Environment Local Management (HELM);
- Historic England Heritage at Risk register;
- National Library of Scotland (Map Library);
- Natural England Heritage Coasts database; and
- Historic England's database of; Listed Buildings (LBs), Scheduled Monuments (SMs), Registered Parks and Gardens, Registered Battlefields, World Heritage Sites and Protected Wreck Sites.

[5] North Lincolnshire Local Plan Update is currently under review and awaiting adoption - https://localplan.northlincs.gov.uk/

6.3.1 Outwith Site Boundary

The indirect impact on the setting and character of known cultural heritage sites will be considered within this assessment. Nationally significant features such as: Scheduled Monuments, Grade I Listed Buildings, Gardens and Registered Parks and Gardens, Protected Wreck Sites, Registered Battlefields, Heritage Coast and World Heritage Sites will be considered within 10km of the Proposed Development. Any sensitive features beyond this distance may also be considered if there is potential for significant impact. Regionally significant features such as Grade II* Listed Buildings and Conservation Areas will be considered out to 2km of the Proposed Development. See **Figure 6.1**. Grade II Listed Buildings are scoped out of this assessment due to their location out with the site causing no direct impact and significant indirect impacts are unlikely.

This assessment will include any visual impacts both to and from the monument and any impacts to sense of place, sense of remoteness, cultural identity, evocation of historical past and associated spiritual responses. Impacts will also be considered cumulatively with other developments in the surrounding area where appropriate.

6.3.2 Within Site Boundary

The direct and indirect impact will be assessed for all features located within the port boundary. In terms of direct impact, the area most at risk of direct impact will be land 50m either side of the access track and any areas within 200m of the proposed wind turbine locations. Additionally, the assessment will include any visual impacts both to and from the monuments and any impacts to sense of place, sense of remoteness, cultural identity, evocation of historical past and associated spiritual responses. Impacts will also be considered cumulatively with other developments in the surrounding area where appropriate.

This assessment will consider any local Historic Environment Record Features as well as regionally and nationally significant features including Grade II Listed Buildings within the port boundary in terms of direct and indirect impacts where appropriate. See **Figure 6.2.**

6.3.3 Cultural Heritage and Archaeology Figures

The assessment will make use of the following visual aids:

- Zone of Theoretical Visibility (ZTV), maps areas that the wind turbines are theoretically visible from. This is a 'bare earth' representation which does not take into account local screening from the natural and built environments; and
- Wirelines and/or photomontages produced using the ReSoft© WindFarm programme where appropriate.

Visual representations will be produced when it is considered to be helpful in visualising the potential indirect visual impact of the development.

6.3.4 Historic Maps

Historic maps and aerial photographs from various sources will be consulted online as part of the desk-based assessment.

6.3.5 Assessment Criteria

The following general criteria outlined in **Table 6.1** and **Table 6.2** will be used in the assessment of level of effect of any direct or indirect impact on any site of cultural heritage importance.

Table 6.1 – Sensitivity of cultural features

Sensitivity	Definition
High	Grade I Listed Buildings Grade II* Listed Buildings

	Scheduled Monuments Registered Parks and Gardens World Heritage Sites Registered Battlefields Protected Wrecks Non-statutory List of sites likely to be of national importance
Medium	Archaeological sites on the Sites and Monuments Record (of regional and local importance) Conservation Areas Heritage Coast Grade II Listed Buildings
Low	Archaeological sites of lesser importance Non-Inventory Parks and Gardens

Table 6.2 – Magnitude of cultural effects

Magnitude	Definition
High	Any number of elements that would result in: • a substantial obstruction or addition to the setting where it significantly alters the quality, setting or the visual amenity of the site both to and from the feature; and/or • the removal or partial removal of key features, areas, or evidence important to the historic character and integrity of the site, which could result in the substantial loss of physical integrity.
Medium	Any number of elements that would result in: • a partial obstruction or addition to the setting where it significantly alters the quality, setting or the visual amenity of the site both to and from the feature; and/or • the removal of one or more key features, parts of the designated site, or evidence at the secondary or peripheral level, but are not features fundamental to its historic character and integrity.
Low	Any number of elements that may result in: • an introduction of elements that could alter to a small degree the quality of the setting or visual amenity of the site both to and from the feature; and/or • a partial removal/minor loss, and/or alteration to one or more peripheral and/or secondary elements/features, but not significantly affecting the historic integrity of the site or affect the key features of the site.
Negligible	Any number of elements developments that may result in: • an introduction of elements that could be visible but not intrusive and the overall quality of the setting or visual amenity of the site would not be affected both to and from the feature; and/or • a relatively small removal, and/or alteration to small, peripheral and/or unimportant elements/features, but not affect the historic integrity of the site or the quality of the surviving evidence.

The level of both direct and indirect effects that the Proposed Development may have on the surrounding features of historical significance is determined by the combination of the sensitivity and magnitude of change. The following matrix in Table 6.3 is used to determine the overall significance of effect.

Table 6.3 – Significance of Effect Matrix

Sensitivity	Magnitude of Change			
	High	Medium	Low	Negligible
High	Major	Major/Moderate	Moderate	Moderate/Minor
Medium	Major/Moderate	Moderate	Moderate/Minor	Minor
Low	Moderate	Moderate/Minor	Minor	Minor
Key:		Significant in terms of the EIA Regulations		
		Not Significant		

The significance of any identified effects will be assessed in terms of Major, Major/Moderate, Moderate, Moderate/Minor or Minor. The matrices should not be used as a prescriptive tool but will allow for the exercise of professional judgement.

Any effects that are classified as Major or Major/Moderate, will be considered to be equivalent to likely significant effects referred to in the EIA Regulations. Careful consideration will also be given to Moderate effects to test whether they are significant in EIA terms or not. In all cases, whether an effect is significant or not will be confirmed within the assessment.

The following section has considered the current settings of the historic features. It is acknowledged that any woodland and vegetation that currently restricts potential views of the proposed wind turbines from any of the historic features within the study radius is subject to change. External factors such as felling, disease and wind damage are outwith the Applicant's control. The assessment will consider the historic features settings at the time of the application submission but recognises that screening provided by vegetation and woodland is potentially subject to change.

6.4 Baseline

6.4.1 Outwith Site Boundary

Figure 6.1 shows the theoretical visibility of the Proposed Development, the regionally significant historical features out to 2km such as Grade II* Listed Buildings and Conservation Areas and nationally significant features such as Grade I Listed Buildings, Scheduled Monuments, Registered Parks and Gardens, Registered Battlefields, Protected Wreck Sites, Heritage Coast and World Heritage Sites. Table 6.4 below lists these historical features found within study radius.

Table 6.4 – Historic Features within 10km of the Site

Ref	Distance from turbine	Schedule/LB Ref	Name	Within ZTV?	Description
Scheduled Monuments					
SM01	3.2km	1008044	Manor Farm moated site	Yes	The moated site at Manor Farm includes two moated sites, a smaller one located in the north-western corner of the larger one, and other associated features.
SM02	3.5km	1007815	North Garth moated site and associated enclosures	Yes	The monument is North Garth moated site. It includes a series of dry ditches enclosing a main moated site and a group of

					associated enclosures. The main moated site is situated at the northern end of the monument.
SM03	4.0km	1007813	Moated site and associated earthworks at Baysgarth Farm	Yes	The monument is the moated site at Baysgarth Farm. It includes a large sub-rectangular moated site, a second smaller moated enclosure, and other associated earthwork features.
SM04	4.8km	1007816	Manor Farm moated site	Yes	The monument is the moated site at Manor Farm, East Halton. It includes a large moated site which is sub-divided by a series of internal ditches.
SM05	5.1km	1020423	Stallingborough medieval settlement, post-medieval manor house and formal gardens	Yes	The monument includes earthwork and associated buried remains of part of the settlement of Stallingborough, together with the earthworks of a post-medieval manor house and associated formal gardens.
SM06	5.2km	1020023	Churchyard cross	Yes	The monument includes a medieval churchyard cross and associated buried remains in the churchyard of St Peter and St Paul's Church, Stallingborough.
SM07	5.2km	1020022	World War II Decoys for Hull Docks	Yes	The monument includes the remains of World War II decoys designed to attract enemy bombers heading for Hull Docks. The monument is in three separate areas of protection: the first and largest includes the decoys for King George V, Alexandra and Victoria docks all lying along the Humber foreshore on The Outstray to the south west of Thorney Crofts; the second area includes the decoy for the River Hull, centred 700m west of Little Humber Farm; the last area lies immediately to the south west of this farm and includes the decoy's shelter from which the operation of the decoy was controlled.
SM08	5.7km	1008686	Site of Medieval Nunnery and Post-Dissolution House	Yes	The monument includes the remains of the medieval nunnery of Nun Cotham, a priory of Cistercian nuns founded in the mid-12th century and dissolved in 1539.
SM09	5.9km	1020187	Stone Creek Heavy Anti-aircraft Gunsite	Yes	The monument includes the standing, earthwork and buried remains of a World War II HAA (Heavy Anti-aircraft) gunsite initially known as Station J and then Station H9 from 1 August 1941 onwards. It includes the full extent of the original station complete with four-gun emplacements and associated structures, as well as the remains of the domestic site.
SM10	5.9km	1011198	Thornton Abbey Augustinian monastery	Yes	Thornton Abbey is situated in Lindsey, south of the Humber estuary, and was formerly in the county of Lincolnshire. The monument comprises a single area which contains the late fourteenth century gatehouse and barbican of the Augustinian

					monastery, an outer precinct surrounded by a moat and containing the earthwork remains of a wide variety of ancillary features and buildings, the walled inner precinct containing the foundations of the abbey church and other cloister buildings and the buried remains of additional structures, the site of the medieval road that predated the abbey, the remains of the fourteenth century bridge that underlie modern College Bridge, and a large number of monastic fishponds.
SM11	6.9km	1008048	Old Little Humber moated site	Yes	The monument is the moated site at Old Little Humber. It includes the remains of a moated site and adjacent earthworks which are contemporary with it.
SM12	6.9km	1018287	Cross in St Bartholomew's Churchyard	Yes	The monument includes the base and the lower part of the shaft of a Grade II Listed standing stone cross. The cross is located in the churchyard of St Bartholomew's Church to the south of the nave. The cross is medieval in date and is constructed of limestone.
SM13	7.1km	1431904	Second World War QF Bombing Decoy	Yes	This Second World War decoy site includes a complete QF (P-series) oil bombing decoy display site, which comprises the structural remains of a circular oil ring, a pair of mirrored oil crescents, a small irregular shaped oil pool and connecting channels with balancing lines, concrete sumps, and other associated structures.
SM14	7.5km	1010947	Two moated sites at Healing Hall	Yes	The monument includes two moated sites at Healing Hall. The larger moat is defined by a silted (and now dry) ditch; the smaller moated site, the ditches of which remain waterlogged, is situated in the south-western corner of the larger one. The larger moated site has a roughly square island surrounded by a ditch with, on the north and west sides, an external bank.
SM15	7.5km	1007875	Paull Holme Moated Site and Tower	Yes	The monument is the site of the medieval moated manor of Paull Holme. It includes a dry rectangular moat surrounding a raised island measuring 190 metres north to south and 100 metres east to west.
SM16	7.6km	1007820	Goxhill Hall moated site, associated drainage system, fishponds and field system	Yes	The monument is the moated site at Goxhill Hall. It includes the main moated site and associated fishponds, drainage ditches, and part of a contemporary field system.
SM17	8.1km	1020425	Paull Point Battery, coastal artillery battery and Submarine Mining Establishment	Yes	The monument includes an enclosed Victorian coastal artillery battery, the remains of a Submarine Mining Establishment and other associated standing, earthwork and buried remains to the south of the village of Paull. It also

					includes what is likely to be the site of at least one earlier artillery battery. The structure of the Victorian battery with its later modifications is Listed Grade II. The monument lies in two areas of protection.
SM18	8.6km	1016858	Medieval Settlement of Croxton	Yes	The monument includes buried and earthwork remains of the medieval settlement of Croxton, together with the surviving part of the village's open field system.
SM19	8.9km	1013526	Camera of the Knights Hospitallers, medieval settlement and cultivation remains, post-medieval house and gardens	Yes	The monument includes the remains of a medieval manor believed to have served as a camera of the Knights Hospitallers from the 14th to the 16th centuries.
SM20	9.3km	1005306	Roman Settlement	Yes	This monument includes a gatehouse situated on the east side of the College Green part of Worcester Cathedral Precincts. The monument survives as a gatehouse tower that was rebuilt between 1300 and 1335, remodelled in 1369 and restored during the late 19th century.
Listed Buildings					
LB01	1.7km	1310011	Church of St Andrew	Yes	Parish church. C11 - C12 nave and responds to north arcade; late C12 - early C13 south arcade, south aisle, lower section of tower arch, chancel arch and west section of chancel; later C13 north arcade; C14 north door, east and west windows to aisles; C15 - C16 north aisle windows, C16-C17 tower, clerestory and chancel east window. Roof replaced in C17. Restorations of late 1880s. Restoration of north aisle in 1921 by W Bond of Grantham, of nave in 1923, of tower in 1924; nave and tower roofs renewed in 1957. Re-floored in 1969. Limestone ashlar to tower and nave clerestory; mixed limestone and ironstone rubble and squared masonry to aisles and east end of nave; similar materials to chancel with some chalk and flint rubble. Slate roofs.
LB02	3.3km	1103701	Church of St Denys	Yes	Parish church. C12 tower arch, C13 chancel with later C13 - C14 windows, C14 nave arcades, aisles and lower stages to tower with C15 upper stage, C16-C17 clerestory and windows to south aisle. Restorations of C18, 1847, 1868, 1889,1910, and 1926 included roofing nave and chancel, re-flooring, raising chancel, new chancel arch. Ironstone and limestone ashlar tower, partly rendered.
LB03	4.0km	1103729	Church of St Peter	Yes	Parish church. C13 chancel, C14 remainder, with some re-used C12 moulded stone. Restorations of 1868 by J Fowler of Louth included raising chancel and north aisle, new south porch, and roofs to nave and

					chancel. Ironstone and limestone ashlar tower; ironstone, limestone, chalk and flint rubble and brick with ashlar dressings to aisles and chancel; ashlar porch with some re-used medieval masonry.
LB04	5.6km	1063419	Newsham Bridge	Yes	Bridge, circa 1772 probably by Capability Brown. Ashlar. Bridge of 7 unequal arches, the central one being the largest.
LB06	6.3km	1215139	Remains of Thornton Abbey Church and Adjoining Monastic Ranges	Yes	Ruins of Abbey church and adjoining monastic buildings founded as a Priory in 1139. Late C12 - early C13 dormitory vault, remainder largely rebuilt between mid C13 and late C14: church begun 1264, south transept 1280-90, chapter house 1282-1308, cloistral range begun 1322-3, refectory 1348-64, with minor late C15 - early C16 additions. C20 repairs.
LB07	6.6km	1103713	Abbot's Lodge	Yes	House, incorporating former monastic range of Thornton Abbey (qv). C13-C14 ground floor, converted to house and first floor rebuilt in C17, reputedly by Sir Vincent Skinner.
LB08	6.6km	1346859	Thornton Abbey Gatehouse and Wing Walls, Precinct Walls and Barbican	Yes	Abbey gatehouse and wing walls, precinct walls and barbican. Gatehouse and wing walls of 1382 for Abbot Thomas Gresham, with later C14-C15 extensions to wing walls and precinct walls; C15-C16 barbican. C20 renovations, including replacement of gatehouse chamber floors.
LB09	6.7km	1359800	Brocklesby Hall	Yes	Large country house, probably C16 originally, altered before 1708 and remodelled circa 1730. Severely damaged by fire in 1898, restored by Sir Reginald Blomfield, and reduced in size and altered C20 by Phillimore.
LB10	6.8km	1063417	Holgate Monument	Yes	Monument 1785, by James Wyatt. Coade stone. Monument in the form of a triangular pedestal with concave sides supported on 3 tortoises and crowned by an urn. 2 circular steps rise to a double plinth and gadrooned base upon which stand 3 tortoises.
LB11	6.7km	1166049	Hunt Kennels and House	Yes	Hunt kennels and house, 1810, James Wyatt. Yellow brick with ashlar and brick dressings, slate hipped roofs with lead dressings, having a central apex stack.
LB12	6.8km	1359820	No 9 Shop and Church End Farmhouse	Yes	Shop, formerly manor house of the South family. c,1200 with extensive alterations of the C14 and some of the C20, Squared chalk blocks, some brick patching, pantiled gabled roof with raised stone coped west gable rising to a carved and decorated C14 roof finial.
LB13	6.9km	1063367	Church of St Bartholomew	Yes	Parish Church, C13, C14, C15, C16, 1692, 1847, 1908-10. West tower, nave, north

					and south aisles, north porch, chancel. Ironstone, limestone ashlar, chalk, brick, slate roofs. C14 west tower with moulded plinth and setback stepped buttresses of 1910, 3 stages.
LB14	7.3km	1063418	The Hermitage	Yes	Root house, late C18, red brick walls lined with randomly coursed blocks of tufa with five tree trunk pillars supporting a slate roof with lead dressings.
LB15	7.6km	1227927	Church of St Nicholas	Yes	Parish church. C13 - C14 tower with C15 parapet and spire, C13 chancel with C14 - C15 windows, C14 nave arcades and aisles. Restorations of 1852 by Keyworth of Hull, north porch rebuilt 1856, south porch rebuilt 1876, restorations of 1878-9 to south aisle and tower openings, chancel restored 1887, top section of spire rebuilt 1928-9 and repaired 1982.
LB16	7.7km	1288428	Medieval Hall Adjoining the North East Corner of Goxhill Hall	Yes	First Floor Hall, formerly part of larger complex. Late C14 - early C15 with later alterations, including blocking of first floor windows, and late C18 roof. Renovations of 1976-78.
LB17	87.6km	1366242	Paull Holme Tower	Yes	Tower house. Mid-late C15 for Holme family. Restorations of 1871 for Colonel Bryn Holme. Banded red and blue brick in English bond (original sections with blue brick header courses).
LB18	8.5km	1083434	Church of St Andrew	Yes	Parish church. Mid C14-C15, perhaps incorporating material from former church. Burnt in siege of Hull 1643. Repairs of 1663, c1700. Restorations of 1879 included reseating, reroofing; further restorations of c1890.
LB19	8.7km	1288450	Church of All Saints	Yes	Parish Church. C13 chancel, C14 - C15 nave, aisles and tower. Restorations of c1857 included re-flooring, removal of plaster; restorations of 1878 to aisles, chancel and tower.
LB20	8.8km	1204699	Church of St Andrew	Yes	Parish church. C13 arcades. C14-15 tower. Restorations of 1851 included rebuilding new chancel and porch, chancel; top of tower rebuilt 1877; C20 restorations to north aisle.
LB21	9.0km	1227786	Church of Saint Lawrence	Yes	Parish church. Late C12 - early C13 chancel, C13 tower, nave arcades and south door, C14 aisles, C15 tower parapet. Restorations of 1884 by J Fowler of Louth included rebuilding south porch, new nave and chancel roofs.
LB22	9.0km	1379843	Church of St Nicolas	Yes	Parish church. c1200, extended in C13; C14 aisles and chancel, C14-C15 tower; late C18 clerestory and north aisle west window; restorations of 1865 by James Fowler of Louth; restorations of 1929-32, including

					new east window; repairs to roof by W and L Bond.
LB23	9.0km	1063361	Mausoleum, Wall and Screen	Yes	Mausoleum, wall and screen, 1792, by James Wyatt. Ashlar, copper dome, cast iron railings.
LB24	9.2km	1359817	Church of Saint Peter	Yes	Parish Church, C12, C13, C14, C16 and various C19 alterations and additions, including a restoration of 1875.
LB25	9.5km	1161566	Church of St Lawrence	Yes	Parish church. C13 chancel and nave arcades; C14 south aisle, C16-C17 tower. Re-seated in 1759. C19 restorations included new aisle and chancel windows, re-roofing. Tower restored 1939. Ironstone ashlar with some squared chalk to chancel; limestone ashlar dressings. Westmorland slate roof to chancel, plain tile roof to remainder. West tower, three-bay aisled nave with south porch, two-bay chancel.
Registered Parks and Gardens					
PG01	5.3km	1000971	Brocklesby Park	Yes	A country house surrounded by early C20 formal gardens by Reginald Blomfield, set within a late C18 landscape park, lakes, and woodland for which Lancelot Brown, Thomas White, and Humphry Repton provided designs, with buildings by James Wyatt.

