Warren Field Single Turbine
Supporting Information: Environmental Report
Spencer Warren Ltd

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1. Introduction

1.1 Project Description

Site Context

1.1.1 LFC Horkstow Limited proposes to erect a single wind turbine at Warren Field, Horkstow, North Lincolnshire (National Grid Reference NGR: SE 98260, 19700) hereafter named 'the site' (Figure 1.1). The site is situated in a predominantly agricultural setting and is approximately 0.16 ha in size. The town of South Ferriby and the Humber Estuary are situated approximately 1.4 km and 1.6 km north of the site respectively.

1.1.2 The site comprises an arable field that slopes steadily from east to west, lying between 21 m Above Ordnance Datum (AOD) and approximately 5 m AOD. The site is bounded to the north, west and south by drainage ditches, and to the east by Main Street/Horkstow Road (B1204). Arable fields are adjacent to the site in each direction (Figure 1.1).

1.1.3 A small wooded area extends northwards from the site's southern boundary. An access track leads from Hall Farm, immediately south-east of the site, along the southern boundary then along the western side of the wooded area. Two high voltage electricity transmission lines cross the site with a lower voltage electricity distribution line also present.

Proposed Scheme

1.1.4 The proposal is to construct and operate an onshore wind turbine of output power capacity up to approximately 400 kiloWatts (kW).

1.1.5 The proposed scheme requires planning permission under the Town and Country Planning Act 1990. However, the scheme is not considered to fall within the scope of the Environmental Impact Assessment (EIA) (England) Regulations 2011 and no EIA is required.

1.1.6 The scheme comprises the following:

- a wind turbine and associated infrastructure including foundation, transformer and crane hardstanding area;
- access track;
- a new external compact housing with underground cabling to the turbine; and
- a connection to the existing 11 kiloVolt (kV) network passing through the site including underground cabling.

1.1.7 The proposed layout of the above turbine and infrastructure is shown in Figure 1.2. Table 1.1 below provides the proposed turbine location.

Table 1.1: Proposed turbine location

Turbine No.	OS Easting	OS Northing	Height of Base AOD* (m)
1	498260	419700	*c.* 5.7

1.1.8 As the continual refinement of the scheme will extend into the construction phase, it is established best practice to seek agreement for the micrositing of the turbine and other infrastructure within 20 m of the approved location in order to avoid any poor localised ground conditions or sensitivities. This will not affect the conclusions of any of the technical assessments.

1.1.9 The preferred turbine provisionally selected has a maximum hub height of up to 40 m, rotor diameter 34 m and a maximum tip height to blade tip of 57 m. The final selection of turbine depends upon the technology available at the time of construction, statutory requirements of tendering, project economics and the desired output from the scheme. All assessments have evaluated the effects by making worst-case assumptions regarding the scheme characteristics.

1.1.10 Foundations for turbines of the size under consideration are typically 10 m by 10 m in plan and 1.2 m in depth, constructed of steel reinforced concrete according to a detailed design following a geotechnical investigation. Concrete will be brought to the site ready-mixed.

1.1.11 Extensions to existing farm access tracks will be constructed to a width suitable for carrying the turbine components, which is expected to be approximately 4 m in width. The required crane hardstanding is typically 20 m by 20 m. Stone for the tracks and the crane hardstanding will be brought to the site from local quarries where possible.

1.1.12 Subject to agreement with North Lincolnshire Council (NLC), the turbine will be an pale grey colour, with a semi-matt finish, to minimise visual effects.

1.1.13 The external compact housing typically measures 2.5 m by 2.5 m and will be raised above the maximum flood level.

1.1.14 The turbine rotor will face into the wind and the maximum rotation speed will be approximately 18-45 revolutions per minute (variable). The construction period is expected to last approximately 16 weeks.

1.1.15 It is anticipated that the turbine will be connected to the grid *via* a new low voltage connection with the existing nearby 11 kV network.

1.1.16 Consent is sought from NLC for a period of operation of 25 years from the time the first electricity is exported to the national grid. After this period, the turbines and associated infrastructure will either be removed to below ground level or, alternatively, a Planning Application could be submitted to extend the life of the scheme.

1.2 Report Contents

1.2.1 This Supporting Information (SI) forms part of the Planning Application for the proposed scheme and is intended to provide the NLC with sufficient information to

identify and consider the significant environmental effects of the scheme and to determine the Planning Application.

1.2.2 In this chapter, a description of the project is provided, which forms the basis of the assessments of environmental effects that are described in subsequent chapters. Potential effects in the following categories have been assessed are:

Chapter 1: Introduction
Chapter 2: Planning Policy
Chapter 3: Landscape and Visual Assessment
Chapter 4: Ecology and Nature Conservation
Chapter 5: Noise
Chapter 6: Flood Risk
Chapter 7: Archaeology and Heritage
Chapter 8: Climate Change

2. Planning Policy

2.1 Introduction

2.1.1 This chapter outlines relevant aspects of planning policy in relation to the proposed scheme. Sources include the Development Plan (North Lincolnshire Council, 2003) and Government Energy Policy and guidance relevant to the application area and other local planning policies. In addition this section considers other material considerations to be taken into consideration during the determination process including national and local planning and energy policy.

2.2 Development Plan

2.2.1 The Planning and Compulsory Purchase Act 2004, Section 38(6) states that:

"In dealing with such an application the authority shall have regard to the provisions of the development plan, so far as material to the application, and to any other material considerations."

2.2.2 On 6th July 2010, all Regional Strategies, including the East Midlands Regional Spatial Strategy (RSS), were revoked under Section 79(6) of the Local Democracy Economic Development and Construction Act 2009[1]. As such the Development Plan that covers the application area is the North Lincolnshire Local Plan (NLLP) (North Lincolnshire Council, 2003) adopted in May 2003. Its aim is:

"To improve and enhance the environment of North Lincolnshire by enabling development to be undertaken in the most economically, socially and environmentally sustainable way."

2.2.3 The Development Plan is the key consideration in determining Planning Applications. Relevant sections of the NLLP (NLC, 2003) are outlined in brief below.

Landscape and Visual Effects

2.2.4 **Policy LC7 Landscape Protection** states that "*where development is permitted within rural settlements or within the local countryside, special attention will be given to the protection of the scenic quality and distinctive local character of the landscape. development which does not respect the character of the local landscape will not be permitted".*

2.2.1 **Policy LC8 Areas of High Landscape Value** states that "*the following Areas of High Landscape Value will be retained:*

1) *Lincoln Edge Cliff between Whitton and Flixborough,*

2) *Lincoln Edge Woodland and Heathland areas, east of Scunthorpe and extending south to Kirton in Lindsey, and*

3) *Wold villages scarp slope."*

2.2.2 **Policy LC10 Development in Areas of High Landscape Value** states that *"Proposals for development in Areas of High Landscape Value, existing or*

[1] http://www.legislation.gov.uk/ukpga/2009/20/pdfs/ukpga_20090020_en.pdf

proposed, will be subject to special scrutiny. development will only be permitted where it is sensitively related to the distinctive local character of the landscape and where:

i) there is no adverse impact on the special scenic quality of the landscape;

ii) the development is required to meet the social and economic needs of rural communities or is for appropriate small scale tourist and recreational facilities;

iii) the development is appropriately sited and is of a high standard of design and uses materials reflecting the traditional character of buildings in the area and the surrounding landscape, and

iv) there is no loss of features important to the local landscape including trees, copses, woodlands, hedges and ponds".

2.2.3 **Policy LC12 Protection of Trees, Woodland and Hedgerows** states that *"proposals for all new development will, wherever possible ensure the retention of trees, woodland and hedgerows. Particular regard will be given to the protection of these features within the setting of settlements, the protection of ancient woodlands and historic hedgerows and the amenity value of trees in built up areas. Tree preservation orders will be made where trees which contribute to local amenity or local landscape character are at risk. Landscaping and tree and hedgerow planting schemes will be required to accompany applications for new development where it is appropriate to the development and setting".*

Ecology

2.2.4 **Policy LC 1 Special Protection Areas, Special Areas of Conservation and Ramsar Sites**. Proposals for development which may affect a Special Protection Area (SPA), a proposed SPA (pSPA), a Special Area of Conservation (SAC) or candidate SAC (cSAC) will be "*assessed according to their implications for the site's conservation objectives. Proposals not directly connected with, or necessary for, the site, and which are likely to have an significant effect on the site (either individually or in combination with other proposals), will not be permitted unless it can be conclusively demonstrated that:*

i) there is no alternative solution; and

ii) there are imperative reasons of overriding public interest for the development.

2.2.5 *Where the site hosts a priority natural habitat type or a priority species, proposals will not be permitted unless it can be conclusively demonstrated that it is necessary for reasons of human health or public safety, or for consequences of primary importance for nature conservation.*

2.2.6 *Where such a development does proceed, the use of conditions or planning obligations to secure all compensatory measures necessary to comply with Article 3 of the EEC Habitats and Species Directive will be considered".*

2.2.7 **Policy LC 2: Sites of Special Scientific Interest and National Nature Reserves**. This policy states that any development deemed to potentially affect a Site of Special Scientific Interest (SSSI) will be subject to "*special scrutiny"* and will not be permitted unless the benefits of the development can be proven to outweigh the environmental benefits of the SSSI.

2.2.8 **Policy LC 3: Development Affecting Sites of Local Nature Conservation Importance.** This policy seeks to protect several local designations including Local Nature Reserves (LNRs), Sites of Importance for Nature Conservation (SINCs) or a Regionally Important Geological Site (RIGS). Any development deemed to adversely affect such designations will be required to demonstrate that the need for the development clearly outweighs the need to safeguard the designation. In the event development is permitted, it is likely that planning conditions will be imposed to ensure any adverse effects are kept to a minimum.

2.2.9 **Policy LC 5: Species Protection**. The development will not be granted consent if it is predicted to have an adverse impact on badgers or species protected under the Wildlife and Countryside Act 1981. In the event that a development is permitted and may have some adverse effects on the aforementioned species, conditions will be imposed to minimise any effects.

Noise

2.2.10 **Policy DS 11: Polluting Activities**. This policy states that planning permission will only be granted for developments which can demonstrate that levels of pollution, including noise, do not "*create adverse environmental conditions likely to affect nearby development or adjacent areas*".

Flood Risk

2.2.11 **Policy DS 14: Foul Sewage and Surface Water Drainage**. This policy states that the Council will require the developer to ensure adequate steps are taken to dispose of any surface water generate by the development.

2.2.12 **Policy DS 16: Flood Risk**. This policy highlights that the Planning Authority will not grant planning consent if a development situated on a flood plain is deemed to result in the following:

- *"Increase the number of people or buildings at risk; or*
- *Impede the flow of floodwater; or*
- *Impede the access for the future maintenance of watercourses; or*
- *Reduce the storage capacity of the floodplain; or*
- *Increase the risk of flooding elsewhere; or*
- *Undermine the integrity of existing flood defences."*

Archaeology and Heritage

2.2.13 **HE2 Development in Conservation Areas**. This policy states "*All development proposals in, or which affect the setting of, Conservation Areas should preserve or enhance the character and appearance of the area and its* setting" and provides a list of criteria to be applied in determining applications for development in Conservation Areas.

2.2.14 **Policy HE 5: Development Affecting Listed Buildings**. This policy states that any development which is deemed to adversely affect the setting of a listed building will not be granted planning permission.

2.2.15 **Policy HE 8: Ancient Monuments.** This policy advises that a development will not gain planning consent if it is considered to result in a detrimental effect on a

Scheduled Ancient Monument (SAM) or other nationally important monuments, including its setting.

2.2.16 **Policy HE 9: Archaeological Evaluation**. This policy requires an archaeological assessment to be undertaken for land that is known, or suspected, to have archaeological importance prior to submission.

2.2.17 In addition the following policies have relevance to archaeology and heritage assessment which have previously been outlined; LC1, LC7. The following policies have relevance to archaeology and heritage.

2.2.18 **Policy LC11 Areas of Amenity Importance:** This policy describes how the Council will seek to protect Areas of Amenity Importance.

2.2.19 **Policy LC13 relates to Parks, Gardens and Landscapes of Special Historic Interest** and states that *"the character and features of parks and gardens of historic or landscape interest will be preserved and enhanced. Development within or adjacent to those listed in the Register of Parks and Gardens of Special Historic Interest, which is maintained by English Heritage, will not be permitted if this would adversely affect their special historic character and appearance or their setting. Where development is permitted the use of conditions or planning obligations to ensure the protection and enhancement of special features will be sought."*

2.2.20 **Policy LC14 Area of Special Historic Landscape** Interest relates to the Isle of Axholme as an area of Special Historic Landscape Interest and states that within this area, development will not be permitted which would destroy, damage or adversely affect the character, appearance or setting of the historic landscape, or any of its features.

2.2.21 Policy LC15 relates to the need for Landscape Enhancement which can result in the creation of new and informal landscape areas, wildlife habitats and improved surroundings for historic buildings and features. They are also important in screening visually intrusive developments, particularly in the open countryside.

2.2.22 **North Lincolnshire Council Supplementary Planning Guidance:** North Lincolnshire Council has published a range of Supplementary Planning Guidance (SPG), including a Landscape Character Assessment and a Countryside Design Summary (adopted jointly as SPG 5). These policies provide guidance on design in the countryside and managing potential impact of development on trees.

2.2.23 The guidance contained in Supplementary Planning Guidance (SPG 3) Design in the Countryside, provides information as to the design of rural buildings (focussed on farm and residential development) and broad guidelines with reference to the development of landscape schemes.

2.2.24 The guidance on trees and development consists of a series of fourteen guidance notes adopted together in 2003 as SPG 11 Trees and Development. The SPG provides a range of information to guide developers as to the implications of their proposals upon trees. It should be noted that the revised British Standard *'BS5837:2005 Trees in relation to construction'* contains information that supersedes some of the provisions made in SPG 11.

Other Issues

Policy ST 3: Development Limits

2.2.25 The application area is covered by Policy ST 3 of the NLLP, which states that the development will only be granted planning consent if it can be shown to be "*essential for the purposes of agriculture, forestry or to meet a special need associated with the countryside*" and "*only development that has an essential and functional need to be located in the countryside, will be appropriate*".

2.2.26 The nature of this scheme is that it requires a countryside location. Wind turbines have numerous requirements which dictate the areas within which they can be located. Principally wind turbines require to be located within areas which have:

- suitable wind speed;
- are free from obstruction that would affect wind flow;
- large amount of available land (turbines will generally require an area in the region of up to 6 times the rotor diameter by 4 times the rotor diameter);
- suitable road network for turbine component deliveries;
- suitable ground conditions to support the structures;
- availability of grid connection, and
- are suitable separation from residential property to avoid noise effects.

2.2.27 An urban environment would not be appropriate and its location in the countryside enables access to all of the above, making the application area suitable for the development. This demonstrates the need for the turbine to be sited in open countryside, and it is therefore considered to comply with Policy ST 3 of the NLLP.

Policy DS 21: Renewable Energy

2.2.28 The nature of the proposed scheme means that Policy DS 21: Renewable Energy is applicable which states that the Planning Authority will look to grant planning permission for renewable energy projects. However the environmental benefits of such development should outweigh any detrimental effects.

2.2.29 The proposed scheme will increase the region's renewable energy generation capacity, and the benefits are discussed in detail in Chapter 8.

2.3 Material Considerations

2.3.1 There are a range of material considerations that will be taken into account when determining this application. This section sets out National Planning Policy and Guidance and local Supplementary Planning Guidance that is considered to be material in the consideration and determination of this Planning Application.

2.3.2 In 2003, the Energy White Paper[2] was published which announced a goal to cut CO_2 emissions by 2050 with "real progress" by 2020. The 2006 Energy Review[3] contains a 'Renewables Statement of Need', which states:

"Renewable energy as a source of low-carbon, indigenous electricity generation is central to reducing emissions and maintaining the reliability of our energy supplies at a time when our indigenous fossil fuels are declining more rapidly than expected. A regulatory environment that enables the development of appropriately

[2] "Our Energy Future – Creating a Low Carbon Economy"
[3] "The Energy Challenge Energy Review Report" The Department of Trade and Industry, July 2006.

sited renewable projects, and allows the UK to realise its extensive renewable resources, is vital if we are to make real progress towards our challenging goals.

New renewable projects may not always appear to convey any particular local benefit, but they provide crucial national benefits. Individual renewable projects are part of a growing proportion of low-carbon generation that provides benefits shared by all communities both through reduced emissions and more diverse supplies of energy, which helps the reliability of our supplies. This factor is a material consideration to which all participants in the planning system should give significant weight when considering renewable proposals. These wider benefits are not always immediately visible to the specific locality in which the project is sited. However, the benefits to society and the wider economy as a whole are significant and this must be reflected in the weight given to these considerations by decision makers in reaching their decisions".

Climate Change Act 2008

2.3.3 In 2008, the Government reiterated its commitment to cut the UK's carbon emissions by adopting the Climate Change Act in November 2008, which sets a target for the UK to reduce carbon emissions to 80 % below 1990 levels by 2050. It also set an interim target of a 34 % reduction by 2020 (with the potential to increase this to a 42 % cut given an international agreement) and established the concept of carbon budgets.

2.3.4 The European Union has set targets and policies that extend beyond the original ambition of the Kyoto Protocol. The European Climate Change Programme (ECCP) outlines a climate change strategy to help prevent temperatures from increasing to more than 2°C above pre-industrial levels. The ECCP's strategy, agreed by the Council of Ministers in Spring 2007, sets three targets to be reached by 2020:

- Greenhouse gas emissions cut by 20 % from 1990 levels (or by 30 % in the event of an adequate international agreement).
- Energy efficiency Improve by 20 %.
- Energy from renewable sources Increase to 20 % of all energy[4].

2.3.5 To achieve these targets, different policy measures have been adopted in the UK. The UK has signed up to the EU Renewable Energy Directive, which includes a UK target of 15 % of energy from renewables by 2020. This target is equivalent to a seven-fold increase in UK renewable energy consumption from 2008 levels: the most challenging of any EU Member State.

Renewable Energy Strategy 2009

2.3.6 Following the major consultation on the Renewable Energy Strategy in 2008, the Department of Energy and Climate Change has published a Renewable Energy Strategy in 2009. This strategy sets out roles to play in promoting renewable energy, from individuals to communities to businesses.

2.4 National Planning Policy

2.4.1 On 27th March 2012 the Government published its National Planning Policy

[4] http://www.carbontrust.co.uk/policy-legislation/international-frameworks/european-union-policy/pages/europeanunionukpolicy.aspx

Framework (NPPF) which came into force with immediate effect and sets out the Government's planning policies for England. The NPPF must be taken into account in the preparation of local and neighbouring plans and is a material consideration in planning decisions as stated in Paragraph 2:

"Planning law requires that applications for planning permission must be determined in accordance with the development plan, unless material considerations indicate otherwise. The National Planning Policy Framework must be taken into account in the preparation of local and neighbourhood plans, and is a material consideration in planning decisions. Planning policies and decisions must reflect and where appropriate promote relevant EU obligations and statutory requirements".

2.4.2 The NPPF constitutes guidance for LPAs and decision-takers both in drawing up Local Plans and as a material consideration in determining Planning Applications.

2.4.3 The key focus of the NPPF is a presumption in favour of sustainable development with three dimensions; economic, social and environmental all of which give rise for the planning system to undertake the following roles:

- *"an economic role – contributing to building a strong, responsive and competitive economy, by ensuring that sufficient land of the right type is available in the right places and at the right time to support growth and innovation; and by identifying and coordinating development requirements, including the provision of infrastructure;*
- *a social role – supporting strong, vibrant and healthy communities, by providing the supply of housing required to meet the needs of present and future generations; and by creating a high quality built environment, with accessible local services that reflect the community's needs and support its health, social and cultural well-being; and*
- *an environmental role – contributing to protecting and enhancing our natural, built and historic environment; and, as part of this, helping to improve biodiversity, use natural resources prudently, minimise waste and pollution, and mitigate and adapt to climate change including moving to a low carbon economy."*

2.4.4 The NPPF provides the following set of core land-use planning principles relevant to this application that should underpin both plan-making and decision-taking:

- *"be genuinely plan-led, empowering local people to shape their surroundings, with succinct local and neighbourhood plans setting out a positive vision for the future of the area. Plans should be kept up to date, and be based on joint working and cooperation to address larger than local issues. They should provide a practical framework within which decisions on planning applications can be made with a high degree of predictability and efficiency;*
- *take account of the different roles and character of different areas, promoting the vitality of our main urban areas, protecting the Green Belts around them, recognising the intrinsic character and beauty of the countryside and supporting thriving rural communities within it;*
- *support the transition to a low carbon future in a changing climate, taking full account of flood risk and coastal change, and encourage the reuse of existing resources, including conversion of existing buildings, and encourage the use of renewable resources (for example, by the development of renewable energy);*

- *contribute to conserving and enhancing the natural environment and reducing pollution. Allocations of land for development should prefer land of lesser environmental value, where consistent with other policies in this Framework;*
- *conserve heritage assets in a manner appropriate to their significance, so that they can be enjoyed for their contribution to the quality of life of this and future generations;*
- *take account of and support local strategies to improve health, social and cultural wellbeing for all, and deliver sufficient community and cultural facilities and services to meet local needs."*

2.4.5 The NPPF outlines 13 principles for delivering sustainable development, the most relevant to which for this Application are provided below:

- building a strong, competitive economy;
- supporting a prosperous rural economy;
- requiring good design;
- promoting healthy communities;
- meeting the challenge of climate change, flooding and coastal change;
- conserving and enhancing the natural environment, and
- conserving and enhancing the historic environment.

