Spring Brook Wind Turbine

Volume 1: Environmental Statement

June 2013

the energy workshop

Table of Contents

Table of Figures

Appendices

1 Introduction

1.1.1 This Environmental Statement (ES) has been prepared by The Energy Workshop Limited (TEW) and forms part of a planning application to Barnsley Metropolitan Borough Council (BMBC) for wind turbine, called the Spring Brook Wind Turbine (Spring Brook).

1.1.2 Included in this document are:

- a description of the project;
- a design and access statement;
- assessments of the proposals environmental impacts;
- conclusions; and
- appendices.

1.1.3 The principal components of the project are listed below and shown in **Figure 1.2**:

- wind turbine with a rated capacity of up to 900kW and a maximum vertical tip height of 79m;
- an electrical control building;
- an appropriately sized crane hard-standing;
- a new access track;
- a temporary construction compound for use during construction; and
- a temporary met
- mast of up to 60m in height, to be erected at the same location as the wind turbine for up to 24 months prior to erection of the wind turbine itself.

1.1.4 This ES describes the results an Environmental Impact Assessment (EIA) and describes, in a systematic way, the project's likely significant environmental effects. It accompanies and supports an application for planning consent, which has been submitted to Barnsley Metropolitan Borough Council (BMBC) for planning permission under the Town and Country Planning Act 1990.

1.1 The Agent

1.1.1 The Energy Workshop (TEW) is a specialist wind energy consultancy based in Huddersfield. TEW has been in business for eighteen years and the team has over sixty years combined experience in the renewables sector. TEW has worked with a wide range of clients including npower renewables, Enviros, Clipper, BT, ENECO, the Department of Trade and Industry (now BIS and DECC) and TNEI.

1.1.2 TEW specialises in managing wind energy proposals of all scales through to operation, and its staff have played a lead role in the consenting of some thirty wind energy projects throughout the UK.

1.2 Approach and Expertise

1.2.1 This ER has been project managed by TEW. Environmental assessments have been undertaken for the following topics:

- Traffic and Transport - TEW Ltd;
- Geology and Soils, and Flood Risk - TEW Ltd;
- Ecology – Keystone Environmental (surveys) and ECUS Environmental Consultants (assessment);
- Noise - TEW Ltd;
- Archaeology and Cultural Heritage - TEW Ltd;
- Landscape and Visual Effects - TEW Ltd;
- Shadow Flicker - TEW Ltd;
- Telecoms, Utilities and Television Reception - TEW Ltd;
- Aviation - TEW Ltd; and
- Socio-economic Effects - TEW Ltd.

1.2.2 TEW has provided input on the proposed development, the scale and siting of the proposed development and the identification of any necessary mitigation measures to minimise any potential environmental effects of the turbine. The iterative site layout design process has been led by TEW, with input from the ecological sub-consultant identified above.

1.3 The Applicant

1.3.1 The applicant is local farmer John Darwin and family. The farmland on which the site lies has been in the Darwin family for three generators, over 80 years. The farm is a family run business and is a mixed farm with livestock and cereal comprising of approximately 125 Ha and 140 dairy cows.

1.3.2 The current milking system on the farm is currently powered via a generator and with the rising fuel costs this cannot be a long term form of power. It is intended that some of the electricity from the wind turbine will be used to power the dairy, with the remaining majority being exported to the electricity network for general use in the local vicinity.

1.3.3 The Darwin family wish to both diversify the farm to help ensure its future by providing other forms of income from the land and to increase the sustainability of their farming practices.

2 Project Description

2.1 Site location

2.1.1 The site is located within the boundary of Sheephouse Farm, above Underbank Reservoir near Stocksbridge, as shown in **Figure 1.1**, below. It is an elevated site with the proposed turbine being located on a south facing hillside. The land is currently used as pasture and arable farmland.

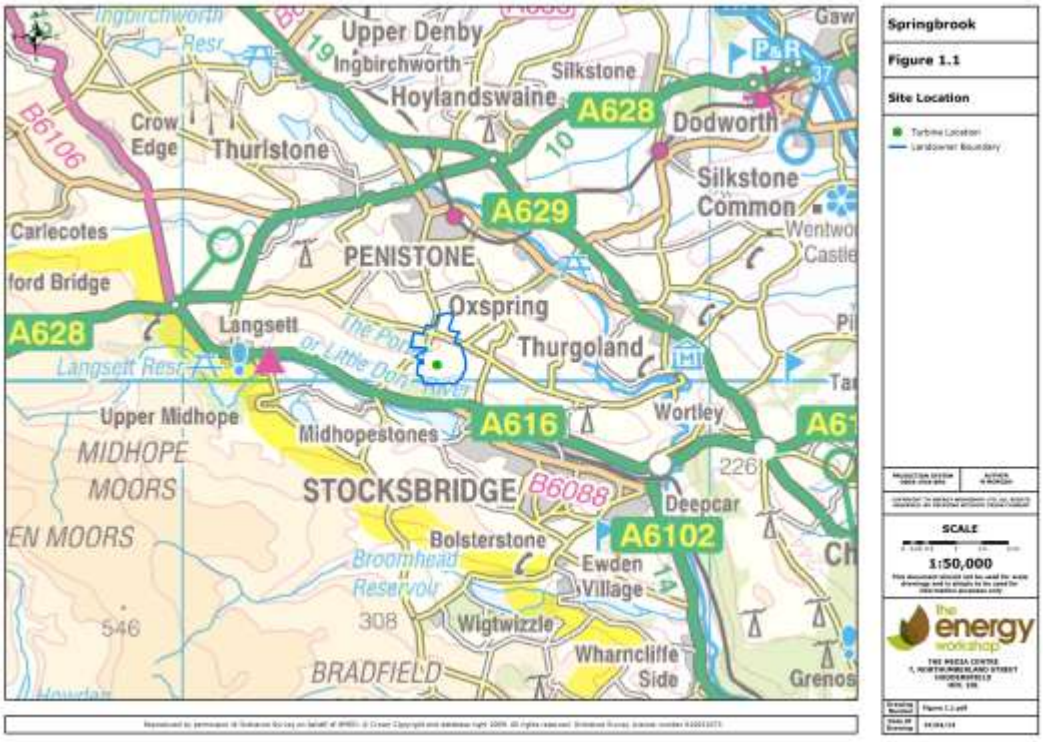


Figure 1.1 - Site Location

2.1.2 The layout of the proposal is shown in **Figure 1.2** and the location of the principal components is given in **Table 2.1**, below.

Component	Locations
Temporary Met Mast (prior to erection of turbine)	424825, 400304
Turbine	424825, 400304
Electrical Control Building	424770, 400328
Temporary Construction Compound	424790, 400790

Table 2.1 - Location of Principal Components

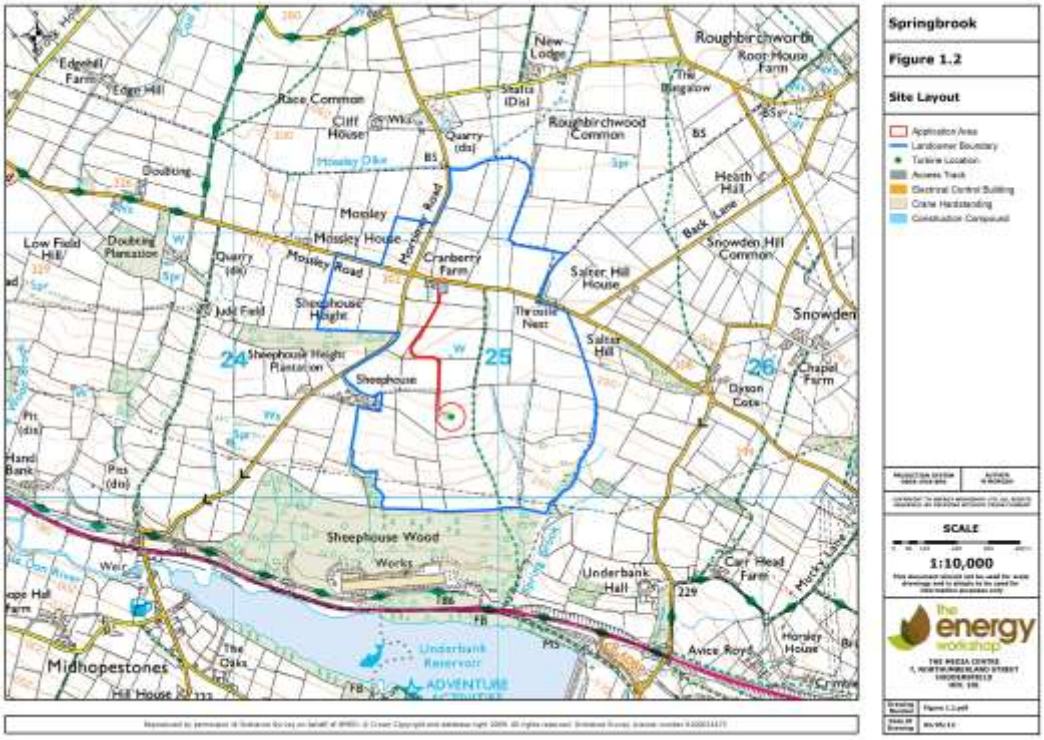


Figure 2.2 - Site Layout

2.1.3 Unforeseen ground conditions may require minor movements (micro-siting) in the position of the turbine following a detailed site investigation at the start of construction.

2.1.4 All of the assessments within this Environmental Statement have been carried out on the assumption that there may be a requirement to micro-site the turbine by up to 25m from the location identified in **Figures 1.2 and 1.3**.

2.1.5 The site of the proposed wind turbine occupies an area of around 1.4 hectares (bounded by the red line boundary, shown on **Figure 1.2**), although the area of ground actually used for the turbine base and new access track will be substantially less.

2.1.6 The closest residential property is Sheephouse Farm, the landowner's property, which lies around 270m to the west of the proposed turbine location. The nearest uninvolved property is approximately 360m the west of the proposed turbine location.

2.2 Key Components of the Spring Brook Proposal

Temporary Met Mast

2.2.1 A temporary met mast of up to 60m in height would need to be erected at the same location as the wind turbine for 12-18 months prior to construction of the turbine to obtain detailed wind data from site.

2.2.2 The mast would be constructed of tubular steel with steel cable guy wires attached to secure ground anchors. Plan and elevation drawings are included as part of the planning application.

2.2.3 In the event that planning permission for the proposal is granted, it is anticipated that any pre-start planning conditions deemed necessary could be separately applied to the temporary anemometer and the main construction project, as appropriate. This would be to enable the temporary met mast to be erected onsite without the need to discharge planning conditions that relate to the construction of the wind turbine.

Wind Turbine

2.2.4 The supplier of the wind turbine has not been identified at this stage so some details may change, however the maximum tip height of 79m will not be exceeded. The assessments undertaken for this ES have been based upon a candidate turbine, the EWT DW-54 which has a blade diameter of 54m and a maximum tip height 79m. Plan and elevation drawings are shown in **Figure 2.1**.

2.2.5 The turbine will be installed on a concrete gravity foundation measuring approximately 15.5m x 15.5m with a concrete depth of approximately 1m as shown in **Figure 2.2**.

Crane Pads, Access Track and Temporary Construction Compound

2.2.6 Approximately 700m of new / upgraded track, 4.5m wide will be required. The access track will be retained throughout the lifetime of the project to accommodate maintenance vehicles.

2.2.7 The total area of crane hard-standing would be approximately 320m^2 (20m x 16m) with an approximate stone thickness of 600mm.

2.2.8 The temporary construction compound will be approximately 1,600m^2 (40mx 40m) and will be removed following completion of construction.

2.2.9 All of the above will have a crushed rock surface laid on top of a geo-textile layer, a semi-permeable membrane as shown in **Figure 2.3**.

Electrical Control Building and Grid Connection

2.2.10 The cable exporting power from the turbine will run underground into the electrical control building, which will house the switchgear and metering equipment (see **Figure 2.4**).

2.2.11 It is intended that a connection will run from the Electrical Control Building via buried cables (in the verge of the access track and public highway) into the nearby existing 11kV electricity network. A spur of cable will connect to the dairy in order to provide power for its milking system, with the majority of power being exported to the local electricity network.

2.2.12 The point of connection to the local electricity network and precise grid connection route will be determined by the local Distribution Network Operator (Northern Power Grid), once a formal connection application has been made to them.

2.2.13 Northern power grid have advised an indicative connection route which is shown in **Figure 2.5**.

2.3 Project Lifetime

2.3.1 The wind turbine will generate electricity for a period of up to 30 years after which time it will either be removed or the life of the project may be extended (subject to a further grant of planning permission).

2.3.2 Prior to decommissioning the site, a decommissioning method statement, part of a Site Restoration Plan detailing how the site will be restored, will be prepared for approval by Barnsley Metropolitan Borough Council.

3 Relevant Policy and the Need for the Development

3.1 Current Electricity Mix

3.1.1 In 2010 the majority of our electricity was created from the combustion of fossil fuels, in particular natural gas and coal as shown below.