All of the features within the study area as outlined in **Table 6.4** are predicted to be within the ZTV and therefore, will be carried forward into the assessment and these will be accompanied by visualisations where appropriate. The assessment of feature outwith the boundary will include 25 Grade I Listed Buildings, 20 Scheduled Monuments and one Registered Park and Garden.

6.4.2 Within Site Boundary

There are no features of regional or national significance located within the port boundary. However, there are a number of Local Historic Environment Records (HER) located within the port boundary. These comprise a number of Post Medieval features generally of industrial nature, one Early and High medieval feature and two Prehistoric and Roman features. A number of these features only exist as documentary evidence and are not visible as features. The area that these features cover can be seen in **Figure 6.2.**

An assessment of the direct impacts will also be undertaken to inform the design. If it is close to the final layout, it will be fenced off to avoid accidental damage during the construction phase.

6.5 Mitigation

Planning guidance states that it is Government policy to protect and preserve archaeological sites and monuments in situ wherever feasible. Where preservation in situ is not possible planning authorities should ensure that an appropriate level of excavation, recording, analysis, publication and archiving is carried out, before and/or during development.

6.5.1 Permanent Land-take and Operation

Current proposals indicate that the turbine locations, access tracks and other aspects of development, avoid the locations of known features of cultural heritage interest and as such direct impacts should be avoided, however a detailed assessment and site walkover of the Proposed Development site will be carried out.

This baseline was prepared using data from English Heritage, The Historic Environment Record and the North Lincolnshire Local Historic Environment Record, however it is nevertheless possible that additional, unrecorded features do exist within the application area. In the event that archaeological features are encountered, a suitable program of archaeological works will be implemented to the satisfaction of the planning authority.

6.5.2 Restoration

It is not anticipated that any restoration measures are required, and the design of the proposal is such that it avoids direct impacts on any features of cultural heritage.

6.6 Summary

The Proposed Development may give rise to some significant effects in terms of indirect impacts on the setting of features of cultural heritage during the operational phase and direct impact during the construction phase. As such, a detailed assessment will be undertaken as part of the ES.

6.7 Key Questions for Council and Consultees

- Q6/1 Do the Council and consultees agree with the proposed methodology and scope of assessment?
- Q6/2 Can the Council or consultees hold any further relevant historical data that may assist with the assessment?
- Q6/3 Do the Council and consultees know of any cultural heritage assets which have not been included within the assessment scope that require inclusion in the final scope?

7 Noise

7.1 Introduction

Noise impacts could potentially arise during the construction, decommissioning and operational phases of the Proposed Development. The Proposed Development would consist of up to three wind turbines with a maximum tip height of 150m.

The following information sets out the proposed methodology to be used for the Noise Impact Assessment and is provided to enable the assessment scope to be tailored to the Proposed Development.

7.2 Policy, Legislation and Guidance

The following sources provide guidance on the assessment of wind turbine noise:

- UK Government: 'National Planning Policy Framework'[6].
- UK Government supplementary guidance for Renewable and Low Carbon Energy[7]

For the assessment of operational wind turbine noise Planning advice, and North East Lincolnshire Council[8] and North Lincolnshire Council[9], endorses the use of ETSU-R-97 and the Institute of Acoustics 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'.

7.2.1 Guidance – Construction phase noise

Guidance for assessing construction phase noise is given in:

- BS 5228-1:2009+A1:2014 - Code of practice for noise and vibration control on construction and open sites.

The standard provides calculation methodology and indicative sound power data for a wide range of construction plant. Assessment of the significance of impacts can be made through comparison of predicted immission levels with criteria that the standard defines.

7.2.2 Guidance – Operational phase noise

Guidance for assessing operational noise from wind farms is given in the Institute of Acoustics Good Practice Guide[10] (GPG). This guidance was developed to standardise the approach to noise assessment of wind farms in the UK. The guidance also provides advice on the form of planning conditions that should be adopted for wind farm projects. The GPG does not address the question of what noise limits should be applied as this has been determined by government.

The basis for operational wind farm noise limits that have been adopted in the UK is given in: 'ETSU-R-97: The Assessment and Rating of Noise from Wind Farms (1997)'; the Department of Trade and Industry (usually referred to as the Noise Working Group Recommendations). National planning guidance is clear that the IoA GPG and ETSU-R-97 should be followed in the assessment of operational noise from wind farms.

[6] UK Government (2021), https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/1005759/NPPF_July_2021.pdf - Last Accessed (28/09/2022)

[7] UK Government (2015), https://www.gov.uk/guidance/renewable-and-low-carbon-energy - Last Accessed (28/09/2022)

[8] North East Lincolnshire Council (2019), https://www.nelincs.gov.uk/assets/uploads/2020/10/AdoptedWindEnergySPD-A11y.pdf - Last Accessed (28/09/2022)

[9] North Lincolnshire Council (2011), https://www.northlincs.gov.uk/wp-content/uploads/2018/11/Planning-for-Renewable-Energy-Development-SPD-Adopted.pdf - Last Accessed (29/09/2022)

[10] Institute of Acoustics (2013), 'A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise'.

The International Standard ISO 9613, 'Acoustics – Attenuation of Sound During Propagation Outdoors - Part 2', noise propagation model has been used for the turbine immission calculations.

IEC/TS 61400-14:2005 - Declaration of apparent sound power level and tonality values is a standard providing a method to derive appropriate sound power level values from several independent sources to improve robustness.

7.2.2.1 Low Frequency Noise

A study[11] carried out in 2006 by Hayes McKenzie, on behalf of the Department for Business, Enterprise and Regulatory Reform, investigated the potential impact of infrasound or low frequency noise arising from wind turbines. The study concluded that infrasound or low frequency noise arising from the operation of wind turbines did not result in adverse health impacts.

A further research study in 2016[12] stated the level of infrasound due to wind turbines is low in comparison to other technical and natural sources. The findings concluded 'that adverse effects relating to infrasound from wind turbines cannot be expected on the basis of the evidence at hand.'

7.2.2.2 Amplitude Modulation

Amplitude Modulation (AM) as an element of turbine noise has been the subject of considerable research in recent years. The University of Salford conducted a study[13] on behalf of the Department for Business, Enterprise and Regulatory Reform to investigate whether noise complaints arising from wind farms were due to the presence of AM. The report found that complaints were highly likely to be caused by AM in 4 out of the 27 wind farms included in the study. However, it concluded, *'that the causes of AM are not fully understood, and that AM cannot be fully predicted at current state of the art.'* The findings of the investigation were reconfirmed in 2013 in an updated research report by Renewable UK[14].

In 2016[15] the IoA produced 'A Method for Rating Amplitude Modulation in Wind Turbine Noise', in which amplitude modulation is defined as the following:

"Wind turbine amplitude modulation is defined as periodic fluctuations in the level of audible noise from a wind turbine (or wind turbines), the frequency of the fluctuations being related to the blade passing frequency of the turbine rotor(s)."

The report acknowledges that certain levels and/or characteristics of amplitude modulation may lead to disturbance and noise complaints. The guidance does not aim to quantify the level at which AM could pose an issue but outlines a proposed methodology to assess and rate AM arising from operational wind farms.

Currently, there is no agreed method of assessment for amplitude modulation, pre-construction. As such, any assessment can only be conducted after the wind farm is operational. A requirement for post-completion assessment of amplitude modulation could be included within an appropriate planning condition, should this aspect of turbine noise be deemed to be excessive by environmental health following a verified noise complaint.

[11] Hayes McKenzie (2006), 'The measurement of low frequency noise at three UK wind farms'.

[12] Landesanstalt für Umwelt, Messungen und Naturschutz Baden-Württemberg (2016), 'Low-frequency noise incl. infrasound from wind turbines and other sources'.

[13] University of Salford, The Department for Business, Enterprise and Regulatory Reform, URN 07/1235, (2007), 'Research into aerodynamic modulation of wind turbine noise'.

[14] Renewable UK (2013), 'Wind Turbine Amplitude Modulation: Research to improve understanding as to its Cause and effects'.

[15] Institute of Acoustics (2016), 'A Method for Rating Amplitude Modulation in Wind Turbine Noise'.

7.3 Methodology

7.3.1 Construction phase noise

The assessment of noise impacts from construction activities includes the installation of ancillary infrastructure as well as the turbines themselves.

The factors influencing the impact of plant noise are: the number and character of noise sources; the duration of activity and hours of work; the separation distance between source and receptor; and reduction of noise by absorption or screening.

Although BS 5228-1 does not specify absolute noise limits relating to construction activities, it does provide detailed guidance on the steps that can be taken to minimise potential noise effects.

During the construction phase of the Proposed Development, it is expected that noise levels in the area will be greater due to the operation and movement of plant. In BS 5228-1, the ABC method outlined in E3[16] sets out the following for classifying the significance of the construction noise:

"Noise levels generated by construction activities are deemed to be significant if the total noise (pre-construction ambient plus construction noise) exceeds the pre-construction ambient noise by 5 dB or more, subject to lower cut-off values of 65 dB, 55 dB and 45 dB $L_{Aeq,\ Period}$, from construction noise alone, for the daytime, evening and night-time periods, respectively; and a duration of one month or more, unless works of a shorter duration are likely to result in significant impact."

Works and operation of plant on this site are expected to be limited to the daytime periods: Monday to Friday (07.00–19.00) and Saturdays (07.00–13.00). As a result, the cut off value for significant construction noise impact is deemed to be 65dB(A) $L_{Aeq,T}$. It is possible that, due to weather constraints (e.g., the impact of weather on the crane operation), the erection of the turbines could occur outside of the working hours defined above. For this or any other activity that extends beyond daytime periods, the lower cut-off limits of 55dB(A) and 45dB(A) would apply dependent on time of day.

The methodology for determining the levels of the construction noise involves calculating the total sound pressure level at the nearest sensitive receptor for a construction task, $L_{Aeq(12hr)}$, [equation 1], by summing the total potential sound power level for a given construction phase [equation 2] and subtracting a correction for its distance from the nearest property, K_S [equation 3]. These three equations are shown below:

[1] $L_{Aeq,T} = L_{WA} - K_S$

[2] $L_{WA} = 10\log\{10^{(Lactivity1/10)} + 10^{(Lactivity2/10)}...\}$

[3] $K_S = 25\log(R)+1$ [for R > 25m]

The calculations assume by default that each activity lasts for the full daytime period at 100% intensity.

7.3.2 Operational phase noise

The assessment of operational noise impacts takes the form of an ETSU-R-97 assessment following the IoA GPG.

The assessment will focus on the highest potential impacts by assessing the nearest affected properties that lie within the study area; determined by the 35dB(A) contour resulting from the proposed layout.

7.3.2.1 Noise Limits

The ETSU guidelines recommend that wind turbine noise should be limited to an absolute lower limit between 35 and 40dB(A) [LA90,10min] for quiet daytime periods and 43dB(A) for night-time periods (defined below), or 5dB(A)

[16] BS 5228-1 'Code of practice for noise and vibration control on construction and open sites', p119

above the background noise levels, whichever the greater. For locations where the resident has a demonstrable financial involvement in a project, a lower fixed limit of 45dB(A) is applicable, or 5dB(A) above the background noise levels, whichever is the greater.

Table 7.1 ETSU assessment periods

The quiet daytime periods (amenity hours) are:	
18:00 - 23:00	Monday to Friday
13:00 - 23:00	Saturdays
07:00 - 23:00	Sundays
Night-time periods are: 23:00 – 07:00 every day	

For a project whose immission levels are not expected to exceed 35dB(A) at the closest Noise Sensitive Receptors (NSRs), a simplified approach may be taken that allows a project to be approved with a single fixed 35dB(A) noise limit applicable at all times or 45dB(A) where a resident has financial involvement. Where proposed project noise levels exceed 35dB(A), the ETSU-R-97 noise assessment should be undertaken with reference to noise limits derived from measured background noise levels. Full ETSU-R-97 limits will also be required where cumulative turbine noise exceeds applicable lower fixed limits.

7.3.3 Noise Sensitive Receptors (NSRs)

The study area adopted for the identification of NSRs that could potentially be impacted by the project sound levels will be those that lie within a 35dB(A) noise contour as calculated from the proposed turbines.

Noise Assessment Locations (NALs) will be positioned at NSRs, 15m from a dwelling façade in the direction of the nearest turbine or as far in that direction as the curtilage will allow. Where NSRs are located adjacent to each other or readily form a grouping, a single NAL will be selected representing the closest of the adjacent receptors to the proposed turbines.

This approach follows the ETSU-R-97 principle of assessing nearest receptors; focussing on the highest impacts allows for a more concise assessment.

7.3.4 Cumulative Assessment Methodology

When considering cumulative impact from two or more developments at a given NSR the IoA Good Practice Guide states:

"*If the proposed wind farm produces noise levels within 10dB of any existing wind farm/s at the same location, then a cumulative noise impact assessment is necessary.*" [17]

Although no fixed criteria are given within ETSU-R-97, a search area radius of 3km from any of the proposed turbines is considered a suitable distance at which to assess immission contributions from third-party projects, beyond which impacts on receptors would be negligible.

The planning portals of North and North East Lincolnshire Councils were reviewed for cumulative wind turbine developments within 3km of the Proposed Development. Presently, no cumulative wind farms have been identified and it is not anticipated that a cumulative impact assessment will be required. Should the baseline scenario change at the time of conducting the Noise Impact Assessment, a cumulative noise assessment would be carried out in accordance with ETSU-R-97.

[17] A Good Practice Guide to the Application of ETSU-R-97 For the Assessment and Rating of Wind Turbine Noise, May 2013, page 23, 5.1.4

7.3.5 Propagation Model

The International Standard ISO 9613, 'Acoustics – Attenuation of Sound During Propagation Outdoors - Part 2', sound propagation model will be used for the turbine sound immission calculations. L_{Aeq} sound propagation will be modelled using WindFarm v5.0.1.2 by ReSoft. Predicted wind turbine sound levels will be calculated, inclusive of appropriate allowance for measurement uncertainties.

L_{A90} levels should be derived by subtracting two decibels from the L_{Aeq} values as per the ETSU-R-97 guidance and subsequent IOA GPG. The input parameters shown in **Table 7.2** will be used and are consistent with the IOA Good Practice Guide.

Table 7.2 Propagation input parameters

Atmospheric Attenuation Assumptions	
Temperature (°C)	10
Humidity (%)	70
Ground Attenuation Assumptions	
Attenuation factor, G (all regions)	0.5 (semi-soft ground)
Receptor height (m)	4.0

The attenuation of sound as it travels through the air varies with frequency. The atmospheric attenuation coefficients to be used in the assessment, corresponding to the assumptions in **Table 7.2** are tabulated in **Table 7.3**.

Table 7.3 Attenuation coefficients used for the noise propagation model

Octave Band (Hz)	63	125	250	500	1000	2000	4000	8000
Attenuation Coefficient (dB/km)	0.12	0.41	1.04	1.93	3.66	9.66	32.77	116.88

7.3.6 Noise Impact Assessment

Predicted turbine sound levels at the nearest receptors resulting from the propagation model will be compared to the applicable noise limits to determine whether those limits would be met. If it is shown that the limits would be met, then the noise impact would be considered acceptable. Should the assessment show exceedance of noise limits, a scheme of mitigation would be proposed that would allow the Proposed Development to operate in compliance with the noise limits, thereby reducing potential impacts to acceptable levels.

7.4 Baseline

7.4.1 Construction Noise Baseline

At this stage of the project, insufficient information is available to produce an indicative assessment of construction noise. Nevertheless, it is common for the impacts of construction noise to be managed via suitable planning conditions. That being the case it is recommended that the assessment of construction noise be scoped out of the NIA. Should it be requested that an indicative assessment of construction noise be included in the NIA, it would follow the methodology outlined in **Section 7.3.**

7.4.2 Operational Noise Baseline

7.4.2.1 Candidate turbine

For the purposes of assessing maximum potential effects the Enercon E138-E2 4.2MW turbine model has been selected. Noise data provided by the manufacturer for the Enercon E138 turbine shows a declared maximum sound power (L_{WA}) of 106dB(A). This level assumes that the turbine blades would be fitted with Trailing Edge

Serration (TES), which are fitted as standard, and that the turbines would operate in Standard operating mode. Sound power spectra specific to the candidate turbine, as provided by the turbine manufacturer, were inclusive of measurement uncertainties as provided within the manufacturer's datasheet[18].

This data was used to generate indicative 35dB(A) and 40dB(A) contours (**Figure 7.1**) that predicts noise levels for a 10m height (v_{10}) wind speed of 10ms^{-1} when the turbines would be operating at their maximum sound power.

7.4.2.2 Study area

The Proposed Development is located at Immingham Port on the southern bank of the Humber Estuary to the north of the settlement of Immingham. The nearest main road is the A1173, which separates the majority of the port from the residential areas. The port area consists mostly of made ground, utilised in the most part for storage associated with the freight operations at the port, as well as other bulk storage and industrial facilities utilising sheds and buildings throughout the estate.

An indicative layout for the Proposed Development is shown in **Figure 7.1** The red contours enclose the worst-case area predicted to receive an L90 turbine noise level in excess of 35dB(A) and 40dB(A).