2.4.6 Details of each of these principles are given in the relevant technical chapters throughout the ES.

2.4.7 The NPPF strengthens policies The NPPF also states that "*Local planning authorities should seek opportunities to achieve each of the economic, social and environmental dimensions of sustainable development, and net gains across all three. Significant adverse impacts on any of these dimensions should be avoided and, wherever possible, alternative options which reduce or eliminate such impacts should be pursued. Where adverse impacts are unavoidable, measures to mitigate the impact should be considered. Where adequate mitigation measures are not possible, compensatory measures may be appropriate*".

2.4.8 The NPPF strengthens policies in relation to the rural economy with development and diversification of all land-based rural businesses to be promoted, not only agriculture.

2.4.9 With respect to planning decisions the LPA should "*look for solutions rather than problems, and decision-takers at every level should seek to approve applications for sustainable development where possible. Local planning authorities should work proactively with applicants to secure developments that improve the economic, social and environmental conditions of the area*".

2.4.10 In determining Planning Applications the LPA "*should apply the presumption in favour of sustainable development*". With regard to planning conditions and obligations the LPA "*should consider whether otherwise unacceptable development could be made acceptable through the use of conditions or planning obligations. Planning obligations should only be used where it is not possible to address unacceptable impacts through a planning condition*".

2.4.11 Paragraphs 96 and 97 of the NPPF include provision to help increase the use and

supply of renewable and low carbon energy. Local planning authorities "*should recognise the responsibility on all communities to contribute to energy generation from renewable or low carbon sources. They should:*

- *have a positive strategy to promote energy from renewable and low carbon sources;*
- *design their policies to maximise renewable and low carbon energy development while ensuring that adverse impacts are addressed satisfactorily, including cumulative landscape and visual impacts;*
- *consider identifying suitable areas for renewable and low carbon energy sources, and supporting infrastructure, where this would help secure the development of such sources;*
- *support community-led initiatives for renewable and low carbon energy, including developments outside such areas being taken forward through neighbourhood planning; and*
- *identify opportunities where development can draw its energy supply from decentralised, renewable or low carbon energy supply systems and for co-locating potential heat customers and suppliers*".

2.4.12 When determining planning applications, local planning authorities "*should:*

- *not require applicants for energy development to demonstrate the overall need for renewable or low carbon energy and also recognise that even small-scale projects provide a valuable contribution to cutting greenhouse gas emissions; and*
- *approve the application if its impacts are (or can be made) acceptable. Once suitable areas for renewable and low carbon energy have been identified in plans, local planning authorities should also expect subsequent applications for commercial scale projects outside these areas to demonstrate that the proposed location meets the criteria used in identifying suitable areas."*

2.4.13 The NPPF states that "*planning obligations should only be sought where they meet all of the following tests:*

- *necessary to make the development acceptable in planning terms;*
- *directly related to the development; and*
- *fairly and reasonably related in scale and kind to the development*".

Planning conditions should only be imposed where they are necessary, relevant to planning and to the development to be permitted, enforceable, precise and reasonable in all other respects".

2.4.14 Where Section 106 obligations are being sought or revised, LPAs should take account of changes in market conditions over time and where appropriate, be sufficiently flexible to prevent planned development being stalled.

2.4.15 Whilst the NPPF consolidates and supersedes previous policy statements, circulars and guidance documents there are exceptions as listed on Annex 3 of the NPPF. In addition technical guidance on flood risk will be published alongside the NPPF. Some key circulars such as Circular 11/95 remain unaltered.

2.4.16 Due to the recent implementation of the NPPF there are also circumstances where

technical advice and best practice methodology contained within individual Planning Policy Statements has not been superseded by new technical guidance notes. Where this is relevant to individual disciplines and does not conflict with the approach set out in the NPPF then individual chapters have been undertaken with reference to these methodologies as detailed in the relevant technical chapter.

3. Landscape and Visual Amenity

3.1 Introduction

3.1.1 This chapter appraises the existing landscape, identifies the locations from which the proposed wind turbine is likely to be visible, considers the sensitivity of the landscape and visual receptors and the magnitude and significance of landscape and visual impacts as a result of the proposed scheme. The assessment is based on a study area derived from a 20 km radius search area, in accordance with best practice guidance for turbines 51-70 m in height (The Landscape Institute and Institute of Environmental Management, 2002). The extent of the study area is illustrated by Figure 3.1.

3.2 Methodology

Consultations

3.2.1 North Lincolnshire Council Planning and Environment teams were consulted during the assessment to discuss potential landscape and visual sensitivities, the study area, cumulatives and viewpoint locations.

3.2.2 A review of English Heritage (EH) data including listed buildings and Scheduled Ancient Monuments (SAMs), Natural England National Landscape Character Areas (NLCAs) and North Lincolnshire Local Landscape Character Areas (LLCAs) was carried out.

Overview

3.2.3 The assessment of landscape impacts and visual impacts has been carried out separately although the results of one inform the other. Landscape impacts are the changes to individual landscape elements and characteristics and the resulting effect on the landscape character. This includes impacts on recreational use of the site and adjacent green space. Visual impacts are changes in the visual amenity of the visual receptors.

3.2.4 The methodology used to carry out the landscape and visual appraisal of the proposed scheme is based upon that set out in Guidelines for Landscape and Visual Impact Assessment by The Landscape Institute and Institute of Environmental Management, 2002).

Baseline Assessment

3.2.5 Baseline assessment involved the recording and analysing of information about the site and its context in terms of landscape character, visibility of the site, existing views, sensitivity of landscape and visual receptors and potential for enhancement.

3.2.6 The landscape baseline study also included assessing the character of the landscape from map data and site surveying. Landscape designations in the vicinity of the site were identified during this process.

3.2.7 The visual baseline identified an approximate extent of visibility of the site and potential key viewpoints by viewing existing map data. The visibility of the site and key viewpoints were confirmed on site and a photographic record was completed showing existing views from the key viewpoints.

Assessment of Effects

3.2.8 This stage involved an assessment of the predicted significance of change experienced by the identified landscape and visual receptors as a result of the proposed scheme.

3.2.9 Whilst an EIA is not required for this scheme, the standard EIA assessment methodology was largely used to ensure the robustness of the assessment. A significant impact or effect has been defined in this assessment as *moderate/substantial* or *substantial.* The conclusions of the assessment are the determination of whether the likely effects of the construction and operation of the proposed turbine on landscape resource and visual amenity in the study area would be significant or not significant. Acceptability of the proposed scheme is not discussed.

3.2.10 The *significance* of landscape and visual impacts depends on the *sensitivity* of the location or viewer and the scale or *magnitude* of the changes that are predicted to occur. These key terms are defined more fully in the Appendix 3.1. Where possible, identified effects are quantified, but the nature of landscape and visual assessment requires interpretation by professional judgement and a matrix has not been used.

The Assessment of Landscape Impacts

3.2.11 Potential impacts on the overall landscape character of the site and its setting along with the individual landscape elements were identified in the desk study and their significance was then evaluated in the field according to the criteria in Table 3.1.

Table 3.1: Criteria for evaluation of landscape Impacts

Level of Significance	Description of Criteria
Substantial Adverse	Total loss of, or major alterations to, key landscape elements or characteristics and/or introduction of elements totally uncharacteristic when set within the attributes of the receiving landscape. Likely to occur where there is a major change or a noticeable change affecting the site and its setting and where the landscape character is highly distinctive and highly sensitive.
Moderate Adverse	Partial loss of, or alteration to, one or more key landscape elements or characteristics and/or introduction of elements that may be prominent but may not necessarily be considered to be substantially uncharacteristic when set within the attributes of the receiving landscape. Likely to occur where the change is moderate and relatively localised and where the landscape character is fairly distinctive and moderately sensitive.
Minor Adverse	Minor loss of, or alteration to, one or more key landscape elements or characteristics and/or introduction of elements that may not be uncharacteristic when set within the attributes of the receiving landscape. This is likely to occur when there are relatively small changes in a landscape of fairly distinctive character with moderate to low sensitivity.
Negligible	Very minor loss or alteration to one or more key landscape elements or characteristics and/or introduction of elements that are not uncharacteristic with the surrounding landscape. Likely

Level of Significance	Description of Criteria
	to occur in a landscape with indistinct character and where there are relatively small changes that can be readily absorbed within the existing landscape.
Minor Positive	Development has some potential to improve the landscape character by restoring valued characteristic features. Likely to occur where the landscape character is indistinct and positive changes are moderate or localised.
Moderate Positive	Development has the potential to fit very well with the landscape character and remove damage caused by existing land uses. Likely to occur where the landscape character is indistinct and positive changes are major and localised or noticeable changes over a wider area.

3.2.12 The assessment of visual impacts included visiting the key viewpoints identified in the baseline study. A panoramic photograph of the existing view towards the site was recorded (Viewpoint 1 Figure 3.8 and Viewpoint 2 Figure 3.9).

3.2.13 The sensitivity of visual receptors is largely dependent on their activity, as indicated in Table 3.2 below, but may also be influenced by the context of the viewpoint.

Table 3.2: Evaluating sensitivity of visual receptors

Sensitivity of Receptor	Type of Receptor
High	Residential properties, public open space and Public Right of Way (PRoW) users
Medium	Pedestrians and cyclists on roads/pavements
Low	Offices and other workplaces, motorists on the roads

3.2.14 The nature and magnitude of the likely change in view as a result of the proposed scheme was judged on site according to the criteria in Table 3.3 below.

Table 3.3: Evaluating magnitude of change to views

Magnitude of Change	Description of Criteria
High	Likely to be many viewers affected. A major change in view. Likely to be within 50 m of the development. May be open views with few foreground landscape elements.
Medium	Likely to be some viewers affected. A moderate change in view. Likely to be within about 100 m of the development. May be some foreground landscape elements to break up the view.
Low	Likely to be few viewers affected. Minor changes in view. Likely to be more than 100 m from the development. May be many foreground landscape elements breaking up the view.
Negligible	Likely to be few viewers affected. Small part of development would be visible and indistinct with very little effect on views.
None	Development not visible. View same as current.

3.2.15 The significance of the landscape and visual impacts was judged according to the criteria in Table 3.1 and 3.4 below. It should be noted that the criteria were used for guidance only and that a certain amount of professional judgement was used to determine the magnitude and significance of impacts.

Table 3.4: Evaluating significance of change in views

Significance of Change	Description of Criteria
Substantial	Would cause a significant change in the existing view. Likely to have a medium to high sensitivity and substantial magnitude.
Moderate	Would cause a noticeable change in the existing view. Likely to have a medium to high sensitivity and slight to moderate magnitude.
Minor	Would cause a barely perceptible change in existing view. Likely to have a low to medium sensitivity and slight to moderate magnitude.
None	Development not visible. View same as current.

Mitigation

3.2.16 When considering the likely effects of the proposed scheme, mitigation measures were identified to reduce, remedy or compensate for the potential landscape and visual impacts identified. The mitigation measures for the scheme are described in Section 3.5 of this report.

Limitations

3.2.17 This field survey work was carried out by visiting only land that is publicly accessible.

Graphic Techniques

3.2.18 The method used to create the photographs and wire line diagrams followed Scottish Natural Heritage's best practice guidance (Scottish Natural Heritage, 2006).

3.2.19 The photographic viewpoints have been taken by Ecus Ltd with a good quality SLR-type digital camera. As is the case with the majority of digital cameras, this camera has a picture coverage that is smaller than a 35 mm format camera. A standard lens attached to this camera will have a telephoto effect that is equivalent to 1.6 times the lens focal length so that a standard 35 mm lens provides photographs that are equivalent to a 56 mm lens used on a 35 mm format camera. This type of lens has been used for the assessment photography as it provides the closest equivalent to the 50 mm focal length that is commonly recommended in guidance for landscape and visual assessment, including Guidelines for the Assessment of Landscape and Visual Impacts (The Landscape Institute and Institute of Environmental Management, and Assessment 2002).

3.2.20 Computer generated wire line drawings were also created for four of the key viewpoints using these perspective parameters including 3D models of the proposed wind turbine. Matching computer-generated panoramas were constructed using LANDVU program (Envision, Edinburgh). The parameters for these computer generated wire line drawings were based upon the recorded viewpoint and camera details. A perspective match was achieved between the computer-generated panoramas and the photographs by iteratively adjusting the perspective parameters (particularly view cone and azimuth) until all major features in the image were aligned satisfactorily. Where landform was not sufficiently distinct to guarantee a match, additional visible features such as field boundaries or roads were digitized from OS mapping and added to the wires to ensure the computer parameters were overlaying correctly. These panoramas showed the surrounding landform based on a digital terrain model derived from the OS "Landform Profile" 10

m Digital Terrain Model (DTM) data.

3.2.21 The photographs and wire lines shown for each viewpoint illustrate a 90° included angle which represent the average human field of view. The inclusion of a 90° view is important as it allows the proposed turbine to be seen in the context of the surrounding landscape, including familiar features and components of the setting. When reproduced at A3 scale, as is the case in this appraisal, the 90° viewpoint photographs and matched wire lines should be viewed from a distance of around 25.5 cm in order to gain as accurate an impression as possible of the real effect on the views.

3.2.22 The photographs and other graphic material such as photomontages used in this appraisal are for illustrative purposes only and, whilst useful tools in the assessment, are not intended to be completely representative of what will be apparent to the human eye. The assessment is carried out on site rather than from photographs.

3.3 Baseline Conditions

Extent of the Study Area

3.3.1 Current industry guidance (Scottish Natural Heritage, 2006) for turbines 51-70 m in height to blade tip advises that the study area should be a minimum 20 km radius. Guidance also states that potentially significant effects should be assessed and a judgement has been made on the potential geographical extent of these effects based on the extent of visibility of the proposals, the distribution of landscape designations, the distribution of sensitive receptors and the pattern of cumulative wind farm developments.

3.3.2 A 20 km radius area has been used to assess NCAs and the Zone of Theoretical Visibility (ZTV). Although a more detailed study area of 10 km radius has been the focus for local character areas and nationally important heritage assets. Scottish Natural Heritage (SNH) recommendations refer to the perception of turbines diminishing significantly beyond 15 km and rotary blades are not often apparent beyond 10 km, however this is dependent on model of turbine and weather conditions.

Baseline of the Study Area

3.3.3 The site and the extent of the 20 km radius study area are shown on Figure 3.1. The study area is centred at the site of the turbine on grid reference co-ordinates 498260, 419700. The baseline study records the existing conditions of the site and study area.

3.3.4 The process of the baseline study helps gain an understanding of what makes the landscape distinctive and what are its important components, characteristics and visibility patterns. It is instrumental that the identification of landscape receptors and viewpoints to be included in the appraisal.

Landscape Context

3.3.5 The landscape conditions of the study area are described below with, firstly, an overview of the whole study area and secondly, a more specific description of the area local to the site.

3.3.6 The landscape of the study area is influenced by a number of natural processes, landscape elements and man-made land uses. The combination of these elements

and patterns has resulted in a series of Landscape Character Types (LCTs) which are described in this section and are a well recognised tool to understand the potential landscape fit of the proposed turbine.

3.3.7 The study area comprises much of North Lincolnshire (including the site itself), Kingston-upon-Hull City and parts of East Riding of Yorkshire, West Lindsey and North East Lincolnshire.

Geomorphology

3.3.8 The study area lies on the north-western edge of the Lincolnshire Wolds, north of Horkstow in the flat and low-lying valley of the River Ancholme. The Ancholme Valley is mostly a flat, open and low-lying agricultural landscape. The proximity to the Lincolnshire Wolds, and characteristic trees and copses, provide a degree of local variation and enclosure.

3.3.9 The Lincolnshire Edge chalk escarpment lies to the east of the site. The scarp forms a distinctive backbone to Lincolnshire where the underlying chalk of the Lincolnshire Wolds meets the low-lying claylands of the Humber Estuary. The underlying geology is characterised by Jurassic Clays, comprised of organic-rich claystone. The chalk escarpment was formed during the Cretaceous period. Approximately 1.5 km west of the site is the old and new River Ancholme, a tributary of the Humber Estuary. It rises south of Bishopbridge and passes through many Lincolnshire villages and the market town of Brigg before flowing north into the Humber at South Ferriby. At Brigg, the river splits into two intertwining channels, the 'Old River Ancholme' which maintains its natural course and is very narrow, except where it flows through Brigg and the man-made much wider, canalised 'New River Ancholme' following a straight course.

3.3.10 The Humber Estuary is approximately 2 km north of the site. It is one of the most important estuaries in Europe for wildlife and is the largest coastal plain estuary on the east coast of Britain.

Settlement and Communications

3.3.11 The highest populations within the study area are within 10-20 km of the site. Primary settlements include Kingston-Upon-Hull (approximately 8 km to the north-east of the site) and Scunthorpe (approximately 8 km to the south-west of the site). These are interspersed by smaller settlements and are linked by a network of roads.

3.3.12 Horkstow Road (B1204) lies at a close proximity to the east of the site and connects South Ferriby and Elsham.

3.3.13 The site is located close to the village of Horkstow and the developable area is located within 1 km of the village. There is an historic suspension bridge at Horkstow.

3.3.14 Horkstow is one of the five Low Villages (Worlaby, Bonby, Saxby All Saints, Horkstow and South Ferriby) between Brigg and the River Humber, so-called because of their position below the northern edge of the Lincolnshire Wolds.

3.3.15 The larger village of South Ferriby is located within 1 km to the north of the site.

Recreation

3.3.16 Close to the site, recreational activity tends to focus on use of the footpaths and

small roads.

3.3.17 Long distance recreational paths within the study area include: the Yorkshire Wolds Way (128km from the banks of the Humber estuary to Filey Brigg on the North Sea coast); the Viking Way (236km between the Humber bridge to Oakham in Rutland) and the Trans Pennine Trail (560km from coast to coast). The High Hunsley Circuit is a 41km circular walk in the East Riding of Yorkshire that follows part of the Yorkshire Wolds Way route.

3.3.18 The River Ancholme is mainly used for recreation in particular boating, whilst rowing, kayaking and canoeing are also popular. The river tow path is well used by pedestrians and anglers.

Land Use and Land Cover

3.3.19 The proposed turbine location was in a wheat field at the time of survey with a deciduous tree belt lying to the south. Horkstow Road to the east of the site is lined with hedgerows interspersed with deciduous trees particularly ash (*Fraxinus excelsior*) and field maple (*Acer campestre*) with some sycamore (*Acer pseudoplatanus*) and oak (*Quercus* sp.).

3.3.20 The South Ferriby cement works, CEMEX, is located 1.5 km north-west of the site and has a 95.7 m high chimney. The chimney acts as a good scale indicator for the appraisal process as it is at least 38 m taller than the proposed wind turbine at Warren Field.

3.3.21 The site of the proposed turbine is close to overhead power lines to the south which are prominent vertical elements in the landscape. The pylons are estimated to be approximately 25-50 m high.

3.3.22 Most of the study area was reclaimed from marshland in the eighteenth century and is characterised by a regular-shaped field pattern, with field boundaries either formed by low, gappy hedgerows, or without boundaries. Tree cover is characteristically distributed in small localised groups.

3.3.23 There are many historic villages within the study area, many of which have conservation areas and listed buildings described in more detail below. Arable agricultural land dominates much of the open space. The Humber Estuary and the River Ancholme are also important features of the land use within the study area.

The Site and Immediate Context

3.3.24 The site and a 2 km context are illustrated by Figure 3.2. Agricultural fields and the settlement of South Ferriby lie to the north of the site. Overhead power lines and pylons, a deciduous tree belt, Horkstow Farm and Hall and Horkstow village beyond lie to the south. Agricultural fields, the River Ancholme and CEMEX lie to the west and the Sluice Road (A1077) to the north-west. The Horkstow Road (B1204), Field House Farm and the chalk escarpment lie to the east of the site.

3.3.25 The immediate context of the site is sparsely populated. Hall Farm and Field House Farm are the nearest dwellings to the site. Field House Farm however is on the escarpment and screened by vegetation and is also known as Middlegate Boarding Kennels and Cattery. Horkstow Hall is a Grade II* listed building and is located to the south of Hall Farm less than 1 km from the site.

Landscape Character

3.3.26 Figure 3.7 shows the NLCAs within the study area and LLCAs within 5 km of the site.

National Landscape Character

3.3.27 At a national level, the 'Character of England Landscape, Wildlife and Cultural Features' produced by the former Countryside Agency (now Natural England) and English Heritage, subdivides England into 159 National Character Areas (NCAs). This map groups areas of similar landscape character to provide a spatial framework at the national scale.

3.3.28 These NCAs provide background and context to more detailed landscape character assessments produced at county and district level. Their broad geographic reach means that the key characteristics identified as typical of a particular character area may not necessarily apply to a specific location within that character area.

3.3.29 The 20 km study area can be divided into eight National Character Areas (NCAs):

- NCA 27 Yorkshire Wolds;
- NCA 39 Humberhead Levels;
- NCA 40 Holderness;
- NCA 41 Humber Estuary;
- NCA 42 Lincolnshire Coast and Marshes;
- NCA 43 Lincolnshire Wolds;
- NCA 44 Central Lincolnshire Vale, and
- NCA 45 Northern Lincolnshire Edge with Coversands.

3.3.30 The proposed scheme lies within NCA 44 Central Lincolnshire Vale close to the boundaries of NCA 43 Lincolnshire Wolds immediately to the east of the site and NCA 41 Humber Estuary to the north of the site.

3.3.31 Key characteristics of NCA 44 include; '*a broad, low-lying arable vale; a regular pattern of medium-sized fields enclosed by hedgerows with few hedgerow trees; a drained landscape north of Brigg; little woodland cover in the centre and north of the area; and sparse, nucleated settlements*'.