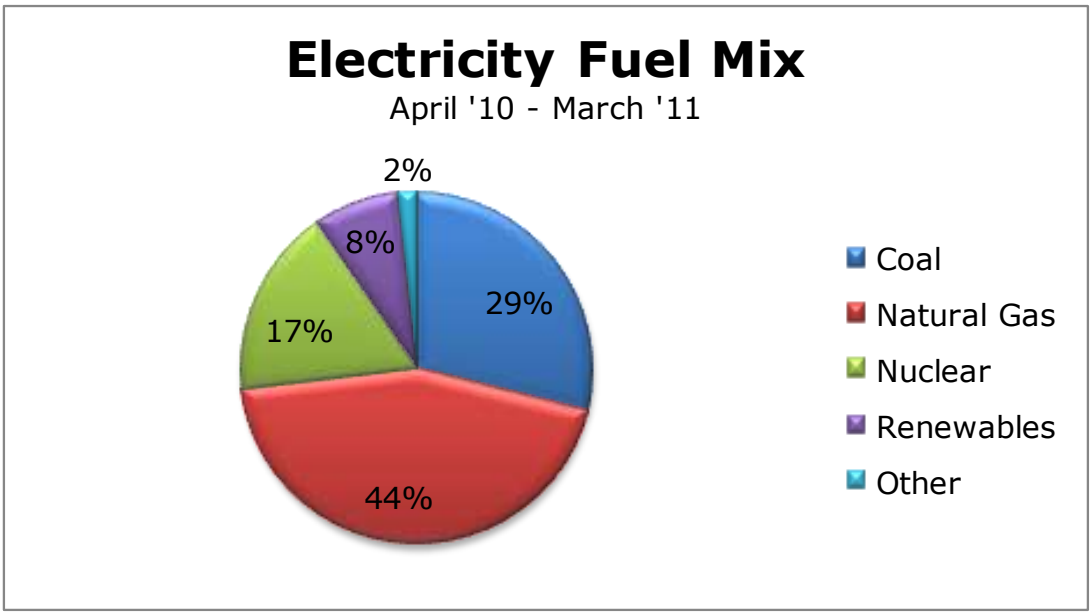


Plate 3.1 Fuel Mix Disclosure Data Table, DECC 2011

3.1.2 Fossil fuels are set to run out within the next few centuries. BP's latest review puts the reserve-to production ratio of oil for proven resources to be 45.7 years, meaning that at current consumption rates, current proven oil reserves will have been completely depleted by 2055[1]. We need to begin the transition from fossil fuels to alternate methods of generation now if we are to meet our rising demands.

3.2 Climate Change

3.2.1 Energy is essential in almost every aspect of modern life and for virtually every aspect of the economy. However, the burning of fossil fuels releases greenhouse gases (such as CO2) into the atmosphere. Due to factors such as population growth and changes in lifestyle, the demand for energy has increased to levels where the use of fossil fuels is releasing enough greenhouse gases into the atmosphere to directly affect the climate. There is now a scientific consensus that climate change is occurring and that it is significantly influenced by the amount of greenhouse gases which are emitted from human activities.

[1] BP Statistical Review of World Energy. (BP, 2010)

3.2.2 One key way to lessen the effects of climate change is to reduce emissions of greenhouse gases, which could be achieved by generating energy from sources that emit low or even zero levels of greenhouse gases, such as renewable sources.

3.3 Carbon Emissions Savings

3.3.1 Spring Brook would comprise 1 turbine with an expected generating capacity of 900kW.

3.3.2 The Spring Brook Wind Turbine would comprise 1 turbine, with a maximum generating capacity of 900kW. Based on offsite, measured wind speed data, the turbine will generate an estimated 2,401,000 kilowatt hours of electricity per annum, equivalent to the average demand of around 570 households[2] or around 17% of population of Stocksbridge[3]. Through generating electricity from a renewable source, it could also prevent the emission of around 1,032 tonnes[4] of carbon dioxide each year, or 30,972 tonnes over a 30 year operating lifetime.

3.4 European Context

3.4.1 The EU produces around 22% of global greenhouse gas emissions and has agreed under the Kyoto Protocol to a cut of 8% from 1990 levels by 2008-2012.

3.4.2 In January 2008, the European Commission put forward a far-reaching package of proposals that will deliver on the European Union's ambitious commitments to fight climate change and promote renewable energy up to 2020 and beyond.

3.4.3 The EU is committed to reducing its overall emissions to at least 20% below 1990 levels by 2020, and is ready to scale up this reduction to as much as 30% under a new global climate change agreement when other developed countries make comparable efforts. It has also set itself the target of increasing the share of renewables in energy use to 20% by 2020.

3.5 UK

Climate Change Act

3.5.1 The Climate Change Act 2008 introduced legally binding targets in the UK to cut carbon dioxide emissions by at least 26% by 2020 (and 80% by 2050) against a 1990 baseline, and a carbon budgeting system capping emissions over five year

[2] Based on an UK average household electricity consumption of 4,160kWh per year from Department of Energy and Climate Change, Energy Trends, March 2013 (p.58): https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/65818/5955-dukes-2012-chapter-5-electricity.pdf

[3] [3] 2011 Census found 3,356 households in Stocksbridge (Sheffield 001, Middle Layer Super Output Area): http://www.neighbourhood.statistics.gov.uk/dissemination/LeadTableView.do?a=7&b=6276922&c=S36+1EP&d=140&e=61&g=6357321&i=1001x1003x1032x1004&m=0&r=0&s=1363605645724&enc=1&dsFamilyId=2570.

[4] Output in kWh x 430 where 0.43 is the assumed average emissions for UK electricity mix of 0.43kgCO_2/kWh.

periods. An increased target of a 34% reduction by 2020 was announced in the 2009 budget.

The Renewable Energy Strategy (RES), July 2009

3.5.2 The UK Government has signed up to the EU requirement that 15% of all energy consumed in the UK should be from renewable sources by 2020, i.e. all energy sources and not just electricity. In the light of the difficulties in providing significant elements of fuel and heating from renewables by 2020, the proportion of electricity supply that will have to come from renewables to balance this out will need to be raised substantially to at least 30%.

Low Carbon Transition Plan, 2009

3.5.3 This White Paper was published alongside the RES and sets out the UK's first ever, comprehensive Low Carbon Transition Plan to 2020 by which time the UK will get 40% of electricity from low carbon sources. It sets out the five year 'carbon budgets' to 2022, and indicates that the Government is committed to moving to tighter carbon budgets pending new global agreements.

National Policy Statement for Energy (EN-1), July 2011

3.5.4 The National Policy Statement for Energy restates the RES and Low Carbon Transition Plan policies, and has material weight in planning decisions. It confirms that 'onshore wind farms are the most established large scale source of renewable energy in the UK' and 'will continue to play an important role in meeting renewable energy targets.'

3.6 LDF Core Strategy

3.6.1 The Barnsley Core Strategy was adopted in September 2011, and sets out the Council's vision for the future development of Barnsley over the next 15 - 20 years and is the principal, overarching document in the LDF.

3.6.2 The 2008 Yorkshire and Humber Plan (RSS) was revoked[5] on 22 February 2013. It set minimum targets for installed renewable energy generation capacity in Barnsley of 15 MW by 2010, and 34 MW by 2021 (ENV5). The Barnsley Core Strategy restates the local RSS renewable energy generation target of 34MW by 2021.

3.6.3 The revoked RSS and current Core Strategy targets are derived from the 2004 Renewable Energy Assessments and Targets Study (GoY&H and the Y&H Assembly (2004)) and a previous 2002 Capacity Study for the region. A more recent capacity study for Local Government Yorkshire and Humber, prepared by Aecom in 2011, points to a potential commercial wind resource of 86MW in Barnsley, predominantly in the southwest of the borough[6].

[5] With the exception of Green Belt policies around York.

[6] Local Government Yorkshire and Humber (2011), Figure 23

3.7 Environmental Impact Assessment

3.7.1 The Town and Country Planning (Environmental Impact Assessment) (England and Wales) Regulations 2011 require an EIA to be undertaken for certain projects before planning permission can be granted. All proposals listed in Schedule 1 of the Regulations requires an EIA, and those listed in Schedule 2 will require an EIA if they are likely to have significant effects on the environment. Where there is any doubt whether an EIA will be required, the applicant may request a screening opinion from the Local Authority.

3.7.2 In July 2012, TEW requested a Screening Opinion on a proposal comprising two wind turbines with a height to blade tip of up to 101m at Spring Brook. BMBC provided a Screening Opinion (2012/ENQ/01557) stating that it would consider such a proposal to be EIA development, principally on the grounds of potential visual impacts. Screening request and response are included at **Appendix 3.1** and 3.2.

3.7.3 TEW subsequently sought pre-application advice on the issue of tip height for the initial two turbine proposal for the site, providing visualisations of two 79m to tip turbines and two turbines of 101m to tip, for comparison. BMBC gave its view that the smaller turbines "appear (based on the submitted wirelines) substantially less obtrusive and visually prominent than the larger turbines."

3.7.4 In December 2012, TEW requested a second Screening Opinion for a single turbine of up to 79m to blade tip. BMBC provided a Screening Opinion (2013/ENQ/00037) stating that it would still consider such a proposal to be EIA development, principally on the grounds of potential visual impacts. The screening request and response are included at **Appendix 3.3 and 3.4**.

3.7.5 No Scoping Opinion was sought from BMBC as it was considered that responses to the previous planning application for the site (including the reasons for refusal), the Screening Opinion and informal discussions with BMBC provided adequate guidance on the required scope of the EIA. As a result, the scope of this EIA has focussed on the key aspects of concern identified. These being the visual and landscape impacts of the proposal, including on the Peak District National Park and local heritage asset (Midhopestones Conservation Area).

4 Design and Access Statement

4.1 Site Selection Rationale

4.1.1 TEW were approached by the applicant / landowner, the Darwin Family, in 2012 to explore the possibility of a wind farm development on their land following refusal of the Sheephouse Heights proposal in 2009.

4.1.2 TEW reviewed the development potential of the site in terms of its technical and planning suitability and consider that the following factors make the site suitable for a wind energy development:

- the average wind speed estimated at 7.3m/s at 50m above ground level, well above a 6m/s notional threshold for financial viability;
- there is a suitable grid connection close to the site;
- there is good access to the site from nearby A roads and minor roads;
- the site is a reasonable distance from residential properties (over 350m from the nearest uninvolved property and over 450 from most);
- the site is outside local, national and international landscape designations (eg. National Parks);
- the site does not support any Sites of Special Scientific Interest (SSSIs) or other areas designated as of conservation importance within or close to its boundaries.

4.1.3 The development potential of the site was also considered specifically in light of the site's history and the reasons for refusal of the previous Sheephouse Heights proposal for five wind turbines of up to 125m to tip. Responding to these reasons for refusal and addressing the issues raised has been an integral part of the design process. This is described further below.

4.2 Design Criteria

Design Responses to the Reasons for Refusal for Sheephouse

4.2.1 The reasons for refusal for the original Sheephouse Heights proposal have heavily informed the design of the new proposal for this location. The reasons for refusal and design responses to these are listed in **Table 4.1** below.

Reason for Refusal of Sheephouse Heights	Design Response
Reason1: Green Belt – "The site lies within the Green Belt in the Barnsley Unitary Development Plan and the proposal constitutes inappropriate development. The Council are of the opinion that the very special circumstances put forward do not outweigh visual harm by virtue of the proposed wind farms inappropriate scale and siting in relation to the immediate surrounding landscape character".	• The proposal is still sited within Green Belt, however, TEW considers that the project's substantial contribution to renewable energy production provides the "very special circumstances" to support this type of development within the Green Belt. • The scale or the proposed development has been drastically reduced from the previous five turbines of up to 125m to tip to a single turbine of up to 79m to tip. This scale of development minimises visual impact whilst ensuring that the contribution of the project remains substantial enough to make a significant contribution to renewable energy targets. • The turbine has been sited below the ridge line, lower down the hillside than turbines from previous development, in order to reduce visual impact.
Reason 2: Impacts on Peak District National Park – "The proposed wind turbines would result in significant harm to the character and appearance of the nearby Peak District National Park. The height and scale of the turbines would represent a major change to the open character of the highly sensitive landscape... The addition of this proposed wind farm would increase the panorama of wind farms visible from the Peak District National Park leading to adverse cumulative effects."	• The height and scale of the proposal has been drastically reduced relative to the previous development. • The Peak District National Park have been consulted on the revised proposals and have have stated that *"while the turbine will be clearly visible from some parts of the National Park it will be in the context of other distant turbines and high voltage pylons.... It is sufficiently far away from the park that we don't think impact on the park is itself a reason for refusal."* John Scott, Director of Planning, Peak District National Park. (Personal Communcation, 7th May).
Reason 3: Proximity to Housing – "The Council consider that the turbines are located too close to residential properties. The proposed turbines, at a height of 125m, lying in close proximity to permanent dwellings would harm the amenity of their occupants by reason of the visual presence and dominant impact of the turbines on outlook from those properties. As a consequence they are likely to result in harm to residential amenity in terms of their oppressive and overbearing nature."	• The distance from housing has been increased been significantly increased (closest uninvolved property was previously 250m). • The height and number of turbines has been drastically reduced relative to the previous development. • All of the closest neighbours have been consulted on the revised proposals, with a majority of those who will have visibility of the turbine being supportive or neutral.

Reason 4: Impacts on Midhopestones Conservation Area – "The proposed development significantly harms the characteristics of Midhopestones Conservation Area by virtue of the inappropriate scale and siting of the proposed wind farm in relation to the Conservation Area, particularly views out of the Conservation Area across the valley."	• The height and number of turbines has been drastically reduced and the turbine has been sited below the ridge line, lower down the hillside than the previous development, in both cases to reduce visual impact on Midhopestones Conservation Area.

Table 4.1 - Design responses to reasons for refusal

4.2.2 In addition, the following design considerations have been taken into account in determining the size, scale and layout of the proposed development.

Wind Resource

4.2.3 The productivity of the wind turbine is highly sensitive to wind speed, the relationship between the two being cubic in nature (i.e. a increase in wind speed by a factor or 3 would lead to an increase in output by a factor of 9). This is therefore a key factor in determining the suitability of a site and the locating of turbines within a site.