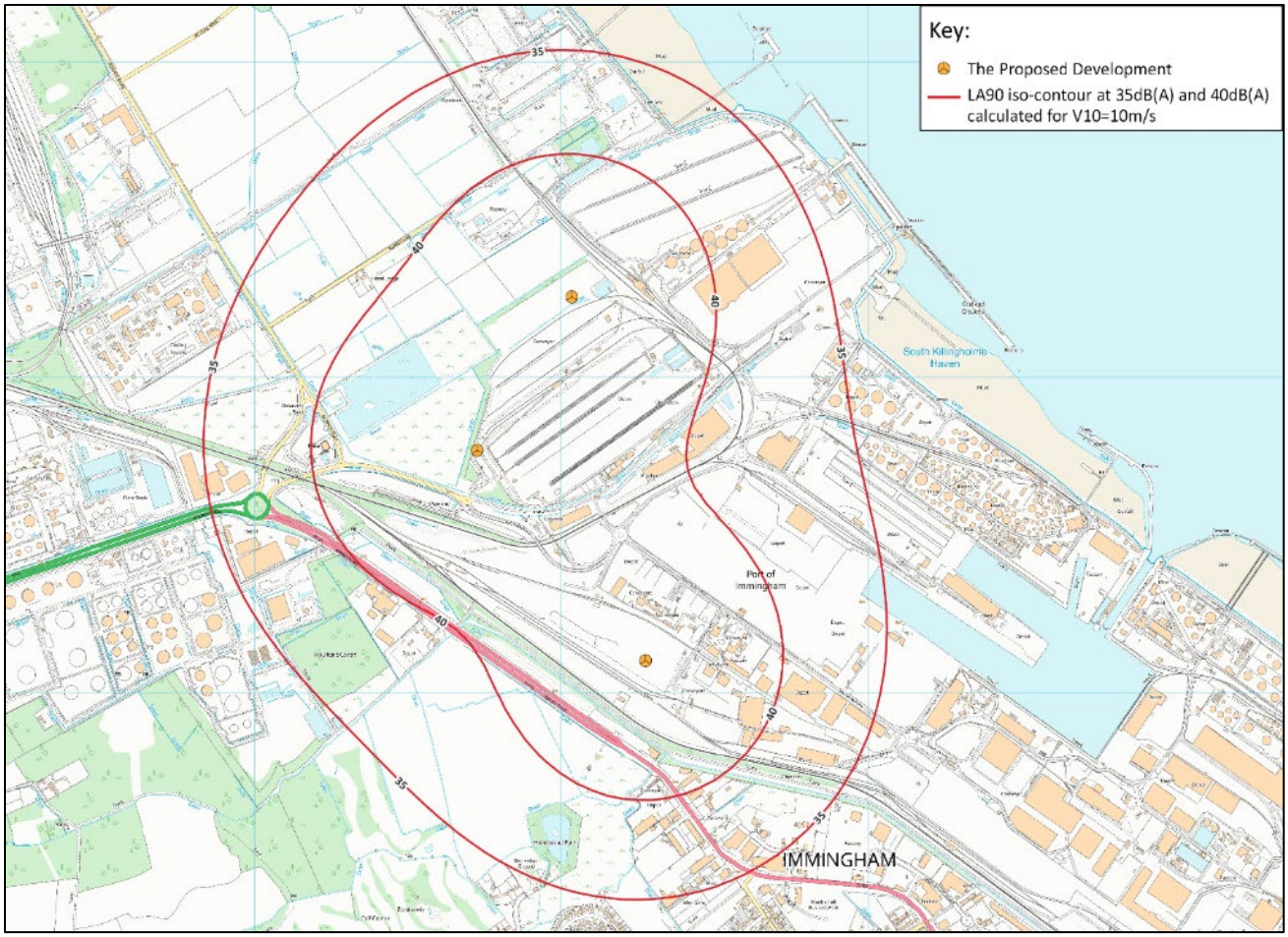

Figure 7.1 - Study Area

[18] Enercon (2022), Doc: D0749845/12.0-en / DA

7.4.2.3 Noise Sensitive Receptors

The immediate surrounding area of the proposed turbines is mostly built industrial areas and port operations. Alongside reviewing satellite imagery, a site visit would be carried out to identify and confirm the nearest residential properties.

7.4.2.4 Noise Limits

Where predicted turbine sound levels exceed 35dB(A), the ETSU-R-97 noise assessment should be undertaken with reference to noise limits derived from measured background sound levels. A review of the satellite imagery within the study area would suggest that turbine sound immission levels are likely to exceed 35dB(A) at a number of residential properties. It is therefore proposed that a background survey be conducted within the study area.

It is suggested that monitoring be conducted at two to three locations, which would be representative of any identified NSRs within the study area. The survey would be conducted in consultation with the respective councils Environmental Health teams and would typically involve logging $LA_{90,10min}$ noise levels for a period such that a representative sample of prevailing conditions has been recorded. This usually takes 2 to 3 weeks. Concurrent wind speed measurements would log speed and direction averaged over consecutive 10-minute periods. This data would be collected and analysed in line with the IoA GPG recommendations. The resulting trends, showing variation of background noise level with wind speed, would inform the ETSU-R-97 noise limit criteria. The predicted turbine immissions would subsequently be tested against these criteria.

7.5 Potential Effects and Mitigation

Noise arising during the construction phase would be for a limited duration and can be suitably controlled by a planning condition specifying standard noise limits. It is not expected that this would be an issue at the port given the 24h operational nature of the site.

ETSU-R-97 guidelines provide threshold criteria for acceptability, balancing residential amenity with the benefits of wind energy. Provided such limits can be met, it can be concluded that the development would be acceptable in noise terms. Therefore, an unacceptable impact would be noise levels exceeding these threshold limits.

Iterative layout design is expected to result in a Proposed Development that does not require operational mitigation to meet the proposed ETSU-R-97 limits and will consider different turbine models, turbine positions and hub heights.

As is now standard for most commercial wind turbines of large size, the selected turbine model will be sufficiently flexible to allow operation in alternative 'modes' should noise measured post-completion require mitigation.

7.6 Summary

7.6.1 Construction phase

There are no particular features of the Site that indicate that construction noise could not be kept to recommended noise limits, as controlled by a suitable planning condition. It is therefore proposed that construction noise be scoped out of the NIA.

7.6.2 Operational phase

An indicative layout has been provided to determine an appropriate study area for the Proposed Development.

No third-party wind farms have been identified within 3km of the Proposed Development. Unless the cumulative baseline changes, a cumulative noise impact assessment will not be required and would be scoped out of the NIA.

The assessment of operational immission levels should be based on sound power data provided by the proposed turbine manufacturer inclusive of an appropriate allowance for measurement uncertainty.

Initial sound level contours show the potential for the proposed project to exceed 35dB(A) at residential properties located within the study area. As such, it is proposed that a background survey be conducted in consultation with the Council to determine appropriate ETSU-R-97 noise limits.

7.7 Key Questions for Council and Consultees

- Q7/1 Do the consultees agree that construction noise can be constrained to recommended limits via a suitable planning condition and therefore scoped out of the NIA?
- Q7/2 Do the consultees agree that if there are no third-party wind projects, proposed or operating, within 3km, a cumulative noise assessment may be scoped out of the NIA?
- Q7/3 Do the consultees agree that a background survey should be conducted to determine ETSU-R-97 limits?
- Q7/4 Do the consultees agree with the proposed methodology to determine compliance with the ETSU-R-97 limits?

8 Hydrology and Hydrogeology

8.1 Introduction

This assessment will present the impact of potential effects of the construction and operation of the Proposed Development on hydrology and hydrogeology.

Understanding surface and groundwater environments is critically important to designing a successful project. Surface water includes watercourses, water bodies, and runoff. It provides an important resource for: potable and other uses; amenity; aesthetic value; conservation; ecological environments; and for recharge to groundwater systems. Groundwater is also an important resource. It provides more than a third of the potable water supply in the UK and includes all water stored in permeable underground strata (or aquifers). In addition, it provides essential baseflow to rivers and wetland areas, often supporting important ecological systems.

8.2 Policy, Legislation and Guidance

Guidance for assessing the potential impact of the Proposed Development on the hydrological and hydrogeological features of the development site will be based on the statutory, general, and national guidance as set out in **Table 8.1**. Any appropriate local policy and guidance will also be considered.

Table 8.1: Policy, Legislation & Guidance

Applicable Good Practice Guidance (N.B The GPP, PPG, and SEPA documents are not government guidance in England however, they provide useful on-site information that is applicable to the Proposed Development)	GPP1 'Understanding your environmental responsibilities – good environmental practices' GPP 2 Above Ground Oil Storage Tanks PPG 3 Use and design of oil separators in surface water drainage systems GPP 4 Treatment and disposal of wastewater where there is no connection to the public foul sewer GPP 5 Works and maintenance in or near water PPG 6 Working at Construction and Demolition Sites GPP 8 Safe Storage and Disposal of Used Oils GPP 13 Vehicle washing and cleaning GPP 21 Pollution Incident Response Planning National Flood and Coastal Erosion Risk Management Strategy for England, updated 2022 A framework for the production of Drainage and Wastewater Management Plans, 2021 CIRIA C515 Groundwater Control - Design and Practice CIRIA C532 Control of Water Pollution from Construction Sites CIRIA C741 Environmental Good Practice on Site CIRIA C753 SUDS Manual
Other Guidance Documents	CIRIA C515 Groundwater Control - Design and Practice CIRIA C532 Control of Water Pollution from Construction Sites CIRIA C648 Control of Water Pollution from Linear Construction Projects CIRIA C689 Culvert Design and Operation Guide CIRIA C741 Environmental Good Practice on Site CIRIA C753 SUDS Manual Safeguarding our soils: A strategy for England, 2009

English Government Policy, Advice and Legislation Documents	Water Framework Directive (2000/60/EC) as implemented in England via the Water Environment (Water Framework Directive) (England and Wales) Regulations 2017. The Groundwater Directive (GWD) (2006/118/EC) as implemented by the Groundwater (Water Framework Directive) (England) Direction 2016 The Groundwater Daughter Directive to WFD (2006/118/EC) as implemented Environmental Permitting (England and Wales) Regulations 2016 The Bathing Water Directive (2006/7/EC) as implemented by the Bathing Water Regulations 2013 Flood and Water Management Act 2010 Land Drainage Act 1991 National Planning Policy Framework, as revised in 2021
Retained European Legislation	Freshwater Fish Directive 2006/44/EC Water Framework Directive (WFD) 2000/60/EC Dangerous Substances Directive 76/464/EEC

8.3 Method of Assessment and Reporting

The assessment of the potential impact of the proposal on hydrology and hydrogeology was carried out by the general method described in the following Sub-Sections.

8.3.1 Desk Study Assessment Methodology

It is important to initially establish the baseline conditions so that an accurate hydrological context map can be developed for the site. This will be done by identifying any features within a 1.2km search radius around the proposed infrastructure locations that have potential to be impacted by the proposals. The criteria for defining the study area have been based on professional judgement, experience regarding expected working areas, and relevant guidance on hydrological assessment. This baseline can then be used to inform the site design.

The following sources of information will be consulted as part of the desk study:

- Draft layout including all associated infrastructure;
- Surface and groundwater information, including local water quality and any relevant groundwater level data, will be obtained from the Environment Agency (EA) and the National River Flow Archive;
- Ground conditions will be initially determined using published geology maps and site-specific geology information will be obtained from the British Geological Survey (BGS), Magic Maps, and Soilscapes;
- Hydrogeological information will be obtained from the BGS and Magic Maps;
- Information relating to private water supplies will be obtained from North and North East Lincolnshire Council's Environmental Health Department; and
- Public water supply information and infrastructure will be obtained from the EA and Anglian Water.

The desk study will also include a review of relevant historical maps, soil maps, and aerial photographs.

8.3.2 Field Survey Methodology

Following the desk study and initial concept of the site, a site visit will be undertaken across the study area and the following actions carried out:

- Verification of any information collected during the desk study;
- Establishment of a first-hand understanding of the study area, including watercourses and ground conditions, to assess the relative location of all the components of the Proposed Development; and
- Identification of potential constraints to the Proposed Development from topography and ground conditions.

A Phase 1 Habitat Survey for the study area will be used to screen for the presence of sensitive habitats and potential presence of Ground Water Dependent Terrestrial Ecosystems (GWDTEs). Areas of potential High and Moderate GWDTE will be investigated to assess whether they are sustained by groundwater as part of the field work.

8.3.3 Consultation

Consultation will be carried out with:

- Environment Agency;
- Natural England;
- North Eastern Inshore Fisheries and Conservation Authority;
- North and North East Lincolnshire Council; and

- Anglian Water.

8.3.4 Assessment Criteria

The criteria set out in the Tables below will be used in the assessment of any potential effects of the Proposed Development on hydrology and hydrogeology.

With the baseline established, sensitive receptors can be determined. **Table 8.2** outlines the various factors taken into account when assessing the sensitivity of a variety of receptors.

Table 8.2: Sensitivity Table

Sensitivity	Definition
High	Receptor of high quality, rarity of a regional or national scale, and limited potential for substitution or replacement. This includes: • Sites of Special Scientific Interest (SSSI), Special Protection Areas (SPA) or Special Area of Conservation (SAC) • Environment Agency Water Quality defined as High • Abstraction for public water supply • Private water supplies – 0 to 100m from construction activities • Designated salmonid fishery and/or salmonid spawning grounds present • Watercourse widely used for recreation, directly related to watercourse quality (e.g., swimming, salmon fishery) <1.2km downstream of development • Active flood plain area (important in relation to flood defence) • Groundwater - public drinking water supply • Groundwater aquifer productivity classed 1A or 2A in the BGS 1:625000 Hydrogeology Map • Geology that is rare or of national importance as defined by SSSI or Regional Important Geological Site (RIGS) • Groundwater dependent terrestrial ecosystems (GWDTE) defined as Class 1 • Peat defined as Class 1 and Class 2 • Peat Slide Risk likelihood of 'probable' or 'almost certain'
Medium	Receptor of medium quality, rarity of a local, regional, or national scale, and limited potential for substitution/replacement. This includes: • Environment Agency Water Quality defined as Good • Surface water abstractions for private water supply for more than fifteen people • Private Water Supplies – Surface water abstractions within 100 – 600m of construction activities, groundwater spring abstractions within 100 – 400m of construction activities, and groundwater borehole abstractions within 0 – 200m of construction activities • Designated salmonid fishery and/or cyprinid fishery • Watercourse widely used for recreation, directly related to watercourse quality (e.g., swimming, salmon fishery) >1.2km downstream of development • Groundwater aquifer productivity classed as 1B or 2B in the BGS 1:625000 Hydrogeology Map • Groundwater dependent terrestrial ecosystems (GWDTE) defined as Class 2, and/or defined as 'Medium Conservation Value' by Ecologist

Sensitivity	Definition
	• Peat Slide Risk of 'Likely'
Low	Receptor of low quality, rarity of a local, regional, or national scale, and limited potential for substitution/replacement. This includes: • Environment Agency Water Quality defined as Moderate or Poor • Occasional or local recreation (e.g., local angling clubs) • Conveyance of flow and material, main river <10 m wide or ordinary watercourse >5 m wide • Existing flood defences • Private Water Supplies – Surface water abstractions >600m from construction activities, groundwater spring abstractions within 400 – 800m of construction activities, and groundwater borehole abstractions within 200 – 600 m of construction activities • May be subject to improvement plans by Environment Agency • Designated cyprinid fishery, salmonid species may be present and catchment locally important for fisheries • Watercourse not widely used for recreation, or recreation use not directly related to watercourse quality • Groundwater aquifer productivity classed as 1C or 2C in the BGS 1:625000 Hydrogeology Map • Groundwater dependent terrestrial ecosystems (GWDTE) defined as Class 3, and/or defined as 'Local Conservation Importance' by Ecologist • Peat Slide Risk of 'Unlikely'
Negligible	Receptor of low quality, rarity of a local scale, and limited potential for substitution/replacement. Environmental equilibrium is stable and is resilient to changes that are greater than natural fluctuations, without detriment to its present character. This includes: • Environment Agency water quality defined as Bad • Fish sporadically present or restricted, no designated features • Receptors not used for recreation, e.g., no clubs or access route associated with watercourse • Watercourse <5 m wide – flow conveyance capacity of watercourse low - very limited floodplain as defined by topography, historical information and Environment Agency's Risk of Flooding from Rivers and Sea map • Private Water Supplies – groundwater spring abstraction >800 m from construction activities, and groundwater borehole abstractions >600 m from construction activities • No public drinking water supplies • Groundwater aquifer productivity classed as 3 in the BGS 1:625000 Hydrogeology Map • Receptor heavily engineered or artificially modified and may dry up during summer months • Geology not designated under a SSSI or RIGS or protected by specific guidance • Peat defined as Classes 3, 4 and 5 • Peat Slide Risk of 'Negligible'

The significance of each impact on a receptor is based on its magnitude. The magnitude of impact includes the timing, scale, size and duration of the potential impact. For the purposes of this assessment the magnitude criteria are defined as follows in **Table 8.3**.

Table 8.3: Magnitude of Impact Table

Magnitude	Criteria	Description and Example
Large	Results in loss of attribute	• Fundamental (long term or permanent) changes to geology, hydrology, water quality and hydrogeology • Loss of designated Salmonid Fishery • Loss of national level designated species/habitats • Changes in WFD water quality status of river reach • Loss flood storage/increased flood risk • Pollution of potable source of abstraction compared to pre-development conditions
Medium	Results in impact on integrity of attribute or loss of part of attribute	• Material but non-fundamental and short to medium term changes to the geology, hydrology, water quality and hydrogeology • Loss in productivity of a fishery • Contribution of a significant proportion of the discharges in the receiving water, but insignificant enough to change its water quality status
Small	Results in minor impact on attribute	• Detectable but non-material and transitory changes to the geology, hydrology, water quality and hydrogeology
Negligible	Results in an impact on attribute but of insufficient magnitude to affect the use/integrity	• No perceptible changes to the geology, hydrology, water quality and hydrogeology • Discharges to watercourse but no loss in quality, fishery productivity or biodiversity • No significant impact on the economic value of the receptor • No increase in flood risk

The sensitivity of the receptor together with the magnitude of impact defines the significance of the impact as set out in Table 8.4.

Table 8.4: Significance of Impact Matrix

		MAGNITUDE			
		LARGE	MEDIUM	SMALL	NEGLIGIBLE
SENSITIVITY	HIGH	Major	Major	Moderate	Negligible
	MEDIUM	Major	Moderate	Minor	Negligible
	LOW	Moderate	Minor	Minor	Negligible
	NEGLIGIBLE	Negligible	Negligible	Negligible	Negligible

Where the significance of an impact is defined to be minor, moderate, or major - mitigation is required to reduce those impacts to a non-significant level.

8.4 Preliminary Baseline

8.4.1 Preliminary Baseline Conditions

The Proposed Development site is located within the operational Port of Immingham, on the south-western bank of the Humber Estuary. The town of Immingham is situated directly south of the landholding, separated by the A1173 Road and various goods sidings. The landholding has a history of ongoing industrial activities as the Port is the largest port in the UK by tonnage of cargo handled which includes coal, oil and steel holding areas along with Load on Load Off (LoLo) and Roll on Roll off (RoRo) freight terminals. There are also various other business complexes located on and around the docks, including a metal recycling site, a waste-based biofuel terminal, and a fertiliser terminal.