3.3.32 Key characteristics of NCA 43 include; '*rolling upland arable landscape; pronounced scarp edge, elevated plateaux and deep steep sided dales to chalk areas; large rectilinear fields with clipped and degraded hedgerows; archaeologically rich; and sparse, nucleated settlements'.*

3.3.33 Key characteristics of NCA 41 include; '*flat, low-lying, sometimes remote estuarine landscape; dominance of sky and open views over the estuary, mudflats and salt marshes; a predominantly reclaimed, formerly inter-tidal landscape of rectilinear fields with boundaries formed by dykes, drains and embankments; a landscape of mainly arable farming; internationally important coastal mudflats and other wetland coastal habitats; urban and industrial influences*'.

Local Landscape Character

3.3.34 The *'North Lincolnshire Landscape Character Assessment and Guidelines (LCA)'*

assesses the special character, distinctiveness and qualities of the landscape and includes landscape guidelines.

3.3.35 The LCA identifies six landscape character areas within North Lincolnshire which are further broken down into a total of 33 distinct local landscape types.

3.3.36 The landscape character areas are based on the National-wide Joint Character Areas and have similar boundaries. The site lies within the Vale of Ancholme character area, close to the boundary with the Lincolnshire Wolds and the Humber Estuary Character Areas.

3.3.37 Key characteristics of the Vale of Ancholme (based on NCA 44) include: *'a broad, low-lying arable vale; intensive, large arable fields, with remnant hedgerows and artificially drained soils; variable woodland, with little on the low-lying clays; and sparsely distributed settlements concentrated on elevated land creating a quiet and rural character'.*

3.3.38 Key characteristics of the Lincolnshire Wolds character area (based on NCA 43) include: '*rolling upland arable landscape; pronounced scarp slopes affording panoramic views across the Vale of Ancholme and the Humber Estuary; large rectilinear late enclosure fields with clipped and degraded hedgerows and few hedgerow trees; small blocks of woodland and shelterbelts; sparsely settled with scattered farmsteads, and villages concentrated on the spring-line of the escarpment; character best developed towards the southern edge of the area'.*

3.3.39 Key characteristics of the Humber Estuary character area (based on NCA 41) include: '*flat, expansive, low-lying, estuarine landscape; visual presence of the Humber itself is often slight, owing to the low-lying nature of the surrounding farmland and the visual obstruction created by flood alleviation berms; the sky and open views dominate; mudflats and salt marshes form where flood embankments allow, with internationally important wetland and coastal habitats; a predominantly reclaimed, formerly intertidal landscape; hedgerow and tree cover is limited; urban and industrial complexes are significant'.*

3.3.40 The site lies within the Flat Valley Bottom Farmland (FVBF) local landscape type, abutting the boundaries with the Flat Drained Farmland (FDF) and the Wooded Farmed Scarp Slope (WFS) local landscape types.

3.3.41 Key characteristics of the FVBF local landscape character type include:

- a flat, broad valley floor of artificially drained carrs, rising gently to the east;
- a peaceful area, scarce of settlement with traditional villages along the boundary;
- remarkably dispersed farmsteads;
- a network of remote, straight minor lanes, running mainly east-west, which reinforce the linear pattern of the landscape and tend to be access only;
- woodland limited and largely consists of small-medium deciduous blocks;
- some semi-natural vegetation along the river and roadsides;
- mature hedgerows and trees have a significant impact; large rectilinear fields relating to the drainage dykes, which emphasise the uniformity of the landscape; and

- enhanced visual presence of transportation corridors situated on embankments; and visually intrusive transmission lines.

3.3.42 A companion to the LCA is the North Lincolnshire Countryside Design Summary (CDS). The CDS is adopted Supplementary Planning Guidance to ensure that any development proposed is compatible with and complementary to the character of North Lincolnshire countryside. The purpose of the CDS is defined as *'to identify the essential relationship between settlement and the countryside'*.

Landscape Designations and Notable Landscapes

3.3.43 The local Development Plans for the study area contain a number of policies which seek to protect the landscape resource across the study area. These policies and designations can give an indication of those parts of the landscape with a recognised value that should be considered in the assessment of the effects of the wind turbine (see Section 2). The landscape planning designations within the study area are illustrated in Figures 3.3 and 3.4 and listed in Table 3.5 below.

3.3.44 No registered parks and gardens are within a 10 km radius of the development. The nearest registered park is East Park, a Grade II listed park in Hull which is approximately 17 km from the development site.

Table 3.5: Landscape related planning designations

Designation	Details	Distance from turbine (km)
Historic Parks and Gardens Register entry	East Park, Hull – Grade II listed park	17
Conservation Area (within 10 km radius)	Saxby All Saints	3
	Barton upon Humber	5
	Appleby	6
	Winterton	5
	Winteringham	6
	North Ferriby	6
	Swanland	8
	Welton	8
	Elloughton	9
Listed Buildings (Grade I within 10 km radius)	1161766 Church of All Saints, Hessle	8
	1346773 Church of St Mary, Barton upon Humber	6
	1346864 Church of Holy Trinity, Barrow upon Humber	9
	1288451 Barrow Hall, Barrow upon Humber	8
	1103736 Church of St Maurice, Horkstow	<1
	1103752 Normanby Hall, Normanby	10
	1260342 Church of St Mary, Roxby	7
	1117004 Church of All Saints, Winterton	6
	1117040 Church of All Saints,	7

Designation	Details	Distance from turbine (km)
	Winteringham	
Listed Buildings (Grade II* within 10 km radius)	1203258 The Church of St Mary, Elloughton	9
	1347029 Church of St Helen, Welton	8
	1347030 Welton Grange, Welton	8
	1347005 Ferriby House, North Ferriby	6
	1346844 - 51 Fleetgate, Barton upon Humber	6
	1040019 New Hall, Barton upon Humber	6
	1252199 Former National School, Barton upon Humber	6
	1083105 Tyrwhitt Hall, Barton upon Humber	6
	1045845 Bardney Hall, Barton upon Humber	6
	1346772 Gate piers to Baysgarth and garden wall and attached lodges to north of the house, Barton upon Humber	6
	1083107 Baysgarth, Barton upon Humber	6
	1103684 Church of All Saints, Elsham	9
	1281128 Elsham Hall, Elsham	9
	1204723 The Old Almshouses, Worlaby	7
	1281071 Church of St Clement, Worlaby	7
	1346882 Church of St Andrew, Bonby	5
	1346851 Horkstow Hall, Horkstow	<1
	1288277 Church of St Nicholas, South Ferriby	<1
	1083728 Church of St Bartholomew, Appleby	6
	1116900 The Hall, Winterton	6
	1260344 Church of St Ethaldreda, West Halton	8
	1241771 Coleby Hall, Coleby	8
	1117354 Church of AT John, Whitton	9
Scheduled Ancient Monuments (within 10 km radius)	1005243 Old Winteringham Roman Settlement	4
	1005244 Ferriby Sluice	1
	1017553 Roman villa immediately east of Horkstow Hall	<1
	1017552 Site of Jacobean manor house and gardens immediately west and south of St Maurice's Church, Horkstow	<1
	1003689 St Peter's Church, Barton upon Humber	6

Designation	Details	Distance from turbine (km)
	1003690 Site of Saxon Manor, Tyrwhitt Hall, Barton upon Humber	6
	1020024 Heavy Anti-aircraft gunsite 220m east of West Marsh Cottage	9
	1007749 'The Castles' motte and bailey, Barrow Haven	9
	1016430 Round barrow on Elsham Golf Course, 380m north-east of Timaru Farm Cottages, Elsham	9
	1016886 Round barrow on Elsham Golf Course, 240m north-east of Timaru Farm Cottages, Elsham	9
	1005233 Roman site 400yds (370m) north-east of Worlaby Church	7
	1017821 Thornholme Augustinian Priory	7
	1016931 Earthwork remains of St Bartolomew's Church, High Risby	8
	1017554 Sawcliffe medieval village and moated site	9
	1005224 Money Field Roman site, Dragonby	9
	1020549 Heavy Anti-aircraft gunsite, 450m north-east of Mere farm, Winteringham	6
	1005243 Old Winteringham Roman settlement, Winteringham	4
	1005219 Brough Petuaria Roman settlement	8
English Heritage Sites (within 10 km radius)	St Peter's Church, Barton upon Humber	6

Wind Energy and the Historic Environment

3.3.45 The English Heritage document '*Wind Energy and the Historic Environment*' includes a best practice check list recommending the following:

- *'The effects of wind energy programmes and projects on the historic environment should be evaluated in all levels of environmental impact assessment.*
- *Consideration of the historic environment should include …archaeology; historic buildings and areas; designed landscapes; and the historic character of the wider landscape.*
- *The significance of internationally and nationally designated sites should be safeguarded and physical damage to historic sites should be avoided.*
- *The impact of wind energy developments on the setting and visual amenity of historic places should also be considered.*
- *Where wind energy developments affect historic sites, national planning policies on the historic environment should be taken into account.*

- *Consideration should always be given to the reversibility of wind energy projects'.*

Visual Appraisal

3.3.46 The ZTV illustrates the approximate extent of the potential visibility for the proposed turbine and is illustrated by Figure 3.5 and the locations of key viewpoints selected for consideration of visual impacts are illustrated by Figure 3.6. The existing views from the viewpoints are illustrated by the panoramic photographs on Figures 3.8-3.16.

3.3.47 The ZTV has been used as a tool to identify potentially sensitive locations where the turbine may be visible. However, the ZTV does not take into account the intervening screening properties of vegetation or buildings and has been verified in the field.

3.3.48 Nine key viewpoints have been selected for the visual appraisal based on the ZTV, consultation and baseline research.

3.3.49 Visibility across the study area is governed by a combination of topography and the pattern of screening elements such as tree belts and hedges, in combination with the pattern of human use of the area.

3.3.50 The site itself and its immediate context are generally open with some screening by deciduous tree belts, hedgerows, and intermittent trees and localised landform character.

3.3.51 Visibility of the site from the east is limited by the Lincolnshire Edge escarpment.

3.3.52 The patterns of visibility are also affected by the sensitivity and numbers of receptors which afford views towards the site. Current views experienced by the key visual receptors are listed in Table 3.6 below (refer to Figure 3.6 for viewpoint locations).

Table 3.6: Existing views

Viewpoint Ref.	Description	Receptor	Sensitivity
1	**View from number 12 Horkstow Road, on the outskirts of South Ferriby.** *Wide open view, looking west across agricultural fields towards the site. The hedgerow lining Horkstow Road dominates the foreground of the view. The wide view includes a clear view of already built vertical features including the CEMEX works and its chimney and the line of pylons which form distinct breaks on the skyline. A small amount of built development is visible from this viewpoint.*	Residents on Horkstow Road.	High
2	**View from Hall Farm, Horkstow.** *Wide open view across relatively flat agricultural fields towards the site. Long, faint distance views where the land rises up beyond the Humber Estuary and west towards Coleby. The plyons are a significant prominent vertical element within the landscape. The CEMEX works are*	Residents of Hall Farm.	High

Viewpoint Ref.	Description	Receptor	Sensitivity
	partially visible beyond the deciduous tree belt. The view is framed by large scale tree belts that screen the chimney.		
3	**View from number 40 Horkstow Road, Horkstow.** *View from Horkstow Road at the edge of Horkstow village, looking north towards the site. The site is not visible from the road due to the screening properties of trees on the fringe of Horkstow. From within the village, intervening buildings and vegetation restrict views out of the village. Possible wider views outside of the village over the agricultural fields from the rear and first storeys of dwellings.*	Residents on Horkstow Road.	High
4	**View from number 3 Main Road, Saxby All Saints.** *View looking north-west along Main Road towards the site from the edge of Saxby All Saints. The rising landform limits the views towards the site. View over Horkstow Carrs and 'The Oaks' woodland block. The top of the CEMEX chimney is visible in the distance from this viewpoint, viewed against the skyline. View of the pylons in the distance against the skyline. Within Saxby All Saints, views beyond the village are limited.*	Residents on Main Road.	High
5	**View from number 19 Carr Lane, Appleby.** *A broad wide-ranging view from the edge of Appleby looking north-east over large scale agricultural fields towards the site. The chalk escarpment is the backdrop of the view. The large tree belts limit views towards the north. The blades of the turbine would be visible in the distance behind the tree belts. Pylons break the skyline in the distance.*	Keb Farm, walkers and passing traffic.	Medium
6	**View from Leys Lane, Winterton**. *Wide open view across agricultural fields looking east towards the site from the edge of Winterton. Genrally a strongly rural character with little built development with exception of the line of pylons visible in the distance beyond trees. Leys Lane is lined by hedgerows and trees, limiting views for walkers and passing traffic. The site is located in a dip with the escarpment forming the backdrop.*	Walkers and passing traffic.	Medium
7	**View from Winterton Road, Winteringham.** *Wide open view towards the site across flat large scale agricultural fields. Pylons, CEMEX and the Humber Bridge and Estuary are visible in the distance. The raised land on the opposite side of the Humber Estuary and the chalk escarpment near the site form a backcloth to the view.*	Residents on Winterton Road and passing traffic.	High
8	**View from Trans Pennine trail, Brough**. *Wide open views over the Humber Estuary towards Winteringham, works along the edge*	Walkers	High

Viewpoint Ref.	Description	Receptor	Sensitivity
	of the Humber Estuary and views towards the site. The CEMEX chimney and works are visible in the distance.		
9	**View from Yorkshire Wolds Way, North Ferriby.** *Wide open view over the Humber Estuary looking south towards the site, South Ferriby and Barton upon Humber. The Humber Bridge is clearly visible. The CEMEX works and chimney is visible in the distance.*	Walkers	High

The Influence of Weather and Aspect

3.3.53 Changing weather patterns and local climatic conditions will influence the visibility of the wind turbine in terms of the extent of view and the colour and contrast of the turbine. There will be periods of low visibility (fog, low cloud and warm conditions that are accompanied by the haze of temperature inversions) as well as periods of high visibility in clear weather. In some instances and from some locations, the turbine may be 'back-lit' (e.g. appearing darker in colour during sunset/sunrise and periods of pale or white blanket cloud) and in other circumstances may appear to be 'up-lit' (e.g. during stormy periods that combine dark clouds and bright sunshine). These factors combine with the direction of view and the location of the sun so that, at different times of day and in different atmospheric conditions, the turbine is likely to appear differently.

Other Wind Turbines

3.3.54 Figure 3.4 indicates the locations of the existing wind farms and wind farms in planning within the study area and these are listed below in Table 3.7. The nearest existing wind farm to the development site is Bagmoor approximately 8 km to the west of the site. A large wind farm of 18 turbines is proposed at Saxby Wold within 3 km of the proposed development.

Table 3.7: Wind farms within the study area

Wind Farm Site	Details		Developer/Operator
	No. of turbines	***Distance from development site (km)***	
Existing Wind Farms			
Bagmoor Lincolnshire	8	8	Wind Prospect/Ridgewind
Croda Chemicals Europe Hull Site	1	16	Croda Chemicals Europe
Consented Wind Farms			
Flixborough Grange	6 [Check]	12	Wind Prospect
Wind Farms in Planning at April 2012			
Saxby Wold resubmission	18	3	RWE Npower Renewables [PP refused]
Bradken UK Lincolnshire	1	11	Wind Direct [PP refused]
Ironstone Quarry	4	7	Waste Recycling Group

Description of the Proposed Development

3.3.55 A full project description is provided in Chapter 1 of this report and the main points relevant to this appraisal are provided as follows.

3.3.56 The proposed development is for a single turbine which is proposed to be situated in a field off Horkstow Road. The nearest dwelling to the site is Field House Farm to the east of the site and the nearest village is Horkstow, less than 1 km south of the site. The development site is currently an arable agricultural field which has pylons and overhead power lines running through the centre. It also contains a deciduous tree belt to the south of the field near to Hall Farm and Horkstow Hall.

3.3.57 . The turbine will have three blades. The hub height is up to 40m and blade length 17 m, therefore the total height will be up to 57 m. All structures would be painted in a colour to be agreed with the Council, to match the surrounding landscape. The blades would be seen as moving or stationary elements depending on wind speed. The turbine would be connected *via* an underground cable to a grid connection point *via* a site control building.

3.3.58 During construction, any surface vegetation and the topsoil would be removed and stored in piles near the location or in a stock pile on site if to be reinstated after construction.

3.3.59 The operational phase would occur over the 25 years of the permission period.

3.3.60 Decommissioning would include removal and restoration of remaining, above ground structures. The existing agricultural uses would be reinstated. The Planning Application is for 25 years and the development is considered to be long term but temporary.

3.4 Assessment of Potential Impact

Landscape Impacts

3.4.1 The potential impacts on landscape elements are as follows. All changes are temporary unless stated otherwise.

Landscape Impacts during Construction

3.4.2 Temporary changes to landscape character will result from the effect of construction activities including the use of a crane and construction vehicles on site.

3.4.1 The cable for the installation of the turbine will pass immediately adjacent to the west of the deciduous tree belt within the field. However, this will be beyond the drain which runs around the tree belt and therefore should not impact on the health or stability of the trees.

3.4.2 The proposals will result in low level change in land-use and land cover. The existing field pattern will be retained and the development will not require amendments to ground levels. The existing farm access tracks will be extended to allow for installation of the turbine.

3.4.3 The B1204 Horkstow Road is lined with a gappy hedge and young individual trees which will be retained and will therefore maintain the landscape character of the road. Vegetation will break up the views towards the site along the road as experienced by residents and pedestrians.

3.4.4 Glimpses of elevated crane activities will be visible in the distance as part of wider

views towards the site. These views will be mainly from along the A1077 Sluice Road to the north of the site and the B1207 Winteringham Road to the west. The construction activites however, will be viewed against the backdrop of the escarpment which will allow the construction to be partially camouflaged as part of a wider view. The escarpment to the east of the site and the raised land and village of Horkstow to the south of the site screens the ground level and much of the elevated construction activities from these areas.

Landscape Impacts during Operation

Landscape Designations

3.4.5 Effects upon the setting of historic features would be minimal. The setting of the Conservation Areas within 10 km of the site would be well screened by existing vegetation and buildings at the edge of the villages with no tangible effect on the setting.

Landscape Character

3.4.6 The ZTV indicates that the proposed development may influence the visual character of the following Local Landscape Character Areas (LLCAs) within 10km of the Site: the Vale of Ancholme LLCA, parts of higher ground within northern parts of the Lincolnshire Edge LLCA and central and western parts of the Humber Estuary LLCA (refer to Figure 3.5 and 3.7).

3.4.7 The existing woodland lining the roads and field boundaries to the edge of the escarpment will ensure that the impacts on the Lincolnshire Edge LLCA will be minimal. The impacts on the Humber Estuary LLCA will also be minimal with the turbine visible in the distance on clear days against the backdrop of the escarpment as part of a much wider view. This is illustrated within viewpoint 8 along the Trans Pennine Trail in Brough Figure 3.15 and viewpoint 9 along the Yorkshire Wolds Way North Ferriby Figure 3.16.

3.4.8 The lack of visibility of the River Ancholme watercourses combined with extensive hedgerow loss in the valley results in a lack of visual definition and structure. Woodlands, where present, have an enhanced visual presence in the valley due to its flatness, the openness of views and general lack of visual diversity. The distribution of roads through the Ancholme Valley is relatively uniform and these straight and regular lanes tend to reinforce linear qualities of the landscape. The openness of the landscape combined with its low-lying nature renders the overhead power lines and CEMEX works and chimney highly visible. Whilst the addition of a single turbine will inevitably result in some cumulative impact, the large scale and simplicity of this landscape is considered to have capacity to absorb the proposed change without affecting the key characteristics of the Flat Valley Bottom Farm landscape character.

3.4.9 The main impacts of the development are visual as described below.

Visual Impacts

Visual Impact During Construction

3.4.10 The greatest visual impacts of the development during construction will affect the local area to the site along the B1204 Horkstow Road. As indicated on the ZTV, to a lesser extent, further visual impacts will be predominantly from the west and north of the site, particularly along A1077 Sluice Road to the north of the site and B1207 Winteringham Road to the west.

3.4.11 By using and extending existing routes for the construction access, the change in views will be limited. Ground level construction activities will be visible from some dwellings along Horkstow Road. However, the views are limited due to the orientation of the dwellings and the hedge and scattered young individual trees along Horkstow Road as shown on viewpoint 1 Figure 3.8.

3.4.12 Field House Farm off Horkstow Road to the east of the site is predominantly screened by a young tree belt which lines the access drive and wraps around the west of the property towards the site. The screening value of these trees will increase as the trees mature. Horkstow Hall to the south of the site is also screened by mature trees around its boundaries whereas Hall Farm has a clear open view of ground level construction activities as shown on viewpoint 2 Figure 3.9. The site operations will be visible from the grounds of the bungalow on Horkstow Road less than one kilometre to the north of the site however, its orientation and location of windows will limit views from here.

Visual Impact During Operation

3.4.13 The predicted visual effects of the proposed development from the key viewpoints are summarised in Table 3.8 below. The existing views are illustrated by the panoramic photographs on Figures 3.8-3.16. Figures 3.8, 3.9, 3.12 and 3.14 for viewpoints 1, 2, 5 and 7 also include wire lines to illustrate the view following the construction of the turbine. Suggestions for mitigating visual impacts are outlined in Section 3.10.