4.2.4 The estimated mean wind speed across this site (based on offsite, measured wind speed data) is 7.3 m/s at 50m above ground level, giving a predicted capacity factor[7] of >30% for the candidate turbine. This is more than the UK average of 28%[8], making the site particularly well-suited for wind energy from a technical perspective.

4.2.5 Wind speeds will decrease lower down the hill, significantly reducing energy yield. The turbine has been deliberately sited off the ridgeline, where wind speeds are highest, in order to reduce visual impact.

Wake Separation

4.2.6 Wind turbines need smooth airflow to work effectively. Turbulence decreases efficiency and dramatically increases wear and tear on the machines. Turbines create "wake effects", or areas of turbulence, down-wind as the wind flows through the swept area of the blades.

4.2.7 As a result, wind turbine manufacturers require certain separation distances between turbines, typically 6 x 4 blade diameters, being 6 blade diameters in the downwind direction and 4 blade diameters in the perpendicular direction.

4.2.8 This places a technical limit to the number of turbines that can fit in a particular area, with larger turbines requiring greater separation distances between them.

[7] The capacity factor of a power plant is the ratio of its actual output over a period of time and its output if it had operated at full nameplate capacity the entire time. The output of a wind farm varies with wind speed.

[8] http://webarchive.nationalarchives.gov.uk/+/http://www.berr.gov.uk/files/file43950.pdf

Ecological Constraints

4.2.9 Natural England Bat Guidance TIN51 (Matthews, Mitchell-Jones & Raynor, 2009) advises a minimum separation distance between the turbine blade tip and linear features such as hedgerows, walls and ditches, which can be used by bats for commuting. This corresponds to a separation of 57m between such features and the turbine base. This separation distance has been observed in determining the turbine location (including a buffer round a nearby tree).

4.2.10 A minimum separation distance of 50m from waterbodies and watercourses has also been observed in order to minimise risk of impacting on these during construction or operation.

Proximity to Residential Properties

4.2.11 Although there is no statutory separation distance between a residential property and a wind turbine, in order to reduce noise and visual effects, TEW has implemented a minimum 350m buffer around any uninvolved residential properties.

Proximity to Telecommunication Links

4.2.12 Telecommunication operators were consulted to establish the location of their links with a view to agreeing a separation distances, where appropriate. One link, shown in **Figure 4.1**, was identified as being potentially affected with an initial objection being raised by the operator JRC. Following further consultation and investigation into the issue, this objection was removed.

Proximity to Utilities

4.2.13 Utility operators (water, gas, electricity) were consulted to establish the location of their networks. Electricity transmission pylons cross the site at the bottom of the hill. National Grid's guidelines stipulate a required separation distance of "three times the diameter of the turbine blade [the candidate turbine proposed has a blade diameter of 54m]" [9]. A buffer of 162m has therefore been applied.

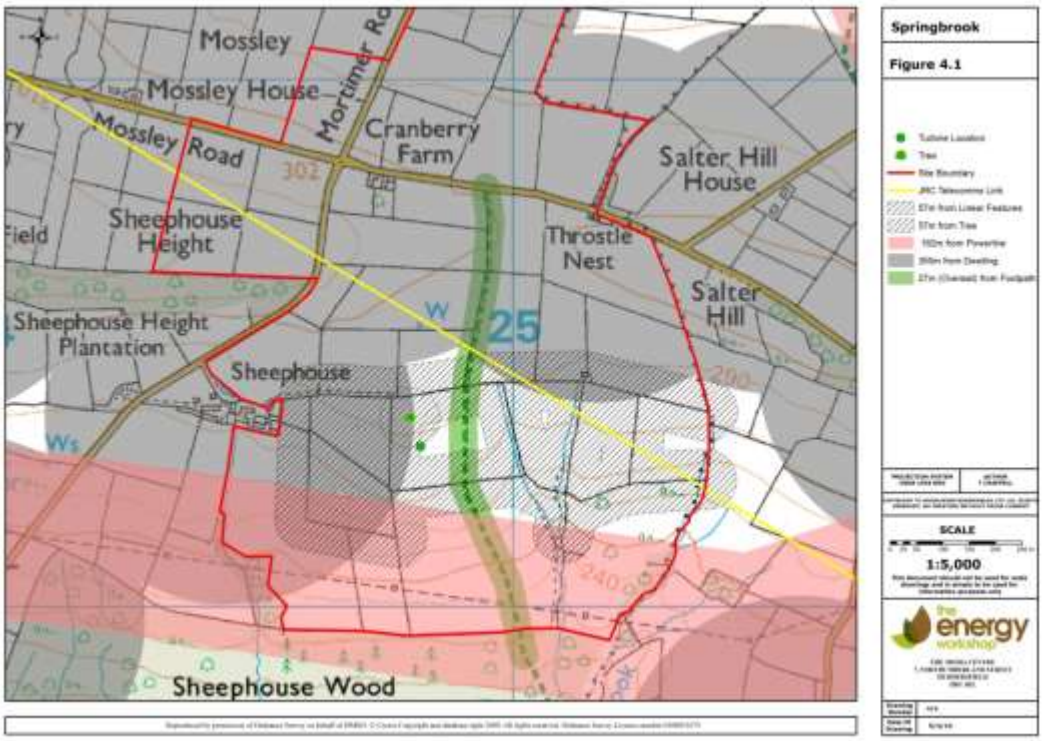
Proximity to Roads and Public Rights of Way

4.2.14 There are several public rights of way that cross the site. There is no statutory separation distance between a wind turbine and a public right of way. Planning for Renewable Energy, A Companion Guide to PPS22 states that "the minimum distance is often taken to be that the turbine blades should not be permitted to oversail a public right of way." As such, as separation distance of 27m (max. blade length) has been applied for this site.

4.3 Constraint Mapping

4.3.1 The above constraints have been mapped as can be seen below (also **Figure 4.1**):

[9] www.nationalgrid.com/.../02APTElectricityOHLGuidanceV13



4.4 Design Iterations

4.4.1 The constraints listed above determine where a wind turbine(s) can be located within the site boundary.

4.4.2 A number of design iterations / alternatives, varying in the number and size of wind turbine proposed, were considered for the site before ultimately settling on the current proposal.

4.4.3 It was considered that within the constraints described above, the scale of project could potentially be accommodated within the technical constraints:

- 1-2 wind turbines at 100m to blade tip (82m diameter rotors) with an installed capacity of 2MW each; or
- 1-3 wind turbines at 80m to blade tip (max. 54m rotor diameter) with an installed capacity of up to 0.9MW each.

4.4.4 These are illustrated in **Table 4.2** below (the rugby ball shapes around the wind turbine locations indicate required turbine separation due to wake effects).

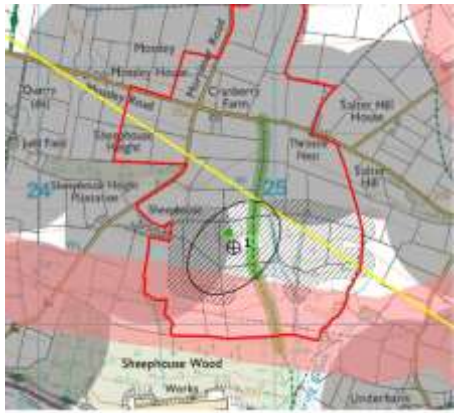
4.4.5 In respect of turbine size, there is a trade-off between visibility and energy yield. The productivity of a wind turbine is directly proportional to the swept area of the blades, which increases as the square of the rotor diameter (blade length).

4.4.6 In effect, this means that for a relatively small increase in turbine height from 80m to 100m to tip, the electrical output is more than doubled: a 100m to tip turbine (such as a Repower MM82, 2MW machine) at this location would be expected to

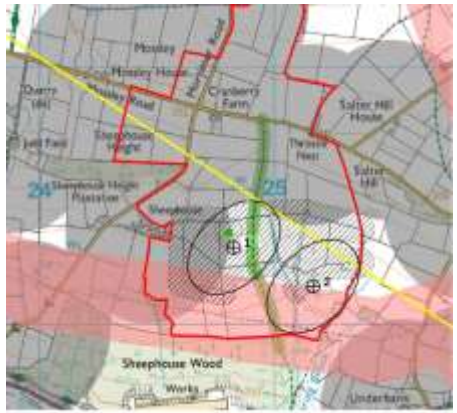
generate around 5,360 MWh per year (equivalent to the yearly demands of around 1,288 homes), more than double that of the turbine currently proposed.

4.4.7 TEW wrote to BMBC on 20th July 2012, stating that it was minded to submit a planning application based on the two 101m (to tip) height turbines on the basis that it considered the difference in visual impact between 79m and 101m to tip to be modest, while the difference in electrical output (and therefore the contribution of the proposal to local and national renewable energy targets) would be disproportionately lower for the smaller turbines. Wireline visualisations were submitted to illustrate the point (these are included at **Appendix 4.1**) and BMBC's views on the issue sought.

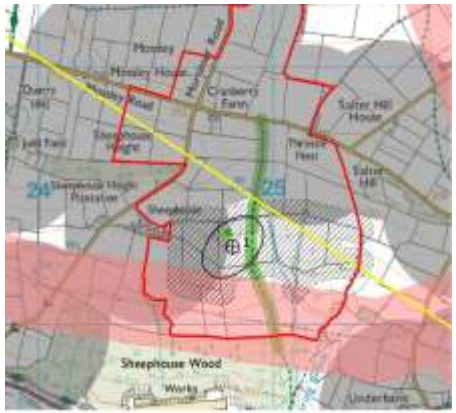
4.4.8 BMBC provided (without prejudice) advice that, "Whilst reducing the scheme [from 125m] to 101m and reducing the prominence by siting the turbines further down slope; I think some of the underlying objections and concerns [that were made to the Sheephouse Heights proposal] would still exist. The smaller turbines (79m to tip) appear (based on the submitted wire lines) substantially less obtrusive and visually prominent than the larger turbines."



Alternative 1 – Single Repower MM82 Turbine (100m to tip; 82m diameter blades; total 2MW)

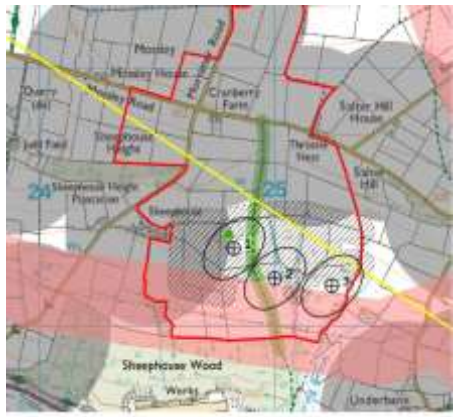


Alternative 2 – Two Repower MM82 Turbines (100m to tip; 82m diameter blades; total 4MW)



Alternative 3 – Single EWT-DW54 Turbine (80m to tip; 54m diameter blade; total 0.9MW)

Alternative 4 – Two EWT-DW54 Turbine (80m to tip; 54m diameter blade; total 1.8MW)



Alternative 5 – Three EWT-DW54 Turbine (80m to tip; 54m diameter blade; total 2.7MW)

Table 4.2 - Design Alternatives / Iterations

4.4.9 In response to this advice and informal consultation with the closest neighbouring properties to the proposal, it was decided that a single wind turbine of 79m to tip would strike the right balance between the benefit of providing a significant amount of renewable generation while limiting any landscape and visual impacts.

5 Landscape and Visual Impact Assessment

5.1 Introduction

5.1.1 The purpose of this section of the Environmental Statement is to provide information about the landscape context within which the proposed Spring Brook wind turbine will be located, the predicted visibility of the proposal from selected viewpoint locations, and an assessment of effects upon landscape character, landscape designations and the existing visual environment. This will inform the overall assessment of whether the proposal is acceptable.

5.1.2 This assessment has been achieved using existing Landscape Character mapping and descriptions undertaken nationally, and at a local level for Barnsley Borough Metropolitan Borough Council (BBMBC), Sheffield Council and the Peak District National Park Authority (PDNPA). Twelve viewpoint locations have been identified for this assessment (**Figure 5.1a**).

5.2 Scope of Appraisal

5.2.1 The scope of this appraisal has been limited to:

- The identification of the character of the landscape within which the wind turbine is located and sensitive landscapes within the study area;
- The production of a Zone of Theoretical Visibility out to a 15km (ZTV) study area;
- The identification of twelve representative viewpoint locations;
- The production of photomontages and/or wirelines of the views and a description of the predicted visual effects on these views;
- A description of landscape effects on sensitive character areas; and
- A cumulative assessment with large (>50m height to blade tip) wind turbines (existing, consented and in planning) within 10km.

5.2.2 An initial ZTV out to 15km was produced to initially assess the visual footprint of the wind turbine as well as to aid in the identification of representative viewpoints. The selected viewpoints fall within a 10km radius of the proposed wind turbine location (**Figure 5.1a**).

5.2.3 The assessment takes into account the site location and additional infrastructure elements of the project, as indicated in **Figures 1.2 and 1.3**. These are shown to include a control building and site access to the wind turbine. The transformer for the wind turbine is expected to be located inside the tower base.

5.3 Consultation

5.3.1 Prior to undertaking the Landscape and Visual Impact Assessment (LVIA), a screening request (**Appendices 3.1 and 3.3**) was sent to BBMBC. This included the proposed scope of the methodology to be used and the extent of the study area proposed. The ZTV includes all features referred to in the Council's screening response (**Appendix 3.2**). The methodology and assessment proposed and followed here reflects the nature of the Spring Brook proposal.

5.3.2 The viewpoint locations are based on those that were used for the previous Sheephouse Heights proposal and were agreed with BBMBC prior to the assessment for Spring Brook being undertaken.