Immingham Dock is situated in the centre of the landholding, which covers c.23 Hectares (ha), and is separated from the Humber Estuary by a lock, there are also a number of in river berths. The terrain within the landholding is relatively flat with the elevation ranging from approximately 0m – 10m AOD. Several man-made drains within the development sites are associated with the industrial activities within the Port.

8.4.2 Hydrology

The study area is situated within the watershed of two operational catchments: the Humber Estuary TraC catchment within the Humber TraC Management Catchment; and the Becks Northern Operational Catchment, which forms the eastern portion of the Louth Grimsby and Ancholme Management Catchment.

The intertidal areas of the Humber Estuary, comprised of mudflats and saltmarsh are situated directly northeast of the Port of Immingham, these are part of the Humber's soft geology system. The mouth of the Humber is c.15km downstream of the Port. The Immingham Dock is connected to the estuary via a lockpit.

Several drains merge with the North Beck Drain as it passes to the east of the study area. This waterbody then passes underneath Laporte Road and the seawall and empties into the Humber Estuary. There is also a series of drains that stem within the southwestern section of the study area and then converge into a single drain (the Habrough Marsh Drain) and pass along the southern side of the railway line. This watercourse then passes underneath the railway line, Robinson Road, and alongside East Riverside Road, before dispelling into the Humber Estuary.

There are numerous ephemeral drains and drainage ponds within the study area that are associated with the drainage for the industrial and housing estates and roads.

Significant waterbodies in England are managed and assessed by the Environment Agency under the Water Framework Directive (WFD). The nearest classified surface water bodies are the North Beck Drain Water Body[19] and the Humber Lower waterbody[20]. Both watercourses were classified with an overall status of 'Moderate' in 2019 and are noted to have a 'Fail' grade for their chemical status.

The study area is also fully situated upon the North Lincolnshire Chalk Groundwater Unit, which was also classified under the WFD and was awarded an overall status of 'Poor' in 2019[21].

The Environment Agency's Risk of Flooding from Rivers and Sea Map indicates that the Immingham Dock basins and some of the man-made drains have a high likelihood of flooding (i.e. there is an annual chance of flooding of > 1:30)[22]. These flood extents were mostly confined to the watercourse channel however, there are further extents beyond the docks to the north and surrounding the drainage pond at Homestead Park. There are also

[19] https://environment.data.gov.uk/catchment-planning/WaterBody/GB104029067575 (Last Accessed: 28/09/2022)
[20] https://environment.data.gov.uk/catchment-planning/WaterBody/GB530402609201 (Last Accessed: 28/09/2022))
[21] https://environment.data.gov.uk/catchment-planning/WaterBody/GB40401G401500 (Last Accessed: 28/09/2022))
[22] https://parallel.co.uk/rofrs/#12.49/53.62574/-0.22171 (Last Accessed: 28/09/2022)

areas indicated to have a medium likelihood of flooding (i.e. there is an annual chance of flooding of 1:30 to 1:100), these are found the length of the shoreline and within the northwest quadrant of the study area. The land directly inland of the seawall is likely associated with tidal movement at the shoreline.

Furthermore, according to the UK Governments' Flood Map for Planning, the study area is mostly located within an area of Flood Zone 3 (an area with high probability of flooding) and both turbines are fully located within Flood Zone 3.

8.4.3 Geology

The British Geological Survey (BGS) Geology Viewer map[23] indicates that the bedrock geology of the northern region of the study area is predominantly comprised of the Flamborough Chalk Formation – Chalk, which is formed of distinctive beds of chalk with common marl seams. The southern region of the study area is underlain with Burnham Chalk Formation – Chalk, which is formed of thinly-bedded chalk with flint bands and marl seams.

The BGS map also identified the study area to mostly be situated upon Tidal Flats, superficial deposits of clay and silt. The most western fringes of the study area however, are underlain with Till, Devensian – Diamicton deposits, and the estuary to the north is sited upon Beach and Tidal Flat deposits that are formed of clay, silt and sand.

The Soilscape map also indicates that most of the study area is located upon loamy and clayey soils of coastal flats with naturally high groundwater, which is noted to have a 'medium' carbon content and is naturally wet in character[24]. However, the western fringes of the study area are underlain with slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils with a 'low' carbon content.

8.4.4 Hydrogeology

The BGS Hydrogeology 1:625000 map classifies the potential for bedrock to supply groundwater and describes the potential groundwater flow mechanism.

The bedrock underneath the inland section of the study area can be generally classified as a Principal Aquifer ('Class 2A') Highly Productive Aquifer. This Aquifer can generally yield 50 to 100 L/s from large diameter boreholes and up to 300 L/s from its systems.

8.4.5 Designated Sites

The northeastern region of the study area encompasses the Humber Estuary, which is designated as a Site of Special Scientific Interest (SSSI), Special Area of Conservation (SAC), Special Protection Area (SPA), and Ramsar site. This coastal plain is noted for being a near-natural estuary with dune systems and humid dune slacks, estuarine waters, intertidal mud and sand flats, saltmarshes, and coastal brackish/saline lagoons, which hosts a vascular plant assemblage and an invertebrate assemblage. This habitat is also designated for supporting a colony of Grey seals, River lamprey, Sea lamprey, and various sensitive ornithological species, including but not limited to European Golden Plover, Red Knot, and Dunlin. The site is also of national importance for geological interest at South Ferriby Cliff (Late Pleistocene sediments) and for its coastal geomorphology of Spurn. The designated estuary is stated by Natural England to be in an unfavourable but recovering condition.

8.4.6 Potential Sensitive Receptors

There are several drains and watercourses within the area that flow into the Humber Estuary. With construction and operation, there is potential for runoff to enter these watercourses and impact water quality and ecology and

[23] https://geologyviewer.bgs.ac.uk/?_ga=2.1688625.1623698529.1665485696-1284998972.1665485696 (Last Accessed: 11/10/2022)
[24] http://www.landis.org.uk/soilscapes/ (Last Accessed: 30/09/2022)

elevate any existing flood risks. As such, these watercourses will be treated as sensitive receptors and form a focus of the hydrological assessment.

The study area is noted to be underlain by a highly productive aquifer and is likely to have relatively unrestricted groundwater movement. There is potential for construction activities to adversely impact on the water quality of the surrounding groundwater unit. As such, the groundwater unit will be included as a sensitive receptor within the hydrological assessment.

The Humber Estuary is located within the northeastern section of the study area, which is designated as a SSSI, SAC, SPA and Ramsar site. Due to the proximity of the Proposed Development to the Humber Estuary and its tributaries, and with the potential for unmitigated runoff to have a detrimental impact, the designated site will be included as a sensitive receptor in the hydrological assessment.

It is not currently known whether there are any private water supplies (PWS) located within the proposed 1.2km study area. Should any PWS be identified, they will be classed as a sensitive receptor in the EIA assessment.

Should the ecological surveys identify any groundwater dependent terrestrial ecosystems (GWDTE) on the site, these will be treated as sensitive receptors in the EIA assessment.

8.4.7 Potential Sources of Impact

The potential impacts this development may have on the water environment of the site and the surrounding area are likely to include:

- Increase in runoff;
- Sedimentation, erosion, and silt-laden runoff;
- Chemical pollution of watercourses or groundwater;
- Disruption to the surface and subsurface runoff and watercourses;
- Increased flood risk to areas downstream; and
- Drop in the water table.

8.5 Assessment and Mitigation

8.5.1 Assessment of Effects

Potential impacts on the water and ground environment, including environmental receptors dependent upon these resources, will be identified.

A qualitative risk assessment will be used to assess potential impacts on the identified receptors whereby the probability of an effect occurring and the magnitude of the effect, if it were to occur, are considered. This approach provides an established process for identifying the areas where mitigation measures are required.

Mitigation measures required to address these impacts will be proposed in accordance with best practice guidance.

The assessment will consider the construction, operational, and decommissioning stages of the Proposed Development.

8.5.2 Mitigation

Mitigation measures, where required, will be identified and based on best practice techniques appropriate to site conditions. It is foreseen that the following types of measures could be relevant:

- Avoidance of sensitive areas;
- Appropriate location of proposed infrastructure;
- Where it is deemed to be required, an appropriate surface water management strategy will be implemented to capture any potential surface water runoff from the Proposed Development; and
- The implementation of general pollution prevention measures to protect the water quality of the surrounding waterbodies and groundwater.

8.6 Summary

Given the presence of sensitive watercourses, the Humber Estuary, SSSI, SAC, SPA and Ramsar, the highly productive groundwater unit, and the potential for GWDTEs and PWSs, there is potential for significant hydrological effects to occur during the construction, operational, and decommissioning phases of the development.

As such, these receptors will be **scoped in** to inform the ES.

8.7 Key Questions for Council and Consultees

- **Q8/1** Do the Council and Consultees agree with the proposed methodology?
- **Q8/2** Do the Council and Consultees agree with the proposed study area?
- **Q8/3** Do the Council and Consultees have any further information that would assist in the preparation of the assessments?
- **Q8/4** Are the Council or Consultees aware of any further guidance or policy documents not mentioned within the report that are relevant to the assessment?
- **Q8/5** Are the Council or Consultees aware of any other relevant consultees that should be consulted with regards to the Proposed Development?
- **Q8/6** Do the Council and Consultees agree with scoping in Humber Estuary SSSI, SAC, SPA and Ramsar, the highly productive groundwater unit, GWDTEs and PWSs?

9 Ecology

9.1 Introduction

Wold Ecology Ltd have been commissioned by Green Cat Renewables (GRC) to undertake the ecological surveys at the Port of Immingham, North East Lincolnshire, on behalf of Associated British Ports (ABP). The intention of this scoping chapter is to set out the proposed methodology for establishing the ecological (non-avian) baseline conditions at the development site, and the proposed methodology for assessing the potential impacts from the construction, operation, and decommissioning of the Proposed Development on any sensitive ecological features.

This chapter will allow for a more focused ecological assessment within the Environmental Impact Assessment Report (ES) and provide the competent authority and its advisers with an opportunity to comment on the provided baseline information and proposed methodology.

The baseline survey work is still ongoing at the development site and is scheduled to be completed by May 2023 therefore, the baseline information contained within this chapter is based on desk study information and initial survey results. All ecology personnel that are conducting the required ecological surveys are members of the Chartered Institute of Ecology and Environmental Management (CIEEM) and have vast experience in the environmental management sector.

9.2 Policy, Legislation and Guidance

The ecological surveys and impact assessment will be undertaken with reference to relevant environmental and wildlife legislation and planning policy. The key legislative and guidance documents considered for the Proposed Development are listed in Table 9.1.

Table 9.1 - Policy, Legislation & Guidance Documents

	Policy, Legislation or Guidance Document
Legislation	• Conservation of Habitats and Species Regulations 2017 (as amended) • Convention on the Conservation of European Wildlife and Natural Habitats 1979 (Bern Convention) • Council Directive 92/43/EEC on the Conservation of Natural Habitats and of Wild Fauna and Flora (the EC Habitats Directive) • Countryside and Rights of Way Act 2000 • Environmental Impact Assessment Directive 85/337/EEC (the EIA Directive) • Environmental Protection Act 1990 • Habitats Directive 1992/43/EEC • Hedgerow Regulations 1997 • Natural Environment and Rural Communities Act 2006 • Salmon and Freshwater Fisheries Act 1975 • The Protection of Badgers Act 1992 • Water Framework Directive 2000/60/EC • Wildlife and Countryside Act 1981 (as amended)

Policy	• Biodiversity 2020: A Strategy for England's Wildlife and Ecosystem Services[25] • National Planning Policy Framework (NPPF): (15) Conserving and Enhancing the Natural Environment[26]
Guidance	• CIEEM (2018) Guidelines for Ecological Impact Assessment in the UK and Ireland[27] • Collins, J. (2016) Bat Surveys for Professional Ecologists: Good Practice Guidelines. 3rd edition. Bat Conservation Trust, London[28] • European Commission (2011). Wind energy developments and Natura 2000[29] • JNCC. (2010) Handbook for Phase 1 Habitat Survey – a Technique for Environmental Audit[30] • Mathews, F., Richardson, S., Lintott, P. & Hosken, D. (2016) Understanding the Risk to European Protected Species (bats) at Onshore Wind Turbine Sites to inform Risk Management[31] • Rodwell (2006). National Vegetation Classification: Users' handbook[32] • SNH *et al.* (2021) Bats and Onshore Wind Turbines[33]

9.3 Site Overview

The Proposed Development site is located within the operational Port of Immingham, on the south-western bank of the Humber Estuary. The town of Immingham is situated directly south of the landholding, separated by the A1173 Road and various goods sidings. The landholding has a history of ongoing industrial activities as the Port is the largest port in the UK by tonnage of cargo handled which includes coal, oil and steel holding areas along with LoLo and RoRo freight terminals. There are also various other business complexes located on and around the docks, including a metal recycling site, a waste-based biofuel terminal, and a fertiliser terminal.

The Proposed Development comprises three turbines located to the north-west of Immingham Docks. A 150m to tip height turbine is proposed at each location.

The Proposed Development is discussed in further detail within **Chapter 2 – the Project Description.**

9.4 Proposed Methodology

The assessment of the potential impact of the proposal on ecological (non-avian) features will be carried out by the general method described in the following Sub-Sections.

9.4.1 Desk Study

The desk study aims to identify any international, national, and local nature sites, and any protected or notable species within or near the development site. The information gathered within this desk study will then inform the ES.

[25] https://www.gov.uk/government/publications/biodiversity-2020-a-strategy-for-england-s-wildlife-and-ecosystem-services (Last accessed: 04/10/2022)

[26] https://www.gov.uk/guidance/national-planning-policy-framework/15-conserving-and-enhancing-the-natural-environment (Last accessed: 04/10/2022)
[27] https://cieem.net/resource/guidelines-for-ecological-impact-assessment-ecia/ (Last accessed: 04/10/2022)
[28] https://cieem.net/resource/bat-surveys-for-professional-ecologists-good-practice-guidelines-3rd-edition/ (Last accessed: 04/10/2022)
[29] https://op.europa.eu/en/publication-detail/-/publication/65364c77-b5b8-4ab6-919d-8f4e3c6eb5c2 (Last accessed: 04/10/2022)
[30] https://cieem.net/resource/handbook-for-phase-1-habitat-survey-a-technique-for-environmental-audit/ (Last accessed: 04/10/2022)
[31] https://cieem.net/resource/understanding-the-risk-of-european-protected-species-bats-at-onshore-wind-turbine-sites-to-inform-risk-management/ (Last accessed: 04/10/2022)
[32] https://hub.jncc.gov.uk/assets/a407ebfc-2859-49cf-9710-1bde9c8e28c7 (Last accessed: 04/10/2022)
[33] https://www.nature.scot/doc/bats-and-onshore-wind-turbines-survey-assessment-and-mitigation (Last accessed: 04/10/2022)

The desk study will cover a study area of 10km from the proposed turbine locations for internationally and nationally designated sites, and a 2km radius for local designations. The desk study will also identify any records of rare or protected species within 5km of the site however, this will be extended out to 10km for bat species.

The following data sources will be utilised for the desk study:

- Lincolnshire Environmental Records Centre (LERC);
- Lincolnshire Local Biodiversity Action Plan (3rd Edition);
- Natural England's Magic Map[34];
- NBN Atlas[35]; and
- The UK Biodiversity Action Plan (UKBAP)[36].

To further inform the baseline for the ES, it is recommended that the following organisations are also consulted to request any additional information or records that they may hold for the site and surrounding area:

- Greater Lincolnshire Nature Partnership;
- Natural England;
- Nearby wind energy applications (within 10km);
- North Lincolnshire Council; and
- North East Lincolnshire Council.

Table 9.2 details the designated sites identified within the relevant study area that are designated for their ecological features. However, Special Protection Areas (SPA) that are designated for their ornithological interest will be considered in Chapter 10 Ornithology.

Table 9.2 – Ecologically Designated Sites

Internationally or Nationally Designated Sites within 10km of the Proposed Development	Distance and Orientation from the Site	Qualifying Feature(s)
Humber Estuary Ramsar	400m to the north	The estuary hosts the following habitats: 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 spp*. 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). The site also hosts the following species: grey seal *Halichoerus grypus*; river lamprey *Lampetra fluviatilis* and sea lamprey *Petromyzon marinus*. The site also supports the following species: avocet *Recurvirostra avosetta*; bar-tailed godwit *Limosa lapponica*; bittern *Botaurus stellaris*; black-tailed godwit *Limosa limosa*; dunlin *Calidris alpina*; golden plover *Pluvialis apricaria*; hen harrier *Circus cyaneus*; knot *Calidris canutus*; little tern *Sternula albifrons*; marsh harrier *Circus aeruginosus*; redshank *Tringa*

[34] https://magic.defra.gov.uk/home.htm (Last accessed: 04/10/2022)
[35] https://nbnatlas.org/ (Last accessed: 04/10/2022)
[36] https://hub.jncc.gov.uk/assets/cb0ef1c9-2325-4d17-9f87-a5c84fe400bd (Last accessed: 04/10/2022)

		totanus; ruff *Philomachus pugnax*; shelduck *Tadorna tadorna*, as well as for its waterbird assemblage.
Humber Estuary SSSI	400m to the north	The Humber Estuary is a nationally important site with a series of nationally important habitats. These are the estuary itself (with its component habitats of intertidal mudflats and sandflats and coastal saltmarsh) and the associated saline lagoons, sand dunes and standing waters. The site is also of national importance for the geological interest at South Ferriby Cliff (Late Pleistocene sediments) and for the coastal geomorphology of Spurn. The estuary supports nationally important numbers of 22 wintering waterfowl and nine passage waders, and a nationally important assemblage of breeding birds of lowland open waters and their margins. It is also nationally important for a breeding colony of grey seals Halichoerus grypus, river lamprey Lampetra fluviatilis and sea lamprey Petromyzon marinus, a vascular plant assemblage and an invertebrate assemblage.
Humber Estuary SAC	400m to the north	The SPA is noted for the following features: Estuary habitat; Mudflats and sandflats not covered by seawater at low tide; 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; Fixed coastal dunes with herbaceous vegetation; Dunes with Hippopha rhamnoides; Sea lamprey *Petromyzon marinus*; River lamprey *Lampetra fluviatilis*; and, Grey seal *Halichoerus grypus*.

An initial desk study revealed that there are no known local, non-statutory ecological designations within 2km of the proposed turbine locations.

9.4.2 Field Surveys

The proposed ecological surveys for the Proposed Development are based on the species and habitat present on the site and the data identified in the initial desk study.

Baseline field studies will comprise of the following:

- Habitat Survey, and
- Protected Species Survey (Bat Surveys).

All surveys will be undertaken in appropriate conditions and seasons, where possible. The timings and weather conditions will be recorded during the surveys and will be provided within the ES.

9.4.2.1 Habitat Surveys

A habitat survey will be carried out within the proposed site, using the UK habitat (UKHab) Classification System to classify the habitats within the survey area and identify any habitats of notable conservation value and any protected plant species[37]. This will include a search for scarce or rare plants. The UKHab tool will ensure the identification of a robust habitat baseline for the development site and provides a unified and comprehensive approach to classifying habitats.