Table 3.8: Appraisal of visual Impacts

Viewpoint Ref.	Description	Change in View	Magnitude	Significance
1	View from number 12 Horkstow Road, on the outskirts of South Ferriby.	Residents will gain views of the turbine as part of a wider view beyond the hedgerow lining Horkstow Road.	Medium	Slight adverse
2	View from Hall Farm, Horkstow.	Hall Farm residents will gain views of the turbine at close proximity as part of a wider view.	Medium	Moderate adverse
3	View from number 40 Horkstow Road, Horkstow.	None	None	None
4	View from number 3 Main Road, Saxby All Saints.	Limited views in the distance of the top of the turbine as part of a wider view. The deciduous tree belt on site and vegetation along Main Road would help to reduce	Low	Negligible

Viewpoint Ref.	Description	Change in View	Magnitude	Significance
		visibility of the turbine.		
5	View from number 19 Carr Lane, Appleby.	View of the turbine in the distance as part of a wider view.	Low	Negligible
6	View from Leys Lane, Winterton.	The top of the turbine would be visible beyond trees and as part of a wider view.	Low	Negligible
7	View from Winterton Road, Winteringham.	View of the turbine in the distance as part of a wider view.	Low	Negligible
8	View from Trans Pennine Trail, Brough.	Glimpses of the turbine in the distance during good clear weather conditions as part of a much wider view.	Low	Negligible
9	View from Yorkshire Wolds Way, North Ferriby.	Glimpses of the turbine in the distance during good clear weather conditions as part of a much wider view.	Low	Negligible

3.4.14 The proposed development would by its nature, be visible over a wide area. Whilst visual impacts would inevitably occur, the essential open aspects across the site will be retained for the majority of local receptors.

3.4.15 Local properties on Horkstow Road at the outskirts of South Ferriby, will experience the greatest change in view due to the open view and proximity of the proposed turbine. However, the view of the turbine is part of a wider cluttered view which already has tall vertical visual man-made features including the pylons and CEMEX chimney.

3.5 Mitigation Measures

Site Planning

3.5.1 Mitigation is instrumental in the avoidance, minimisation or reduction of the magnitude of change on the landscape receptors and views, and also in the avoidance or minimisation of adverse effects. The mitigation of effects of wind turbines are generally implemented through the design of the site layout and turbine selection, as, due to the height of the turbine, more superficial methods such as screening are rarely effective.

Process of Design

3.5.2 The development site would be accessed by the existing road and track access and any construction tracks would be reinstated.

3.5.3 If required, new access tracks would relate to the field patterns where possible and avoid visibility from settlements and dwellings.

3.5.4 Disturbed areas would be reinstated using methods to encourage existing vegetation types to re-colonise where appropriate although much of the site would be returned to agriculture.

3.5.5 A distance of at least 50 m would be retained between the swept area of the turbine and the minor roads, woodland, trees and the electricity pylons.

3.5.6 A distance of at least 500 m would be retained from dwellings with views to the turbine.

Turbine Selection

3.5.7 The landscape and visual assessment has been completed on the turbine specification of 3-bladed turbines with a maximum height to blade top of 57 m.

3.5.8 The choice of material and colour for the proposed turbine is important as this can increase of diminish the visual impact. Neutral colours with a matt finish, sympathetic to the surroundings, would be applied to all new features in order to assist in integrating the development into the wider landscape. Matt colours would be non-reflective which would assist in reducing potential impact during sunny conditions and in particular under certain sunlight conditions causing 'flashing' or 'glinting' from the blades. The turbine would be painted an pale grey colour, with a semi-matt finish. Where possible (depending on turbine specification) transformers would be located within the turbine towers as a visual preference, otherwise the transformers would be located at the base of the turbine tower. This detail is dependent on procurement and final turbine selection for construction but is not likely to affect the conclusion of this assessment.

3.6 Conclusions

3.6.1 This appraisal has considered the landscape and visual impacts of the wider area and concluded that the proposals would be limited to the localised area. Views of the turbine would be as part of a much wider, often cluttered view at distances greater than 2 km of the site.

3.6.2 The lack of visibility of the River Ancholme watercourses combined with extensive hedgerow loss in the valley results in a lack of visual definition and structure. Woodlands, where present, have an enhanced visual presence in the valley due to its flatness, the openness of views and general lack of visual diversity. The distribution of roads through the Ancholme Valley is relatively uniform and these straight and regular lanes tend to reinforce linear qualities of the landscape. The openness of the landscape combined with its low-lying nature renders the overhead power lines and CEMEX works and chimney highly visible. Whilst the addition of a single turbine will inevitably result in some cumulative impact, the large scale and simplicity of this landscape is considered to have capacity to absorb the proposed change without affecting the key characteristics of the Flat Valley Bottom Farm landscape character.

3.6.3 The open aspects across the site will be retained for the majority of local receptors.

Local properties on Horkstow Road at the outskirts of South Ferriby will experience the greatest change in view. The views of the turbine for the majority of receptors is part of a wider cluttered view which already has tall vertical, visual man-made features including the pylons and CEMEX chimney.

3.7 References

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English Heritage (2005) Wind Energy and the Historic Environment.

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Landscape Institute & Institute of Environmental Management & Assessment (LI-IEMA) (2002). Guidelines for Landscape and Visual Impact Assessment. 2nd Edition. Spons Press, London.

North Lincolnshire Council and Estell Warren (1999). North Lincolnshire Landscape Character Assessment and Guidelines.

North Lincolnshire Council (1999). SPG 5a Contryside Design Summary (CDS).

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WEBSITES

www.countryside.org.uk

www.landscapecharacter.org.uk

www.lincswolds.org.uk/jac.htm

4. Ecology and Nature Conservation

4.1 Introduction

4.1.1 The purpose of this report is to provide an appraisal of the ecological value of the proposed development site and to assess the likelihood and nature of any impacts to this ecological value that may occur as a result of the proposed development. This assessment is based on information gathered from consultees and from field survey undertaken as part of this study.

4.1.2 Elements of the ecological assessment detailed within the report include the following:

- data consultation with appropriate organisation(s);
- habitat and species surveys supported by maps and descriptions of baseline conditions;
- evaluation of ecological interest of the proposed development site;
- assessment of the potential ecological impacts associated with the proposed development, and
- mitigation measures required in relation to the assessment.

4.1.3 The assessment has been carried out in line with the Institute of Ecology and Environmental Management (IEEM) *Guidelines for Ecological Impact Assessment in the United Kingdom* (2006).

4.2 Methodology

Desk Study and Data Consultation

4.2.1 As part of the ecological assessment process a data consultation exercise was undertaken to determine whether any sites, habitats or species of note have previously been recorded on, or within 2.5 km of, the site. Data requested from the consultees included:

- statutory and non-statutory designated wildlife sites, and
- species and habitats included in the Section 41 list (list of species and habitats of principal importance in England, as required under Section 41 of the Natural Environment and Rural Communities [NERC] Act, 2006).

4.2.2 Lincolnshire Environmental Records Centre (LERC) and National Biodiversity Network Gateway website (www.nbn.org.uk) were consulted for biological information pertaining to the proposed development site and surrounding land. A search of designated sites and biological records within 2.5 km of a central grid reference was requested from LERC in July 2011. Records of species included in the Section 41 list occurring since 2001 was obtained from NBN Gateway website from within 2.5 km of the site.

4.2.3 Relevant information received from consultees is included as Appendix 4.1, and within the report text as appropriate.

Phase 1 Habitat Survey

4.2.4 An initial Phase 1 Habitat Survey of the proposed development site (Figure 4.1) was undertaken in July 2011. Survey methodology followed the standard approach described within the Handbook for Phase 1 Habitat Survey (JNCC, 2010). Plant species and habitat types, according to the Phase 1 classification, were identified and recorded. Botanical recording aimed to characterise the vegetation present and was not intended to comprise a complete list of all plants occurring on the site.

4.2.5 The abundance of plant species recorded was classified according to the subjective yet commonly used DAFOR abundance rating. The standardised terms are as follows:

- D – Dominant;
- A – Abundant;
- F – Frequent;
- O – Occasional, and
- R – Rare.

4.2.6 Where necessary, the abundance rating given indicates co-dominance of species (CoD) or that a particular rating is appropriate only within a localised area (preceding the rating category by L).

4.2.7 Notable, rare or scarce plants were highlighted if present. The information collected is presented using Target Notes (TN), the locations of which are shown in Figure 4.1. Target notes and DAFOR abundance ratings are given in Appendix 4.2.

4.2.8 Survey of hedgerows within the study area was undertaken to identify whether any of the hedgerows on site are considered important under the Hedgerow Regulations (1997) under the criteria listed in Schedule 1 Part II was undertaken (Wildlife and Landscape criteria only).

Protected Species Survey

Badgers

4.2.9 Badger (*Meles meles*) survey followed methods as detailed in Surveying Badgers (Harris *et al.,* 1989) and included inspection of all linear boundary features, such as hedges or fences, for signs of badger activity. Typical signs of badger activity include setts, dung pits and hairs caught in fence wire where regular foraging routes cross boundary features.

Bats

4.2.10 An appraisal was carried out of the potential of any trees and structures on site to contain features of interest (cracks, crevices etc.) to roosting bats following best practice guidelines (Bat Conservation Trust, 2007). The surrounding habitats were also recorded and evaluated for their suitability as foraging habitat for bats.

Birds

4.2.11 No formal bird survey was undertaken, however, whilst on site the opportunity was taken to record all species of birds encountered and the suitability of the habitats present to support nesting and foraging birds.

Water Voles

4.2.12 Water vole (*Arvicola amphibius*) survey was undertaken following the methodology detailed in the Water Vole Conservation Handbook (Strachan & Moorhouse, 2006). This will include searching for water vole signs, including latrines, burrow entrances (both above and below water level), feeding stations, runs and pathways, footprints and 'lawns' around burrow entrances. Any sightings and sounds of water voles entering the water was also recorded. In addition, selected habitat features of significance to water voles was recorded, including bank profile and substrate, width, depth and flow of watercourse and the amount of any shade and vegetation cover, along with the dominant plant species present.

Ecological Assessment Methodology

4.2.13 The value and sensitivity of ecological features was determined based on the guidance given by the IEEM (IEEM, 2006). Individual ecological receptors (habitats and species that could be affected by the proposed development) were assigned levels of importance for nature conservation in one of the following categories:

- international;
- UK;
- national;
- county;
- district;
- local, or
- within the immediate zone of influence only.

4.2.14 For a given receptor, determination of value includes consideration of the size, conservation status and quality of the species or feature.

Valuation of Habitats

4.2.15 Some sites are automatically assigned a nature conservation value through designation and the reason for designation is taken into account within this assessment. Designated sites are considered at the following levels:

- International – Special Areas of Conservation (SAC), Special Protected Areas (SPA) and RAMSAR Sites. World Heritage Sites (WHS) are also considered to be of international value at the site level, but not necessarily in terms of their ecological value.
- National – Sites of Special Scientific Interest (SSSI) (England).
- County or district – sites designated by Local Authorities or County Wildlife Trusts and others.

4.2.16 Habitats that are not subject to specific nature conservation designations have been valued against published selection criteria where possible, including the following:

- Special Areas of Conservation site selection criteria (EC Habitats Directive, Annex III) within the Habitats Directive Atlantic Biogeographical Region (Hopkins & Buck, 1995);
- guidelines for the section of biological SSSIs (Nature Conservancy Council, 1989);
- UK Biodiversity Action Plan (UK BAP) priority habitat descriptions (BRIG, 2010), and
- appropriate habitat inventories.

4.2.17 Habitats are also assessed against the Ratcliffe Criteria (Ratcliffe, 1977) where no appropriate selection criteria exist.

Species

4.2.18 In ascribing values to populations of species, consideration has been given to the legal status of species, as well as their size and status on the site and within the geographic area. Certain species receive protection under various pieces of legislation and this has been taken into account when determining value. Legislation considered includes:

- the EC Habitats Directive 1992;
- the Conservation (Natural Habitats &*c*.) Regulations 2010; and
- the Wildlife and Countryside Act 1981 (as amended).

4.2.19 The rarity of the species in the context of status, i.e. whether populations of a species are declining either nationally or at a more local level has also been considered. Particular species are typically assigned a higher value if they are included within the appropriate Local Biodiversity Action Plan (LBAP).

4.2.20 The presence of invasive alien species or injurious weeds is considered to represent an ecological disbenefit.

Sources and Magnitude of Impact

4.2.21 The key sources of impact to the nature conservation interests of the area resulting from the development may arise as direct and indirect effects, examples of which are given below:

Direct effects:

- Habitat loss (land take), where the severity of impact is directly related to the amount of habitat lost and the conservation value of that habitat.
- Habitat fragmentation (severance of habitats and/or wildlife corridors linking them). This can lead to reduced genetic diversity and increase the likelihood of species being lost.

Indirect effects:

- Including disturbance (visual or noise), dust deposition, incidental vehicle trafficking, water discharges and surface runoff. These impacts may affect habitats both within and outside the footprint of the works.

4.2.22 Impacts may also be either temporary or permanent in nature. Temporary effects occur during the construction phase of development and may include impacts such as short-term increases in dust deposition resulting from construction traffic. It should be appreciated that temporary loss of habitats of high value for nature conservation may have as great or greater impact as permanent land take of less sensitive habitats.

4.2.23 Land take comprising the footprint of the scheme following post-construction restoration is considered to be permanent and some indirect effects may also be permanent.

4.2.24 The magnitudes of impacts are evaluated in terms of their predicted effect on the integrity of an ecological receptor, where integrity is defined as:

"[...] the coherence of its ecological structure and function, across its whole area, that enables it to sustain the habitat, complex of habitats and/or the levels of populations of species for which it was classified." (IEEM, 2006).

4.2.25 Consideration is given to the nature and duration of the disturbance, its reversibility, timing and frequency as well as any cumulative effects, and the potential for impact avoidance or minimisation.

4.2.26 In assessing the significance of impacts, each has been considered in its entirety, ensuring all identified facets of the impact are considered. The significance of an impact depends upon the nature of the impact, the magnitude and duration of the impact and the sensitivity or importance of the receptors that it affects, as determined using assessment criteria detailed above. For the purpose of this assessment the significance of all potential impacts to habitats of local or higher conservation value has been assessed.

4.2.27 A significant impact is defined as an impact (adverse or positive) on the integrity of a defined site or ecosystem, and/or the conservation status of habitats or species within a geographical area, including cumulative impacts.

4.2.28 IEEM have also adapted a description of conservation value form the EC Habitats Directive and applied it to habitats:

"conservation status is determined by the sum of the influences acting on the habitat and its typical species, that may affect its long-term distribution, structure and functions as well as the long-term survival of its typical species within a given geographical area." (IEEM, 2006).

4.2.29 And species:

"conservation status is determined by the sum of influences acting on the species concerned that may affect the long-term distribution and abundance of its populations within a given geographic area." (IEEM, 2006).

4.2.30 The value of the significantly affected receptor is then used to determine the implications, in terms of legislation, policy and/or development control.

4.2.31 If an impact is found not to be significant at the highest geographical level at which the receptor has been valued it may be significant at a lower geographical level. Significant impacts on ecological receptors have been determined in accordance with guidance derived from policies applied at a scale relevant to the value of the

feature or resource. Any significant impacts remaining after mitigation are termed residual impacts and should be considered in the context of legislation, policy and development control in determining the application.

4.2.32 It is also useful to assign a level of confidence to the assessment of individual impacts and the definitions for confidence levels are shown in Table 4.1. Unless otherwise stated confidence levels are high.

Table 4.1: Confidence levels and defining criteria

Confidence level	Criteria
High	The predicted impact is either certain e.g. land take or is considered to be very likely to occur based on reliable information and/or previous experience.
Low	The predicted impact and its level are best guesses generally derived from first principles of ecological theory and the experience of the assessor. More information may be required to improve the level of confidence.

Limitations

4.2.33 This report serves to indicate the value of the site in nature conservation terms based upon the survey data gathered. As with any survey of this kind, the information collected defines the habitat types and quality and is not intended to be a record of every species present.

4.3 Relevant Legislation

4.3.1 Both the habitats and species assessments have taken account of international, national, regional and local policy, legislation and guidance. Those that are most relevant are summarised below.

International Legislation

Directive 79/409 on the Conservation of Wild Birds 1979 (The Birds Directive)

4.3.2 The Birds Directive aims to protect all bird species and their habitats within the member states. In particular, it requires special protection for a range of species (listed in Annex I of the Directive) and requires member states to establish Special Protection Areas (SPAs) for the protection of internationally important bird habitats. The Birds Directive is implemented in the UK by the Wildlife and Countryside Act 1981 and its subsequent amendments.

Directive 92/43 on the Conservation of Natural Habitats and of Wild Fauna and Flora 1992 (The Habitats Directive)

4.3.3 The EU Habitats Directive aims to provide protection for a range of natural and semi-natural habitats and species. Its Annexes identify a number of priority habitats and species requiring special protection. Member states are required to identify sites within their territory for designation as Special Areas of Conservation (SACs) for the protection of these habitats and species. The Habitats Directive is implemented in England and Wales by the Habitats Regulations 2010.

Ramsar Convention on Wetlands

4.3.4 The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty which provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their

resources. There are presently 154 Contracting Parties to the Convention, with 1674 wetland sites, totalling 150 million ha, designated for inclusion in the Ramsar List of Wetlands of International Importance.

UK Legislation

Wildlife and Countryside Act 1981 (as amended)

4.3.5 The habitats and species protection provided within the Birds Directive (Directive 2009/147/EC, which is the codified version of Council Directive 79/409/EEC as amended) is transcribed into UK legislation through the Wildlife and Countryside Act 1981, and its amendments.

4.3.6 The 1981 Act allows for the designation of National Nature Reserves (NNRs) and SSSIs to protect areas that support habitats and species of national or international importance. The network of SSSIs forms the basis for selection of the SPAs and SACs within the UK.

4.3.7 All bird species, including eggs, young and nests while in use, are protected under the Wildlife and Countryside 1981 Act as amended. These include a number of specially protected birds (listed in Schedule 1). Other animals that are afforded protection are listed in Schedule 5 and a number of protected plant species are included in Schedule 8. The nests of certain bird species that re-use their nests are also protected while no longer in use as a result of an amendment made under the NERC Act 2006.

4.3.8 Key amendments to the 1981 Act are made through the Countryside and Rights of Way (CRoW) Act 2000, which applies to England and Wales only. Relevant amendments include the strengthening of legislation to protect sites designated for nature conservation by imposing heavier penalties on offenders. The NERC Act 2006 also adds intentional or reckless damage, destruction or disturbance of designated flora or fauna with a SSSI as an offence.

Conservation of Habitats and Species Regulations 2010

4.3.9 The habitats and species protection provided within the Habitats Directive (Council Directive 92/43/EEC) is transcribed into UK legislation through the Conservation of Habitats and Species Regulations 2010. The Habitats Regulations 2010 consolidates the Conservation (Natural Habitats, *&* *c*.) Regulations 1994 and its several amendments, which provide the original transcription of Habitats Directive into UK legislation. Special Protection Areas and SACs are designated under the Habitats Regulations 2010. These sites, including those throughout the European Union, for a network termed Natura 2000.

4.3.10 The Regulations make provisions through which Natural England can enforce the management of Natura 2000 sites for the benefit of nature conservation, particularly in respect of features for which the sites have been designated, and prevent actions that would otherwise damage the nature conservation value of these sites. The Regulations also require Natural England to consider planning permissions and, subject to certain exceptions, restrict those permissions where the integrity of a Natura 2000 site would be adversely affected.

4.3.11 The Regulations make it an offence (subject to exceptions) to deliberately capture, kill, disturb, or trade in the animals listed in Schedule 2, or pick, collect, cut, uproot, destroy, or trade in the plants listed in Schedule 4. However, these actions may be permitted through licenses granted by Natural England. Licenses may be granted

for a number of purposes, such as science and education, conservation, preserving public health and safety, but only after Natural England is satisfied that there are no satisfactory alternatives and that such actions will have no detrimental effect on wild population of the species concerned. Schedules 2 and 4 contain lists of species that are protected under the EC Habitats Directive and occur within the UK. Where these species formerly appeared within Schedules 5 and 8 of the Wildlife and Countryside Act 1981 (as amended) they have been removed. These species are termed European Protected Species (EPSs).

Natural Environment and Rural Communities Act 2006.

4.3.12 The NERCs Act 2006 defines the roles of the various statutory conservation organisations throughout the UK countries to reflect devolved powers.

4.3.13 The NERC 2006 Act imposes a 'duty to conserve biodiversity' through fulfilment of their functions on all public authorities. Under the Act (2006) the Secretary of State for England and the National Assembly for Wales must compile and maintain a list of species and habitats that they consider to be of principal importance for the purpose of conserving biodiversity, these are referred to at the Section 41 and Section 42 lists respectively.

4.3.14 Enforcement powers in relation to wildlife have been strengthened and the possession of certain pesticides harmful to wildlife has been made an offence. In addition, codes of practice in connection with invasive non-native species must now be approved by the Secretary of State.

Protection of Badgers Act 1992

4.3.15 Under the Protection of Badgers Act 1992 all badgers and their setts are protected from disturbance. The Act also includes provisions to allow Natural England to grant licences permitting interference with a badger sett in the course of development. Such a licence will normally incorporate conditions to ensure that undue disturbance and suffering to badgers is avoided in the course of the development works.

4.4 Baseline Conditions

4.4.1 The findings of the ecological survey and desk study are described in this section of the report, which aims to identify and evaluate the importance of ecological receptors in respect of the proposed development. The assessment of the potential impacts to these receptors is presented in the following section.

Designated Sites

Statutory Designation

4.4.2 No part of the proposed development site is subject to statutory designation, international, national or local, for its importance to nature conservation.

4.4.3 The Humber Estuary lies approximately 1.5 km to the north of the proposed turbine location. This site is designated as SAC, SPA, Ramsar and SSSI. The range of designations reflects the international importance of this site and the variety of coastal and estuarine habitats it support, including intertidal mudflats and sandflats, saltmarsh, coastal lagoons and sand dunes. The Humber Estuary also supports internationally and nationally important populations grey seals, sea and river lampreys, and a variety of bird species.