5.4 Methodology

5.4.1 The following guidance has been referred to in the preparation of this assessment and production of supporting materials:

- Barnsley Borough Metropolitan Borough Council (2002) Barnsley Borough Landscape Character Assessment
- Landscape Institute & Institute of Environmental Management & Assessment (LI-IEMA) (2002) Guidelines for Landscape and Visual Impact Assessment
- Julie Martin Associates (2010) Landscape Capacity Study for Wind Energy Developments in the South Pennines
- ODPM (2004) PPS22 Renewable Energy - Companion Guide
- Peak District National Park Authority (2008), Peak District Landscape Character Assessment
- Sheffield City Council (2011) Sheffield Preliminary Landscape Character Assessment
- SNH (2012) Assessing the Cumulative Impact of Onshore Wind Energy Developments
- SNH (2009a) Siting and Designing Windfarms in the Landscape
- SNH (2006) Visual Representation of Windfarms: Good Practice Guidance
- University of Newcastle (2002) Visual Assessment of Windfarms Best Practice, SNH Commissioned report F01AA303A

Overview

5.4.2 This report has been undertaken in a number of stages. The baseline conditions have been researched and presented. This includes the gathering of studies and assessments pertaining to the site, including screening responses, landscape assessments and planning policy. This part of the study includes the production of a Zone of Theoretical Visibility (ZTV) to identify two additional viewpoints to the north requested by the Planning Authority and to validate those 10 viewpoints previously assessed in the Sheephouse application.

5.4.3 The site layout options were considered within the constraints identified through other assessments undertaken for the site. This included the turbine specification (height and design) and mitigation options available.

5.4.4 The assessment considers the landscape within which the turbine is located, key receptors and visual effects encountered by its implementation. This part of the assessment is supported by photomontages and wirelines from the viewpoints.

5.4.5 A cumulative assessment was undertaken after the completion of the assessment for the baseline and proposal. This assessed the effects of the proposed wind turbine in combination with other wind turbine developments of more than 50m to

tip, within a 10km study area (Hazlehead, Royd Moor, Blackstone Edge and Spicer Hill Wind Farms).

5.4.6 The ZTV aided in the identification of 12 viewpoints, which form the basis of the LVIA and the photomontages and site visits enabled its completion.

5.5 Planning Policy

5.5.1 Detailed policy is described and assessed within a separate Planning Statement, accompanying the application. This includes national, regional and local policies on renewable energy generation, environmental protection and the Green Belt. Due to the characteristics of the proposal and its location, planning policies in the adjacent administrative areas of Sheffield and the Peak District are also of relevance.

5.6 Landscape Designations

5.6.1 Although the Spring Brook site does not fall within any designated landscapes, the following landscape designations fall within the study area:

5.6.2 The Peak District National Park is 2.3km to the south of Spring Brook. The PDNPA seeks to conserve and enhance the natural beauty, wildlife and cultural heritage of the area, which extends to over 1400 square kilometres. The landscape encompasses dramatic gritstone edges, wild heather moorlands and gentle limestone dales. The character of the Peak District within the study area is described in more detail below.

5.6.3 In 2009, BBMBC cited significant harm to the character and appearance of the Peak District National Park in refusing a proposal for five 125m wind turbines at "Sheephouse Heights" (2008/0838). The height and scale of the turbines was considered to represent a major change to the open character of the highly sensitive landscape increasing the panorama of wind farms visible from the Peak District National Park leading to adverse cumulative effects.

5.6.4 The South Pennine Moors SAC/SPA lies within the Peak District National Park, and relates to the Annex I habitats, as discussed in the ecology chapter of this ES.

5.6.5 There are 3 sites identified within the Register of Historic Parks and Gardens within 10km of Spring Brook:

- Wortley Hall (grade II) – 5.9km to the east
- Wentworth Castle (grade I) – 7.1km to the east, and
- Cannon Hall (grade II) – 7.7km to the north.

5.6.6 As detailed in the Heritage chapter, there are 5 Conservation Areas within 5km of Spring Brook:

- Midhopestones (Sheffield) – 1.145km
- Pennistone (Barnsley) – 2.4km
- Thurlstone (Barnsley) – 3.3km
- Bolsterstone (Sheffield/Peak District) – 4km

- Hoyland Swaine (Barnsley) – 4.4km

5.6.7 The character and appearance of these areas, potential visibility and effects are described in the Heritage chapter. The assessment below focuses on effects on only one of the Conservation Areas, Midhopestones, as visibility from the remaining areas is limited. Potential effects on the Midhopestones Conservation Area – due to 'the inappropriate scale and siting of the proposed wind farm' – was one of BBMBC's reasons for refusing the Sheephouse Heights proposal. A particular concern was views out of the Conservation Area across the valley.

5.6.8 The adopted Sheffield UDP proposals maps 1 and 2 indicate 4 "Areas of High Landscape Value" (AHLV) falling within the study area. AHLV is a local landscape designation which planning authorities began to phase out post PPS7 (2009 - superseded in 2012 by the NPPF), because they often lacked rigorous justification. The fact that the pre-submission LDF proposals maps no longer include the designation indicates that Sheffield Council has not been able to justify their inclusion. However, the UDP is the statutory development plan, and are not expected to be replaced by LDF proposals maps until 2014. The AHLV descriptions provide, in the meantime, a useful characterisation of the local area, alongside LCA descriptions discussed in the next section.

5.6.9 The Midhopestone Environs AHLV, covers both the Midhope and Underbank reservoirs and associated woods, and extends between the Grill Royd Road boundary of the Peak District National Park to the south and the A616 boundary to the borough of Barnsley to the north – some 800m to the south of the Spring Brook site. The area is formed by the north facing farmland slopes of The Potter or Little Don. Aside from the woodland around the reservoirs, a string of woods also extends up the valley slope along Knoll Brook tributary. The small gritsone settlement of Midhopestone and a number of farmsteads and dwellings are linked by local roads.

5.6.10 The More Hall Reservoir and Environs AHLV stretches to the southeast from Bolsterstone (4.2km southeast of Spring Brook) over the small steep-sided valley containing Ewden Beck, which lies between the larger Broomhead Reservoir and woodland within the National Park to the west and steep wooded slopes of the River Don to the east. The area contains Ewden Village, which is formed by a scatter of farms and dwellings on local roads extending up the steeper south-facing slopes linked to Bosterstone, which is on higher ground. The south-facing valley slopes are farmed and the north-facing slopes are wooded.

5.6.11 The largest AHLV is the Pennine Fringe, which continues southwards from the More Hall AHLV, stretching the length of the Sheffield City Boundary with the Peak District National Park from Wharncliffe Side in the north to Burbage Moor in the south, and averages between 1 and 3km wide. The area is formed by the eastern farmland foothills of the Pennines. The river valley and associated woodlands which fall from the higher land to the west, interplay with major cross Pennine roads and the conurbation of Sheffield City to the east, forming a unique urban and rural fringe.

5.6.12 The Greno Wood and Whitley AHLV includes the woodland at Greno, some 8.4km to the southeast of Spring Brook, and the farmland around the small settlement of Whitley. This area is associated with Wharncliffe Wood and Wharncliffe Chase and is contained by the settlements of Grenoside, Ecclesfield and Chapeltown of Sheffield borough. The area is crossed by the A61 and is close to mainline railways and junction 35 of the M1 to the east.

5.7 Landscape Character

5.7.1 The study area is covered by the following Landscape Character Assessments (LCA):

- The Countryside Agency: Countryside Character Volume 3: Yorkshire and the Humber (1998);
- The Barnsley Borough Landscape Character Assessment (2002);
- The Peak District National Park Landscape Character Assessment (2009);
- The Sheffield Preliminary Landscape Character Assessment (2011).

Regional Landscape Character Assessment

5.7.2 There are 3 regional character areas within the 10km study area, as shown on **Figure 5.1c**. Spring Brook is located within regional character area (RCA) Yorkshire Southern Pennine Fringe (37) which forms a buffer between Dark Peak (51) to the west and Nottinghamshire, Derbyshire and Yorkshire Coalfield (38) to the east.

5.7.3 The Southern Pennine Fringe (RCA 37) landscape marks the transition from the Pennine uplands to the west, to the lower, undulating landscapes of the Nottinghamshire, Derbyshire and Yorkshire Coalfield to the east. The most striking aspect of the landscape is the mingling of predominantly 'gritstone' industrial towns and villages with the strong valley forms and pastoral agriculture of the Pennine foothills.

5.7.4 The Dark Peak (RCA 51) is an extensive area of high moorland and adjacent in-bye land within the Pennines comprising a large part of the Peak District National Park. The area lies between the population centres of Manchester, Huddersfield and Sheffield and extends south towards Matlock. It is a highly valued environmental resource and is heavily used for recreation. Much of the area is designated as open access land. The Pennine Way starts in Edale village and rises to cross the Dark Peak on its way north.

5.7.5 The Coalfields (RCA 38) is a large landscape area which embraces the major industrial towns and cities as well as a substantial slice of countryside and the villages of the Nottinghamshire, Derbyshire and Yorkshire Coalfields. It is generally defined by shallow Coal Measures as the underlying bedrock and is bounded by the Peak District and the woollen towns of the Yorkshire Southern Pennine Fringe to the west, by the Pennine Dales Fringe to the north and by the Southern Magnesium Limestone escarpment to the east.

Local Landscape Character Assessment

5.7.6 Three local landscape character documents have been referred to in this assessment: The Barnsley Borough Metropolitan Council (BBMBC) LCA, the Sheffield Council Preliminary LCA and the Peak District National Park LCA.

5.7.7 The assessment has focussed on the most sensitive landscapes as well as those where the magnitude of change would be greatest. The most sensitive were considered to be the two character types displaying 'wild land' characteristics within the Dark Peak RCA, mostly within the National Park. The landscape where the greatest magnitude of change is likely to occur was considered to be the character area within which the proposed wind turbine would be sited. All other local

landscape character areas/types are considered to be sufficiently covered by the RCA and AHLV descriptions.

5.7.8 The proposed Spring Brook wind turbine site is within "Penistone Upland farmland" (F2), as described by the Barnsley LCA. This landscape type covers a large upland area in the south-west of the Borough. The western boundary of the area is defined by the open moorland of character area "Thurlstone and Langsett Unenclosed Moorland" (A1). The northern and eastern boundaries of the area are clearly defined by the valley of the River Don (B1 – "Upland Don River Valley") and the southern boundary by the valley of the Little Don River (the administrative boundary of Barnsley Borough).

5.7.9 The Key Characteristics of Penistone Upland Farmland are:

- Stepped landform rising to 364m at Hartcliffe Hill.
- Fields of pasture comprising small to medium geometric field units strongly defined by distinctive stone walls.
- Linear or circular beech plantations stand out on the skyline, sometimes enclosed by stone walls.
- Unimproved pasture with scrub on steeper slopes.
- Scattered farmsteads of local light coloured stone.
- Penistone is the largest settlement in the area, lying on the edge of the Don Valley.
- Isolated trees form silhouettes against the skyline.
- Pylons and power lines are visually prominent on the skyline.
- Single lane rural roads criss-cross the open countryside, bounded by stone walls.
- Disused industrial quarries, shafts and mines indicate the historical importance of the area for the extraction of coal and stone.
- Panoramic views over adjacent river valleys and towards the open moorland of the Peak District National Park.

5.7.10 The Barnsley LCA describes the landscape as having a strong character owing to strong topography, its intact network of stone walls, rural upland character and panoramic views. But the condition of the landscape is described as moderate, given a lack of maintenance to key features (walls, buildings, trees).

5.7.11 The following existing large (>50m) wind turbine developments are present within the 10km study area, between 5-8km to the northwest of Spring Brook, in the Ingbirchworth Upland Farmland LCT:

- Hazlehead Wind Farm (2006/1575) - 3 (100m) turbines
- Royd Moor Wind Farm - 13 (54m) turbines - erected in 1993 and due to be decommissioned in 2018
- Blackstone Edge Wind Farm (2008/0171) - 3 (101m) turbines
- Spicer Hill Wind Farm (2009/0572) - 3 (95m) turbines

5.7.12 There is currently no landscape capacity study for wind turbines covering the Spring Brook site, although Barnsley Council are at the early stages of preparing one for all renewable energy technologies. A strategic level, regional capacity study was prepared in 2011 and identified the area around Spring Brook as a "practically viable wind resource" [10]. The Barnsley LCA does include an assessment of sensitivity and capacity for development, but primarily for the purpose of predicting the effects of new Greenfield housing development. The sensitivity it accords to the Penistone Upland Farmland landscape is 'high' and its capacity to absorb development 'low', given high visibility from the Peak District, the presence of Important Geographic Sites, distinctive field patterns, the low density settlement pattern and rural character. In relation to wind energy development, the Council's screening opinion (**Appendix 3.4**) describes the local landform and character as 'delicate and sensitive' to this type of development.

5.7.13 The LCA's description of features which contribute to the openness of the land around the site – low settlement density, unimproved pasture, panoramic views – is also of relevance to the assessment of how the proposal will harm the Green Belt. BBMBC considered that the Sheephouse Heights proposal failed to demonstrate very special circumstances sufficient to outweigh the 'visual harm by virtue of inappropriate scale and siting'.

5.7.14 A landscape capacity study[11] for wind energy developments was prepared in 2010 for the South Pennines authorities to the north, including Kirklees Council, whose administrative area is within 10km of Spring Brook (as shown on **Figure 5.1c**). As the South Pennine RCA continues south over the study area and includes the site, the capacity study has wider relevance to the study area.