The study area will map the relevant habitat types out to 300m from the proposed infrastructure, which will cover a 250m study area plus an additional 50m buffer to account for the micrositing allowance. During the habitat

[37] https://ukhab.org/ (Last Accessed: 06/10/2022)

survey, the surveyor will also assess the habitat suitability to potentially support other protected species, which may inform the requirement for further species-specific survey work. Target notes will be taken

Any non-native invasive species such as Japanese knotweed will also be recorded as target notes.

The results of the habitat survey will be fed into the design process. Where possible, an appropriate buffer will be implemented around any identified sensitive habitats and sensitive construction methods will be proposed.

9.4.2.2 Bat Surveys

In the UK, all wild bat species are classes as European Protected Species (EPS) and bats and their roost are therefore legally protected under the Wildlife and Countryside Act (1981) (as amended) and Conservation of Habitats and Species Regulations (2017) (as amended).

As such, it is a criminal offence to either:

- Deliberately or recklessly capture, injure or kill a bat;
- Deliberately or recklessly disturb a bat in its roost or deliberately disturb a group of bats;
- Deliberately or recklessly damage or destroy a breeding or resting roosts for bats (even if bats are not presently occupying the roost);
- Deliberately or recklessly obstruct access to a bat roost (without a licence); and
- Possess or advertise/sell/exchange a bat of a species found in the wild in the EU.

Habitat with the potential to support bat species is present near to the proposed turbine locations, such as watercourses, hedge lines, and broadleaf woodland belts. If bats could potentially be impacted by the Proposed Development and no measures have been taken to avoid the impacts occurring, then an offence may be committed.

Roost Surveys

A daytime visual assessment will identify whether there are any buildings, structures, or trees within 200m of the proposed turbine locations that may support roosting bats. This survey will include an external search of these structures for present roosting bats or signs of their presence.

Trees present within the study area will be evaluated on their characteristics, health, site conditions, and defects in order to assess their potential to support roosting bats.

Crevices and cracks on buildings present within the study area will be assessed to evaluate the buildings potential to support roosting bats.

Ground-level Static Surveys

Anabat static recorders will be deployed at ground level at the approximate location of each proposed turbine for a minimum of 10 consecutive nights in each of spring (April-May), summer (June-mid-August) and autumn (mid-August-October). These surveys will not run in succession between seasons, and will be carried out during nights with appropriate weather conditions for bats (i.e. temperatures of 10°C and above; maximum ground level wind speed of 5m/s, and no or light rainfall).

As the proposed turbine locations are not located within woodland, it is considered that monitoring at height is unlikely to detect the presence of any species that is not already recorded at ground level and therefore, at height monitoring will not be carried out.

Walked Surveys

Walked surveys will be carried out to complement the data gathered by the ground level static recorders. This will aid in identifying flight lines and the number of bats present within the study area, rather than a broader distribution of activity across the development site.

The walked surveys will be carried out at dusk, and the surveyor will walk set transects to identify any potential key flight paths and foraging areas. The surveyors will note the number of individual bats, number of passes, and flight heights wherever possible.

9.5 Assessment

Potential impacts on the sensitive ecological features identified during the desk study and field surveys will be assessed.

A qualitative risk assessment will be used to assess potential impacts on the identified receptors whereby the probability of an effect occurring and the magnitude of the effect, if it were to occur, are considered. This approach provides an established process for identifying the areas where mitigation measures are required.

Both embedded and site-specific mitigation measures required to address these impacts will be proposed in accordance with best practice guidance. Any residual effects after the proposed mitigation measures will then be assessed, and any required compensation measures or opportunities for ecological enhancement will be identified.

The assessment will consider the construction, operational, and decommissioning stages of the Proposed Development.

9.6 Initial Findings

The development site is located on the north, west and southern boundaries of Immingham Docks; in a suburban and industrialised location. The proposed turbines are located adjacent to an area of heavy industry with large coal storage yards, docks and transit sheds/heavy industry within 1.5km; the Humber Estuary is located within 1.2km of the turbines. It is concluded the proposed turbines will be located within an area of well-lit heavy industry.

Woodland cover within 2km is low and occurs as shelterbelts, screening and riparian tree cover. The Application Site is not directly connected to any optimum bat foraging habitat although fragmented habitat connectivity within 500m is provided by scrub and woodland belts associated with railway lines and screening.

Turbines 1 and 2 are located within an area of existing hard standing immediately surrounded by scrub habitat as part of a larger belt to screen industrial areas. The coal storage and associated areas of hard standing are heavily disturbed in a well-lit environment. The Humber Estuary is located within 1km of turbine 1 and 1.5km north of turbine 2.

The bat transect survey on 28th September 2022 identified commuting common pipistrelle *Pipistrellus pipistrellus* bats in very low numbers and frequency; despite optimum weather conditions.

9.7 Key Questions for Council and Consultees

- Q9/1: Do consultees agree that the range of ecological surveys proposed is sufficient and proportionate to inform the design and assessment of the Proposed Development?
- Q9/2: Do Natural England agree with the proposed methodology and approach to the assessment?
- Q9/3: Are there any other relevant consultees who should be contacted with respect to the ecology assessment and scope of baseline information gathering?
- Q9/4: Are there any other relevant consultees who should be contacted with respect to the ecology assessment and scope of baseline information gathering?

10 Ornithology

10.1 Introduction

This section sets out the proposed scope of the ornithological features that will be included within the assessment. In particular, the assessment will focus on species cited in the Humber Estuary SPA/Ramsar citation, birds of prey and Red listed species of Conservation Concern. The assessment will also consider use of the site by breeding birds of any species. Additional consideration will also be directed towards species that may be particularly vulnerable to either collision such as raptors (Thaxter *et al.* 2017) or displacement from wind farm sites such as Anseriformes (swans, geese, and ducks) and Charadriiformes (shorebirds) (Hötker 2017). However, it is acknowledged that impacts may vary between sites and between season, with avoidance/displacement impacts occurring more commonly during the non-breeding season (Hötker 2017).

It is acknowledged that collision risk is greater where wind turbines occupy flight lines, such as between roosting and feeding grounds, or where birds such as raptors use a site for foraging (Natural England 2010). Therefore, the assessment will also consider additional contextual ornithological information on the abundance and distribution of coastal waterbirds using different areas of habitat within the vicinity of the proposed turbine development, identifying any regularly used flightlines between functionally linked land that may be regularly used by birds protected by the Humber Estuary SPA/Ramsar site.

10.2 Legislation Policy and Guidance Position

The potential ornithological impacts of the ABP Wind Turbine development at the Port of Immingham will be considered in the respective topic-specific ES chapter, which will cross-reference, as appropriate, the following legislation including:

- The Habitats Directive (92/43/EEC);
- The Birds Directive (2009/147/EC);
- The Wildlife and Countryside Act (WCA) 1981, as amended;
- The Countryside and Rights of Way Act (CRoW) 2000;
- The Natural Environment and Rural Communities (NERC) Act 2006;
- The 2017 Habitats Regulations, which implement the Birds Directive (2009/147/EC) and Habitats Directives (92/43/EEC)[38];
- The Water Environment (Water Framework Directive) (England & Wales) Regulations 2017 (referred to as the WFD Regulations), (2000/60/EC);
- The Town and Country Planning (Environmental Impact Assessment) Regulations 2017;
- UK Marine Policy Statement (HM Government, 2011) as required by Section 44 of the Marine and Coastal Access Act 2009;
- East Inshore and East Offshore Marine Plans (Defra, 2014);
- UK Biodiversity Action Plan (Her Majesty's Stationary Office (HMSO), 1994), superseded by the UK Post-2010 Biodiversity Framework (JNCC, 2012);

[38] These have been amended by the Conservation of Habitats and Species (Amendment) (EU Exit) Regulations 2019. Available at: https://www.legislation.gov.uk/uksi/2019/579/contents/made (accessed February 2023).

- Lincolnshire Local Biodiversity Action Plan;
- UK Marine Strategy (Defra, 2019a);
- Advice Note Ten: Habitat Regulations Assessment relevant to Nationally Significant Infrastructure Projects (Planning Inspectorate, 2017b); and
- Relevant local policy.

The following guidance and information relevant to the ornithological impact assessment of wind farm developments has also been consulted:

- CIEEM (2018). Guidelines for ecological impact assessment in the UK and Ireland: Terrestrial, Freshwater and Coastal (2nd Edition);
- Band (2000). Wind farms and birds: calculating a theoretical collision risk assuming no avoidance action. SNH Guidance note;
- Band, W., & Madders, M. & Whitfield, D.P. (2007). Developing field and analytical methods to assess avian collision risk modelling at wind farms;
- SNH (2018). Avoidance rates for the onshore SNH Wind Farm Collision Risk Model;
- SNH (2017). Recommended bird survey methods to inform impact assessment of onshore wind farms, Scottish Natural Heritage, 2017;
- Scottish Environment Protection Agency (SEPA) (2017) Guidance Note 4- Planning guidance on on-shore windfarm developments;
- Scottish Renewables, SNH, SEPA, Forestry Commission (Scotland), Historic Scotland (2019). Guidance- Good Practice During Windfarm Construction (4th Edition);
- European Commission (2010). Natura 2000 Guidance Document 'Wind Energy Developments and Natura 2000', European Commission, Brussels;
- Eaton MA, Aebischer NJ, Brown AF, Hearn RD, Lock L, Musgrove AJ, Noble DG, Stroud DA and Gregory RD (2015). Birds of Conservation Concern 4: the population status of birds in the United Kingdom, Channel Islands and Isle of Man. British Birds 108, 708–746; and
- Gilbert, G., Gibbons, D.W., & Evans, J. (1998) Bird Monitoring Methods: A Manual of Techniques for UK Key Species. The Royal Society for the protection of Birds, Sandy, Bedfordshire, England.

10.3 Survey Methodologies and Assessment

This section provides background information on the port and survey area and outlines the scope and methodology of the surveys to be carried out in respect of the Proposed Development.

ABP intend to install three wind turbines within the Port of Immingham (**Figure 10.1**) a mixed-use port on the Southern bank of the Humber Estuary. To assess the impact this may have on migratory and resident bird populations a series of surveys have been carried out to determine the abundance of species present on site and seasonal variation, with observations also made on flight height and behaviour.

The survey area includes the immediate port area, the adjacent foreshore, and three areas of functionally linked land within the immediate vicinity of the port, including the Rosper Road Nature Reserve, all of which are known to be regularly used by qualifying species of the Humber Estuary SPA and Ramsar site.

10.3.1 Survey Methodologies

The survey methodology has been developed based on the Department for Environment, Food and Rural Affairs (Defra's) and Natural England's standing advice for local planning authorities, developers and ecologists for assessing the impacts of wind farms on wild birds with respect to surveys and monitoring for onshore wind farms[39]. In addition, as this advice only provides relatively high-level guidance on survey methods, the protocols within Scottish Natural Heritage (SNH) (2017) have also been used. This established guidance is widely used to develop project specific methods not only within Scotland but widely in the UK. This method of data collection is also consistent with that required for collision risk modelling (using the Band Model). The surveys have been developed further based on advice provided by Natural England as part of a Discretionary Advice Service (DAS) request. All surveys will be conducted over a two-year period to provide a robust baseline characterisation of the ornithological interest of the proposed wind turbine development.

Based on the guidance listed above and the advice provided by Natural England through the Discretionary Advice Service, the following survey programme was proposed:

- Vantage Point surveys;
- Walkover breeding bird surveys;
- Foreshore surveys; and
- Surveys of functionally linked land, including the Rosper Road Nature Reserve, which although not part of the SPA designation are known to be used by birds from the Humber Estuary SPA.

[39] https://www.gov.uk/guidance/wild-birds-surveys-and-monitoring-for-onshore-wind-farms

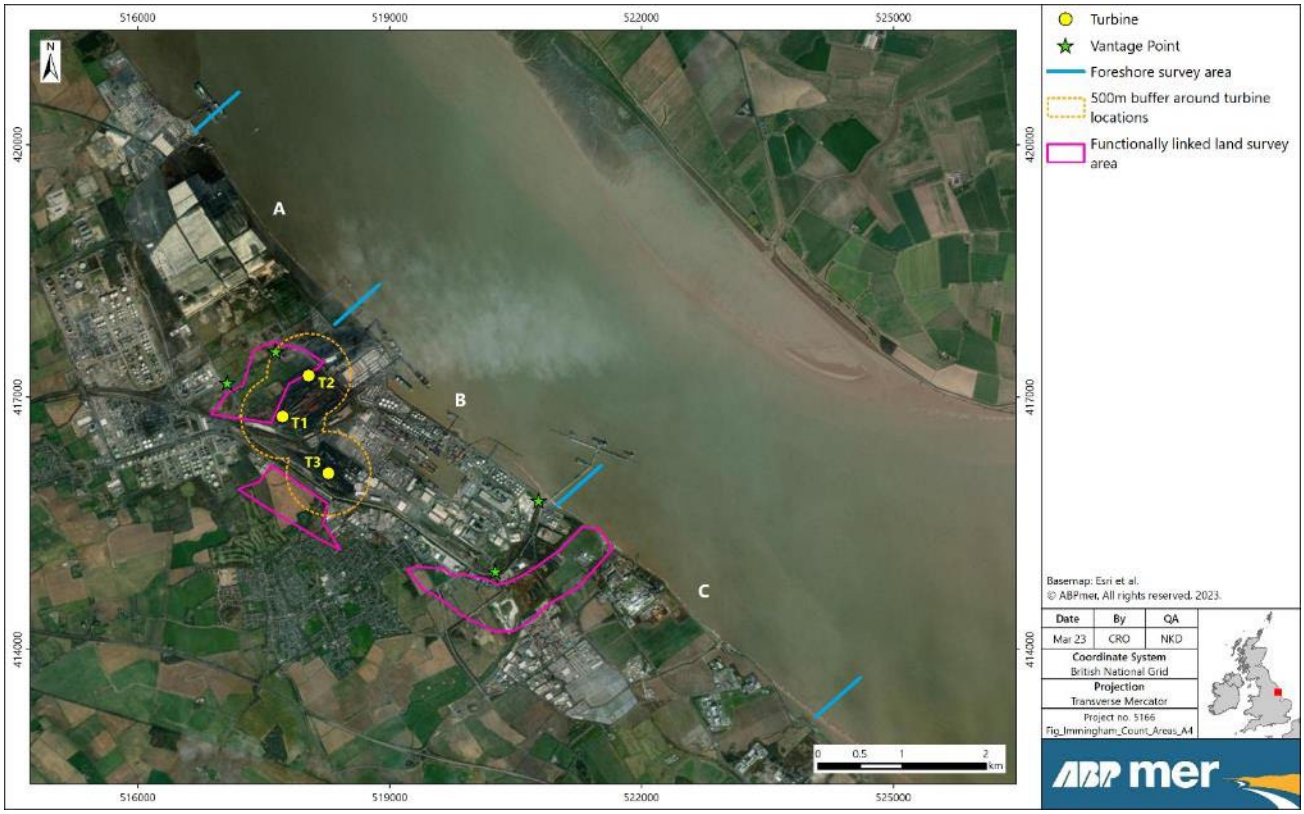

Figure 10.1: Proposed turbine locations, 500m buffer area, Vantage Point locations and locations of the foreshore and functionally linked land surveyed during the monitoring programme.

10.3.1.1 Vantage Point Surveys

Statutory guidance for bird monitoring for onshore wind farms recommends that baseline Vantage Point (hereafter VP) surveys are undertaken during key overwintering and passage period for coastal waterbirds (October to March) for a minimum of two winter seasons. Further consultation on the scope of the VP surveys with Natural England also recommended that the passage periods were extended to include April and May for spring passage and September for autumn passage. Guidance also recommends that breeding season VP surveys are undertaken in areas with the potential to support breeding species over a period of two years. Therefore, the following survey programme was devised based on the guidance:

- Autumn passage periods: Four visits per month from September to October;
- Winter periods: Two visits per month from November to February;
- Spring passage periods: Four visits per month in March;
- Spring passage/breeding periods: Four visits per month in April to May; and
- Breeding periods: Two visits per month in June and July.

Surveys were undertaken from December 2020 to November 2022. Four VP locations were selected to provide optimum coverage of bird flight activity within a 500m buffer area of the four proposed turbine locations (**Figure 10.1**).

Guidance states that a minimum of 72 hours survey work should be undertaken for non-breeding and breeding seasons combined. However, following advice from Natural England, further work was undertaken to provide 96 hours of surveys per VP per year. In addition, the surveys were planned to capture dawn and dusk periods as well

as a range of tidal phases so that the influence of tidal state on bird activity could be described and assessed, and so that effort could be focussed on periods when flight activity is potentially greatest, such as on a rising spring tide when birds are displaced from the mudflats to nearby land.

SNH (2017) guidance states that a list of target species should be determined for the surveys based on those species which are potentially most vulnerable to potential impacts at a site and the level of conservation/ protection afforded to the species. Target species for the surveys included all the species listed on the Humber SPA designation and included coastal waterbirds such as waders and wildfowl (ducks, geese, and swans). Birds of prey and Red listed Birds of Conservation Concern were also classified as target species. Information on non-focal species, that is bird that are not specifically of conservation concern, was aggregated and summarised in five-minute intervals and recorded on the VP recording form. Although recording movements of the target species was always prioritised, any occurrences of non-target species either in significant numbers, or which could be considered as rare or unusual in any way, were always recorded.

During each VP survey the area was scanned constantly until a target species was detected. The bird was then followed until it landed or was lost to view. The following information was recorded for each target species on a standardised form:

- Species;
- Time of observation;
- Duration of observation;
- Count;
- Estimated flight height (every 15 seconds);
- Direction of flight;
- Estimated distance and direction of bird from the observer; and
- Flight type / behaviour, where apparent (e.g. foraging, displaying, commuting etc.).

Weather data was recorded at the start of each VP survey, with the conditions formally reassessed and recorded on at least an hourly basis thereafter (or at such point as it was apparent a change in conditions had occurred).

Data was recorded on standardised forms. Flight line maps were created for each VP survey which show the flight lines of target species and indicate direction of flight.

10.3.1.2 Walkover Breeding Bird Surveys

Walkover breeding bird surveys were conducted using the standard BTO/JNCC/RSPB Breeding Bird Survey (BBS) methodology. Three visits were undertaken between April and July 2022 to establish the range of species breeding within the site area, and their abundance. The surveys encompass all breeding species regardless of their conservation concern.

10.3.1.3 Foreshore and functionally linked land surveys

ABP holds a long-term ornithological dataset for the foreshore at Immingham (survey areas shown in **Figure 10.1**) extending back to 1997/8. The foreshore has been monitored annually twice per month between October to March, with five counts taken every two hours after high water. These surveys are ongoing.