4.4.4 The Humber Estuary SPA qualifies under Article 4.1 of the EC Birds Directive (79/409/EEC) by supporting populations of European importance of species listed on Annex I of the Directive as follows:

4.4.5 During the breeding season;

- Bittern (*Botaurus stellaris*): 10.5 % of the population in Great Britain (2000 – 2002);
- Little Tern (*Sterna albifrons*): 2.1 % of the population in Great Britain (1998 - 2002);
- Marsh Harrier (*Circus aeruginosus*): 6.3 % of the population in Great Britain (1998 - 2002), and
- Avocet (*Recurvirostra avosetta*): 8.6 % of the population in Great Britain (1998 - 2002).

4.4.6 Over winter;

- Bar-tailed Godwit (*Limosa lapponica*): 4.4 % of the population in Great Britain 1996/7 to 2000/1;
- Bittern: 4% of the population in Great Britain 1998/9 to 2002/3;
- Golden Plover (*Pluvialis apricaria*): 12.3 % of the population in Great Britain 1996/7 to 2000/1;
- Hen Harrier (*Circus cyaneus*): 1.1% of the population of Great Britain 1997/8 to 2001/2, and
- Avocet: 1.7 % of the population in Great Britain 1996/7 – 2000/1.

4.4.7 On passage:

- Ruff (*Philomachus pugnax*): 1.4 % of the population in Great Britain 1996-2000.

4.4.8 This site also qualifies under Article 4.2 of the EC Birds Directive (79/409/EEC) by supporting populations of European importance of the following species:

4.4.9 Over winter;

- Dunlin (*Calidris alpina alpine*): 1.7 % of the population in Great Britain 1996/7 to 2000/1;
- Red Knot (*Calidris canutus*): 6.3 % of the population in Great Britain 1996/7 to 2000/1;
- Redshank (*Tringa tetanus*): 3.6 % of the population in Great Britain 1996/7 to 2000/1;
- Shelduck (*Tadorna tadorna*): 1.5 % of the population in Great Britain 1996/7 to 2000/1, and
- Black-tailed Godwit (*Limosa limosa islandica*): 3.2 % of the population in Great Britain 1996/7 to 2000/1.

4.4.10 On passage;

- Dunlin: 1.5 % of the population in Great Britain 1996 to 2000;
- Red Knot: 4.1 % of the population in Great Britain 1996 to 2000;

- Redshank: 5.7 % of the population in Great Britain 1996 to 2000, and
- Black-tailed Godwit: 2.6 % of the population in Great Britain 1996 to 2000.

4.4.11 The site also qualifies under Article 4.2 of the Birds Directive (79/409/EEC) as an internationally important assemblage of birds by regularly supporting at least 20,000 waterfowl in the non-breeding season. The area regularly supports 153,934 individual waterfowl (5 year peak mean 1996/7 - 2000/1) including: Mallard (*Anas platyrhynchos*), Golden Plover, Bar-tailed Godwit, Common Shelduck, Red Knot, Dunlin, Redshank, Cormorant (*Phalacrocorax carbo*), Dark-bellied Brent Goose (*Branta bernicla bernicla*), Bittern, Teal (*Anas crecca*), Curlew (*Numenius arquata*), Pochard (*Aythya farina*), Goldeneye (*Bucephala clangula*), Oystercatcher (*Haematopus ostralegus*), Ringed Plover (*Charadrius hiaticula*), Grey Plover (*Pluvialis squatarola*), Lapwing (*Vanellus vanellus*), Sanderling (*Calidris alba*), Black-tailed Godwit, Wigeon (*Anas penelope*) and Whimbrel (*Numenius phaeopus*). The Humber Estuary SPA/SAC/Ramsar site is considered to be of international importance for nature conservation.

4.4.12 South Ferriby Chalk Pit SSSI lies approximately 1.30 km to the east of the proposed turbine location. This site is designated for its geological interest and is not considered to an ecological receptor. For this reason South Ferriby Chalk Pit SSSI is not given further consideration within the report.

Non-statutory Designation

4.4.13 No part of the proposed development site is subject to non-statutory designation for its nature conservation interest.

4.4.14 A total of eight non-statutory designated sites have been identified within 2.5 km of the proposed turbine location. These sites are Manor House Farm Field Local Wildlife Site (LWS), South Ferriby Churchyard LWS; South Ferriby Chalk Springs LWS; and East Drain LWS, and Ancholme Fields Sites of Nature Conservation Interest (SNCI); Winterton Carrs and Ings SNCI; Horkstow Brickworks SNCI and Horkstow Scarp and Pits SNCI. Table 4.2 indicates the distance from these designated sites to the proposed turbine location.

Table 4.2: Non-statutory wildlife sites within 2.5 km of the of the proposed turbine location, and distance to turbine location

Site	Distance (km)	Direction from Turbine
Manor House Farm Field LWS	1.25	N
South Ferriby Churchyard LWS	1.27	NE
South Ferriby Chalk Springs LWS	1.18	NE
East Drain LWS	0.95	NW
Ancholme Fields SNCI	1.03	N
Winterton Carrs and Ings SNCI	2.19	W
Horkstow Brickworks SNCI	1.16	SW
Horkstow Scarp and Pits SNCI	1.79	S

4.4.15 Designation as LWS supersedes SNCI designation and, subject to renewed survey and assessment under LWS selection criteria, all existing SNCIs within Lincolnshire are being currently designated as LWSs.

4.4.16 The non-statutory designated sites within the vicinity of the proposed development

are designated for a broad range of locally important habitats. These habitats include standing waters, ditches, broadleaved woodland, scrub and various grassland habitats, including marshy grassland.

Habitats

4.4.17 The study area comprises an arable field and associated boundary features including hedgerows, ditches and a small block of broad-leaved wood, which is outwith the application area. Descriptions of all habitats present within the study area are provided below. A full list of all species recorded is included as Appendix 4.2 with habitats shown on Figure 4.1.

Arable Field

4.4.18 The dominant habitat within both the application area and the study area is the arable field, which was planted with winter wheat at the time of survey. This is an intensively managed habitat supporting a low botanical diversity and exhibiting a low degree of naturalness. This habitat is considered to be of value for nature conservation within the immediate zone of influence only.

Arable Field Margins

4.4.19 Field margins are present on all sides of the arable field that comprises the majority of the study area. A small portion of the northern field margin is located within the application area. This margin appears to be managed for nature conservation and comprises a strip of neutral grassland approximately 6 m wide supporting a relatively diverse grass flora dominated by cock's-foot (*Dactylis glomerata*) and false oat-grass (*Arrhenatherum elatius*), with sheep's fescue (*Festuca ovina*), bent grass (*Agrostis* sp.), timothy (*Phleum pratense*) and wild-oat (*Avena fatua*). Herbs include common mallow (*Malva sylvestris*), hawkweed (*Hieracium* agg.), white campion (*Silene latifolia*) and common poppy (*Papaver rhoeas*). Arable field margins that are in active management for nature conservation are a UK BAP Priority Habitat and are also included on the local BAP.

4.4.20 Whilst this field margin is not considered to be of sufficient size, species diversity or intrinsic value to be considered locally important it is likely to contribute to a wider resource of arable field margins in the local area that could be important at a local level.

4.4.21 The remaining field margins are approximately 2 m wide and support an impoverished flora typical of intensively managed arable field boundaries. These habitats are considered to be of value to nature conservation within their immediate zone of influence only.

Species poor hedgerows

4.4.22 The field boundaries are delineated by a combination of hedgerows and ditches, with a compacted hard-core track along the northern boundary (Figure 4.1).

4.4.23 The northern boundary comprises a ditch, with a hedgerow on the southern bank, between the track and field. The hedgerow at the northern boundary (H1, Figure 4.1) is a gappy hawthorn (*Crataegus monogyna*) dominated hedge with occasional elder (*Sambucus nigra*) and as such is not considered to qualify as an important hedgerow under the Hedgerow Regulations (1997) due to the lack of species diversity and frequent gaps.

4.4.24 A hawthorn dominated hedgerow (H2, Figure 4.1), also containing field maple (*Acer*

campestre) and dog rose (*Rosa canina*), stands on the western bank top. There was evidence of recent gap planting. This hedge also contains a number of mature ash (*Fraxinus excelsior*) trees, which are described below.

4.4.25 The eastern field boundary is that adjacent to the B1204 road, and comprises a hedgerow at the top of an embankment up to the road (H3, Figure 4.1), which is approximately 3 m higher than the level of the field. The hedge is flail managed on the road side and substantially intact, with only occasional small gaps, and is dominated by hawthorn. Early mature standard trees include ash, sycamore, field maple, rowan (*Sorbus aucuparia*), hazel (*Corylus avellana*) and oak (*Quercus* sp.).

4.4.26 A hedgerow is defined in the UK BAP as, "...*any boundary line of trees or shrubs over 20 m long and less than 5 m wide, and where any gaps between the trees and shrub species are less than 20 m wide (Bickmore, 2002). Any bank, wall, ditch or tree within 2 m of the centre of the hedgerow is considered to be part of the hedgerow habitat, as is the herbaceous vegetation within 2 m of the centre of the hedgerow*." Hedgerows are also included on the local BAP.

4.4.27 The hedgerows present on site are gappy, species poor and heavily managed. They represent a poor example of this UK and Local BAP habitat and therefore considered to be of intrinsic importance to nature conservation within their zone of influence only.

Ditches

4.4.28 Four ditches are present within the study area (Figure 4.1), the majority of which were in water at the time of survey.

4.4.29 D1 is located along the northern boundary and is not included within the application area. This ditch was predominantly dry at the time of survey except at the western end. In the dry section vegetation communities included grass and herb species including cock's-foot, perennial rye-grass (*Lolium perenne*), cow parsley (*Anthriscus sylvestris*), hedge woundwort (*Stachys* sylvatica) and field bindweed (*Convolvulus arvensis*), with locally dominant bramble (*Rubus fruticosus* agg.), common nettle (*Urtica dioica*) and rosebay willowherb (*Chamerion angustifolium*).

4.4.30 In the wetter western end of the ditch species include false oat-grass, timothy, smaller cat's-tail (*Phleum bertolonii*), hogweed (*Heracleum sphondylium*) and spear thistle (*Cirsium vulgare*), with standing water supporting water-cress (*Rorippa nasturtium-aquaticum*) and sparse common reed (*Phragmites australis*).

4.4.31 D2 comprises a large drainage ditch located along the western boundary of the study area and outwith the application area. The ditch is approximately 4-5 m deep with sides approximately 45°. At the time of survey the water depth was approximately 20 cm. The ditch banks are shaded by standard trees and subsequently have developed a field layer typical of woodland and influenced by the presence of standing water in the channel. Plant species include bramble, cleavers (*Galium aparine*), herb Robert (*Geranium robertianum*) and common nettle, with hard rush (*Juncus inflexus*) growing towards the bottom of the slope and water-cress and common reed in the channel.

4.4.32 D3 is located along the southern field boundary to the west of the wooded copse. The ditch is approximately 1.5 m deep with approximately 10 cm water at the time of survey. The copse is bounded by D4, another steep sided drainage ditch with 45° banks approximately 5 m deep. The bank vegetation of these ditches

comprises tall ruderal and grass species as above. At the time of survey the channel contained approximately 50 cm of water flowing at an imperceptible rate.

4.4.33 Whilst none of the drainage ditches present within the study area are of particular intrinsic nature conservation importance they contribute to a wider ditch network that can be considered to be of local to district importance to nature conservation.

Broadleaved Woodland

4.4.34 A small wooded copse dominated mature ash and sycamore, with understory predominantly comprising elder and field maple is present within the southern portion of the study area.

4.4.35 The wooded copse that lies at the southern boundary of the surveyed arable field was inaccessible due to the large draining ditches surrounding it, however, it was possible to describe this habitats from the far bank of the ditches. Although comprised of common species, areas of mature semi-natural woodland are not common within the vicinity of the proposed development site and, due to the age of the trees that comprise these habitats, are not readily replaced. However, due to the small size the woodland habitat is considered to be of value to nature conservation at a local level only.

Species

Badgers

4.4.36 Several records of badger were provided by LBP within 2.5 km of the application area and the habitats within, and adjacent to, the proposed development site, including grassland, woodland and hedgerows, are suitable for supporting foraging badger.

4.4.37 All boundary features within, and adjacent to, the proposed development site were surveyed for evidence of badger activity and while no setts or tracks were recorded, an excavated wasp nest was recorded in the bank of a drainage ditch at the southern part of the site. This is indicative of the possible presence of foraging badger.

4.4.38 Due to the suitability of the habitats and recorded evidence of foraging badger, the proposed development site and immediate vicinity is considered likely to be used, on occasion, by badgers as part of a wider foraging resource. However, due to the suitability of the habitats in the wider landscape for foraging badger, the proposed development site is considered to be of value to badgers within the immediate zone of influence only.

Bats

4.4.39 Several non-specific records of bats were provided by the LBP from within 2.5 km of the application area. All British species of bat are protected under UK and European legislation.

4.4.40 The land immediately surrounding the proposed development site includes an intact network of linear features, including hedgerows and drainage ditches, which are of potential value as bat foraging and commuting routes. The grassland habitats of the field headlands, particularly the more diverse field margin at the north, are also potentially suitable as foraging bat habitat. As such foraging and commuting bats may use the application site as part of a wider resource. However, given the extent of similar habitat within the wider area (*c.* 5 km) the study area is not considered to

be of importance to foraging/commuting bats outwith the zone of immediate influence.

4.4.41 The site and surround area also include numerous mature trees, occurring as standard trees in hedgerows and canopy trees in semi-natural broadleaved woodland. Ash occurs frequently and mature and over-mature specimens of this species can contain crack and crevices that are potentially suitable for roosting bat species including noctule (*Nyctalus noctula*). Mature ash with broken limbs and the potential to support roosting bats were recorded in the hedgerow to the west of the site and in the cops to the south of the site.

Birds

4.4.42 While no formal bird survey was undertaken at the site, incidental records were made at the time of survey and consultation with Lincolnshire Bird Club (LBC) has returned bird records for the area within 2.5 km of the turbine location (Appendix 4.1).

4.4.43 Inspection of the data supplied by LBC demonstrates that the majority of bird reports for the area relate to the proximal sections of the Humber SPA/SAC/Ramsar around South Ferriby and Read's Island comprising predominantly wildfowl, gulls and waders.

4.4.44 None of the SPA cited species records provided by LBC were from the study area and no records of these species were made at the time of survey. The study area was in intensive agricultural production at the time of survey and as such is likely to be suboptimal for supporting populations of wintering bird species for which the SPA is designated. Neither the study area nor application area are considered likely to be critical to the requirements of any of these species, although it is possible that they may use or fly over the site from time to time. However, the habitats present on site are not considered to be of importance to populations of these species outwith their zone of immediate influence. dance of similar suitable habitat within the wider landscape.

4.4.45 Other than single sightings, the only species with multiple records registered directly for the study area are common buzzard (*Buteo buteo*) and little owl (*Athene noctua*); both with records made in 2010. Of the species included on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) only quail (*Coturnix coturnix*) has been reported within the study area on more than one occasion.

4.4.46 During the Phase 1 Habitat survey incidental bird registrations were noted. The records reflect the cultivated nature of the site including pheasant (*Phasianus colchicus*), wood pigeon (*Columba palumbus*), buzzard and barn swallow (*Hirundo rustica*).

4.4.47 The hedgerows and woodland are likely to provide suitable foraging and nesting habitat for a range of farmland bird species. However, the extent of suitable foraging and nesting habitat for farmland bird species is limited within the application area compare to the wider landscape and therefore hedgerows and woodland is not considered to be important to foraging and nesting bird species outwith the immediate zone of effects.

Water Voles

4.4.48 A large number of records of water vole have been supplied by Lincolnshire Biodiversity Partnership, which are included as Appendix 4.1. All of these records

were made in 2007 and originate from either Fulseas Drain or Marsh Drain. Fulseas Drain runs parallel to East Drain and at its closest point lies *c.* 142 m to the north of Marsh Drain and the proposed development site. Fulseas Drain is not connected to any part of network that surrounds the field containing the proposed development site. Marsh Drain is the drainage ditch that flows along the northern boundary of the site.

4.4.49 The eastern part of Marsh Drain was dry at the time of survey and the ditch bottom did not support vegetation indicative of wet ground. This part of the drain is therefore considered to be only seasonally wet and not suitable for supporting a population of water voles.

4.4.50 Where accessible all ditches surrounding the field containing the proposed development site were searched for evidence of water vole. No evidence of the presence of water vole were found, however, tall vegetation and steep banks impeded access to the ditch bottom of the large ditches surrounding the copse at the south of the survey area.

4.4.51 Water voles are a UK BAP listed species. Due to the presence of suitable water vole habitat and the recent recorded presence of water vole in habitat immediately adjacent to the proposed development site, the drainage network as a whole is potentially considered to be of value for supporting water vole at a local level.

Other Species

4.4.52 No waterbodies were recorded within 250 m of the application area and as such great crested newts (*Triturus cristatus*) are not considered to be a receptor with respect to this development. The watercourses (ditches) are not considered suitable to support otter (*Lutra lutra*) due to the lack of water and bankside shelter. Similarly, due to the lack of water white clawed crayfish (*Austropotamobius pallipes*) are not considered to be a receptor with respect to this scheme.

4.4.53 Brown hare (*Lepus europaeus*) were not recorded during the survey, but habitats within the study area are considered to be suitable for supporting this species. Brown hare are a UK and Local BAP listed species. The field margins and hedgerows within the application area provide limited cover when compared to the extent of these habitats in the wider area. The application area is considered to be of importance to brown hare within the immediate zone of influence only.

4.4.54 No other species of nature conservation importance were noted during survey. No invasive species listed on Schedule 9 of the Wildlife and Countryside Act (1981) as amended were recorded at the time of survey.

4.5 Assessment of Potential Impact

4.5.1 This section of the report aims to assess the impacts that will result from implementation of the proposed development to the baseline condition described above.

Designated Sites

4.5.2 The application area is located approximately 1.5 km from the Humber Estuary SSSI/SPA/SAC. No direct impacts to these sites are anticipated to result from the scheme as proposed.

4.5.3 The network of drainage ditches within the survey area connects to East Drain,

which ultimately flows into South Channel of the Humber Estuary. There is therefore potential for runoff resulting from construction works within the proposed development site to reach the Humber Estuary. Due to the distance between the Humber Estuary and the proposed development site together with the small scale of construction and decommissioning works no impacts associated with pollution risk to designated sites are anticipated to result from the scheme as proposed.

4.5.4 The potential for the operation of the proposed scheme to affect bird species for which the Humber SPA is designated is discussed in Section XX below.

4.5.5 East Drain, South Ferriby LWS is designated as a good example of a drain habitat. This designated site is directly connected to the proposed developments site through Marsh Drain and lies 0.95 km from the proposed turbine location. There is potential for runoff from the proposed development to impact on this habitat. However, due to the small scale of construction and decommissioning works, a pollution event arising from the works it is not considered likely to have an impact on the East Drain and South Ferriby LWS outwith the local level.

4.5.6 There is no connectivity between the proposed development site and the remaining non-statutory designated sites within the vicinity. No mechanism by which impacts to the habitats for which these sites are designated has been identified.

Habitats

Arable Field

4.5.7 Due to its intensively managed nature and low botanical diversity, the arable crop area within the proposed development site is considered to be of value to nature conservation within the immediate zone of influence only. Land take of this habitat will result in only a small proportion of the arable field being lost and due to the low value of this habitat not considered to be of importance to nature conservation outwith the zone of immediate effects.

Arable Field Margins and Headland

4.5.8 The scheme as proposed does not require landtake of the northern field margin, which is currently managed for nature conservation and as such no impacts are proposed to this feature.

Boundary Features

4.5.9 No land take of hedgerow habitats is anticipated to occur as a result of the proposed development and no impacts to these features are predicted to occur as a result of the proposed development.

4.5.10 The proposed development will require a crossing of one drainage ditch, which was dry at the time of survey. This ditch is the dry, eastern section of Marsh Drain and in terms of its botanical interest is considered to be of value to nature conservation within its immediate zone of influence only. As only limited land take of this habitat is required, and assuming that any crossing maintains the capacity of the ditch to carry water during particularly wet periods, land take of this habitat is considered to represent an impact to nature conservation within the immediate zone of effect only.

Woodland and Standard Trees

4.5.11 No loss of mature trees or land take of woodland habitats will occur as a result of the development as proposed. No impact to the ecological function of these

habitats is therefore anticipated to occur.

Species

Badger

4.5.12 The proposed development site and immediate vicinity include habitats suitable for foraging badger and evidence of potential foraging badger was recorded in the wider area during the walkover survey. However, land take of habitats suitable for foraging badger are anticipated to be minimal and when compared to the extent of alternative foraging habitat within the wider landscape impacts land take of potential badger foraging habitat is not considered to be of importance to nature conservation outwith the zone of immediate effects.

Bats

4.5.13 The study area contains features considered to be suitable for foraging and commuting bats including ditches, hedgerows and an area of broad-leaved woodland. In addition there is some potential for mature ash trees to contain features of potential interest to supporting roosting bats.

4.5.14 The turbine location has ensured a minimum of a 50 m standoff between the swept area of the turbine blade and the nearest hedgerow or woodland edge in accordance with NE Technical Information Note (TIN059), which contains interim guidance in relation to bats and single turbines larger than 250 kW. No trees with potential to support roosting bats are located within 200 m of the proposed turbine location.

4.5.15 Due to the location of the turbine away from suitable bat foraging and roosting features and the small size of the swept area it is considered highly unlikely that the scheme as proposed will result in a bat strike risk of sufficient magnitude to adversely affect the favourable conservation status of any bat populations that may be present in the local area. No significant impacts in respect of strike risk are anticipated to result from the scheme as proposed.

4.5.16 No land take or severance of linear features potentially used by commuting bats is included in the development proposals, and only limited land take of sub-optimal bat foraging habitat (arable fields), representing only a small proportion of that available within the site and its immediate vicinity, is anticipated. As such land take of potential bat foraging habitat is considered to be of importance to foraging bats within the zone of immediate effects only.