5.7.15 The most relevant landscape character type covered by the capacity study, 'Moorland Fringes/ Upland Pastures', is given a sensitivity rating as High (locally Moderate-High) "due to its close relationship to the adjoining open moorland plateaux, as well as its small scale, complex land cover, wide visibility, high scenic quality, natural and cultural heritage features, and nationally or regionally important recreational interests" (p.62). However, the study cautions that "high" does not indicate no capacity. "This is because [...] most LCTs vary in sensitivity across their areas; and also because sensitivity varies depending on the scale of wind energy development proposed" (p.53).

5.7.16 The Peak District National Park LCA covers the same area as the RCA within the study area. The Peak District Eastern Fringe lies outside the National Park boundary and is fully described within the Southern Pennine Fringe (RCA 37) character area. The Dark Peak and northern section of the Derwent River Landscape Character Areas are described by Dark Peak (RCA 51).

5.7.17 Two Landscape Character Types from the Peak District National Park LCA are considered in this assessment because both are described as containing wilderness characteristics. These are:

[10] Local Government Yorkshire and Humber (2011), Vol.2, Figure 61

[11] Julie Martin Associates (2010)

- Open Moorland and Heath, and
- Moorland Slopes and Cloughs.

5.7.18 Both Landscape Character Types are characteristically and spatially in close association and therefore will be assessed together as one landscape receptor.

5.7.19 Open Moorland and Heath is a visually prominent landscape which covers more than half the area of the Dark Peak and is associated almost exclusively with the blanket peat on the higher summits at the core of the region. This is a wild, unsettled landscape with wide views to distant surrounding hills.

5.7.20 Key characteristics are:

- Undulating high gritstone plateau
- Localised rock outcrops and boulders, in the form of rocky ridges and tors
- Thick deposits of peat with incised groughs
- Unenclosed heather and grass moorland, managed in places for shooting.
- Wild, unsettled landscape with vast panoramas over surrounding hills and lower ground.

5.7.21 Moorland slopes and cloughs areas comprise of steep slopes and cloughs rising to precipitous gritstone edges and scree slopes, with widespread rough grassland and heather moor, grazed by sheep. This is a wild unsettled landscape with exposed views over lower ground.

5.7.22 Key characteristics are:

- Steep slopes and cloughs rising to precipitous edges
- Prominent gritstone outcrops, boulders and scree slopes
- Thin soils over gritstone bedrock
- Rough acid grassland and heather moorland grazed by sheep
- Exposed views over lower ground, sometimes limited by dough sides

5.7.23 Due to the proximity of Spring Brook to Midhopestones Conservation Area – the characteristics of which are described more fully in the Heritage chapter of this ES – an assessment has been carried out on potential effects on its character and appearance.

5.8 Visual Appraisal

Area of Visibility

5.8.1 As part of the desktop study, an initial ZTV out to 15km from the wind turbine location was produced to identify the potential theoretical visibility of the wind turbine being proposed. The ZTV indicated that the scale and visual footprint of the proposed wind turbine (and surrounding wind turbines) is primarily contained within 10km of the proposed location. Two ZTVs have been produced (**Figures 5.1a and 5.1b**). The first shows theoretical visibility at eye-level of the hub and the blades (up to tip) of the proposed turbine, but excludes the screening effects of woodland and buildings, therefore presenting a worst-case potential bare ground

visibility. The second ZTV includes the effects of screening from woodland and settlements, but excludes localised features, such as hedgerows, small copses, or individual mature trees.

Receptors

5.8.2 The viewpoints assessed have included and enabled the representation of a range of receptors. These included:

- Residents and settlements - These have a tendency towards greater sensitivity to change than those passing through. Most important are views from homes although views when travelling to work and to local destinations may also be included in that category. Most of the viewpoints identified cover views representative of these receptors.
- Workers - These are generally less sensitive to effects as they are focussed on the tasks being carried out. Indoor workers are seen as being less affected by change and views with in some cases more awareness to change being held by farmers who will spend much time outdoors.
- The travelling public - This group includes to some extent local residents, workers and those who come to visit the area. They include motorists using the main routes and motorways. Travelling at speed, these tend to be focussed in achieving their destination. As slower routes are used and local lanes, more awareness is placed on the landscape being travelled through. This applies to cyclists and footpath users who are there to enjoy the outdoor experience rather than simply reaching their destination.
- Visitors - These include receptors holding a range of interests and therefore potentially holding a range of views with regards to changes in the landscape and views. Visitors can include those taking enjoyment from cultural and heritage sites, cyclists to walkers and riders. Again a number of the viewpoints identified cross over in covering the interests of these receptors.

5.8.3 Many of the selected viewpoints also represent the general landscape character of the area as well as the visual receptor.

Potential visibility to 5km

5.8.4 Potential visibility out to 5km on the ZTV (5.1a) is shown as including most of the area within this distance. Areas with no visibility include the Ewden Beck valley in the National Park to the south, a 3.6km stretch of the A616 and Barnsley Boundary Walk, to the southeast, and low lying areas along the River Don, to the north, including much of the route of the A628. On this crude model, visibility is predicted from most of the settlements within 5km. The ZTV showing the screening effects of woodland blocks and buildings (5.1b) indicates how much existing features in the landscape will prevent views of the proposed turbine.

5.8.5 The Barnsley to Huddersfield railway is shown on the crude ZTV to have potential visibility of the Spring Brook wind turbine within this distance, but extensive tunnelling and embankments, plus planting and buildings, as the railway enters Penistone, would filter or screen views completely.

5.8.6 Viewpoints 1, 2, 3, 5, 6, 8, 10, 11 and 12 have been identified within this distance.

Potential visibility 5 to 10km

5.8.7 Within this zone the ZTV indicates more discreet areas of visibility. Many of the major roads in this zone experience no or only limited visibility, such as the A6102 to the southeast, A629 south of the A616, A628, A635, A616, and A636. A section of the M1 motorway also passes thorough the north-eastern edge of the 10km band, but road users are likely to experience only limited views of the proposed turbine given the local landform and planting associated with the road corridor. The 3 registered Parks and Gardens in the area are also predicted to have either no or limited visibility of the turbine (even before tree screening is taken into account).

5.8.8 No visibility is predicted from the Sheffield Country Walk to the south east, only short sections of the Transpennine Trail in the east of this zone, but visibility is predicted along much of the Barnsley Boundary Walk to the west of the area.

5.8.9 Viewpoints 4, 7 and 9 are within this distance.

Perception of wind turbines in an open landscape

5.8.10 Scottish Executive (2002) Planning Advice Note 45 (since superseded), offers the following general guide to the effect that distance has on perception of a windfarm in an open landscape (without relating this to tower height but having earlier referred to turbines of tower height >70m and rotor diameters of >80m).

	Perception
Up to 2kms	Likely to be a prominent feature
2-5kms	Relatively prominent
5-15kms	Only prominent in clear visibility – seen as part of the wider landscape
15-30kms	Only seen in very clear visibility – a minor element in the landscape

5.8.11 Research by Bishop (cited in University of Newcastle (2002)) used animated computer simulations in paired comparisons of scenes, with and without a wind turbine, to test the ability of respondents (students) to first detect, then recognise, and then judge the impact of the turbine in relation to distance, contrast and atmospheric conditions. The test turbine was 63m to tip (16m lower than being proposed in this case). Key conclusions included:

- Recognition was only made by 5% of respondents at 30km distance.
- Recognition was only made by 10% of respondents at 20km distance.
- The most significant drop in recognition rates occurred at 8-12km in clear air.
- The most significant drop in recognition rates occurred at 7-9km in light haze.

- Visual impact drops rapidly at approximately 4km and is <10% at 6km in clear air.
- Visual impact in light haze is not greatly different. A rapid decrease in visual impact begins at under 4km and is <10% at 5km.
- Low contrast in light haze reduces the distance thresholds by 20%.
- High contrast can dramatically increase the potential impact of white towers.
- Ratings are highly sensitive to changing atmospheric conditions[12].

5.8.12 In addition to distance, contrast and atmospheric conditions, the visual impact of a wind turbine is also determined by its size, the nature of the view (framed/open, backclothed/skyline) and its context[13].

5.8.13 The nature of the selected views is described below, and expands on the characterisation of the wider area in the LCA.

5.8.14 The 10km study area was considered appropriate for the scale of the turbine being proposed, given the above research and the landscape context (including wider initial ZTV assessment).

5.9 Viewpoint Location and Description

Viewpoint 1 - View from Midhopestones - SK 23538 99542; Figure 5.2

5.9.1 This viewpoint, approximately 1.5km southwest of the proposed wind turbine location, was identified from the ZTVs as being representative of potential visibility from Midhopestones Conservation Area, looking northeast towards the wind turbine being proposed. It is representative of views obtained by some of the residential receptors.

5.9.2 From this viewpoint, the ZTVs indicate that the turbine will be visible. The theoretical visibility is indicated on the wireframe included in the Figure.

5.9.3 The view is from a steep hillside facing north-eastwards over the valley towards a ridge along which a pylon line is routed. The landscape is generally farmland with large areas of woodland interspersed with dwellings and other buildings. A small wind turbine is visible amongst several pylon towers further east along the ridgeline. There is a constant traffic noise from the A616. The wireline view also shown on the Figure, indicates the position and scale of the proposed turbine in this view in relation to the surrounding landform.

Viewpoint 2 - View from Underbank Reservoir near Smithy Moor Lane - SK 25235 98960; Figure 5.4

5.9.4 This viewpoint is located to the east of the reservoir, beside some modern housing, 1.4km to the southeast of Spring Brook. It is at the south-western edge of Stocksbridge and represents residential and potentially recreational views. The

[12] http://www.snh.org.uk/pdfs/publications/commissioned_reports/f01aa303a.pdf

[13] SNH (2009), paragraph 4.20

view is over the steeply banked dam at the foot of an expansive reservoir framed by woodland on both sides of the valley. Out of shot, tall pine trees line the side of the road between the reservoir and Stocksbridge. Above the wooded valley side, pylons march through pasture and between farm buildings, across the ridgeline. The small turbine further east along the ridgeline is visible from the road. The noise from the reservoir overflow weirs varies according to rainfall.

5.9.5 The Figure also contains a wireline of the proposed turbine from this location.

Viewpoint 3 - View from Gilbert Hill - SE 21051 00731; Figure 5.6

5.9.6 This viewpoint, to the northwest of Langsett village, is approximately 3.8km from Spring Brook and represents the views of drivers entering the Little Don valley from the west, and also walkers on the Barnsley Boundary walk. The view presents the upland ridgeline as studded with electrical infrastructure – pylon towers and a single small turbine. Both sides of the valley are farmed. Extensive woodland snakes through the valley bottom and surrounds Underbank reservoir. Out of view, moorland is visible on a summit to the south, and clumps of woodland cover summits above farmland to the east. Stone walls line the roads.

5.9.7 The Figure also contains a wireline of the proposed turbine from this location.

Viewpoint 4 - View from A628 nr Barnsley Boundary Walk - SE 16922 00659; Figure 5.8

5.9.8 This viewpoint, 7.9km to the west represents receptors such as walkers and those travelling east on the A628. The busy 3 lane hilltop road creates additional movement in this windswept landscape. To the west the wind turbines at Hazlehead, Royd Moor and Spicer Hill are visible, though the tallest feature is the Emley Moor Communications Tower (330m). To the right of the view (south) is wild moorland, which descends towards the middle of the view (east) into a wooded valley. Beyond the valley is a patchwork of farmland, with pylons and clumps of woodland along the ridgeline.

5.9.9 The Figure also contains a wireline of the proposed turbine from this location.

Viewpoint 5 - View from Public Footpath at Bolsterstone - SE 27110 96967; Figure 5.10

5.9.10 This viewpoint is located approximately 4km southeast of Spring Brook. It was selected as representative for potential views from Bolsterstone Conservation Area. Even at this distance traffic on the A616 is audible. The view is across small stonewall-lined fields, rugby pitches, housing at Stocksbridge, and the upland ridgeline where Spring Brook is located. 11.5km to the west, the 3 Hazlehead wind turbines are fully visible, as is the small turbine further east along the ridgeline from Spring Brook. Also just visible above woodland to the west of Spring Brook is a turbine blade from Spicer Hill. The stone walls, wooden telegraph poles, built development line and ridgeline draped with a line of pylons, are all strong linear features in the view.

5.9.11 The Figure also contains a wireline of the proposed turbine from this location.

Viewpoint 6 - View from Green Moor - SE 27895 99526; Figure 5.12

5.9.12 This viewpoint is around 3.2km due east of Spring Brook. It was identified as representative of potential views of walkers and nearby residents. The viewpoint is located beside a footpath on a minor road on the north side of the ridgeline, with views across the agricultural fields, the well wooded Don valley and with Thurgoland on the hill summit beyond. A 2 bladed small wind turbine is visible to the west of Thurgoland. Emley Moor communications tower is visible 14.5km to the north. To the southwest, rows of pylons march in a westerly direction across the ridgeline.

5.9.13 The Figure also contains a wireline of the proposed turbine from this location.

Viewpoint 7 - View from Royd Moor Hill - SK 21555 04184; Figure 5.14

5.9.14 This viewpoint is located at the Royd Moor viewing point approximately 5km northwest of Spring Brook at an altitude of approximately 320m. It was identified as representative for recreational views from the viewpoint, which also lies on cycle route (627), a spur from the main Transpennine Trail. At the centre of the viewpoint is a stainless steel disc engraved with compass points, distances to towns, and arrows and descriptions of industrial and cultural heritage, such as the steel works at Stocksbridge, cloth mills, Woodhead Railway Tunnels. The viewpoint is adjacent to Royd Moor wind farm, which consists of thirteen 53m turbines and was built in 1993. It is due to be decommissioned in 2018. A short distance to the north of Royd Moor is the 3 x 95m Spicer Hill Wind Farm and behind this cluster lies the 3 x 101m Blackstone Edge Wind Farm. The 3 x 100m wind turbines at Hazelhead are also visible from this viewpoint, as is the Emley Moor communications tower.