Following the advice given by Natural England as a part of the DAS request, ornithological monitoring at Immingham was extended to cover the Rosper Road Pools Nature Reserve and the adjacent grassland fields, as well as two other areas of habitat immediately inland of the foreshore which are known to be used by SPA species. This survey work consists of twice monthly visits carried out two hours before and two hours after high water to

monitor the number and distribution of SPA species using the fields for feeding and roosting. These areas of functionally linked land are shown in **Figure 10.1**. This monitoring is due to finish in March 2023.

Both the foreshore and functionally linked land surveys will provide further contextual information the abundance and distribution of coastal waterbirds using the adjacent foreshore and functionally linked land. This will inform interpretation of how birds use local habitats both within and outside of the SPA boundary. In addition, data from Wetland Bird Survey (WeBS) counts is also available for foreshore sectors adjacent to the proposed turbine locations and would be used to supplement the survey data described above.

10.3.2 Assessment Methodologies

To facilitate the impact assessment process and ensure consistency in the terminology of significance, a standard assessment methodology will be applied to determine the significance of effects within the ES. This methodology has been developed from a range of sources, including relevant Environmental Impact Assessment (EIA) Regulations, the EIA Directive (2014/52/EU), statutory and non-statutory guidance, consultations and ABPmer's previous (extensive) EIA project experience. The assessment also follows the principles of relevant guidance, including Institute of Environmental Management and Assessment (IEMA) guidelines, and the latest Chartered Institute of Ecology and Environmental Management (CIEEM) guidelines for ecological impact assessment in the UK and Ireland (which combine advice for terrestrial, freshwater and coastal environments) (CIEEM, 2018). The methodology adopted is 'best practice'.

The assessment will consider potential collision risk through use of the Band model. Predicted mortality will be assessed in the context of the conservation status and trends within species' regional populations. Potential displacement impacts for each species using the site will be assessed using a matrix-based approach, with the significance of each potential effect judged by integrating scales relating to ecological value, behavioural sensitivity, and magnitude of effects. If required, measures will be presented to mitigate any effects deemed to be significant in terms of the EIA Regulations.

The assessment will encompass all forms of potential displacement and contribution to habitat fragmentation. Barrier effects will also be addressed and discussed in relation to each species observed during the survey work. Impacts will be considered during construction, operational and decommissioning phases of the development.

The assessment will also consider cumulative impacts in combination with other proposed and existing wind turbine developments within the region. Assessment will follow the principles presented in the current CIEEM guidance (2018).

10.4 Baseline Environment

In addition to the dedicated survey work described above, a desk-based study will be undertaken to inform the baseline characterisation on which the impact assessment will be based. The process will identify sensitive receptors, particularly those that are the subject of statutory or local designations. Although not a designated site, birds using the Rosper Road Pools Nature Reserve will also be included on the basis that it is a locally important site. Constraints will be identified and used to inform the final development of the turbines and infrastructure layout.

10.4.1 Data sources

The desk study will include consideration of the following key data sources:

- Natura 2000 standard data forms or information sheets for designated sites;
- MAGIC Interactive Map (http://www.magic.gov.uk): Information on the boundaries of designated sites (Natural England, 2020);

- Natural England Conservation Advice for Marine Protected Areas: Humber Estuary SAC (Natural England, 2021a) and Humber Estuary SPA (Natural England, 2021b) available at https://designatedsites.naturalengland.org.uk/;
- The UK post-2010 Biodiversity Framework;
- The NERC Act 2006;
- Regular ornithological surveys conducted by ABP covering the foreshore and functionally linked land. This work consists of twice monthly visits to carry out counts of birds before and after high tide to look at the abundance, distribution and species composition of the waterbirds using these areas. WeBS data for the Humber Estuary;
- Natural England Designated Sites Portal: Background information on the ecology of SPA qualifying bird species in the Humber Estuary (Natural England, 2021b); and
- BTO Research Report Analysing WeBS data for the Humber Estuary: Population trends of waterbird species in different parts of the Humber Estuary for the period 2000/01 to 2016/17 (Woodward et al., 2018).

10.4.2 Nature conservation sites

The foreshore adjacent to the turbine locations lies within the Humber Estuary SPA. The Humber Estuary Ramsar site also lies within 20km of the proposed turbine locations. Qualifying features of the Humber Estuary SPA and Humber Estuary Ramsar site are shown in **Table 10.1** and **Table 10.2** respectively.

Table 10.1: Qualifying features of the Humber Estuary SPA

Internationally Important Populations of Regularly Occurring Annex 1 Species	
Breeding Species Population	
Bittern *Botaurus stellaris*	2 calling males (10.5 % of the GB population)
Marsh Harrier *Circus aeruginosus*	10 breeding females (6.3 % of the GB population)
Avocet *Recurvirostra avosetta*	64 pairs (8.6 % of the GB population)
Little Tern *Sternula albifrons*	51 pairs (2.1 % of the GB population)
Wintering Species Population	
Bittern *Botaurus stellaris*	4 (4.0 % of the GB population)
Hen harrier *Circus cyaneus*	8 (1.1 % of the GB population)
Bar-tailed Godwit *Limosa lapponica*	2,752 (4.4 % of the GB population)
Golden Plover *Pluvialis apricaria*	30,709 (12.3 % of the GB population)
Avocet *Recurvirostra avosetta*	54 (1.7 % of the GB population)
On passage Species population	
Ruff *Calidris pugnax*	128 (1.4 % of the GB population)
Internationally Important Populations of Regularly Occurring Migratory Species	
Wintering Species Population	
Teal† *Anas crecca*	2,322 (<1 % of the population)
Wigeon† *Mareca penelope*	5,044 (<1 % of the population)
Mallard† *Anas platyrhynchos*	2,456 (<1 % of the population)
Turnstone† *Arenaria interpres*	629 (<1 % of the population)
Common Pochard† *Aythya ferina*	719 (<1 % of the population)
Greater Scaup† *Aythya marila*	127 (<1 % of the population)
Brent Goose† *Branta bernicla*	2,098 (<1 % of the population)
Goldeneye† *Bucephala clangula*	467 (<1 % of the population)
Sanderling† *Calidris alba*	486 (<1 % of the population)
Dunlin *Calidris alpina*	22,222 (1.7 % of the Northern Siberia/Europe/Western Africa population)
Red Knot *Calidris canutus*	28,165 (6.3 % of the North-eastern Canada/Greenland/Iceland/North-western Europe population)
Ringed Plover† *Charadrius hiaticula*	403 (<1 % of the population)

Oystercatcher† *Haematopus ostralegus*	3503 (<1 % of the population)
Black-tailed Godwit *Limosa*	1,113 (3.2 % of the Icelandic Breeding population)
Curlew† *Numenius arquata*	3,253 (<1 % of the population)
Grey Plover† *Pluvialis squatarola*	1,704 (<1 % of the population)
Shelduck *Tadorna tadorna*	4,464 (1.5 % of the North-western Europe population)
Redshank *Tringa totanus*	4,632 (3.6 % of the Eastern Atlantic Wintering population)
Northern Lapwing† *Vanellus vanellus*	22,765 (<1 % of population)
On passage Species Population	
Sanderling†	818 (<1 % of the population)
Dunlin	20,269 (1.5 % of the Northern Siberia/Europe/Western Africa population)
Red Knot	18,500 (4.1 % of the North-eastern Canada/Greenland/Iceland/North-western Europe population)
Ringed Plover†	1,766 (<1 % of the population)
Black-tailed Godwit	915 (2.6 % of the Icelandic Breeding population)
Whimbrel† *Numenius phaeopus*	113 (<1 % of the population
Grey Plover†	1,590 (<1 % of the population)
Greenshank† *Tringa nebularia*	77 (<1 % of the population)
Redshank	7,462 (5.7 % of the Eastern Atlantic Wintering population)
Internationally Important Assemblage of Waterfowl	
Waterfowl assemblage	153,934 waterfowl
†Species with this symbol do not represent a population that is > 1 % of the international threshold but are included in the waterfowl assemblage.	

Source: JNCC[40] (2022)

Table 10.2: Qualifying ornithological features of the Humber Estuary Ramsar Site

Bird Assemblages of International Importance	
Wintering waterfowl	153,934 waterfowl (5-year peak mean 1998/99-2002/3)
Bird Species/Populations Occurring at Levels of International Importance	
Species	**Spring/Autumn Population (5-year peak mean 1996-2000)**
Golden Plover	17,996 (2.2 % of the Iceland & Faroes/East Atlantic population)
Red Knot	18,500 (4.1 % of the West & Southern African wintering population)
Dunlin	20,269 (1.5 % of the West Siberia/West Europe population)
Black-tailed Godwit	915 (2.6 % of the Iceland/West Europe population)
Redshank	7,462 (5.7 % of the population)
Species	**Wintering Population (5-year peak mean 1996/7-2000/1)**
Shelduck	4,464 (1.5 % of the North-western Europe Population)
Golden Plover	30,709 (3.8 % of the Iceland & Faroes/East Atlantic population)
Red Knot	28,165 (4.1 % of the West & Southern African wintering population)
Dunlin	22,222 (1.7 % of the West Siberia/West Europe population)
Black-tailed Godwit	1,113 (3.2 % of the Iceland/West Europe population)
Bar-tailed Godwit	2,752 (2.3 % of the West Palearctic population)

The Humber Estuary itself supports a wide variety of marine habitats including intertidal mudflats and sandflats, intertidal seagrass beds, coastal lagoons, saltmarsh, reedbeds, subtidal sandbanks and mixed sediment habitats (Humber Nature Partnership 2015, Natural England 2015, Franco 2015). The estuary supports important numbers of waterbirds (especially geese, ducks and waders) during the migration periods and in winter. In summer, it

[40] https://jncc.gov.uk/jncc-assets/SPA-N2K/UK9006111.pdf Accessed 28 September 2022.

supports important breeding populations of Bittern *Botaurus stellaris*, Marsh Harrier *Circus aeruginosus*, Avocet *Recurvirostra avosetta* and Little Tern *Sternula albifrons.*[41]

The foreshore adjacent to the turbine locations is part of the Humber Estuary Site of Special Scientific Interest and is designated for, amongst other features, its importance to breeding, wintering and passage birds. North Killingholme Haven Pits SSSI is also located around 5 km from the Proposed Development. This site comprises saline lagoon habitats and supports important populations of waders including Black-tailed Godwits and Redshank. The Lagoons SSSI is located approximately 20 km from the Proposed Development and supports a variety of coastal habitats (such as saline lagoons and sand dunes) as well as a population of breeding Little Terns. Other locally important sites used by SPA species include the Rosper Road Pools Nature Reserve (30m from Turbine 1), which supports wader roosts at high water, and which also includes islands created for breeding Avocet. At Cleethorpes, some 15km away there are two local nature reserves, Cleethorpes Country Park and Cleethorpes Sands, both of which are used by overwintering waders.

During the vantage point surveys carried out between December 2020 and July 2022, 32 species were observed (**Figure 10.1**). Of these species Black-tailed Godwit *Limosa limosa*, Lapwing *Vanellus vanellus*, Curlew *Numenius arquata* and Pink-footed Goose *Anser brachyrhynchus* were the most frequently recorded. The latter of these was only encountered during the winter, whilst the other three species occurred all year round. The majority of Black-tailed Godwit, Lapwing and Curlew sightings were observed transiting to and from the Rosper Road Pools Nature Reserve. Other wader species associated with the pools included small numbers of Avocet *Recurvirostra avosetta* and Oystercatcher *Haemotopus ostralegus.* Several duck species were also associated with the pools including Mallard *Anas platyrhynchos,* Shelduck *Tadorna tadorna* and Gadwall *Anas strepera*. Several raptor species were also observed including Buzzard *Buteo buteo*, Peregrine *Falco peregrinus*, Kestrel *Falco tinnunculus*, Sparrowhawk *Accipiter nisus* and Marsh Harrier *Circus aeruginosus*. Only the former of these occurred regularly and, in any number, (maximum count of 5), whilst the other species were encountered far less frequently with sightings limited to single birds.

10.5 Potential Environmental Effects

Wind turbines have the potential to impact on birds through i) direct collision with turbine blades, ii) displacement from the area occupied by wind turbines and subsequent loss of habitat, and iii) displacement due to barrier effects, whereby the wind farm creates an obstacle to regular movements of birds. Regular movements of birds include both migration and movements of birds to and from feeding, nesting or roosting areas. Displaced birds may no longer use suitable habitat within or close to a wind farm or use it less frequently than they would in the absence of the wind farm. Displacement may result in a reduction of habitat available for the population and contribute to habitat fragmentation.

The Proposed Development has the potential to impact on birds both during the construction/decommissioning phases and during the operational phase. The following sections describe the impacts that will be assessed in the ES Ornithology Chapter.

10.5.1 Construction/decommissioning

The construction/decommissioning phases of the project are assumed to be comparable in terms of the likely impact pathways on sensitive receptors. Potential impact pathways during the construction/decommissioning phase include:

- Potential disturbance to coastal waterbirds, and any other species utilising the site and nearby habitat, due to construction activity; and

[41] Designated Sites View (naturalengland.org.uk)

- Disturbance to breeding birds within and near to the turbine footprint and 500m buffer area;
- Potential change/damage to bird habitat due to construction activity.

10.5.2 Operation

Potential impact pathways during the operational phase of the project include:

- Direct loss of bird habitat due to the footprint/presence of the turbines;
- Potential collision with turbine blades;
- Displacement of coastal waterbirds, and other species, from nearby intertidal habitat and functionally linked habitat (habitat fragmentation); and
- Potential disturbance to coastal waterbirds, and any other species utilising the site and nearby habitat, due to maintenance activity.

10.6 Mitigation

Embedded mitigation measures will be adopted to avoid or minimise adverse impacts upon ornithological features and will constitute part of the iterative design process for the Proposed Development.

Turbines have been located within industrial settings within the Port of Immingham and are located wherever possible on hard standing in locations where land has already been developed for other purposes. A Construction Environmental Management Plan (CEMP) will be in place during the construction, operational and decommissioning phases of the development. The CEMP will include all good practice construction measures, pollution prevention controls and monitoring to be implemented over the course of the development in line with current guidance.

Full details of embedded and site-specific mitigation measures in relation to ornithology will be detailed within the ES.

10.7 Reporting

The ornithology chapter will include:

- Background information of the impacts of wind farms on birds, informed by a review of wind farm sites located within similar coastal habitats;
- A description of the assessment methodology, including a description of the survey methods, the methodology used to assess displacement, and the methods and parameters adopted to run the Band collision model;
- A full description of the baseline environment and its use by birds with reference to designated sites, review of existing data, and the results of the survey programme;
- A description of the sensitivity of the bird species encountered within the survey area;
- An assessment of the potential impacts of the wind turbines during construction, operation, and decommissioning phases of the project, including cumulative impacts in combination with other wind farm sites; and
- Any recommended mitigation, and a description of any residual impacts once mitigation has been applied, and (if required) a description of how the mitigation would be monitored.

All impacts will be considered in the construction, operational and decommissioning phases of the project. Any information considered sensitive, such as nesting locations of protected species will be included in a confidential appendix which will be issued to Natural England. The appropriateness and feasibility of principles will be

confirmed in consultation with Natural England and relevant consultees, as necessary, over the course of the EIA process. Further consultation with Natural England is suggested in relation to the proposed assessment methodology. However, potentially significant effects that may undermine biodiversity conservation objectives for avifauna will be identified and assessed.

11 Shadow Flicker

11.1 Introduction

This section of the report presents the proposed methodology and baseline information that would inform a shadow flicker impact assessment for the proposed onshore wind farm at Immingham Port.

Tall structures such as wind turbines cast shadows. The shadows vary in length according to the sun's altitude and azimuthal position. Under certain combinations of geographical position and time of day, the sun may pass behind the rotor of a wind turbine and cast a moving shadow over neighbouring properties. Where this shadow passes over a narrow opening such as a window, the light levels within the room affected will decrease and increase as the blades rotate, hence the shadow causes light levels to 'flicker' - an effect commonly known as 'shadow flicker'.

Whilst the moving shadow can occur outside, the shadow flicker effect is only experienced by indoor receptors where the shadow passes over a window opening. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the site. A single window in a single building is likely to be affected for a few minutes at certain times of the day for limited periods of the year. The likelihood of this occurring and the duration of such an effect depend upon:

- The direction of the residence relative to the turbine(s);
- The distance from the turbine(s);
- The turbine hub-height and rotor diameter;
- The time of year;
- The proportion of hours in which the turbine operates;
- The frequency of bright sunshine and cloudless skies (particularly at low elevations above the horizon); and
- The prevailing wind direction.

The further the observer is from the turbine the less pronounced the effect will be. There are several reasons for this:

- There are fewer times when the sun is low enough to cast a long shadow;
- When the sun is low it is more likely to be obscured by either cloud on the horizon or intervening buildings and vegetation; and,
- The centre of the rotor's shadow passes more quickly over the land reducing the duration of the effect.

At a distance, the blades do not cover the sun but only partly mask it, substantially weakening the shadow. This effect occurs first with the shadow from the blade tip, the tips being thinner in section than the rest of the blade. The shadows from the tips extend the furthest therefore, the strength of the effect decreases with distance.

11.2 Legislation , Policy and Guidance

North Lincolnshire Council planning guidance[42] states that where residential properties fall within ten rotor diameters of a turbine a full assessment of potential shadow flicker impacts should be undertaken.

Department of Environment and Climate Change (DECC)[43] studies have shown that even in UK latitudes, shadows from wind turbines can only be cast approximately 130 degrees either side of north relative to the turbine due to the orientation of the earth's axis and the positioning of the sun. This equates to a region of 50 degrees either side of due south where a wind turbine will never cast a shadow. Properties within this region will experience no shadow flicker effects, regardless of their distance from the turbine. While DECC has now been replaced by the Department for Business, Energy and Industrial Strategy which does not provide guidance on shadow flicker, these findings are still considered relevant.

11.3 Methodology

11.3.1 Candidate Turbine

For the purposes of conducting a shadow flicker impact assessment the candidate turbine model will be the Enercon E138 with a hub height of 81m and a tip height of 150m. This model has been selected to assess the maximum potential impacts for a turbine of this height.

11.3.2 ReSoft WindFarm software

ReSoft Windfarm software will be used to model the shadow flicker effects of the development. The program uses simple geometric considerations: the position of the sun at a given date and time; the size and orientation of the windows that may be affected; and the size of the turbine that may cast the shadows. The model calculates the maximum possible duration of flicker effects by assuming that:

- Turbines are facing the sun at all times of the day;
- It is always sunny;
- The turbines are always operating; and
- There is no local screening.

11.3.3 Modelling of Façades

Given that the glazed area will not be known at every property, windows will be modelled conservatively with dimensions of 4m x 4m.

The orientation of each façade will be included in the model, measured in terms of degrees from north. This means, for example, that if a window faces due south, it is 180 degrees from north.

11.3.4 Modifying Factors

The degree of shadow flicker impact that will typically occur in practice is always much less than the maximum possible flicker calculated by the model. Modifying factors consider actual annual hours of sunlight for the area and hours of turbine operation. These factors have been applied to the modelling results in order to reach a more realistic estimate of shadow flicker impact that would typically occur in practice.