Birds

4.5.17 The construction of a wind turbine can potentially have a number of direct and indirect impacts on bird populations. These impacts may result in bird disturbance, displacement, habitat fragmentation or collision risk.

4.5.18 Indirect impacts from noise, dust and traffic movements during construction and decommissioning will be temporary and of no significance outwith the immediate zone of effect.

4.5.19 Providing any required minor works (tree pruning, hedge trimming etc.,) are undertaken outside the breeding bird season they are not considered to be of significance to bird species outwith the immediate zone of effect.

4.5.20 Direct impacts of construction can include bird displacement through hedgerow and

arable habitat land-take although in this case the small footprint of the single turbine is not considered to be of significance to breeding or wintering bird populations outwith the immediate zone of effect.

4.5.21 Direct impacts also include the risk of bird collision with the rotors. Large bird species with lower manoeuvrability are most at risk from collision and would include wildfowl, raptors and waders. The site is approximately 1.5 km south of the Humber Estuary (SPA/SAC/Ramsar). From data supplied by the Lincolnshire Bird Club it is clear that the majority of records for wildfowl, raptors and waders from the Humber area to the north (Read's Island, South Ferriby etc.) rather than the uniform, arable habitats associated with this area of North Lincolnshire. There are no registrations for SPA cited species from the immediate Horkstow area within the LBC data. Due to the lack of records of high risk species from within the vicinity of the application area and the small scale nature of the proposed scheme, including the limited swept area of the candidate turbine, the potential for unacceptable levels of collision risk to these species to result from the operation of the proposed scheme is considered to be low.

4.5.22 The main bird populations utilising these habitats during both the breeding and winter seasons will be passerines; largely finches, buntings and tits. The risk of collisions from a single turbine involving such species having a significant impact on local populations is considered to be low.

Water Voles

4.5.23 The proposals will require crossing of a drainage ditch for access to the site. No water voles were recorded within the drainage ditch network within the study area at the time of survey and as such no impacts to this species are anticipated to occur through habitat loss.

4.5.24 Without mitigation there is the potential for indirect impacts due to runoff from the site during construction to enter Marsh Drain and subsequently the wider drainage network. Due to the importance of the wider drainage network for supporting water vole, indirect impacts resulting from pollution are anticipated to represent an impact to water vole at the local level.

Brown Hare

4.5.25 The scheme as proposed will require minimal landtake of arable habitats and only temporary and localised disturbance during the construction and decommissioning phases. No significant adverse effects to brown hare populations that may be resident in the local area are anticipated to result from the scheme as proposed.

4.6 Mitigation Measures

Designated Sites

4.6.1 Indirect impacts to the Humber Estuary and East Drain, South Ferriby LWS will be avoided through implementation of the guidance contained within *PPG5: Works and Maintenance in or near Water*.

Habitats

4.6.2 No specific mitigation is required in order to prevent significant impacts to the botanical interest of habitats within or immediately adjacent to the proposed development site. Upon decommissioning of the scheme the site will likely be reverted back to agricultural usage resulting in no net loss of this habitat in the long

term.

Species

Badgers

4.6.3 Badgers are highly mobile and therefore care should be undertaken to ensure any trenches dug during the construction phase are covered overnight or planks left within them to ensure badgers do not become trapped.

Birds

4.6.4 No specific mitigation is required in order to prevent significant impacts to the bird population within or immediately adjacent to the proposed development site. It is however recommended that the cropping regime in the immediate vicinity of the turbine is managed to avoid winter crops that might attract significant numbers of wildfowl such as Pink-footed Geese e.g. cereals (particularly not left as winter stubble) or legumes which are favoured for feeding. Spring grass growth is also an important food source for geese and should be avoided if possible.

Water Voles

4.6.5 Whilst no water voles were recorded within the drainage ditch network within the study area at the time of survey, they are highly mobile species and are known to be in the wider area. It is therefore recommended that prior to works commencing any drainage ditch within 5 m of works are checked for signs of water vole presence by a suitably experienced ecologist, as a precautionary measure.

4.6.6 See 4.6.1 above from pollution prevention measures to safeguard water vole populations in the wider area from effects of pollution events during construction and decommissioning.

Brown Hare

4.6.7 No significant adverse impacts to brown hare populations are anticipated to result from the development as proposed. Therefore no mitigation in respect of this species is anticipated to be required.

4.7 Conclusions

4.7.1 This ecological assessment is based on the findings of surveys undertaken and the responses of consultees. The information obtained and assessment processes have highlighted the following key areas.

- **Habitats and Vegetation**: Land take of vegetation communities as a result of the proposed development is considered to represent an impact to nature conservation within the zone of immediate effect only.
- **Badgers**: No direct impacts to badgers or badger setts are anticipated to occur from the proposed development. However, evidence suggests that badgers use the land within the vicinity of the proposed turbine as part of a wider foraging resource. Due to the abundance of suitable badger foraging habitat within the wider area, impacts to foraging badgers are anticipated to occur within the zone of immediate effect only.
- **Bats**: No direct impacts to roosting bats are anticipated to result from the proposed works. A minimum of 50 m buffer between proposed turbines and

hedgerows/trees/woodland edge will be maintained in accordance with the Natural England guidelines.

- **Birds**: The habitats present within the application area are not likely to be critical to the requirements of any bird species. No significant impacts to birds are anticipated during the construction phase. In view of the low number of records of bird species considered to be at high risk of collision with turbines and the small scale nature of the proposed scheme no significant impacts to birds are anticipated to result from the operation of the proposed scheme.
- **Water Vole**: Water voles are known to be present within the wider area. However, no individuals or evidence of water voles was recorded during the site survey. Appropriate pollution prevention measures will be employed to prevent runoff into water courses. In addition, prior to any works within 5 m of the drainage ditches, i.e. the crossing point, the banks will be inspected by an appropriately qualified ecologist. Appropriate mitigation will be designed in light of the survey findings. Assuming the status of water voles within the site remains static, impacts to water voles in terms of habitat loss are anticipated to occur within the zone of immediate effect only.
- **Brown hare**: No evidence of brown hare was recorded during the walkover survey and no records of brown hare were returned as a result of the data consultation process. However, the land within the footprint of works includes habitats suitable for supporting brown hare. Due to the abundance of alternative similar habitats within the immediate vicinity, and the limited landtake to result from the proposed development, any impacts to brown hare are anticipated to occur within the zone of immediate effect only.

4.7.2 In summary the majority of the potential effects of Warren Field are predicted to be neutral (i.e. no detectable effect) or of no significance outside their area of immediate effect. No significant adverse residual effects are anticipated to result from the scheme as proposed.

4.8 References

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5. Noise

5.1 Introduction

5.1.1 Assessment of noise impacts associated with the proposed scheme has been undertaken by Blue Tree Acoustics.

5.1.2 The proposed development is for installation of one wind turbine with 37 - 40 m hub height on a section of land some 470 m from the nearest residential property, which is northeast of the proposed turbine location. In addition, there is a residential property some 480 m to the east and 520 m to the southeast of the proposed turbine location. Properties to the west of the site are approximately 3.25 km away.

5.1.3 The noise impact assessment has included:

- inspection of the site and surroundings, and study of the plans provided by the client;
- a six-day noise monitoring survey undertaken at the nearest residential locations, and
- evaluation of the site in accordance with ETSU-R-97 (ETSU, 1997) (hereafter called ETSU) and the Institute of Acoustics (IOA) Noise Working Group guidance.

5.2 Methodology

5.2.1 The following guidance and information sources have been considered in carrying out this assessment:

- Planning Policy Statement 22 Renewable Energy (2004) (hereafter “PPS 22”) and PPS 22 ‘Companion Guide’ - Planning for Renewable Energy (Chapter 2).
- Planning Policy Guidance Note 24 Planning and Noise (1994) (hereafter “PPG 24”) (Chapter 2).
- ETSU-R-97: The Assessment and Rating of Noise from Wind Farms (1997).
- The Prediction and Assessment of Wind Turbine Noise – Agreement about relevant factors for noise assessment guidance by a Noise Working Group published in IOA bulletin March/April 2009.

5.2.2 Planning Policy Statement 22 has recently been superseded by the NPPF but there has been no new guidance issue which suggests a change from the usual practice of using ETSU-R-97 for the assessment of wind farm noise.

5.2.3 ETSU provides a framework for the rating and assessment of noise from wind turbines. It is the primary UK noise standard for wind turbine noise assessments. ETSU describes a framework for the measurement of wind farm noise and gives indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours, without placing unreasonable restrictions on wind farm development or adding unduly to the costs and administrative burdens on wind farm developers or Local Authorities.

5.2.4 ETSU recommends that noise limits be determined and proposed development be designed to meet these limits at the nearest noise-sensitive properties in order to

protect outside residential amenity and prevent sleep disturbance in bedrooms. It proposes that noise limits be site-specific, as they should be based on the existing background noise levels measured using the $L_{A90(10min)}$ parameter (see Appendix 5.1 for glossary of terms).

5.2.5 Background noise levels fluctuate throughout the day and night and can be affected by local and distant noise-generating activity, such as vehicular movement, as well as by weather conditions including wind and rainfall.

5.2.6 Noise levels generated by wind turbines correlate to wind speed and ETSU requires that background noise levels and wind turbine noise levels be considered with reference to wind speeds. Background noise levels elevated due to heavy rainfall should be excluded. In addition ETSU sets separate noise limits for quiet daytime and night-time periods.

5.2.7 Quiet daytime is defined as 18:00–23:00 h daily, as well as 13:00–18:00 h on Saturday, and 07:00–18:00 h on Sundays. During these periods, ETSU is concerned with the protection of outdoor amenity for residents. ETSU proposes the adoption of a site-specific standard of 5 dB(A) above the prevailing wind varying background noise level.

5.2.8 In addition to the limit of 5 dB(A) above background noise level, where background noise levels are low, the limit is defined as 35–40 dB(A). The quiet daytime limit also applies to all other daytime periods, with the limits based on the quiet daytime background noise levels.

5.2.9 At night, ETSU is concerned with sleep disturbance. Night-time is considered to be all periods between 23:00 and 07:00 h. The same limit of 5 dB(A) above the prevailing wind varying background noise level applies. In addition, a limit of 43 dB(A) is set where background noise levels are low.

5.2.10 The following limits are therefore set in accordance with ETSU:

- Daytime: The greater of 35 dB(A) or 5 dB(A) above the prevailing quiet daytime background noise level.
- Night-time: The greater of 43 dB(A) or 5 dB(A) above the prevailing night-time background noise level.

5.2.11 There is also provision for an increase in the limit where the resident has a financial interest in the development. In this situation, the limit for both daytime and night-time becomes the higher of 45 dB(A) or 5 dB(A) above the prevailing background noise level for the relevant period.

5.2.12 Noise sources with tonal characteristics as defined in ETSU are penalised by a correction of up to 5 dB(A).

5.2.13 The IOA guidance is not adopted by Government, but it provides some useful guidance relating to wind farms. Some of the advice is widely acknowledged to be prejudicial to small developments.

5.2.14 The guidance states that, ideally, wind speeds should be measured on site at two heights which are not less than 60 % and between 40–50 % of the hub height. A method is then provided for the amount of wind shear to be estimated, and noise levels are adjusted accordingly. The document states that, where wind speeds can

only be measured at 10 m height, a clearly defined method for allowing for wind shear should be adopted and presented. The correction can be applied to either the background or turbine noise levels.

5.2.15 The guidance suggests that the octave band prediction method of ISO9613-2 should be used in order to calculate noise radiation from the turbines, and that sound power levels should be used as an input with temperature of 10 °C and 70 % Relative Humidity (RH) used in the calculation. The guidance also comments on ground effects, permitting either G=0 or G=0.5, but advising that G=1 should not be used. In addition, the guidance states that the effect of barrier attenuation should not normally be taken account.

5.2.16 The relationship of $L_{A90,10m} = L_{Aeq,10m} – 2$ (see Appendix 5.1 for glossary of terms) is supported and encouraged.

5.3 Baseline Conditions

5.3.1 A noise survey was undertaken beginning at 23:00 h on 28th July 2011 for six days in order to determine the existing noise climate in the vicinity of the nearest residential properties to the proposed wind turbine.

5.3.2 It was intended to survey for 14 days, however equipment was tampered with and failed at the end of the sixth day. However, ETSU states that it is expected that at least one week's worth of measurements would be required in order to avoid the influence of unrepresentative conditions, but that the actual duration will depend upon the weather conditions, including wind speed and direction and rainfall present during the survey period. It should be noted that there was no rainfall on site during the period, thus fortunately all of the measured data collected in the two significant time periods is useable, and this dataset is considered representative of a typical week. More useable data has been collected in this case than could have been collected in, for example, another fortnight period with average or high amounts of rainfall.

5.3.3 Noise levels were measured at locations representative of the nearest residential properties in all directions. The following locations were selected, as indicated on Figure 5.1:

- Hall Farm *c.* 520 m to the south east;
- Middlegate Kennels *c.* 480 m to the east;
- Detached House *c.* 470 m to the northeast, and
- Sedgeworth Farm *c.* 3250 m to the west.

5.3.4 Noise measurements were carried out using four Norsonic 118 Type 1, Class 1 Integrating Sound Level Meters. Noise was measured in terms of broadband A-weighted indices. The sound level meters were mounted on a tripod at approximately 1.5 m height from local ground in free-field conditions, i.e., at a minimum of 3.5 m from reflecting surfaces other than the ground, and a proprietary windshield was fitted to the microphone. Calibration checks were carried out both before and after the measurements with no variance observed. Where possible, microphone locations were placed in close proximity to the residential properties in each location; however, in all cases the microphone location is such that the measured background noise level is considered representative. It should be noted that security must be a consideration in selecting monitoring locations.

5.3.5 One Vantage Pro 2 Weather Station with 10 m anemometer mast was installed at a location slightly north of the proposed turbine location. The site was selected for security reasons, but the weather data is representative of the installation location.

5.3.6 Data was logged every 10 minutes with wind speed (m/s), direction, rainfall (mm) and L_{Aeq}. L_{Amax}, L_{A10} and L_{A90} parameters stored for each location. The measurement results are detailed in Appendix 5.2 with glossary in Appendix 5.1.

5.3.7 Appendix 5.3 sets out the measured background noise level data (shown as blue diamonds and blue squares) plotted against measured wind speed at 10 m height for quiet daytime and night-time periods. The data represented by blue diamonds is included in the following regression equations whilst the data represented by blue squares is excluded, as it is considered to be strongly influenced by extraneous noise sources. In each case, the 'best fit' regression equations are generated considering a number of regression options, i.e. exponential, linear, logarithmic, polynomial (of 2^{nd} to 6^{th} order). The results of each of these types of trendline were compared with the 'best' option finally selected and presented (shown with a black line). It is often difficult to determine what is 'best', but a plausible relationship between background noise levels and wind speed should be sought. Wind-generated background noise increases with wind speed. The exclusion of data considered likely to be strongly influenced by extraneous noise sources has the effect of ensuring that the ETSU noise limit is not elevated as a result of extraneous and potentially infrequent noise sources.

5.3.8 In each case, the ETSU noise limit is represented with the red line. As shown in Appendix 5.3, the 35 dB(A) day and 43 dB(A) night limits are appropriate for some wind speeds at some locations, and at other times the 5 dB(A) above background noise limit is used.

5.4 Assessment of Potential Effects

Wind Turbine Noise

5.4.1 In addition to the background noise levels and ESTU limits, the graphs in Appendix 5.3 also show the calculated noise levels generated by the turbine, represented by a purple 'X'.

5.4.2 The noise level has been calculated in accordance with ISO9613-2 and the IOA guidance, taking account of the manufacturer's sound power level data in octave bands, the distance between noise source and receiver, atmospheric attenuation, ground effects with G_s, G_r and G_m all given the value 0.5 and receiver height selected as 4 m, with a -2 dB(A) correction from L_{Aeq} to L_{A90}. The calculations make no allowance for barrier attenuation. An extract from the manufacturer's specification based on 37 m hub height is shown in Appendix 5.4 and has been has been used in the calculations. The turbine has no tonal content.

5.4.3 Appendix 5.5 presents similar calculations with input data as above; however, in this case, an allowance has been made for wind shear.

5.4.4 The proposed development is for the introduction of a single turbine rather than for a large industrial wind farm. The cost associated with measuring wind speeds at 60 % and 40–50 % hub heights as suggested in the IOA guidance means that this is not a practicable proposal for this site. The IOA guidance is at odds with ETSU in this area, as ETSU selects 10 m high wind speed monitoring partially because measurement at this height is generally possible within reasonable cost.

Nonetheless, the issue of wind shear should be addressed. In order to ensure suitable allowance for wind shear, the above data has been adjusted such that 5 m/s data is used at 1m/s 10 m height speeds, 6 m/s data is used at 2 m/s 10 m height speeds, etc. This method in effect considers the impact of the turbine operating at full noise level when 10 m height wind speeds are only 6 m/s at 10 m height. This adjustment is large, and assumes that there is a significant difference in wind speed between 10 m height and hub height, although this is only 27 m higher for this proposed installation.

5.4.5 As shown in Appendix 5.3 in all cases the turbine noise level is within the ETSU/IOA guidance limit, as the wind shear adjusted turbine noise (purple 'X') is always below the ETSU limit (red line). Location 4 noise turbine noise levels are so low that they fall below the range of the graph; the range of Location 4 graphs has not been adjusted in order to allow easy comparison between all graphs. It is reiterated that this calculation assumes downwind noise propagation for all locations, a large wind shear correction, and no barrier effects.

5.4.6 In addition, it should be noted that the calculations indicate that the following wind shear adjusted maximum noise levels will be generated at the four locations:

- Location 1 – 36.6 dB LA90;
- Location 2 – 37.4 dB LA90;
- Location 3 – 37.6 dB LA90, and
- Location 4 – 16.8 dB LA90.

5.4.7 These levels of noise are relatively low, and in all cases they are a minimum of 5 dB(A) below the ETSU fixed limit of 43 dB L_{A90}, which is independent of the measured background noise levels. As such, the night-time background noise levels and subsequent use thereof are actually irrelevant when considering whether or not the site meets the ETSU criteria at night.

5.4.8 The levels are at most 2.6 dB(A) higher than the ETSU quiet daytime fixed limit of 35 dB L_{A90}, which is independent of the measured background noise levels. However, in all cases, the calculated noise levels meet the background adjusted noise limits, even with the significant adjustment for wind shear.

5.4.9 The following information is given for guidance only.

5.4.10 The possible effect of Aerodynamic Modulation (AM) and low frequency noise is commonly a concern when new onshore wind turbines are considered in the UK. Aerodynamic modulation is always present in wind turbine noise as it is the nature of wind turbines to generate the periodic 'swish' noise which is AM. The term can also be used to describe a periodic low frequency sound which has occasionally been observed at existing wind farms.

5.4.11 These issues have been researched extensively over recent years and ETSU takes AM into consideration, since blade swish accounts for the majority of the overall noise levels generated by a turbine, and therefore no correction is needed.

5.4.12 In 2006, work was carried out to investigate low frequency and infrasonic noise from three existing wind farms in the UK. This assessment, 'The measurement of low-frequency noise at three UK wind farms' by Hayes MacKenzie Associates Ltd, for the Department of Trade and Industry (2006) concluded that the common cause

of complaints was not low-frequency noise, but the audible modulation of aerodynamic noise, especially at night. The study suggested that the issue be revisited at a later date, and subsequently Salford University were commissioned by Defra, BERR and the CLG to investigate AM further. The report concluded that AM was a definite factor at four of the 133 UK operational sites at the time, and a possible factor at a further eight sites. The conditions associated with AM additional impact therefore might occur between 7 % and 15 % of the time. At the time, the government published a statement accompanying the report stating that PPS 22 and ETSU remain the appropriate assessment tools.

5.4.13 Noise from the proposed Warren Field wind turbine is broad-band in nature, containing no particular tone. Based on the above, it is considered that AM and low frequency noise are not additional issues at this site, and that ETSU limits will satisfactorily protect local residents from turbine noise.

5.4.14 In addition, it should be noted that the ability of wind turbines to transmit discernible vibration into the ground was investigated by Keele University in 2005. The report found that there is no possibility of humans sensing the minuscule amount of vibration that may exist, and absolutely no risk to human health Keele University, (2005).

5.4.15 It is considered that levels of vibration in this case will be such that they will be un-measureable as well as imperceptible at 100 m from the turbine, with levels much less at the residential locations.

5.4.16 In addition, the IOA guidance concludes that there is no robust evidence that low frequency noise (including 'infrasound' or ground-borne vibration from wind farms) generally has adverse effects on wind farm neighbours.

Construction Noise

5.4.17 The nature of construction works is such that there are usually both static and moving noise sources at various times on site. Mobile construction plant, earthmoving equipment, and heavy haulage will typically move around the site and access track. Static noise sources generally include items such as generators, and are placed temporarily at fixed locations during the course of the works.

5.4.18 Construction noise is usually assessed with reference to BS 5228 part 1:2009 'Code of Practice for Noise and Vibration Control on Construction and Open Sites'. This standard sets out various methods for the prediction and control of construction noise levels using sound power level data for each item type and making allowance for operation, location, etc. Calculated noise levels are then compared with absolute noise limits, which define acceptable limits for short-term construction activities during the normal working day.

5.4.19 British Standard 5228 suggests a daytime noise limit of 65 dB $L_{Aeq,1h}$ in rural areas, as this generally provides sufficient protection of amenity. Night-time construction works noise limits are set at 45 dB $L_{Aeq,1h}$. However, night-time construction is not envisaged at this site.