5.9.15 The view is across elevated pasture where cattle are grazing, beyond which the ridgeline continues to the southeast and is punctuated by pylons. The sky is large in this relatively featureless view across a plateau.

5.9.16 The Figure also contains a wireline of the proposed turbine from this location.

Viewpoint 8 - View from A629 nr roundabout with A628 - SK 25949 04131; Figure 5.16

5.9.17 This viewpoint, 4km to the north, represents views from drivers coming into the area from the north, on the A628. It is an elevated and panoramic view across the Don valley. From this viewpoint the Royd Moor, Spicer Hill, Blackstone Edge and Hazelhead wind farms are visible to the west. The mixture of turbine types makes for a discordant composition, with the older shorter Royd Moor turbines spinning far faster than the more modern slower larger turbines.

5.9.18 The view is across large arable rolling farmland, over a settled and wooded valley towards a patchwork of fields with pylons along the ridgeline, and in the distance the darker hills of the Peak District.

5.9.19 The Figure also contains a wireline of the proposed turbine from this location.

Viewpoint 9 - View from Dukes Road (Path) - SE 24191 94678; Figure 5.18

5.9.20 This viewpoint, 5.7km to the south, represents possible views of the proposed turbine for horse riders and walkers. The landscape at this point is in transition from moorland to enclosed farmland, with farmsteads visible on the farmed valley

side. Pylons , blocks of woodland, and the Emley Moor communications mast are all features along the horizon beyond the deep valley which contrast with the wild moorland around and to the west of the viewpoint. Blade tips from Spicer Hill and Blackstone Edge wind farms are also visible (over 10km away) above the ridgeline to the northwest.

5.9.21 The Figure also contains a wireline of the proposed turbine from this location.

Viewpoint 10 - View from Public Footpath/Trail at Langsett Reservoir - SK 20177 99793; Figure 5.20

5.9.22 This viewpoint, 4.7km to the west, represents possible views of the proposed turbine from recreational trails to the west of Langsett Reservoir. The viewpoint is located to the west of two abandoned steadings, and the view is to the east across braken, heather, and the reservoir, and over plantations towards the upland ridgeline, which is topped with clumps of woodland and pylons. To the northeast lie farmed uplands, and to the southeast forestry and wild moorland.

5.9.23 The Figure also contains a wireline of the proposed turbine from this location.

Viewpoint 11 - View from Cubley - SE 24586 01890; Figure 5.22

5.9.24 This viewpoint is located 1.6 km to the north of the Spring Brook turbine, on Royd Field Lane, on the south side of the village of Cubley. The viewpoint represents potential views from the settlement, southbound road users, and walkers on the Penistone Boundary Walk, which runs along Royd Field Lane. The viewpoint and view are contained within the Penistone Upland Rolling Farmland character area. The view is of gently undulating farmland, with a strong pattern of distinctive geometric gritstone walls along field boundaries and roads. Trees are clustered around buildings and along boundaries, and are prominent features on the southern horizon, alongside high voltage pylons. Other vertical features in the view are wooden telegraph poles around the housing and dotted through fields, and a small turbine beside a pylon tower, on the horizon to the left (east) of the view.

5.9.25 The Figure also contains a wireline of the proposed turbine from this location.

Viewpoint 12 - View from Oxspring - SE 26594 01890; Figure 5.24

5.9.26 This viewpoint is located on Roughbirchworth lane 2.3km from the turbine, on the UDP settlement boundary of Oxspring, where the ZTV indicated potential visibility. The ZTV indicates that at this point, when travelling southwest, the turbine hub would become visible. The ZTV shows that the landform screens views of the turbine tower section and hub from most of Oxspring.

5.9.27 The view is southwest along Roughbirchworth lane, which is bounded on its west side by a continuous gritstone wall, and on its east side by post and wire fencing. Beyond the wall, the land rises a short distance to some large agricultural buildings at Sycamore Farm. To the east, large fields divided by stone walls, descend gradually towards the river Don valley. Slightly below the summit to the south, which is itself crowned by a short line of trees, two lines of high voltage pylons run across the view from east to west. Evenly spaced trees line the west side of Roughbirchworth lane, which is also lit on both sides by street lamps. Wooden telegraph poles run along field boundaries to the east.

5.9.28 The Figure also contains a wireline of the proposed turbine from this location. As intervening vegetation completely screens views of the turbine from this location, a photomontage has not been produced.

5.10 Visual Effects

5.10.1 The photomontages included within this application were taken from 11 viewpoints using a 35mm digital SLR camera with a 50mm lens 1.5m agl. The location of the viewpoint was recorded using a GPS satellite navigation system in accordance with the Landscape Institute Advice Note 01/11. A wireline has been produced for viewpoint 12 from which visibility would be screened by vegetation.

5.10.2 For each[14] viewpoint the following have been produced:

- Detailed Location plan
- 50mm panoramic photo and wireframe
- 50mm panoramic photomontage

5.10.3 Ordinance Survey DTM 5-metre Contour Data has been used to create the 3D computer generated terrain model.

5.10.4 The resultant photomontages show the turbine to the same scale as the photograph. These have been constructed in accordance with the dimensions stated in the ES, with the dimensions of the turbine tower, nacelle and blades conforming with the manufacturers specification related to the turbine output and nacelle height.

5.10.5 The cumulative assessment was undertaken for sites within 10km of the Spring Brook site. Only sites containing turbines of at least 50m were considered. In line with SNH (2012) guidance, both operational and consented sites were assessed, as were sites within the planning process. The emphasis of the cumulative assessment is as follows:

> *"The key principle for all cumulative impact assessments is to focus on the likely significant effects and in particular those which are likely to influence the outcome of the consenting process."* [15]

Proposed View: Viewpoint 1 (Midhopestones) - Figure 5.3

5.10.6 The photomontage provides an indicative view with the wind turbine in position. The proportions of the wind turbine are balanced with regard to the blade length to tower height ratio.

5.10.7 From this location, the proposed wind turbine is visible in the centre of the view. The turbine is seen set on the ridgeline set against the sky, alongside the pylon

[14] A panoramic photomontage was not produced for Viewpoint 12, as intervening vegetation resulted in full screening of the wind turbine from this location.

[15] SNH (2012), para.33

line, and of a similar scale to the nearby pylon tower. The height of the hill also diminishes the scale of the turbine.

5.10.8 Other elements in this view include the woodland, strongly delineated field boundaries, and some buildings. A smaller wind turbine is also visible further to the east.

5.10.9 At this distance, the wind turbine would be a prominent feature along the ridgeline, but due to its scale (both in number and height), it would not dominate the view or significantly change the village's setting.

5.10.10 The associated components (access track, crane pad, electrical control building) would not be visible from this location.

5.10.11 The wind turbine from this location and in its immediate surroundings would be seen as a clear visual element with a clear link to be made between the wind turbine and its function[16].

5.10.12 The only other wind turbine visible (in combination) in this view is the small turbine to the east of Spring Brook which means that there is an existing awareness of the presence of a wind turbine (and a moving element) in this view. The proposed (larger) turbine at Spring Brook follows the pattern established by the pylons of allowing separation distance between vertical features, and thereby maintains openness.

Proposed View: Viewpoint 2 (Underbank Reservoir) - Figure 5.5

5.10.13 The photomontage of this viewpoint provides an indicative view of the wind turbine in position.

5.10.14 From this location, as shown from the montage, the Spring Brook turbine would be a very prominent feature on the ridgeline, seen set against the sky. Due to its height it would likely become a local landmark, but at the same time the turbine is not wholly out of scale with the steeply rising ridgeline above this large scale reservoir and dam.

5.10.15 No other elements of the proposal would be visible from this location. The sequential cumulative impact of the Spring Brook turbine alongside the small turbine to the east would be negligible due to the small scale of the small turbine and the distance between the projects.

Proposed View: Viewpoint 3 (Gilbert Hill) - Figure 5.7

5.10.16 The photomontage of this viewpoint provides an indicative view of the wind turbine set within this viewpoint.

5.10.17 From this location as indicated, the wind turbine is visible on the ridgeline alongside pylons.

[16] SNH (2009)

5.10.18 At this distance, the proposed wind turbine would be relatively prominent in clear visibility but would not detract from the view over the valley.

5.10.19 It is likely the small wind turbine (visible a short distance to left of the Spring Brook turbine in the photomontage) would not be visible at this distance.

Proposed View: Viewpoint 4 (A628) - Figure 5.9

5.10.20 The photomontage of this viewpoint provides an indicative view of the wind turbine set within this viewpoint.

5.10.21 From this location, as shown the montage, the base of the towers would be backlothed against rising ground. The rest of the turbine would be seen set against the sky.

5.10.22 Other vertical features are the pylons with run along the ridgeline close to the site.

5.10.23 At this distance, the proposed wind turbine would only be prominent in clear visibility.

5.10.24 The potential for sequential cumulative impacts exist at this location, as 4 wind farms are visible to the north as one drives eastwards. The location of the Spring Brook turbine however follows the established pattern of locating wind turbines on upland landscapes (where the wind resource is best), on agricultural land rather than moorland, and the scale of the proposal avoids establishing another 'wind farm' in this more sensitive location. The proposed wind turbine in this view would not detract or further compromise from the existing view available.

Proposed View: Viewpoint 5 (Bolsterstone) - Figures 5.11

5.10.25 The photomontage of this viewpoint provides an indicative view of the wind turbine set within this viewpoint.

5.10.26 At just over 4km to the proposed turbine has the potential to be a relatively prominent feature in the view, on the horizon. However, there are several existing vertical features in the view, which mean that the proposed turbine would not be wholly out of character. Such features include the rugby goal posts on the nearby playing fields, telegraph poles, pylons along the ridgeline and existing wind turbines.

5.10.27 This view has the greatest potential for combinatory cumulative impacts with other wind turbine developments, as described above. Yet the separation distance and substantial screening of Spicer Hill prevent the turbines from becoming dominant features in the landscape. The new addition of the proposed wind turbine in this view would therefore not detract from or further compromise the existing view available.

Proposed View: Viewpoint 6 (Green Moor) - Figure 5.13

5.10.28 The photomontage of this viewpoint provides an indicative view of the wind turbine set within this viewpoint.

5.10.29 At just over 3km, the turbine has the potential to be relatively prominent in this view. However, as shown in the photomontage, topographical screening results in only the blade tips being visible.

5.10.30 Given reduced visibility, cumulative impacts would be negligible.

Proposed View: Viewpoint 7 (Royd Moor) - Figure 5.15

5.10.31 The photomontage shows that full visibility of the wind turbine would be possible from this location, with part of the wind turbine tower screened by trees, and the rest seen set against the skyline.

5.10.32 At over 5km, the proposed wind turbine would only be prominent in clear visibility and would be seen as part of the wider landscape.

5.10.33 Given the proximity of the viewpoint to existing wind farms, there is a potential for sequential cumulative effects. However, the extent of those effects is tempered both by the distance to Spring Brook and the location of the receptor adjacent to an existing windfarm.

5.10.34 From this location, the access track and other project components would not be visible.

Proposed View: Viewpoint 8 (A629) - Figure 5.17

5.10.35 The photomontage shows that full visibility of the wind turbine would be possible from this location, with part of the wind turbine tower backclothed by the Peak District and the rest seen set against the skyline.

5.10.36 At this distance the proposed wind turbine could be a relatively prominent feature in the view. However, its scale, the presence of existing vertical features (pylons), and the complexity of the existing view reduces the sensitivity of the landscape. Sequential cumulative effects are possible given good visibility of the 4 wind farms to the west from this viewpoint. However, the scale of the Spring Brook proposal will allow it to be absorbed into this large landscape.

5.10.37 From this location, access tracks to the southern turbine and the control building are unlikely to be visible.

Proposed View: Viewpoint 9 (Dukes Road) - Figure 5.19

5.10.38 The photomontage shows the proposed turbine is partially screened by intervening woodland, and the rotors are largely set against the skyline.

5.10.39 At this distance (5.7km) the proposed wind turbine would likely be seen as an element within the wider view. Other vertical features, as discussed, raise the capacity of the landscape to absorb the proposal. Limited visibility of other wind turbines and the transition in landscape character indicates effects will be negligible.

5.10.40 From this location, other project components would not be visible.

Proposed View: Viewpoint 10 (Langsett Reservoir) - Figure 5.21

5.10.41 The photomontage shows that full visibility of the wind turbine would be possible from this location, with the wind turbine seen set against the skyline.

5.10.42 At close to 5km, the proposed wind turbine would only be prominent in clear visibility, and would be seen as an element within the wider view. Sequential

cumulative effects will be possible due to the visibility of the 4 wind farms to the west. However, the single 79m turbine at Spring Brook is detached from that grouping and would not change the character of local landscapes to wind farm landscapes.

5.10.43 From this location, other project components would not be visible.

Proposed View: Viewpoint 11 (Cubley) - Figure 5.23

5.10.44 The photomontage shows the wind turbine is partially concealed behind a tree on the horizon. Topography is also shown to screen the bottom part of the turbine tower (and other project components) from views in this general area.

5.10.45 At this distance (1.6km), the Spring Brook turbine could be a prominent feature, but its impact is likely to be lessened by the presence of existing vertical features on the horizon, and partial screening by vegetation. The turbine does not appear out of scale with existing features either, with trees to the west and along Mortimer road appearing to be taller that the turbine. The presence of an operational single turbine to the east means that the Spring Brook turbine would not be an entirely new (moving) feature in this landscape. And, the separation distance between the two turbines (and from electrical infrastructure) serves to maintain the openness of the area.