[42] North Lincolnshire (2011), https://www.northlincs.gov.uk/wp-content/uploads/2018/11/Planning-for-Renewable-Energy-Development-SPD-Adopted.pdf - Last Accessed (01/12/2022)

[43] Update of UK Shadow Flicker Evidence Base, by PB Power, commissioned by DECC (2011) http://www.decc.gov.uk/assets/decc/What%20we%20do/UK%20energy%20supply/Energy%20mix/Renewable%20energy/ORED/1416-update-uk-shadow-flicker-evidence-base.pdf - Last Accessed (29/09/2022)

The modifying factors are derived from the following:

- The average sunlight hours for the local area have been taken as 1,591 hours, based on meteorological data obtained from Cleethorpes (13km south-east of the development)[44]. Therefore, on average, it is sunny for ~35% of the daylight hours, though this varies from month to month. The monthly hours are provided below in **Table 11.1**.
- The rotor of a modern wind turbine can be expected to turn approximately 90% of the time.
- No adjustment will be made in regard to wind direction, and it will be assumed that the turbines are always yawed such that flicker is possible.

The monthly sunshine hours expected to occur based on nearby Met-Office records are given below:

Table 11.1 – Average monthly sunshine hours

Month	Mean Hours[44]	Total hours[45]	Sun
January	60	238	25%
February	85	267	32%
March	121	366	33%
April	160	424	38%
May	210	504	42%
June	190	524	36%
July	206	525	39%
August	188	468	40%
September	142	385	37%
October	105	325	32%
November	67	251	27%
December	57	220	26%

11.3.5 Assessment of the Impact

There is currently no standard UK Guidance on acceptable levels of shadow flicker. The only guidance that provides suggested levels is Northern Ireland's Best Practice Guidance to Renewable Energy[46], which recommends that shadow flicker at neighbouring offices and dwellings within 500m should not exceed 30 hours per year. This document also comments that at distances greater than 10 rotor diameters, the potential for shadow flicker is very low. This position is based on research by Predac, a European Union sponsored organisation promoting best practice in energy use and supply which draws on experience from Belgium, Denmark, France, the Netherlands and Germany. In 2017, this research was reviewed by ClimateXChange[47] and remains an industry standard.

[44] https://www.metoffice.gov.uk/research/climate/maps-and-data/uk-climate-averages/gcxbxmgb8 - Last Accessed (29/09/2022)

[45] Taken from Forsythe et al.(1995) A model comparison for daylength as a function of latitude and day of year. Ecological Modelling. 80: 87 - 95

[46] Best Practice Guidance to Planning Policy Statement 18: Renewable Energy, Department of the Environment (Northern Ireland), (2009). https://www.infrastructure-ni.gov.uk/sites/default/files/publications/infrastructure/Best%20Practice%20Guidance%20to%20PPS%2018%20-%20Renewable%20Energy_0.pdf – Last Accessed (29/09/2022)

[47] Review of Light and Shadow Effects from Wind Turbines, by ClimateXChange, commissioned by Scottish Government, 2017 (accessed 15/04/2022)

11.4 Baseline

Based on the guidance referenced above, a study area of 1,380m around the proposed turbines will be considered. The resulting study area is shown in

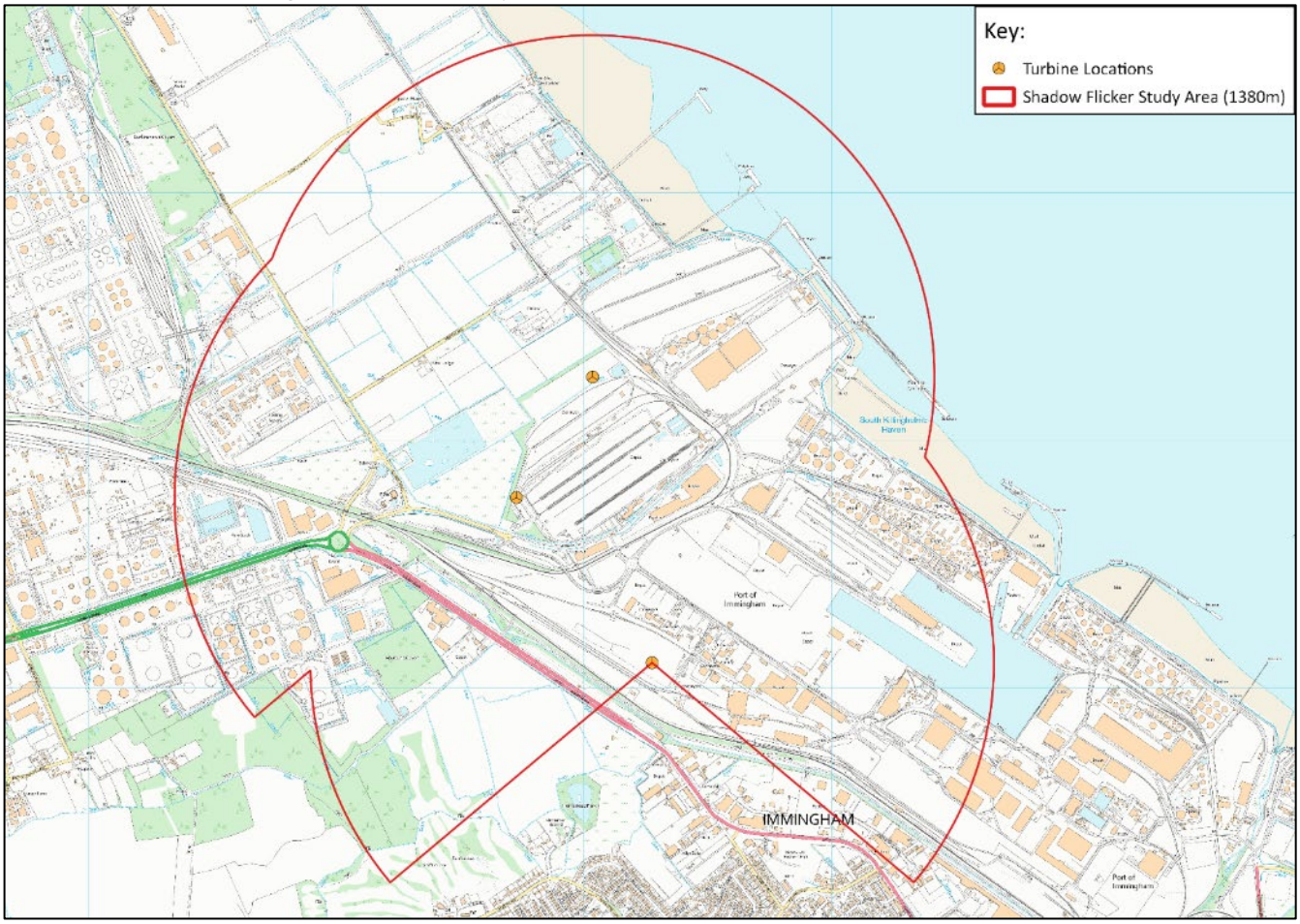

Figure 11.1.

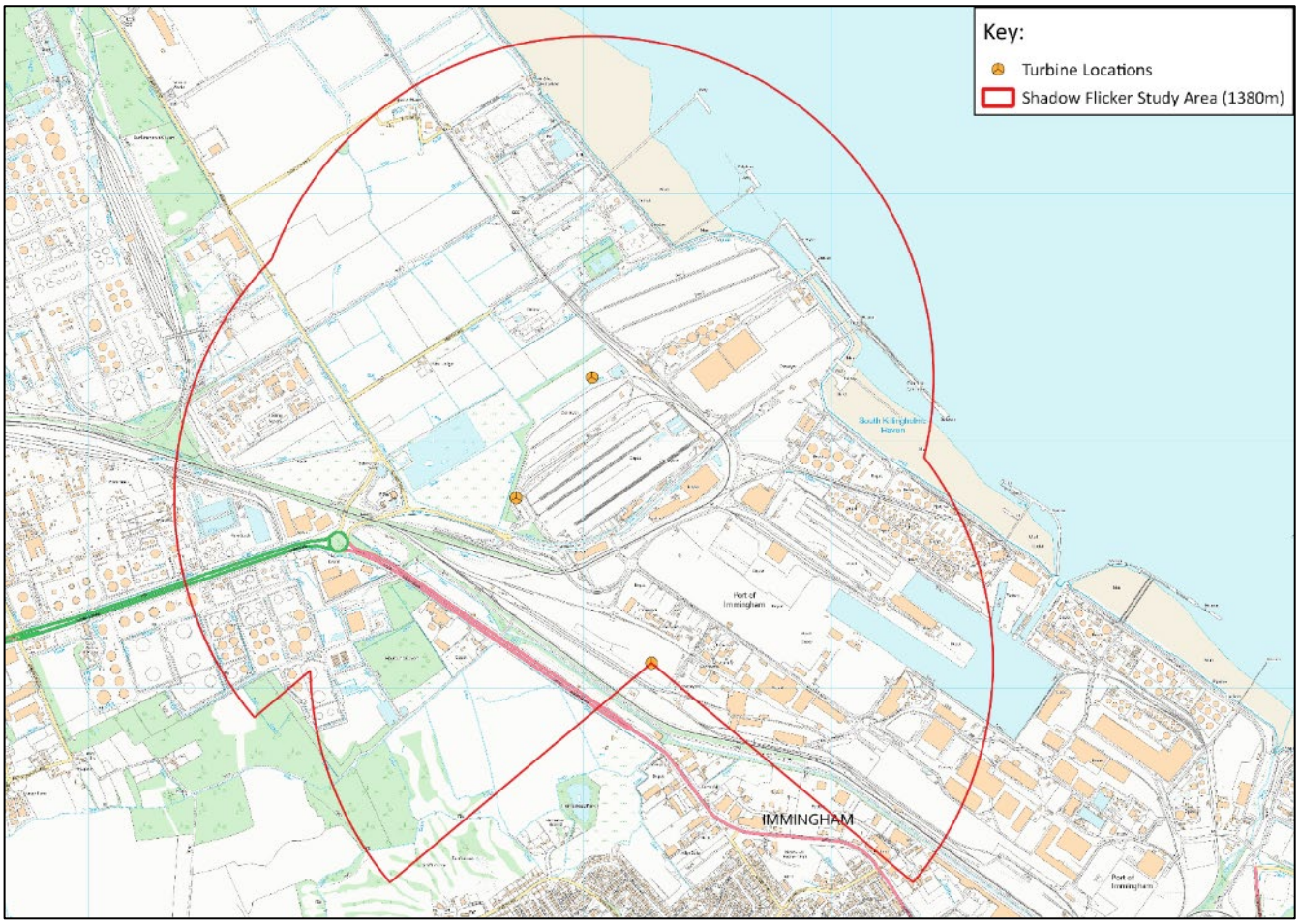

Figure 11.1 - Shadow flicker study area

11.4.1 Sensitive Receptors

It can be seen from

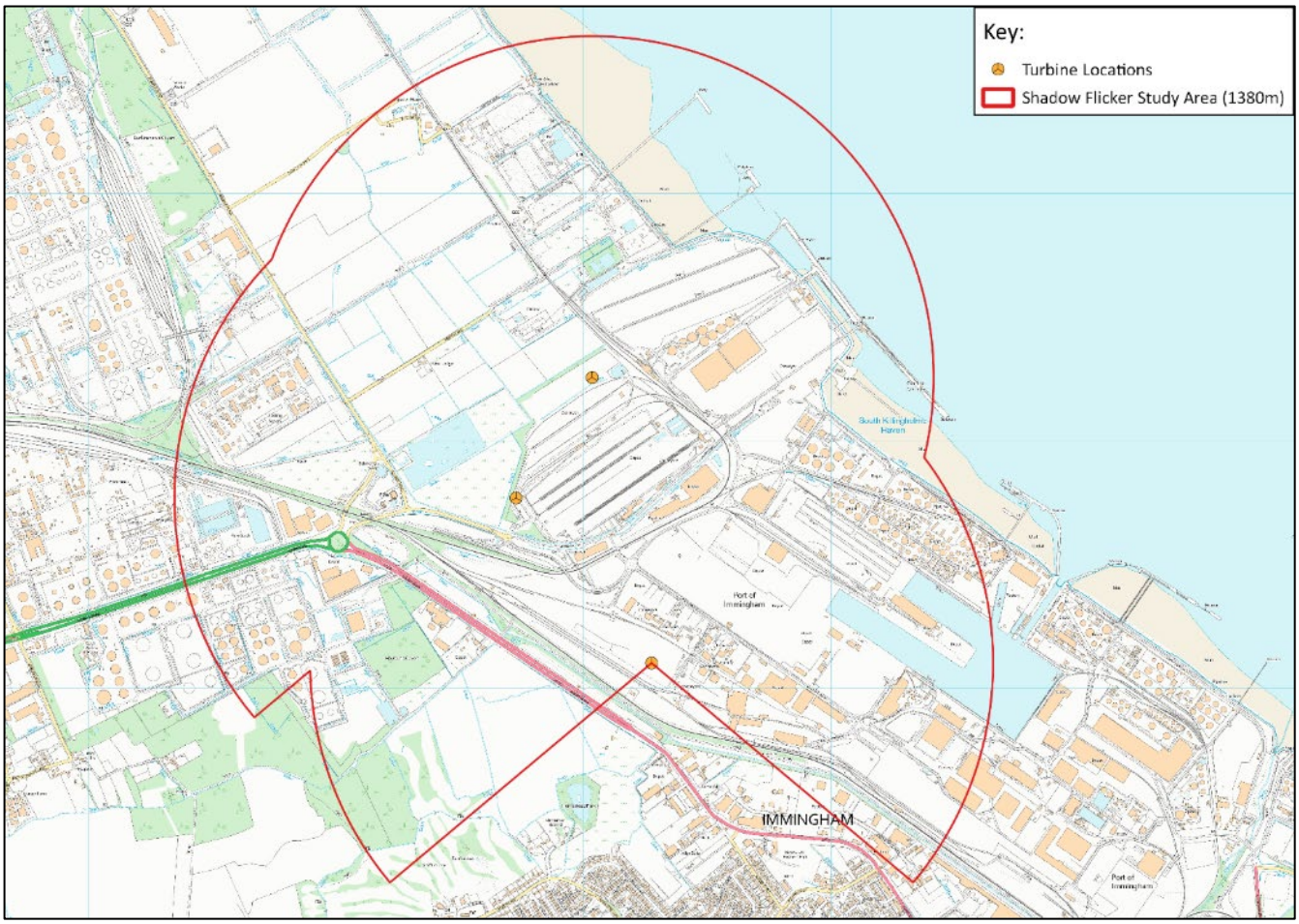

Figure 11.1 that properties located to the north of the town of Immingham fall within the defined study area. Therefore, a full shadow flicker impact assessment should be carried out. The location of potential receptors will be informed by both a desktop assessment and information gathered during site visits.

11.4.2 Cumulative Impact

No third-party wind developments were found within the vicinity of the proposed turbine locations. As such, the assessment of cumulative shadow flicker impacts can be **scoped out**.

11.5 Mitigation

Where shadow flicker is predicted to occur for short periods of time, it is likely that no mitigation will be required as the magnitude of any resulting impact will be low.

Should shadow flicker prove to be problematic in practice, the turbines can be fitted with a shadow stop system that can be programmed to automatically shut down when environmental conditions are conducive to shadow flicker at affected properties. This means that the turbines would be equipped with a light level sensor, to detect periods when there is sufficient light to generate shadow flicker.

Shadow flicker impacts could be managed through a suitable planning condition that would require a mitigation scheme to be submitted to, and approved by, the Council in response to a complaint.

11.6 Summary

A shadow flicker study area has been defined that encompasses any property within 10 rotor diameters of the proposed turbines. Properties to the north of the settlement of Immingham fall within this area. As such, a full shadow flicker impact assessment should be carried out as part of any subsequent Environmental Impact Assessment Report.

11.7 Key Questions for Council and Consultees

Q11/1: Do the Council and consultees agree with the proposed methodology to conduct the shadow flicker impact assessment?

12 Aviation and Radar

12.1 Introduction

This section considers the issues and potential concerns associated with aviation and radar, resulting from the Proposed Development during the construction, operation and decommissioning phases. The Proposed Development has the potential to cause a variety of adverse effects on aviation during wind turbine operation only. They include but are not limited to:

- Physical obstruction;
- Generation of unwanted returns on Primary Surveillance Radar (PSR); and
- Adverse effects on overall performance of Communications, Navigations and Surveillance (CNS) equipment.

An initial impact assessment has been conducted by Wind Business Support with regards to potential aviation impacts.

12.2 Guidance

Civil Aviation Authority (CAA) guidance, within CAP 764 (CAA Policy and Guidance on Wind Turbines), sets out recommended consultation and assessment criteria for the impacts of wind turbines on all aspects of civil aviation.

The CAA involvement in the Wind Farm Pre-Planning Consultation Process has ceased; CAP 764 now states that "developers are required to undertake their own pre-planning assessment of potential civil aviation related issues" and that "it is incumbent upon the developer to liaise with the appropriate aviation stakeholder to discuss – and hopefully resolve or mitigate – aviation related concerns without requiring further CAA input."

The primary planning policy document is the National Planning Policy Framework document (NPPF), which states a requirement to assess impacts on aviation, other defence matters and seismological recording. As well as this primary document reference will be made, where appropriate to:

CAA guidance, within CAP 764 (CAA Policy and Guidance on Wind Turbines), sets out recommended consultation and assessment criteria for the impacts of wind turbines on all aspects of civil aviation;

CAA CAP 393, The Air Navigation Order and Regulations, specifies the statutory requirements for the lighting of onshore wind turbines over 150 m tall;

DfT/ODPM circular 1/2003, Safeguarding aerodromes, technical sites and military explosives storage areas, contains annexes which describe the formal process by which planning authorities should take into account safeguarding, including in relation to wind energy developments.

As a statutory consultee, the Ministry of Defence (MOD) will be consulted through the scoping application. They publish a guidance document called 'Wind farms: MOD safeguarding', Updated 21 Jul 2021. The MOD wind energy team liaises with a broad range of experts to formulate a comprehensive MOD response. Where the MOD has concerns about a development, the team will work with the developer to look for ways to mitigate them

12.3 Methodology

The impact assessment aims to identify all stakeholders potentially affected by the Proposed Development. This involves considering all military and civil aerodromes in the wider area out to circa 60 km, all radar installations out to the limit of their range, all navigational aids, air-ground-air communications stations and low flying activities.

The acceptability of the Proposed Development, in terms of net effects on aviation related interests, is established through direct consultation with all relevant stakeholders within the consenting process. The initial task is to

independently assess the potential effects and, where significant effects may occur, to enter into a dialogue with the affected stakeholders. Where impacts are of concern additional analysis may be required and where impacts are deemed unacceptable, further mitigation solutions would be identified and explored with the goal of reducing impacts to acceptable levels. While the aim of this dialogue is to avoid objection from all stakeholders before full submission, this is not always possible where stakeholders will only engage once the application has been submitted.