5.4.20 Given the distances between site and noise receivers, the daytime noise limit of 65 dB $L_{Aeq,1h}$ can be met. It is therefore considered appropriate for construction noise to be controlled by a suitably worded Planning Condition.

5.4.21 During construction works, there may be additional road traffic in the vicinity of the

site; however, disruption and noise would be minimised where possible.

5.4.22 A Construction Management Plan should be developed in order to minimise noise impact at noise sensitive locations following the guidance on good practice for noise reduction set out in BS 5228.

5.5 Conclusion

5.5.1 The predicted wind turbine noise levels, calculated in accordance with ETSU and the IOA guidance, will remain within the ETSU noise limits at all times.

5.5.2 This assessment demonstrates that the development would not have undue effect on the amenity of residents by reason of noise.

5.5.3 Noise impact during construction of the proposed wind turbine site will be minimised by utilising the appropriate mitigation measures and recommendations given in BS 5228 and defined in the Construction Management Plan. If necessary, construction noise can be controlled by a suitably worded Planning Condition.

5.6 References

ETSU (1997). The Assessment and Rating of Noise from Wind Farms.

Noise Working Group (2009) The Prediction and Assessment of Wind Turbine. Noise Working Group.

Planning Policy Statement 22 Renewable Energy (2004)

Planning Policy Statement 22 'Companion Guide' - Planning for Renewable Energy.

Planning Policy Guidance Note 24 Planning and Noise (1994)

The Measurement of Low-Frequency Noise at Three UK Wind Farms (2006) Hayes MacKenzie Associates Ltd, for the Department of Trade and Industry,

BS 5228-1:2009 Code of Practice for Noise and Vibration Control on Construction and Open Sites (2009). BSi.

Keele University (2005) Microseismic and infrasound monitoring of low frequency noise and vibrations from wind farms: recommendations on the siting of wind farms in the vicinity of Eskdalemuir, Scotland.

6. Flood Risk

6.1 Introduction

6.1.1 This Flood Risk Assessment (FRA) was prepared for the proposed development site as a consequence of the Environment Agency's (EA) Flood Zone Mapping indicating that the site was located within Flood Zone 3. Information received in the preparation of this report has shown that the previously published Environment Agency information was incorrect and the site actually lies within Flood Zone 1.

6.1.2 Given the small size of the site (approximately 0.16 ha) and its location within Flood Zone 1, a formal FRA would therefore not usually be required by the EA. In spite of the above, the data that had already been received from the EA has been analysed, in order to clarify the flooding status of the site and provide further confidence in the EA's assessment. The following FRA is considered proportionate for the development proposed in its current context and follows the General Principles outlined by the Government (TSO, 2010).

6.2 Baseline Conditions

Development Category & Vulnerability Classification

6.2.1 The site is currently an agricultural field, with two electricity transmission lines crossing the site in an approximately east to west direction. The proposed works involve the installation of a single wind turbine with associated infrastructure, to include an access track and hardstanding for a crane. In PPS 25, this development's Flood Risk Vulnerability Classification would be *Essential Infrastructure* (TSO, 2010).

6.2.2 Topographic heights across the site are shown on Figure 6.1. A topographic survey has not been undertaken in the production of this report, rather data have been taken from the Ordnance Survey Land-Form PANORAMA Digital Terrain Model dataset, obtained from Landmark Information.

Consultation

6.2.3 Information and data have been obtained from the EA and the site has been discussed with staff of the EA's Development Control Team. Information received is presented in Appendix 6.1 to this report. Further information received from the EA during the preparation of this report is included in Appendix 6.2.

6.2.4 Information has also been received from the Ancholme Internal Drainage Board (AIDB) and is presented in Appendix 6.3.

6.3 Assessment of Potential Impact

Flood Zone Status

6.3.1 The Flood Zone map obtained from the EA is included in Appendix 6.1, with an extract also included in Figure 6.2 (with the turbine location marked). This data, plus information from PPS 25 shows the proposed turbine location lying within the boundary of Flood Zone 3a. This equates to an annual risk of flooding from rivers of 1 % (1 in 100 year flood event) or a risk of 0.5 % from the sea (1 in 200 year event) with the risk of flooding being considered to be of high probability.

6.3.2 However, the NLC Strategic Flood Risk Assessment (SFRA) as approved by the EA in August 2006 was accessed on the NLC website (North Lincolnshire Council, 2006). This shows the turbine location as lying outside of the high risk area and designates the location as being within Flood Zone 1 (little or no risk). An extract of the interactive SFRA map is included Figure 6.3.

6.3.3 The EA was contacted for clarification on this discrepancy; the reply received is included in Appendix 6.2. The EA confirmed that the fluvial flood extents had been incorrectly mapped at this location and supplied an updated map with the correct extents indicated (this will be formally issued in November 2011). This updated map confirms that the location of the proposed wind turbine, and that of the associated infrastructure, lie wholly within Flood Zone 1 (Figure 6.4).

6.3.4 Despite this clarification, as the site lies close to the boundary of Flood Zone 3, the data previously received from the EA was assessed in order to provide further confidence in the EA's assessment of the flood risk to the site. This assessment is given in Section 6.3.9 below.

6.3.5 There are several watercourses in the vicinity of the site. Drains on the field boundaries (including the named Marsh Drain) run from east to west, draining into East Drain. This runs from south to north and lies approximately 770 m west of the turbine location. Immediately west of East Drain is the New River Ancholme, both of which drain into the River Humber at Ferriby Sluice.

6.3.6 It should be noted that the EA's Flood Zones are determined without taking into consideration any existing flood defences which may affect the site. The EA's Flood Map (Appendix 6.1) shows that flood defences are present between the site and East Drain, and therefore the actual risk to the site may be lower than indicated by the Flood Map.

6.3.7 In addition to the Flood Zones, the EA Mapping highlights those areas known to have been affected by flooding in June 2007. The nearest historical flooding shown lies approximately 550m west of the proposed turbine, adjacent to East Drain.

6.3.8 Information received from the AIDB (Appendix 6.4) states that the site is remote from any adopted watercourses for which they are responsible. In addition, as they consider that the development will not increase the rate of discharge of surface water runoff at the site, then consent from the AIDB will not be required.

Flood Risk Assessment

6.3.9 According to PPS 25 (now superseded by NPPF), sites within areas at risk of flooding must pass the Sequential Test; demonstrating that there are no other reasonably available sites in areas with a lower probability of flooding which could be used for the proposed development. Sequential and exception tests are planning considerations and are outside the scope of this FRA.

6.3.10 This FRA will demonstrate that the residual risks of flooding to the development are acceptable and can be satisfactorily managed.

6.3.11 The most recent information received from the EA shows that the site lies within Flood Zone 1. The proposed location of the turbine is at an elevation of approximately 5.7 m AOD (taken from Ordnance Survey Land-Form PANORAMA Digital Terrain Model dataset) with all other proposed infrastructure at the site lying at higher elevations than this.

6.3.12 The original information received from the EA is included in Appendix 6.1. The EA has indicated that since the development is classified as essential infrastructure, then the proposed turbine and associated transformers, etc., are required to be located above the 1 in 1000 year flood level (plus an allowance for climate change).

6.3.13 Modelled flood levels have been provided for three different return periods at three locations on East Drain and three on the New River Ancholme. The most applicable points are considered to be EAST01500 and ANCH01500, immediately to the west of the site. This information indicates that a 1 in 1000 year flood event (taking into consideration the potential effects of climate change) would reach 2.59 m AOD for the New River Ancholme in the vicinity of the site.

6.3.14 The proposed turbine location, lying at 5.7 m AOD, would therefore not be inundated with flood waters from East Drain in a 1 in 1000 year flood event.

6.3.15 In addition, modelled tidal flood levels have been provided by the EA (Appendix 6.1). Data provided for South Ferriby shows that a 1 in 1000 year flood event would give water levels of 5.63 AOD for this location. This level is also lower than the elevation of the proposed turbine site.

6.3.16 As defences against tidal flooding are present in the vicinity of the site, the EA has modelled the effects of a breach in the defences to give an indication of maximum flood hazard (flood risk to people), depth and velocity. The worst case modelled scenario for the site (1 in 1000 year flood with an allowance for climate change) shows that the maximum flood extents would not reach the proposed turbine, and there would therefore be no predicted risk to equipment or people at the site.

Effect of Development on Surface Water Runoff

6.3.17 The site is not located within a Functional Floodplain (Flood Zone 3b) as defined within the NLC SFRA. The site will therefore not have a detrimental effect on adjacent sites through the displacement of flood waters; therefore, no flood water storage mitigation measures are considered necessary.

6.3.18 The new access track and crane hardstanding to be provided are to be constructed from crushed stone and will therefore not reduce the area of permeable surfacing at the site.

6.3.19 The footprints of the turbine base and compact substation housing are to have a combined area of approximately 15.25 m^2. This area of extra impermeable surfacing will be minimal in proportion to the area of the whole site. It is therefore considered that the potential extra run-off generated by the proposed substation will have a negligible effect on the risk from flooding to areas adjacent to the development.

6.4 Mitigation Measures

Flood Risk Mitigation

Infrastructure Protection

6.4.1 The discussions in Sections 6.3 above have shown that there is a very low risk to the proposed development from flooding of rivers or the sea (taking into consideration a 1 in 1000 year flood event plus an allowance for climate change).

6.4.2 However, it is prudent to locate the most sensitive infrastructure at the highest elevation within the site. Information received from the client shows that a compact substation will be provided to link the turbine with the National Grid. This is to be located close to the B1204 road. This area of the site lies at an elevation of 15 m to 20 m AOD and is therefore considered suitable for the location of the substation with respect to potential flooding.

6.5 Conclusions

6.5.1 The flood risk assessment has shown that:

- The site lies within Flood Zone 1 and there is therefore a very low risk to the site from fluvial or tidal flooding.
- The development will produce a minimal amount of extra rainfall run-off and will therefore have a negligible effect on the risk from flooding to other adjacent areas.

6.5.2 Based on the findings of this FRA, the development proposals are considered acceptable.

6.6 References

TSO, 2010. Planning Policy Statement 25: development and Flood Risk. Annex D.

North Lincolnshire Council (2006):
http://www.northlincs.gov.uk/NorthLincs/Advicebenefitsandemergencies/floods/SFRA.htm

7. Archaeology and Heritage

7.1 Introduction

7.1.1 This chapter assesses the potential impacts of the proposed development on archaeology and heritage. The assessment examined a 5 km radius around the development site and identified key potential issues.

7.2 Methodology

Desk Study and Data Consultation

7.2.1 The desk based assessment has consulted the following sources:

- North Lincolnshire Historic Environment Record (HER);
- National Monuments Record (NMR);
- North Lincolnshire Archives;
- Scunthorpe Local Studies Library;
- British Geological Survey;
- East Midlands Regional Research Framework, and
- Historic Ordnance Survey mapping.

7.2.2 This desk based assessment evaluates available archaeological evidence pertaining to the development site. This assessment provides information on archaeological assets, archaeological potential and put forward possible strategies to allow the provision of sufficient archaeological mitigation works if required.

Survey Methodology

7.2.3 As part of the assessment an extensive walkover survey was undertaken in order to assess the potential for surviving above ground archaeology. In addition to this site visits were made to significant designated heritage assets located within 1 km and 5 km of the development boundary. This included SAMs, Listed buildings, Historic Parks and Gardens and Conservation Areas.

7.2.4 Photography of key sites was undertaken along with geographical plotting of key heritage assets utilising Geographical Information systems (GIS).

Assessment Methodology

7.2.5 This assessment has been undertaken in accordance with IfA Standards and Guidance for Archaeological Desk-Based Assessments (Institute for Archaeologists, 2008).

7.2.6 This assessment is carried out in line with the following pieces of regional and national legislation and planning policy (see Chapter 2). This assessment consulted the following pieces of national legislation and planning policy:

- Ancient Monuments and Archaeological Areas Act 1979;
- Planning (Listed Buildings and Conservation Areas) Act 1990, and

- National Heritage Act 2002.
- Planning Policy Statement 5: Planning for the Historic Environment (PPS5)

Valuing Heritage Assets

7.2.7 Assessment of the value of key heritage assets has been carried out utilising the criteris outlined in Annexe 1 of the DCMS guidance for Scheduled Ancient Monuments (http://www.culture.gov.uk/images/publications/ScheduledMonuments.pdf) relates to the intrinsic interest of the feature and a number of factors such as rarity, association with people or events, or historical documentation. In establishing categories of significance, it may be useful to employ a relatively wide range of values. These qualitative criteria define the nature of significance for the site and its individual elements. To give the assessments a practical value, it is also sometimes appropriate to specify degrees of significance. The criteria are set out in the following section:

- special architectural or historic interest - for Listed Buildings;
- character and appearance - for Conservation Areas (Figure 7.5), and
- national significance - for Scheduled Monuments.

7.2.8 These designations provide a formal framework of significance, but are too broad to reflect alone the cultural and historical interest of a particular site. A range of more specific values is needed to assess general site significance and the importance of individual elements, and to serve as a basis for comparison with other sites and within the site itself. These additional values may be drawn from existing sets of assessment criteria, or further developed to suit the circumstances of the site in question. Particularly useful for assessing significance in more precise terms are the criteria employed for listed building designation. These are:

- architectural interest design; decoration; craftsmanship; building types and techniques; significant plan forms;
- historic interest important aspects of the nation's social, economic, cultural and military history;
- historical association with nationally important people or events, and
- group value where buildings comprise an important architectural or historic unity.

7.2.9 A further group is represented by the criteria for scheduling monuments under the Monuments Protection Programme, including:

- ability to characterise a period;
- rarity of survival;
- extent of documentation;
- association with other monuments in a group;
- survival of archaeological potential, above and below ground;
- fragility/vulnerability, and
- diversity - the combination of high quality features.

Evaluation of receptors

7.2.10 The criteria above have also helped to define degrees of sensitivity, the relative importance of key elements or phases, and the judgements on individual elements of the site at Gazetteer level. The degrees adopted are detailed below.

Exceptional Value

7.2.11 Aspects or elements of the site which are of key national or international significance, as among the best examples (or the only surviving example) of an important class of monument or artefact, or outstanding representatives of important social or cultural phenomena, or of very major regional or local significance. Typically, in terms of Listed Building designation, this assessment might equate with Grade I or II*, and would also include all SAMs, though other individual elements of the site might be of lesser significance.

Considerable Value

7.2.12 Elements, which individually constitute good and representative examples of an important class of monument or feature, have particular significance through association (although surviving examples may be relatively common on a national scale) or are major contributors to the overall significance of the site. This degree of importance might typically equate with Grade II in terms of Listed Buildings, though other related elements might be of greater, or lesser, significance.

Moderate Value

7.2.13 Elements which show some cultural significance, or contribute to the character and understanding of the site, or help to provide an historical or cultural context for features of individually greater significance. This may include buildings and features not individually listed but where the presumption is towards protection and enhancement as part of the site's essential character.

Low Value

7.2.14 Elements which are of individually low value in general terms, or have little or no direct significance in promoting understanding or appreciation of the site, without being actually intrusive.

Intrusive

7.2.15 Items which are visually intrusive or which detract from or obscure understanding of significant elements or values of the site. Recommendations may be made on removal or other treatment. Lower degrees should not be taken to imply that elements so assessed can be lost or damaged without having impact on the significance of the site as a whole. Each element contributes to the overall values and character of the site and should not be sacrificed without assessing the broader implications.

<u>Sources and Magnitude of Impacts</u>

7.2.16 The key sources of impact to below ground archaeology and Cultural Heritage of the area resulting from the development may arise as direct and indirect effects, examples of which are given below:

Direct effects:

- Loss of the archaeological resource where the severity of impact is directly related to the loss of historic assets, designated or undesignated, reducing the

conservation value of a group of heritage assets or the historic character of the area.

Indirect effects:

- Effects on group value (severance of groups of key heritage assets and interruption of key views from or onto them). This can lead to impact on the setting and contexts of key historic assets.

7.2.17 Impacts may also be either temporary or permanent in nature. Temporary effects occur during the construction phase of development and may include impacts such as short-term erosion activities resulting from construction traffic. It should be appreciated that temporary loss of the context of high value heritage assets may have as great or greater impact as permanent land take of less sensitive heritage assets.

7.2.18 Land take comprising the footprint of the scheme following post-construction restoration is considered to be permanent and some indirect effects may also be permanent.

7.2.19 The magnitudes of impacts are evaluated in terms of their predicted effect on the integrity of a cultural heritage receptor.

7.2.20 Consideration is given to the nature and duration of the disturbance, its reversibility, timing and frequency as well as any cumulative effects, and the potential for impact avoidance or minimisation.

7.2.21 In assessing the significance of impacts, each has been considered in its entirety, ensuring all identified facets of the impact are considered. The significance of an impact depends upon the nature of the impact, the magnitude and duration of the impact and the sensitivity or importance of the heritage receptors that it affects, as determined using assessment criteria detailed above. For the purpose of this assessment the significance of all potential impacts to heritage assets of local or higher value has been assessed.

7.2.22 A significant impact is defined as an impact (adverse or positive) on the integrity of a defined site or heritage asset, or designation status of heritage assets within a geographical area, including cumulative impacts.

7.2.23 The value of the significantly affected receptor is then used to determine the implications, in terms of legislation, policy and/or development control.

7.2.24 If an impact is found not to be significant at the highest geographical level at which the receptor has been valued it may be significant at a lower geographical level. Significant impacts on cultural heritage receptors have been determined in accordance with guidance derived from planning policies and legislation applied at a scale relevant to the value of the feature or resource. Any significant impacts remaining after mitigation are termed residual impacts and should be considered in the context of legislation, policy and development control in determining the application.

7.3 Baseline Conditions

Relevant Site Context

7.3.1 The site proposed for development is located on the edge of the floodplain of the River Ancholme, now canalised, and was a natural route inland from the Humber

Estuary. The surrounding area is agricultural land with dispersed settlements, with low lying land to the north and west, with low rolling hills rising towards Barton upon Humber in the east. Historically this was rich agricultural land and has been settled from the late prehistoric period onwards, with evidence of earlier prehistoric activity also present.

7.3.2 Study of both historic Ordnance Survey maps and pre Ordnance Survey tithe maps held in North Lincolnshire Archives show no evidence of land use other than agricultural fields within the development site (Figures 7.6 to 7.8). The current field boundaries are clearly marked with no significant changes demonstrated over time.

7.3.3 The following sections describe the archaeological and historic assets recorded within a 5 km radius of the proposed development site. Section 7.4 onwards assesses the archaeological and historical context by period based on the available evidence.

Features Beyond the Development Area

7.3.4 The NMR holds 95 records for heritage assets within 5 km of the development. These are summarised in Appendix 7.1 and shown on Figure 7.1. These range from early prehistoric flint find spots to the remains of crashed Second World War aircraft.

7.3.5 The HER records numerous heritage assets within 5 km of the development, and these are summarised in Appendix 7.2 and shown on Figure 7.2. They illustrate he high potential for Roman and prehistoric archaeology in the area surrounding the development site.

Features within Core Study Area

Listed Buildings

7.3.6 There are 42 listed buildings within 5 km of the development, and these are summarised in Appendix 7.3 and shown on Figure 7.3. Horkstow Hall is the closest to the proposed site and has the potential to be significantly impacted upon by the development.

7.3.7 There is a single Grade I listed building within the 5 km study area and this is the Church of St Maurice, in Horkstow which dates to the 13th century. This has some exceptionally well preserved elements including the 13th century tower although the main body of the church has been remodelled slightly during the 17th 18th and 19th centuries.

Table 7.1 Grade I listed buildings

Name	Designation	Contribution of setting	Distance from site
Church of St Maurice	I	Medium	<1 km

7.3.8 There are four Grade II* listed buildings within the 5 km study area the closest are Horkstow Hall a small country house of 1776, with an ornate red brick frontage less than 1 k m to the south of the proposed development site. It is possible that the setting will be impacted upon by the development. Horkstow suspension bridge built in 1834-5 by Sir John Rennie is also less than 1 km form the development site.

7.3.9 The Church of St Andrew is located 2.5 km to the south of the proposed

development and is a well preserved example of a 12th century nave with later 13th and 15th century additions. The Church of St Nicholas in South Ferriby is another 13th century church which has subsequently been extensively remodelled in the 15th and 17th centuries. **Table**

Table 7.2 Grade II*listed buildings

Name	Designation	Contribution of setting	Distance from site
Horkstow Suspension Bridge	II*	Low	1 km
Horkstow Hall	II*	High	1 km
Church of St Andrew	II*	Medium	2.5 km
Church of St Nicholas	II*	Medium	>2 km

7.3.10 There are 37 Grade II listed buildings in the wider study area, and these vary from minor agricultural buildings such as barns and outbuildings through to farmhouses and these are summarised in the below table.