Proposed View: Viewpoint 12 (Oxspring)

5.10.46 No photomontage was prepared from this viewpoint due to complete screening of the Spring Brook turbine by trees. The scale of the proposal when viewed from this location is however apparent by comparing the photograph and wireline on **Figure 5.24**. At 2.3km, the proposed turbine has the potential to be relatively prominent at this distance. However, its impact is reduced by topographical and tree screening. The existing two-bladed wind turbine at Sycamore farm is largely screened by the established roadside trees, and the small wind turbine to the east of Spring Brook along the ridgeline, is almost completely screened by tree cover, and is not prominent due to the distance. The potential for adverse cumulative impacts on this view is therefore low.

5.11 Landscape Effects

Penistone Upland Farmland

5.11.1 The key characteristics of this LCT, within which the Spring Brook wind turbine would be located, are described above. The ZTVs predict widespread visibility of the proposed turbine within this landscape, though more limited visibility to the west (over Ecklands and Millhouse) due to topographical screening. Viewpoints 3, 4, 6, 11 and 12 are all located within this LCT.

5.11.2 The character area extend northwards from the main trunk road (A616), up the steep south facing slopes of The Potter or Little Don River valley, over a shallow ridge line to the upland farmland plateau and descends on gentler northern facing slopes to The Don River to the north.

5.11.3 The northern area has wider views of the farmland plateau and the settlement of Penistone. The southern area of south facing slopes contains more woodland cover and is dominated by a line of electricity pylons. The character of this southern

farmland is influenced by the larger scale manmade features within the valley - the A616, Underbank Reservoir and the main industrial and residential areas of Stocksbridge.

5.11.4 Due to the elevated ('upland') character of the area, many of the 12 viewpoints provide a view into this LCT. Viewpoints 3 and 4 provide views along the ridgeline, while viewpoints 6, 11 and 12 provide views from the gentler northern facing slopes to the north. Viewpoints 1 and 2 provide views of the steep south facing slopes.

5.11.5 Set within the northern slopes the turbine is frequently screened by topography and trees. Where it is fully visible, it appears alongside - and of a similar scale to - individual trees along the horizon. The open, rural character of these northern slopes, and the panoramic views over the LCT is preserved by the proposed single turbine, which avoids cluttering the horizon.

5.11.6 The turbine appears as a prominent feature along the ridgeline when viewed from the west and the south. There are however existing vertical features along the ridgeline, including the small turbine to the east. The proposed turbine also follows an established pattern of locating wind turbines on upland landscapes, where the resource is best, but at the same time limiting the scale of such proposals in more sensitive/ delicate landscapes.

Peak District National Park

5.11.7 The key characteristics of the two National Park LCTs within the study area are described above. The ZTVs (and **Figure 5.1c**) show the extent of predicted visibility over the National Park. Less than 30% of the National Park within the 10km study area has predicted visibility. Viewpoints 4, 9 and 10 are located within the National Park. Viewpoint 4 is within the higher, Open Moorland and Heath LCT, but is also contained within the Penistone Upland Farmland LCT.

5.11.8 The National Park lies some 2.3km to the south of the Spring Brook site. The two LCTs within the study area are identified as a continuous band from above the settlement of Matlock in the south to the settlement of Marsden in the north, and curving around the catchment of the River Derwent to just above the settlement of Hope. The band is intricately incised by landscape character types associated with wooded and farmed landscape types. Both LCTs have a wild and unsettled character, with varying potential for distant views. Southern parts of the National Park within the study area, where visibility is predicted, will afford views of the proposed wind turbine partially screened by topography and vegetation (as seen at viewpoint 9). Existing man-made features are already visible on the horizon from these areas, such as electricity pylons and the Emley Moor communications mast. From more elevated western areas (see viewpoints 4 and 10), where visibility is predicted, the proposed turbine will be fully visible on the farmed upland on the horizon. The Royd Moor cluster is already visible to these areas, but due to the contrasting scale and separation distance, they would be seen as separate.

5.11.9 From parts of the National Park, the proposed turbine would appear as a relatively prominent feature on the farmed landscape to the north. There are existing vertical features along this ridgeline, including the small turbine to the east, which the proposed turbine would not be out of scale with. The established pattern of locating wind turbines on upland landscapes, as seen at Royd Moor, would be maintained here, without changing the character of the local landscape and views from the National Park.

Midhopestones Conservation Area

5.11.10 As discussed in the Heritage chapter of this ES, there would be relatively extensive visibility of the proposed turbine from the more open parts of the Midhopestones Conservation Area, which encompasses a number of open fields associated with the character of the village. Visibility from listed buildings within the Conservation Area will be limited to a varying extent by screening from both other buildings and from trees, particularly in the case of the Church of St James.

5.11.11 **Figure 5.3** shows a predicted view of the turbine from a position on Chapel Lane (viewpoint 1) with open views out from the centre of the Conservation Area. This illustrates how the turbine would be a significant feature on the horizon, but would not be out of proportion with the landscape or the existing electricity infrastructure which shares the ridge.

5.12 Conclusion

5.12.1 The site of the proposed wind turbine is not covered by any national or regional designations. The area around the site was identified in a 2011 regional renewable energy capacity study as a "practically viable wind resource". However, the area is described by the Barnsley LCA and South Pennines capacity study as of high sensitivity, and the recent EIA Screening Opinion describes the local landscape as 'delicate and sensitive' to wind energy development due to high visibility from the Peak District, distinctive field patterns, low-density settlement pattern and rural character.

5.12.2 The visualisations indicate that the nature of the proposal, a single turbine with a 79m tip height, can be accommodated within this landscape and views.

5.12.3 Although clearly visible and prominent in close views, the wind turbine does not dominate the view, becoming part of the wider view as distance increases from the proposed location. From these locations the wind turbine becomes part of the view as opposed to being a prominent feature within it.

5.12.4 A number of existing features within the landscape contribute to the integration of the proposed Spring Brook Wind turbine within this landscape and views:

5.12.5 The scale of the proposal takes advantage of the local landform without substantially changing the local landscape character and the settings of the valley settlements.

5.12.6 The single 79m turbine does not significantly disrupt the openness of the land, maintaining its countryside character and the availability of views across to the Peak District.

5.12.7 The presence of the existing wind turbines in many of the views leads to the proposed turbine being seen as following a similar pattern of development, avoiding more sensitive (wild moorland) locations, being located instead on low-grade upland pasture (where the wind resource is best).

5.12.8 The assessment shows that the addition of the Spring Brook wind turbine does little to add to the cumulative baseline. Its location and visual footprint mitigates against any sensitive effects such an addition could have. The landscape within which the wind turbine is located enables it to be absorbed and contained within a visual

envelope able to assimilate it without significantly detracting from the overall character of the landscape.

5.12.9 With regard to visual amenity, proposals of this nature will always be visible. The site of the proposed wind turbine is located away from the larger population centres. Potential visibility is mainly contained to 5km, with limited visibility out to 10km.

5.12.10 Wind turbines appear as new features within the landscape. However, given the existing landscape, the range of potential views, and the limited scale of this proposal, it is considered that visual effects will be minimised and contained. As such it is not considered that the proposal will result in unacceptable landscape and visual effects.

6 Ornithology

6.1 Introduction

Scope

6.1.1 The purpose of this chapter is to provide an ornithological impact assessment of a proposed turbine at Spring Brook ("the site") near Stocksbridge, South Yorkshire (OS Grid Ref SE24904 00359). The proposal is for the installation of a 79 m (to blade tip), 900-kilowatt (kW), monopole turbine and associated infrastructure. Keystone Ecology undertook ornithological survey at the site in 2012. Data has also been used in this assessment from ornithological survey and assessment at the site undertaken in 2006 - 2007 (Arcus, 2008) to accompany a planning application for a 15 MW five wind turbine scheme at Sheephouse Heights. This scheme was not consented.

6.1.2 The information gathered from ornithological survey and data consultation by Arcus and Keystone Ecology Ltd in 2006/7 and 2012 respectively have been used to evaluate the ornithological importance of the site and to assess potential impacts of the proposed single wind turbine scheme.

6.1.3 The assessment has been carried out in general accord with the Institute of Ecology and Environmental Management 'Guidelines for Ecological Impact Assessment' (IEEM, 2006).

6.2 Methodology

Assessment Methodology

6.2.1 This ornithological impact assessment describes the baseline avifauna of the site as assessed through desk-study and survey work undertaken in 2012 by Keystone Ecology with supporting evidence from surveys undertaken for a proposed five turbine site at the same location in 2006 – 2007 (Arcus, 2008). The impacts associated with the construction, operation and decommissioning of the wind turbines are described, their effects on the avifauna of the site are proposed and their importance/significance assessed using the most up to date information available.

6.2.2 The degree to which an impact is considered significant or not is assessed on the basis of how any particular impact affects the integrity of the ecosystem in which the birds live and/or the conservation status of the habitats or species within a given geographical area (IEEM, 2006).

Species Conservation Status

6.2.3 The conservation status of the avian receptors is reflected in a tiered system of international, national and local, regulatory and conservation designations currently applicable to Europe's bird population. They take into account the species status in terms of threat and vulnerability, their distribution and rarity. This structure is presented in **Table 6.1**.

EC Directive 2009/147/EC on the Conservation of Wild Birds	Annex 1 Species
These are rare breeding European birds, which are afforded special protection under Annex 1 of the EC 'Birds Directive'.	
Wildlife and Countryside Act 1981 (as Amended)	**Schedule 1 Species**
These are rare breeding UK birds, which are afforded special protection under Schedule 1 of the Wildlife and Countryside Act 1981 (as Amended).	
Birds of Conservation Concern (BoCC)	**Red List Species**
These are listed by the RSPB/BTO ((Eaton *et al*., 2009)) as species of high national conservation concern. Species are included on the list if they meet one or more of the following criteria; • Globally threatened; • Historical population decline in UK during 1800-1995; • Severe (>50 %) decline in UK breeding population over the last 25 years; • Severe (>50 %) decline in the UK non-breeding population over the last 25 years and • Severe (>50 %) contraction of the UK breeding range over last 25 years.	
Birds of Conservation Concern (BoCC)	**Amber List Species**
These are listed by the RSPB/BTO as species of medium national conservation concern. Species are included on this list if they meet one or more of the following criteria: • Species of European Conservation Concern; • Historical population decline during 1800-1995, but now recovering with population size having more than doubled over the last 25 years; • Moderate (25-49 %) decline in UK breeding population over the last 25 years; • Moderate (25-49 %) contraction of UK breeding range over the last 25 years; • Moderate (25-49 %) decline in UK non-breeding population over the last 25 years; • Five year mean of between only 1 and 300 breeding pairs in the UK; • Five year mean of less than 900 non-breeding individuals; • >50 % of the UK breeding population in 10 or fewer sites; • >50 % of the UK non-breeding population in 10 or fewer sites; • >20 % of the European breeding population in the UK, and • >20 % of the NW European (wildfowl), East Atlantic Flyway (waders) or European (others) non-breeding populations in the UK.	
Natural Environment & Rural Communities (NERC) Act 2006	**England Biodiversity List Species**

The England Biodiversity List is developed under Section 41 of the NERC Act to guide authorities in conserving biodiversity. Forty nine bird species and sub-species are included on the List that is largely based on the pre-existing UK Biodiversity Action Plan list.	
Local Biodiversity Action Plan	**LBAP Species**
The Barnsley Biodiversity Action Plan (BBAP) is intended to provide a sound basis for local action to conserve, protect and enhance the biodiversity of the borough.	

Table 6.1 - Relevant Regulatory and Conservation Designations

Geographical Context

6.2.4 When considered within a geographical context the conservation status of a species gives one measure of ecological value. The significance or importance of any specific impact must therefore be considered within a geographical frame of reference. Impacts that appear insignificant at one level may be considered significant more locally. For the purposes of this ornithological assessment, the geographical levels considered are as follows:

Ecological Value Frame of Reference	Definition
International	Species included in the international designation citation text for Special Protection Areas (SPAs) or Special Areas of Conservation (SACs) under the EU legislation. International EU Birds Directive Annex 1 species or regularly occurring migratory species listed under Annex II/B of the Birds Directive connected to an SPA designated for this species.
UK/National	Species listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as Amended). Species included in national notification text for Sites of Special Scientific Interest (SSSIs). National BoCC Red List species.
Regional/County	A regularly occurring, regionally important population of a nationally important species listed as a UK BAP priority species. Other species that contribute to the integrity of an SPA or SSSI. A local population of more than 1 % of the national population of a species.
Local	A regularly occurring, locally important population of a nationally important species listed as an England Biodiversity List/UK BAP priority species. Local BAP priority species. National BoCC Amber List species. Any other species of conservation interest.
Immediate zone of influence/effect only	All other species that are widespread and common and which are present in locally, regionally or nationally important numbers which are considered to be of low ecological concern (e.g. UK Birds of Conservation Concern Green List species).

Table 6.2 - Ecological Value Frame of Reference Summary

Impact Description

6.2.5 Impacts can be negative, if they act at detriment to the species or habitat, or positive if they act to the benefit of the species or systems.

6.2.6 The key impacts on the avifauna of an area resulting from the scheme may arise as direct and indirect effects, examples of which are given below:

Direct Effects

6.2.7 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;

6.2.8 Habitat fragmentation (severance of habitats and/or wildlife corridors linking them). This can lead to reduced genetic diversity within a population and increase the likelihood of that population going extinct, and

6.2.9 Bird collision with the turbine blades during operation.

Indirect Effects:

6.2.10 Including disturbance (visual, 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.

6.2.11 Impacts vary in their duration, potentially being either temporary or permanent (irreversible). Temporary effects may occur during the construction phase of a scheme and include impacts such as short-term increases in noise and/or dust deposition resulting from construction traffic. It should be appreciated that temporary loss of habitats of high value for bird species may have as great or greater impact as permanent land-take of less sensitive habitats.