An obstacle lighting scheme will be designed to minimise the visual impacts. Approval for a lighting scheme will be sought from the CAA, having consulted with local airspace users such as the MOD and Air Ambulance and Police Services.

12.4 Consultation

Wind Business Support have begun formal consultation with operators in the region, this includes:

- Humberside Airport
- NATS; and
- MOD

This process is likely to take some time and will continue throughout the scoping and development phase of the Proposed Development.

12.5 Key Questions for Council and Consultees

- Q12/1 Do the Council and consultees agree with the proposed methodologies?
- Q12/2 Do the Council and Consultees have any further information that would assist in the preparation of the assessments?
- Q12/3 Are the Council or consultees aware of any further guidance or policy documents not mentioned within the report that are relevant to the assessments?

13 Telecommunications

13.1 Introduction

Wind farms have the potential to interfere with point-to-point microwave links such as fixed link telecommunications infrastructure. This section considers the following potential interference from the Proposed Development:

- Physical Obstructions;
- Adverse effects on overall performance of Communications;
- Interference with electro-magnetic signals and potentially affecting television reception and fixed telecommunication links.

13.2 Legislation, Policy and Guidance

Guidance for assessing the potential impact of wind turbines on telecommunications infrastructure is given in:

- Ofcom (2009) 'Tall Structures and their Impact on Broadcast and other Wireless Systems;
- BBC & Ofcom (2006) 'The Impact of Large Buildings and Structures, including Wind Farms, on Terrestrial Television Reception';
- Healthy and Safety Executive – GS 6 (2012) 'Avoiding Danger from Overhead Powerlines';
- Healthy and Safety Executive – HSG 47 (2014) 'Avoiding Danger from Underground Services'.

The potential effects of the Proposed Development will be assessed with reference to these documents.

13.3 Methodology and Consultation

As a general rule wind developments will seek to avoid impacts on telecommunication infrastructure where possible. Consultation will be undertaken with appropriate stakeholders to identify any potential impacts and discuss appropriate mitigation should effects be identified.

13.3.1 Telecommunications

Wind farms produce electromagnetic radiation which has the potential to interfere with broadcast communications and signals. In order to determine the potential impact of the Proposed Development, initial consultation will be undertaken with the following consultees:

- Ofcom;
- Joint Radio Company Windfarm Co-ordinations;
- Atkins Global;
- British Telecom;
- Virgin Media
- Vodafone;
- EE; and
- O2.

The potential for a significant impact on any fixed radio links within the vicinity of the site will be determined through consultation with these key stakeholders.

13.3.2 Television

Since the digital switchover was completed the potential impacts on television signals from wind farm developments has been significantly reduced as these digital signals are much better at coping with the signal reflections which could cause ghosting effects on an analogue signal.

However, if the development is found to cause interference to TV signals there are a number of options available to mitigate the effects, such as re-aligning the aerial or installing a satellite dish. As potential television reception problems are difficult to predict and identify, assurance that the developer will rectify any problems is normally formalised in a planning condition which is now fairly standard practice with approved wind applications.

13.4 Baseline

From initial site review, there appears to be a number of potential links within and around the site of Proposed Development. However, because not all microwave links are published, system operators will be individually consulted to ensure there are no impacts on unregistered or presently planned fixed links. The potential impact on these will be assessed and mitigation proposed as required. In the first instance, the mitigation will be to design the Proposed Development to avoid the telecommunication links, however, where unavoidable, the telecommunication link operator will be contacted directly in relation to the acceptance of the proposal.

13.5 Mitigation

In the event that a significant impact on a telecommunication link is identified, the first mitigation will be to seek to avoid any direct impacts by micrositing the wind turbines. Where micrositing does not mitigate the potential impacts, a more detailed impact assessment will be undertaken using Fresnel Zone calculations to ascertain the potential for interference on the link resulting from the proposed wind turbines. In cases where these mitigation proposals are not acceptable to the link operator, it may be possible to re-route the link, at the developer's expense, to follow a different communications tower, avoiding the impact from the Proposed Development.

13.6 Summary

The Proposed Development may give rise to some significant effects upon telecommunication links. As such, a full assessment of the potential impacts will be **scoped in** to the EIA.

13.7 Key Questions for Council and Consultees

- **Q13/1** Do the Council and consultees agree with the proposed methodology?
- **Q13/2** Do the Council and Consultees have any further information that would assist in the preparation of the assessments?
- **Q13/3** Are the Council or consultees aware of any further guidance or policy documents not mentioned within the report that are relevant to the assessment?

14 Carbon Balance

14.1 Introduction

This chapter considers the potential impact of the Proposed Development on climate change. The UK Government has developed ambitious targets for tackling climate change:

- The UK Government, in the 2008 Climate Change Act made a commitment to reduce the UK's emissions of CO_2 by 34% (on 1990 levels) by 2020 and 80% by 2050.
- The UK Government amended the Climate Change Act of 80% reduction, to 100% reduction by 2050.[48] These targets will be achieved through an investment in energy efficiency and clean technologies such as renewable energy generation.

Renewable electricity generated by wind turbines is already considered to be the cheapest form of new electricity generation[49] and as such, has a vital role to play in achieving the ambitious targets set by the UK Government.

The manufacturing, construction, and installation of the wind turbines on site has an associated carbon cost, and carbon losses are also generated by the requirement for extra capacity to back up wind power generation. Carbon losses associated with reduced carbon fixing potential and loss of soil organic matter occurs through the excavation of peat for construction and drainage effects.

Turbine blades currently make up approximately 13% of the carbon impact of a wind turbine and are the hardest section of the turbine to be recycled. However, there are options for recycling or disposal, such as burning the epoxy, which generates energy, that can be recovered. The residues from the fibreglass incineration can be used in other secondary applications such as cement production. The carbon cost of the blades is incorporated into the lifecycle emission of the turbine. [50]

14.2 Guidance

To provide the carbon calculations for the assessment, the Scottish Government's Carbon Calculator Tool V1.6.1[51] will be used to inform the discussion in the ES chapter, in lieu of England specific guidance.

14.2.1 Electricity Mix

The UK electricity factor is prone to fluctuate from year to year as the fuel mix consumed in UK power stations (and auto-generators) and the proportion of net imported electricity changes.

These annual changes can be large as the factor depends very heavily on the relative prices of coal and natural gas as well as fluctuations in peak demand and renewables.

In the 2019 greenhouse gas (GHG) Conversion Factors, there was a 10% decrease in the UK Electricity $CO2_e$ factor compared to the previous year. In the 2020 update, the $CO2_e$ factor decreased again by 9% (compared with 2019). In the 2021 update, the $CO2_e$ factor has again decreased by 9% (in comparison to the 2020 update). The above decreases are all due to a decrease in coal use in electricity generation and an increase in renewable generation.[52]

[48] https://www.legislation.gov.uk/ukpga/2008/27/section/1 (Accessed June 2021)
[49] https://www.renewableuk.com/general/custom.asp?page=WindEnergy – (Accessed June 2022)
[50] https://www.siemensgamesa.com/-/media/siemensgamesa/downloads/en/products-and-services/offshore/brochures/siemens-gamesa-environmental-product-declaration-epd-sg-8-0-167.pdf (Accessed June 2022)
[51] https://informatics.sepa.org.uk/CarbonCalculator/index.jsp - (Accessed June 2022)
[52] https://www.gov.uk/government/publications/greenhouse-gas-reporting-conversion-factors-2021 - (accessed June 2022)

The most recent emissions factor for 2021 grid mix electricity is 0.21tCO_2 per MWh.

14.3 Methodology

Once a design has been established and the excavation and construction parameters obtained, the Carbon Calculator will present results based on the input variables entered. The data delivered will inform the quantity of tCO_2 eq over its lifetime. The following activities will be calculated from the calculator:

- Losses due to turbine life (e.g. manufacture, construction, decommissioning)
- Losses due to backup
- Losses due to reduced carbon fixing potential
- Losses from soil organic matter
- Losses due to DOC & POC leaching
- Losses due to felling forestry

Although it is noted that some topics will not be applicable in a port setting such as forestry and soils.

14.4 Baseline

The Proposed Development is located within the Port of Immingham, which is primarily made ground. Ground investigation works will be undertaken to inform site works and final turbine locations.

The turbines are anticipated to have a generation capacity of up to 6MW dependent on final turbine selections with the Proposed Development consisting of 5 turbines. This generation will positively contribute to meeting local and national renewable energy targets by producing clean energy to be distributed to both the port electricity network and the local grid network.

14.5 Mitigation

Given the Proposed Development will reduce the CO_2 released by the electricity generation system as well as the avoidance of any significant removal or disturbance of peatlands, it is not considered that any mitigation will be required.

The Applicant will seek to incorporate any additional enhancements at the construction phase with their appointed contractor through the provision of a Construction and Environmental Management Plan (CEMP), to be agreed during the discharging of planning conditions. The document will be produced in line with best practice guidance and appropriate consultation with key stakeholders.

14.6 Summary

Given the current challenges to deliver net-zero, it is considered that the Proposed Development will deliver an overall positive effect on carbon savings, contributing to the decarbonisation of the electricity sector - there will be low levels of emissions produced during construction and net emissions savings over the life of the turbines. Therefore, the Carbon Balance should be **scoped in** to the EIA.

14.7 Key Questions for Council and Consultees

- Q14/1 Do the Council and consultees agree with the proposed methodology?
- Q14/2 Do the Council and Consultees have any further information that would assist in the preparation of the assessments?

- **Q14/3** Do the Council or consultees agree that Scottish guidance should be used in lieu of English specific guidance?

15 Topics out of scope for ES

15.1 Introduction

This section of the Scoping Report sets out the proposed approach in respect to the 'Other Issues' assessments that are required in order to provide a comprehensive assessment of the potential environmental impacts of the Proposed Development.

Other Issues include:

- Air Quality;
- Population and Human Health;
- Major Accidents and Disasters;
- Traffic and Transport;
- Material Assets; and
- Vibration

15.2 Air Quality

The Proposed Development will reduce demand for fossil fuels electricity generation and will support the transition to a low carbon energy system. The Site is not located near an Air Quality Management Area and operational emissions to air, water and soil are anticipated to be negligible given the nature of the Proposed Development. The only likely emission to the air caused by the Proposed Development would be from construction. Given the industrial nature of the Site close to the urban fringes and the potential access routes to be used, construction of the Proposed Development is not considered to lead to a significantly increased traffic level that would significantly impact on local air pollution levels that would approach any relevant limit values.

A construction environmental management plan (CEMP) will be prepared and agreed with the Council prior to construction commencing. The CEMP will contain standard industry good practice mitigation regarding emissions during construction that will be put into practice. No significant air quality effects are anticipated, and it is proposed that an assessment of air quality impacts is **scoped out** of the EIA.

15.3 Population and Human Health

The Proposed Development will be designed and maintained in accordance with all relevant industry guidelines, standards and regulations including those pertaining to safeguarding the risk to human health. This includes the design and siting of wind turbines at an appropriate distance from sensitive receptors such as roads, core paths and residences. This will minimise the risk to human health during operation. Risks associated with ice build-up, lightning strike and structural failure are removed or reduced through the wind turbine manufacture and guidance on construction procedures.

As the Proposed Development is a non-emitting development, it is considered that it will not present a risk to human health from an emissions perspective. There will be some greenhouse gas and dust emissions during construction and decommissioning, but appropriate air quality and dust management measures will be put in place via the CEMP. As a result, emissions from the Proposed Development are not considered to present a risk to human health.

There is potential for impacts to the local population in relation to amenity. These will be included as part of the relevant assessments and reported accordingly. This includes the following:

- Visual Impacts (landscape and visual impact assessment);
- Residential and Settlements (landscape and visual impact assessment);
- Noise;
- Shadow Flicker;
- Private Water Supplies (Hydrology and Hydrogeology chapter); and
- Traffic and Transportation.

Given the absence of potential significant effects on human health from emissions and the capture of other population and human health issues in other technical assessments, a stand alone Population and Human Health chapter is proposed to be **scoped out** of the EIA.

15.4 Major Accidents and Disasters

The EIA Regulations state that an EIA must identify, describe and assess in an appropriate manner, the expected effects deriving from the vulnerability of the Proposed Development to risks, so far as relevant to the Development, of major accidents and natural disasters.

Renewable energy development has an exemplary safety record, with stringent best practice guidance to minimise risk during the construction, operation and decommissioning phases of the Proposed Development.

During the construction phase, the Site will be under supervision of a suitably qualified team, governed by Health and Safety legislation and best practices. This will include the induction of all staff to the Site and publication of all appropriate H&S practices applicable to the working site.

Climate change is considered in **Section 14** this Scoping Report. It is considered that the Proposed Development will deliver an overall positive effect on carbon savings and will contribute to the decarbonisation of the electricity sector.

Flood risk will be addressed in the Hydrology and Hydrogeology assessment of the ES.

Given the Proposed Development is not located in an area that is known to be prone to natural disasters, and climate change and flooding risk will be covered in other chapters, it is considered that a stand alone chapter for this topic is not required and is therefore **scoped out** of the EIA.

15.5 Traffic and Transport

Wind turbine components will be delivered directly to Port. While there will be a requirement to move the turbines this will mostly be done within the port operated road infrastructure. There will be a need to bring other construction materials to the site but given the day to day operations in and around the port estate it is not considered that this will give rise to a significant increase in traffic movements within the local region. As such it is proposed that this topic is **scoped out** of the ES.

15.6 Vibration

Vibration impacts during the construction of a wind turbine are generally ruled out beyond 100m from the construction zone. Given the current operations at the port and the distance from the nearest local receptors and the potential construction site, it is considered that a stand alone chapter for this topic is not required and is therefore **scoped out** of the EIA.

15.7 Material Assets

Considering the nature and scale of the Proposed Development, significant effects on material assets are not anticipated. The manufacturing or construction of the Proposed Development is not anticipated to result in significant use of primary or secondary materials. There would be negligible waste generation during construction, and this would be reduced through controls to minimise material use and water generation which will be included within a CEMP which will be prepared and implemented prior to construction commencing. During operation, material resource use and waste generation is anticipated to also be negligible and concern routine maintenance of the wind turbines only. As such, it is therefore proposed that this topic is **scoped out** of the ES.

15.8 Key Questions for Council and Consultees

- **Q15/1** Do the Council and consultees agree to scope out the above aspects?
- **Q15/2** Are there any other elements/assessments not noted within the Scoping Report that the Council/consultees think should be included?

16 Summary of Effects

The scoping report has set out a number of key environmental topics which will be considered during the EIA process. Within the scoping report it has been proposed to scope these assessment areas either 'in' or 'out' of further assessment as part of the EIA process. These key topics and the assessments and whether they require to be scoped into or out of the EIA assessment is outlined in Table 16.1.

Table 16.1 – Summary of assessments to be scoped 'in' or 'out' of EIA.

Topic	Assessment	Scoped into EIA?
Landscape and Visual	Potential impacts on landscape character	Yes
	Potential impacts on landscape designations	Yes
	Visual assessment of settlements within 15km	Yes
	Visual assessment of main transport routes	Yes
	Cumulative landscape visual assessment	Yes
	Viewpoint Analysis	Yes
	Cumulative viewpoint analysis	Yes
Cultural Heritage and Archaeology	Indirect Impact Assessment on setting and character of known cultural sites out with the site boundary.	Yes
	Direct impacts on features within the site boundary	Yes
	Indirect impacts on features within the site boundary	Yes
	Selected viewpoint assessment to assess setting and impact on key features/views.	Yes
Noise	Construction phase noise assessment	No
	Operational phase noise assessment	Yes
Hydrology and Hydrogeology	Potential Impacts on sensitive water courses	Yes
	Potential Impacts on SSSI, SAC, SPA and Ramsar Sites	Yes
	Potential impacts on Ground Water Dependent Terrestrial Eco-Systems (GWDTE)	Yes
	Potential Impacts on Water Supplies	Yes
	Potential impact on Flood Risk	Yes
Ecology	Habitat Survey	Yes
	Protected species surveys (Bat Survey)	Yes
Ornithology	Vantage point survey	Yes
	Walkover breeding bird survey	Yes
	Foreshore surveys	Yes
	Surveys of functionally linked land	Yes

	An assessment of the potential impacts of the wind turbines during construction, operation, and decommissioning phases of the project, including cumulative impacts in combination with other wind farm sites	Yes
	Collision risk modelling for target species	Yes
Shadow Flicker	Shadow flicker impact assessment	Yes
Aviation and Radar	Radar assessment to be undertaken alongside consultation with key stakeholders including Humberside Airport, NATS and MOD	Yes
Telecommunications	Assessment of potential impacts on telecommunication infrastructure will be undertaken	Yes
Carbon Balance	An assessment of the overall carbon balance of the Proposed Development will be undertaken.	Yes
	Adaptability for Climate Change	Yes
Other Topics	Impacts on air quality during construction and operation	No
	Potential impacts on human health and Population are generally covered in individual topic areas.	No
	Assessment of potential for major accidents and disasters.	No
	Impact on material assets.	No
	Traffic and Transport impact assessment.	No
	Vibration	No

Abbreviations/Acronyms

ABP	Associated British Ports
AM	Amplitude Modulation
BGS	British Geological Survey
CAA	Civil Aviation Authority
CEMP	Construction and Environmental Management Plan
CIEEM	Chartered Institute of Ecology and Environment Management
CLVIA	Cumulative Landscape and Visual Impact Assessment
CNS	Communications, Navigations and Surveillance
COP26	Conference of the Parties held in Glasgow
CZTV	Cumulative Zone of Theoretical Visibility
dB	Decibels
DECC	Department of Environment and Climate Change
EA	Environmental Agency
EIA	Environmental Impact Assessment
ES	Environmental Impact Assessment Report
EPS	European Protected Species
GCR	Green Cat Renewables
GHG	Greenhouse Gas
GPG	Good Practice Guide
GWD	Groundwater Directive
GWDTE	Ground Water Dependent Terrestrial Ecosystems
HELM	Historic Environment Local Manager
HER	Historic Environment Record
IoA	Institute of Acoustics
LBs	Listed Buildings
LCA	Landscape Character Areas
LCT	Landscape Character Types
LERC	Lincolnshire Environmental Records Center
LoLo	Load on Load off
LPA	Local Planning Authority
LVIA	Landscape and Visual Impact
MOD	Ministry of Defence
NALs	Noise Assessment Locations

NCA	National Character Area
NELLP	North East Lincolnshire Local Plan
NPPF	National Planning Policy Framework
NSRs	Noise Sensitive Receptors
PSR	Primary Surveillance Radar
PWS	Private Water Suppliers
RIGS	Regionally Important Geological Sites
RoRo	Roll on Roll off
SAC	Special Area of Conservation
SL	Single Lens Reflex Camera
SM	Scheduled Monuments
SO	Strategic Objectives
SPA	Special Protection Areas
SSSI	Sites of Special Scientific Interest
TES	Trailing Edge Serration
UKBAP	UK Biodiversity Action Plan
UKHAB	UK Habitat Classification System
WFD	Water Framework Directive
ZTV	Zone of Theoretical Visibility

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