Table 7.3 Grade II listed buildings

Name	Designation	Contribution of setting	Distance from site
Bonby Hall	II	Medium	>2km
Barn approx. 50m North of Manor Farmhouse	II	Low	>2km
Horkstow House	II	Medium	1km
Gate, gate piers, and flanking walls to front of Horkstow Hall.	II	Low	1km
Barn approx. 30 m north east of Hall Farm Cottage	II	Low	>2km
Church of All Saints	II	Medium	>2km
Monument and Drinking Trough	II	Low	>2km
Saxby Hall	II	Medium	>2km
Woodside Farmhouse	II	Medium	>2km
Horkstow Grange Farmhouse	II	Low	>2km
Church House	II	Medium	>2km
Outbuildings at Wintringham Grange	II	Low	>2km
Farm buildings to east of Westfield Farmhouse	II	Low	>2km
Chapel Farmhouse	II	Medium	>2km
442602	II	Low	>2km
Tomb stone 5 m South West of Dents Cottage	II	Low	>2km
Eastfield Farmhouse and adjoining stable block to rear.	II	Low	>2km
Barn approx. 50m east of Winteringham Grange Farmhouse	II	Low	>2km

Name	Designation	Contribution of setting	Distance from site
Cartshed approx. 120m south of Horkstow Grange Farmhouse	II	Low	>2km
Tombstones 5m south of tower of Church of St Maurice	II	Low	>2km
Ivy House	II	Medium	>2km
South Ferriby Hall	II	Medium	2km
Grange Farmhouse	II	Low	>2km
Outhouse and screen wall adjoining north west angle wall of Winteringham grange Farmhouse	II	Low	>2km
Saxby Manor	II	Low	>2km
Winteringham Grange Farmhouse	II	Low	>2km
Dents cottage	II	Low	>2km
Eastfield Farmhouse and adjoining buildings	II	Low	>2km
Farmhouse and barn at barton field farm	II	Low	>2km
Westfield Farmhouse and attached Barn	II	Low	>2km
Manor Farmhouse	II	Medium	>2km
Hall Farm Cottages	II	Low	>2km
The Old Rectory	II	Medium	>2km
Saxby Bridge	II	Low	>2km
Glentworth House	II	Medium	>2km
Bonby House	II	Medium	>2km

Scheduled Ancient Monuments

7.3.11 There are four SAMs within 5 km of the development, and these are summarised Appendix 7.4 and shown on Figure 7.3. The Roman Villa at Horkstow Hall is the closest to the proposed site and has the potential to extend within the development area.

SAM number	Name	Description	Contribution of setting	Distance from site
30116	Roman villa immediately east of Horkstow Hall	Modern fencing, walls and access ways to drains excluded, ground beneath included.	Low	<1 km
OCN11	Ferriby sluice		Low	2km
OCN8	Old Winteringha	South part of boundary	Low	4 km

SAM number	Name	Description	Contribution of setting	Distance from site
	m Roman settlement	measured in.		
30115	Site of Jacobean manor house & gardens immediately W and S of St Maurice's Church.	Post & wire fencing excluded from scheduling, ground beneath included.	Medium	3 km

Archaeological Potential

7.3.12 Numerous archaeological investigations in the vicinity of the development including, watching briefs, evaluations, survey and field walking. These are summarised on Figure 7.4. Within the area of the proposed development there have been no significant archaeological investigations. Overhead power lines that pass to the south of the site were subject to watching brief undertaken by Humberside Archaeological Unit in 2000. No significant archaeological remains were recorded.

7.3.13 The findings of Desk-based Assessment are detailed below:

Early Prehistory (c. 10,000 – 2500 BC)

7.3.14 No recorded Mesolithic or other early prehistoric sites are present in the vicinity of the proposed development, although there are isolated find spots of artefactual evidence in the surrounding landscape.

Iron Age (c. 800 BC – AD43)

7.3.15 Iron Age or Roman British enclosures and field systems have been identified in the vicinity of the development using aerial photographic survey. These are located proximal to the north and east of the site.

Romano British Period (c. AD 43 – AD 410)

7.3.16 The buried remains of a Romano-British Villa, located in the grounds of Horkstow Hall are located approximately 500 m south east of the proposed turbine. A Romano-British mosaic, dated stylistically to the fourth century AD, was discovered by labourers setting out a kitchen garden in 1797. Their quality indicates the affluence of the villa owner. It is possible that the remains of the villa site at Horkstow Hall extend into the development area. As such there is a medium to high potential for further Roman remains to be discovered within the development site.

7.3.17 The field in which the proposed development is to be located has produced localised small finds of Romano British Pottery although these did not come from stratified deposits. There is potential for more surviving Roman archaeology in this area.

Early Medieval/Anglo Saxon Period (c. AD 410 – 1066)

7.3.18 The town of Barton upon Humber, located 4.5 km to the east of the development is known for its Saxon church tower of St Peter's, and there have been many Saxon

archaeological finds within the town. Closer to the development in South Ferriby is the church of St Nicholas. While there is currently no surviving evidence of an Anglo Saxon place of worship, it is reputed that villagers have worshipped continuously in this church for almost a thousand years. There is mention of the church in 1086 in the Doomsday Book. There is also a nearby Anglo Saxon settlement along the Horkstow Road at South Ferriby. This consisted of a Dark Age ditch and Anglo Saxon grübenhaus. It is unlikely that this settlement extended as far as the proposed development site, however the possibility of further Anglo Saxon remains cannot be ruled out.

Medieval Period (1066 -– c.1500)

7.3.19 There is evidence for considerable medieval settlement in the wider area surrounding the development site. The nearest significant medieval settlement was located at Barton upon Humber which was a very important market town in North Lincolnshire during the medieval period. There is also evidence for medieval settlement at South Ferriby and Horkstow, both recorded in the Domesday Book. There are also localised find spots of this period within the development area including medieval pottery that could be residual from agricultural "night soiling. However there is still low potential for *in situ* medieval archaeology to be impacted upon by the development.

Post Medieval Period (1500 – c.1900)

7.3.20 During the 18th and 19th century the River Ancholme was canalised and the Ancholme navigation was created to carry agricultural produce to the Humber Estuary. This was promoted in the Navigation Acts of 1767, 1802 and 1825. This changed the landscape of the area and the original course of the river can be seen in the surrounding field patterns. Several small industrial sites such as the South Ferriby Brick Works also appear along the new navigation and the settlements in the area can be seen to grow and expand.

Modern Period(1900 – present)

7.3.21 In the 20th century the development of South Ferriby CEMEX Plant is the most significant development. There are also other sites of interest including the position of a crashed Second World War bomber plane. However there is no evidence from maps or other sources that there is any significant 20th century archaeology surviving within the development site.

Summary

7.3.22 There is high potential for further Roman remains given the existing evidence form find spots, the Roman Villa at Horkstow and crop marks located to the north of the site. There is less potential for archaeological remains from other periods based on current evidence (Table 7.1).

Table 7.4: Archaeological potential

Period	Archaeological potential
Early Prehistoric	Low
Later Prehistoric	Medium/High
Romano British	High
Early Medieval	Low
Medieval	Low
Post Medieval	Low
Modern	Low/Negligible

7.4 Assessment of Potential Effects

Effects of construction

7.4.1 The most significant impacts on archaeology associated with the construction phase will be to previously unknown or unrecorded below ground archaeology located within the development footprint.

7.4.2 Given the proximal location of a Roman Villa to the proposed development site there is medium to high potential for buried archaeology of the Romano British period as identified in Section 7.3. Should archaeological remains be present within the footprint of works then there is potential that these could be damaged or destroyed during the construction phase. This would represent a major adverse impact to buried unknown and undesignated heritage assets present. Depending on the nature and value of these remains any such damage could represent a highly significant impact.

Effects of Operation

7.4.3 During the operational phase of the development impacts will relate primarily to the visibility of turbines both from above ground heritage assets within 5 km of the turbine location and as part of key views onto any heritage assets.

7.4.4 The ZTV for the proposed scheme (Figure 3.5) indicates that the turbine may be visible from 42 of the above ground heritage assets present within 5 km of the site comprising 4 Scheduled Ancient Monuments, 1 Grade I Listed building, 4 Grade II* listed buildings, and 33 Grade II listed buildings. Predicted changes in views are detailed in Chapter 3.

7.4.5 In general, whilst the turbine can be expected to be visible to and/or from many of the above ground heritage assets, the settings of many of these receptors are already affected by modern development, including the Cemex Cement Works to the west of the site, the urban fringes of Kingston upon Hull and the Bagmoor windfarm development 8 km to the west. The proposed development site is to the west of an area designated as of high historic/landscape value, however it is not set within it. The impacts upon this area will be low due to the existing modern development in the area to the west, including the Bagmoor Wind Farm and South Ferriby CEMEX works.

7.4.6 The addition of a single medium sized turbine in the location is not considered likely to substantially affect the overall character and setting of the local area. Predicted effects at individual designations and designations categories are detailed below.

Scheduled Ancient Monuments

7.4.7 The turbine proposed is not to be located within any surviving historic parkland or garden features relating either to Horkstow Hall or the former Jacobean manor house to the south of Horkstow Hall (SAM no DLS1740). There is no surviving evidence of features such as planned formal gardens, landscaped gardens, open parkland, or avenues relating to these two sites. These monuments have already had their historic setting altered by industrial development such as the CEMEX plant at South Ferriby and no significant adverse impacts are predicted to result from the scheme as proposed..

7.4.8 The impact on other SAMs present within the study area will be low/negligible due to the presence of existing modern development and associated impacts to their

original settings. Most are also heavily screened from the development by tree cover or by later development leaving few clear viewpoints onto the proposed turbine site. No significant impacts to these features are predicted.

Listed Buildings

7.4.9 All listed buildings within the ZTV have theoretical potential to be affected by the proposed development. However given the nature of the landscape in the 20th century these listed buildings have already had their historic setting altered. Most are heavily screened from the development by tree cover or by later development leaving few clear viewpoints onto the proposed turbine sites. Potential impacts to specific assets and groups of assets are detailed below.

7.4.10 The Church of St Maurice (Listed Grade I) near Horkstow will have views on the hill in Horkstow. However these will be mitigated by the current impacts from modern development, particularly the CEMEX works in South Ferriby. As such potential impacts to this building are classified as low/negligible.

7.4.11 Horkstow Hall (Listed Building no. 165848, Grade II*), and Hall farm cottages and barn (Listed building num 165850 and 16585, Grade II*) are the closest designated properties to the proposed scheme and form part of the Horkstow Estate. Although there could potentially be clear views of the turbine from the upper floors of these buildings they are heavily screened by vegetation and visibility is likely to be restricted. As with the other local heritage assets, the 20th century development of the landscape reduces the potential impact on these properties as they are no longer in their original landscape context. The overall impact to these properties is considered to be low/medium magnitude and is not considered to represent a significant impact to the heritage assets.

7.4.12 The church of St Nicholas at South Ferriby (Listed Building no. 165868, Grade II*) has the most prominent potential view of the development site being located on a local high point; however the church is currently completely screened from view by evergreen and deciduous trees most likely planted in the 19th century. There is currently no clear view to or from the development site from this church. The historic setting has also been significantly altered by the development of South Ferriby and the CEMEX plant so the resulting impacts of the proposed development on this listed building will be low and will not significantly affect the heritage value of this asset.

7.4.13 Grange Farmhouse (Listed Building no. 165870, Grade II) will have clear views of the site. However this listed building currently has clear views of the CEMEX works and the in-combination effect with the proposed scheme on the historic setting will be low and is not considered significant.

7.4.14 Impacts to other Grade II Listed buildings within the study area, including the most proximal buildings in Horkstow and South Ferriby and along the B1204 road are considered to be of medium or low magnitude due to the presence of existing built development and the small scale of the proposed scheme. No significant impacts to these buildings are anticipated.

Consideration of Cumulative Effects

7.4.15 As stated above the cumulative effect of this development is not considered high due to the nature of current industrial development surrounding the proposed site. Although the development will impact upon the setting of many heritage assets with 5 km, in most cases these sites are already significantly impacted upon, most

prominently by the wind farm at Roxby and the chimney of the concrete works at South Ferriby. In most cases the proposed development will not significantly add to the current impacts. Where heritage assets are proximal to the development in Horkstow and South Ferriby the impacts are mitigated by screened by vegetation and modern development.

7.5 Mitigation Measures

7.5.1 No significant impacts to above ground heritage assets are predicted to result from the proposed scheme and therefore no specific mitigation is proposed.

7.5.2 There is potential for buried archaeological remains associated with the Roman Villa at Horkstow Hall to be present within the footprint of works. Prior to the construction of the development an archaeological evaluation should be undertaken to ascertain the survival of any buried archaeological deposits. It is recommended that a programme of geophysical survey followed up by evaluation trenches to investigate the footprint of the turbine and access tracks etc., would suitably mitigate likely impacts to below ground archaeology. If significant and archaeological rich remains are discovered *in situ* it may be preferable to micro site the turbine locations in order to preserve these remains *in situ*.

7.5.3 If geophysical survey or any *in situ* archaeological deposits are discovered by excavation and cannot be avoided by repositioning the turbines within the investigated area, then these should be fully excavated and recorded by a suitably qualified archaeological contractor in order to preserve these remains through record.

Residual Impacts

7.5.4 The excavation process will damage or destroy any below ground archaeology that may be present within the footprint of works. However recording of buried archaeology may add considerably to the archaeological knowledge base of the area, which can be considered to represent a benefit. The net residual impacts to below ground archaeology within mitigation are therefore considered to be negligible and of no significance.

7.6 References

Institute for Archaeologists 2008. Standard and guidance for archaeological desk-based assessment

Cooper N (ed.) 2006 The Archaeology of the East Midlands; An Archaeological Resource Assessment and Research Agenda Leicester Archaeology Monographs No. 13

BGS online: http://www.bgs.ac.uk/data/services/digmap50wms.html

DCMS guidance on criteria for assessing SAMs:
http://www.culture.gov.uk/images/publications/ScheduledMonuments.pdf

8. Climate Change

8.1 Tackling Climate Change

8.1.1 There is now clear evidence that global warming and climate change are a reality and have the potential to cause major adverse effects on sea levels, water supply and agriculture in the coming decades.

8.1.2 One of the major causes of global warming is the emission of CO_2 from power stations burning fossil fuels (coal, oil, gas) to generate electricity. In order to combat the threat of global warming, there is a need to obtain clean, diverse and sustainable supplies of energy from renewable sources such as wind.

8.1.3 The Stern Review on the Economics of Climate Change, carried out for the UK Government by the economist Sir Nicholas Stern, was published on 30th October 2006. It was the first serious study of the economics of climate change and highlights the impacts and risks arising from uncontrolled change, and on the costs and opportunities associated with action to tackle it. Stern reports that:

"An overwhelming body of scientific evidence now clearly indicates that climate change is a serious and urgent issue. The Earth's climate is rapidly changing, mainly as a result of increases in greenhouse gases caused by human activities."

8.1.4 Sir Nicholas Stern presented his report to Government with the following conclusion:

'The conclusion of the Review is essentially optimistic. There is still time to avoid the worst aspects of climate change if we act now and act internationally. Government business and individuals all need to work together to respond to the challenge. Strong, deliberate policy choices by Governments are essential to motivate change. But the task is urgent, delaying actions, even by a decade or two, will take us into dangerous territory. We must not let this window of opportunity close."

8.2 Security of Energy Supply

8.2.1 Energy markets both within the UK and worldwide are in transition. In the past 20 years the coal and oil share of electricity generating in the UK halved, and gas usage has significantly increased.

8.2.2 In the longer term, as North Sea fossil fuel resources are depleted the decline in UK fossil fuels will leave the country more dependent on imported fuel resources from international markets. The 2006 Energy Review Report estimated that the country could become a net importer of energy by 2010 and be importing as much as 90 % of its gas needs by 2020, compared to 10 % in 2006. The largest global reserves of oil and gas are concentrated in Russia, Central Asia, the Middle East and African countries.

8.2.3 Such dependency would undermine the security of supply, with risks possibly arising from elevated costs and terrorist activity and consequently the need to ensure indigenous, secure and diverse energy supplies becomes increasingly important.

"A diversity of energy sources - ensuring that we are not dependent on any one supplier, country or technology - is fundamental to managing the risks to the UK"s

security of supply. Energy from diverse renewable sources across the electricity, transport and heat sectors will play an important role in this regard. Meeting our targets cold reduce gas imports by between 12-16 % in 2020, with increasing benefits as these become more scarce and expensive" (UK Renewable Energy Strategy - Consultation, June 2008).

8.2.4 Electricity demand in the UK is increasing at 1 % per annum. However, by increasing the amount of energy we get from the renewable sources around us, dependence on imported fossil fuels will be reduced. In this way the extra diversity that renewables bring to the UK's energy infrastructure can make a significant contribution to the Government's goal of ensuring secure and reliable energy supplies.

8.3 Renewable Energy Strategy

National Renewable Energy Action Plan for the United Kingdom

Article 4 of the Renewable Energy Directive 2009/28/EC)

8.3.1 Under Article 4 of the European Renewable Energy Directive (2009/28/EC) each Member State was required to submit a National Renewable Energy Action Plan (NREAP).

8.3.2 The NREAP is based on a template set by the European commission which asks for the trajectory and measures that will enable the UK to reach its target of 15 % of energy consumption in 2020 to be from renewable sources.

8.3.3 The "lead scenario" set out in the UK NREAP documentation that it is possible to achieve the 15 % target and provides one view of the technology mix in 2020. However, this scenario does not represent a target for any particular sector as technology, and it should not be seen as an upper limit to the UK's ambition for renewable deployment.

8.3.4 Extracts from this document which highlight the importance of increasing the amount of energy in the UK generated from renewable sources, and in unlocking restrictions on delivery are given below:

"The UK needs to radically increase its use of renewable energy. The UK has been blessed with a wealth of energy resources. Until now we have relied on the use of our coal, oil and gas supplies to supply our homes, support our businesses, and power our transport. The depletion of our domestic fossil fuels reserves, combined with projected growth in global energy demand, puts our security of energy supply at risk. Exploiting our renewable resources will make a strong contribution to our energy needs and allow us to be less reliant on others".

"The UK Government believes climate change is one of the gravest threats we face, and that urgent action at home and abroad is required. We need to use wide range of levers to decarbonise the economy. The development of renewable energy sources, alongside nuclear power and the development of carbon capture and storage, will also enable the UK to play its full part in international efforts to reduce the production of harmful greenhouse gases".

This National Renewable Energy Action Plan provides details on a set of measures that would enable the UK to meet its 2020 target. But we want to go a lot further. We want to secure our energy supplies through 2020 and beyond and provide a sound framework for business to develop in the new industries, providing jobs and

cutting harmful greenhouse gases. The Coalition: our programme for Government sets out a range of proposals to ensure that we go as far as we can in exploiting the UK's renewable energy resources.

We are commissioning the independent UK Committee on Climate Change to review the renewables target and provide advice on increasing the level of ambition. We have also committed to make an Annual Energy Statement to the UK Parliament to set strategic energy policy and guide investment in all forms of energy including renewables. At the European level we are pushing for greater leadership in tackling international climate change by supporting an increase in the European Union emission reduction target by 30 % by 2020.

The history of energy production in the UK has been based around our natural resources of fossil fuels. This means that we have not been as active in our exploitation of our renewable resources - this must change. Compared to many other Member States, the UK is starting from a very low level of renewable energy consumption and this means that our challenge to meet the 2020 targets is even greater.

The 2009 Renewable Energy Directive sets a target for the UK to achieve 15 % of its energy consumption from renewable sources by 2020. This compares to only 1.5 % in 2005. As chart 1 below shows, while there has been a small increase in renewable energy use in recent years, there will have to be a much greater level of deployment over the next decade in order to meet the target".

8.3.5 Under the Framework for Action Section of the report, the following statement references the objective for communities to obtain greater benefits from renewable schemes.

"It is not only businesses which will see benefits from higher levels of renewables. We will be providing opportunities for communities to benefit through the promotion of community owned renewable energy schemes. We are currently investigating the opportunity for communities that host renewable energy projects to keep the additional business rates they generate as part of these schemes. This way local people will benefit from the power they are producing".

UK Renewable Energy Roadmap Published July 2011

8.3.6 The UK Renewable Energy Roadmap, the UK's first Renewable Energy Roadmap, sets out the Government's current approach to unlocking the UK's renewable energy potential.

8.3.7 Relevant extracts from this document in summarising the Government's policy in respect of deployment of renewable energy across the UK are given below:

"*The Coalition Government has made clear its commitment to increasing the deployment of renewable energy across the UK in the sectors of electricity, heat and transport. This will made the UK more energy secure, will help protect consumers from fossil fuel price fluctuations, is driving investment in new jobs and businesses in the renewable energy sector, as well as keep us on track to meet our carbon reduction objectives for the coming decades.*

Over the last year, the Office of Renewable Energy Deployment in DECC, has been working with market participants and others from across the renewables sector to better understand how much renewable energy can be deployed through to 2010, and to identify the current constraints which must be addressed to allow this rapid

transformation".

8.3.8 The Ministerial Foreword in the document includes the following statements:

"*The nations of the United Kingdom are endowed with vast and varied renewable energy resources. We have the best wind, wave and tidal resources in Europe.*

The Government's Electricity Market Reform White Paper, published alongside this Roadmap, sets out our reforms to the separate Great Britain and Northern Ireland markets for all forms of electricity generation.

Renewable energy already employs more than a quarter of a million people; by 2020, it could be over half a million. The creation of jobs in the renewable energy sector, investment in new manufacturing capability, and the consequent direct and indirect benefits will support our transition to a green economy.

Getting more renewable energy across the UK can give us much more security and a greater degree of energy independence - helping to shield us from global fossil fuel price fluctuation.

Timely investments will ensure renewable energy will have a long-term role to play as part of a mix of low carbon generation. Alongside energy efficiency, nuclear and carbon capture and storage, renewable energy will help reduce UK emissions in line with our carbon budgets and help keep us on track to hit our 2050 target - an 80 % cut in emissions.

The time for broad strategy statements has passed. The UK Renewable Energy Roadmap sets out a comprehensive suite of targeted, practical actions to accelerate renewable energy in the UK - driving innovation and the deployment of a wide range of renewables".

8.3.9 Four priority actions have been identified in this report for on-shore wind schemes as follows:

- Minimise Investment Risk - Implement proposed electricity market reform and RO transition measures to secure long term certainty to 2020 and beyond and enable historically strong investor confidence in on-shore wind to be maintained.
- Reform the Planning System in England and Wales - Set out the national need for new renewable energy infrastructure through ratification of National Policy Statements. Reform the local planning system in England to ensure that it supports economic growth, give communities a greater say and stake in development.
- Overcome radar interference with wind farms.
- Ensure cost effective grid investment and connection.