Impact Significance or Importance

6.2.12 A significant impact is defined as "an impact (negative 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". The ecological value of the affected receptor is then used to determine the implications, in terms of legislation, policy and/or development control.

6.2.13 Significant impacts on avian 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 important 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. In this assessment regional significance is taken as county level with local significance related to areas within c. 5 km of the site.

Confidence in Predictions

6.2.14 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 6.3**. Unless otherwise stated confidence levels are high.

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.

Table 6.3 - Confidence Levels

Existing Data and Consultation

6.2.15 A consultation exercise was undertaken by Arcus as part of the assessment for the previously proposed five wind turbine array on the same site in 2006 – 2008. This included Barnsley MBC, Yorkshire Wildlife Trust, Sheffield City Council, North & East Yorkshire Ecological Data Centre, Sorby Natural History Society, Sheffield Bird Study Group and Barnsley Bird Study Group. No bird records were provided for the site area. Discussions between Arcus and Natural England (NE) (Brian Davis) and RSPB (Tim Melling) in 2008 did not raise any issues with the scope of the surveys or identify any particular species or habitats of concern.

6.2.16 The Barnsley Biodiversity Action Plan was consulted. The latest update was published in 2009 provided summary action plans for nine bird species of concern:

- Grey Partridge
- Bittern
- Kestrel
- Little Ringed plover
- Lapwing
- Barn Owl
- Skylark
- Tree Sparrow
- Twite

Breeding Bird Surveys 2010

6.2.17 Keystone Ecology undertook a breeding bird survey on the 31st July 2012 following an abridged version of the CBC originally set up by the BTO (Marchant, 1983) and described by Gilbert et al., (1998). **Table 6.4** provides information on the survey dates and weather conditions

Date	Start time	End time	Start temp °c	End temp °c	Cloud cover %	Wind speed*	Precipitation
31/07/12	05:00	08:30	12	12	100	1 - 2	Light rain

Table 6.4 - Breeding Bird Survey Information (Keystone Ecology Ltd)

6.2.18 The survey area was walked at a steady pace by an experienced ornithologist. All birds identified by sight or call, along with their behaviour at the time, were mapped using standard British Trust for Ornithology (BTO) species and behaviour codes. The survey area comprised all land within 500 m. of the turbine location that fell within the ownership of the applicant with scans of an additional 50 m. buffer. The surveyor walked within at least 50 m. of all parts of the site and closer where vegetation was dense.

Breeding Status	Activity in the field
Possible	• Birds active in suitable nesting habitat and/or • A male bird singing in the breeding season
Probable	• A pair of birds in suitable nesting habitat, • Defensive or agitated behaviour indicating an established territory • Courtship and display • Adults visiting a probable nest site or • Actual nest building.
Confirmed	• Adult bird performing a distraction display • Carrying faecal sacs or food for young • Entering or leaving a nest-site in circumstances indicating an occupied nest • Presence of a nest containing eggs or young • Presence of a used nest or eggshells found from this season. • Recently fledged young*
** Some species can move significant distances from the nest shortly after fledging therefore the presence of juvenile birds from highly dispersive species with no records of previous signs of breeding within the study area would be treated as a likely breeding record only.*	

Table 6.5 - Breeding Activity Assessment (Keystone Ecology Ltd)

Winter (non-breeding) Bird Survey 2012

6.2.19 Keystone Ecology undertook two field count surveys on the 5th and 12th November 2012. The survey area was walked at a steady pace by an experienced ornithologist. All birds identified by sight or call, along with their behaviour at the time, were mapped using standard British Trust for Ornithology (BTO) species and behaviour codes. The survey area comprised all land within 500 m of the turbine location that fell within the ownership of the applicant with scans of an additional 50 m. buffer beyond. **Table 6.6** provides information on the survey dates and weather conditions.

Date	Start time	End time	Start temp °C	End temp °C	Cloud cover %	Wind speed*	Precipitation
05/11/12	11:50	13:50	5	5	10	2	Dry
12/11/12	10:20	12:50	6	7	100	3	Light rain

Table 6.6 - Non-breeding Field Count survey information (Keystone Ecology Ltd)

Vantage Point Surveys

6.2.20 Vantage Point (VP) surveys of the proposed wind turbine location were undertaken by Keystone Ecology. These surveys are a means of quantifying flight activity of birds of collision vulnerability/conservation importance within the wind turbine

envelope. In addition, and in combination with the winter and breeding bird surveys, the VP surveys contribute to the assessment of impact from habitat loss and displacement.

6.2.21 The methodology for the VP survey was based on that proposed by Scottish Natural Heritage (SNH) (2005 and 2010b) and the method published by NE (Natural England, 2010).

6.2.22 The scope of the survey was considered by Keystone to be proportionate to the scale and sensitivity of the scheme; the latter comprising a proposal for a single turbine in a non-sensitive agricultural setting. Indeed, the environmental assessment for the previous five turbine array had discounted the need for vantage point surveys as discussions with RSPB, coupled with the results of the desk study, had not identified any collision-vulnerable bird species locally or highlighted the site as a likely avian migration or commuting route (Arcus, 2008).

6.2.23 Six hours of survey were undertaken in late summer and a further six hours in early winter 2012. Vantage point survey dates and weather details are provided in **Table 6.7**.

Date	Start time	End time	Start temp °C	End temp °C	Cloud cover %	Wind speed (Beaufort Scale)	Precipitation
31/07/12	05:00	08:30	12	12	100	1 - 2	Light rain
01/08/12	18:00	21:00	16	16	60 - 100	3	Heavy rain at times
05/11/12	13:55	16:55	5	4	10	2	Dry
12/11/12	07:10	10:10	6	7	100	3	Light rain-occasionally heavy

Table 6.7 - Vantage Point Survey Information (Keystone Ecology Ltd)

6.2.24 The vantage point was located approximately 350 m north west of the turbine location at 424691, 400642, providing a survey viewshed that allowed mapping of bird activity within a 500 m buffer zone.

6.2.25 Vantage Point observations concentrated on focal key species known to be more prone to collision risks, principally, raptors, waders and wildfowl. In particular, the information was recorded as follows:

- Species;
- Number of birds;
- Location and direction of flight (recorded on a details site plan);
- Duration of flight (divided into four height bands above ground level (0 – 10; 10 – 35; 35 – 125; >125 m).

- Any relevant behavioural observations.

6.2.26 Other non-target (secondary) species were recorded during fifteen-minute periods when key species were not being tracked. Other groups included here included gulls (except Herring Gull) and all other non-target species included in Annex 1, Schedule1, the Red/Amber List (Eaton et al. 2009) and the UK and Local BAPs.

6.2.27 Keystone recorded target and secondary species within the entire viewshed to allow for any subsequent modification of the proposed turbine location and to provide supplementary information on bird usage of the wider landscape.

6.3 Planning Policy and Legislation

6.3.1 Birds are protected under UK and European law. The protection legislation most relevant to the UK planning process is outlined below. Further details are provided in the Ecology and Nature Conservation Chapter (Chapter 7).

European Legislation

6.3.2 Directive 79/409 on the Conservation of Wild Birds (The Birds Directive) 1979 Codified through Directive 2009/147/EC on the Conservation of Wild Birds 2009

6.3.3 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 SPAs for the protection of internationally important bird habitats. The Birds Directive is implemented in the UK by the Wildlife and Countryside Act 1981 (as Amended).

Ramsar Convention on Wetlands

6.3.4 The Convention on Wetlands, signed in Ramsar, Iran, in 1971, is an intergovernmental treaty that provides the framework for national action and international cooperation for the conservation and wise use of wetlands and their resources. There are presently 160 Contracting Parties to the Convention, with 1967 wetland sites, totalling 191 million ha, designated for inclusion in the Ramsar List of Wetlands of International Importance.

UK Legislation

Wildlife and Countryside Act 1981 (as Amended)

6.3.5 The habitat and species protection provisions of both the EC Directives on Birds and Habitats receive domestic implementation through the Wildlife and Countryside Act 1981 and its amendments. The 1981 Act allows for the designation of National Nature Reserves (NNRs) and SSSIs to protect areas containing habitats and species of national or international importance. All SPAs and SACs identified under the EC Directives are also SSSIs.

6.3.6 Part 1 of the Wildlife and Countryside Act 1981 (as Amended) protects all species of bird, their nests, eggs and young against death, injury and taking. In addition, a number of birds receive further protection through their inclusion on Schedule 1 of the Act which makes it an offence, with certain exceptions to:

- intentionally kill, injure, or take any bird;

- take, damage or destroy the nest of any wild bird while that nest is in use or being built; or
- take, damage or destroy the nest of a wild bird included in Schedule ZA1
- intentionally take or destroy eggs, and
- intentionally or recklessly disturb any species whilst building a nest or whilst in, or near a nest containing eggs or young.

Natural Environment and Rural Communities Act 2006

6.3.7 The Natural Environment and Rural Communities (NERC) Act came into force on 1st Oct 2006. Section 41 (S41) of the Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The list has been drawn up in consultation with Natural England, as required by the Act.

6.3.8 The S41 list is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the Natural Environment and Rural Communities Act 2006, to have regard to the conservation of biodiversity in England, when carrying out their normal functions. This list, known as the England Biodiversity List (EBL), includes 49 bird species. Regional Planning Bodies and Local Planning Authorities will use the list to identify the species that should be afforded priority when applying the requirements of Planning Policy Statement 9 (PPS9) to maintain, restore and enhance species and habitats.

6.3.9 Local Planning Authorities will use the list to identify the species and habitats that require specific consideration in dealing with planning and development control, recognising that under PPS the aim of planning decisions should be to avoid harm to all biodiversity.

6.3.10 In 2007, the UK Biodiversity Partnership published a new list of priority UK species and habitats. The UK BAP list of priority species and habitats is an important reference source and will be the focus for conservation action across the UK over the next few years. It has been used to draw up the species and habitats of principal importance in England under S41 of the NERC Act.

6.3.11 The assessment of scheme impacts on birds described below takes into account this legislation.

6.4 Baseline Conditions

Site Setting

6.4.1 Lying approximately 1.3 km north of Midhopestones and 2 km north-west of Stocksbridge, the Spring Brook site comprises predominantly improved grazing pasture. Stonewalls define the vast majority of field boundaries. The proposed wind turbine location is to the north of Sheephouse Wood and the high voltage power lines and pylons that run west to east across the north to south land fall. Sheephouse Farm lies immediately to the west of the proposed wind turbine location. A strip of broad-leaved woodland runs north-south along Cote Field Beck, which runs south of the application site. The southern section of the site contains a small area of acidic grassland.

6.4.2 The wider area comprises a mosaic of arable and pasture farmland with occasional areas of broad-leaved woodland plantation.

6.4.3 The site does not have any statutory or local nature conservation designations. The site is within 5 km of the boundary of the South Pennine Moors Special Protection Area (SPA). However the site does not share any significant habitats with the SPA. Of the bird species for which the SPA is designated only Golden Plover was found and then only on fields adjacent to the Spring Brook site; a party of 12 loafing amongst a larger flock of Lapwing (Keystone Ecology Ltd, 2012).

Survey Results

6.4.4 This section discusses those bird species identified during surveys undertaken by Keystone Ecology Ltd and Arcus, focussing on those considered as most important in terms of their level of conservation concern and aims to reflect their status within the context of the study area.

6.4.5 Thirty species of bird were recorded over one breeding season and 23 in the non-breeding season (Keystone Ecology Ltd, 2012). A full list is presented in **Appendix 6.1**. English vernacular names of birds follow the British Ornithologists Union.

6.4.6 **Table 6.8** presents a sub-set of those species registered during the surveys that have a combination of conservation designations under European and UK law and/or are of high or medium conservation concern within the UK and/or are EBL/UK or Local Biodiversity Action Plan species (BAP species).

Common Name	Scientific Name	Site Seasonal Presence*		BoCC Status	W&CA 1981 Sch 1	NERC EBL/ UK Biodiversity Action Plan Species	EC Directive 2009/147/EC Annex 1	Importance of study area to Key Species
Lapwing	*Vanellus vanellus*	W	count=600 – 700 on the boundary of the 500 m buffer zone	R		**EBL/LBAP**		Local Level
Sky Lark	*Alauda arvensis*	Br	Possible – observed in suitable habitat	R		**EBL/LBAP**		Site level
Song Thrush	*Turdus philomelos*	Br	Probable – pair in suitable habitat	R		**EBL**		Site level
Linnet	*Carduelis cannabina*	Br	Probable – pair in suitable habitat	R		**EBL**		Site level
Yellowhammer	*Emberiza citrinella*	Br	Possible – observed in suitable habitat	R		**EBL**		Site level
Mallard	*Anas platyrhynchos*	W	count=10 flushed from pond on application site	A				Site level
Golden Plover	*Pluvialis apricaria*	W	count=12 on the boundary of the 500 m buffer zone	A			A1	Site level
Black-headed Gull	*Chroicocephalus ridibundus*	W	count=8 in ploughed field west of Mortimer Rd	A				Site level
Green Woodpecker	*Picus viridis*	Br		A				Site level
Swallow	*Hirundo rustica*	Br		A				Site level
Dunnock	*Prunella modularis*	Br	Possible – observed in suitable habitat	A		**EBL**		Site level

Whitethroat	*Sylvia communis*	Br		A				Site level
Willow Warbler	*Phylloscopus trochilus*	Br		A				Site level
Bullfinch	*Pyrrhula pyrrhula*	Br	Possible – observed in suitable habitat	A		**EBL**		Site level

Table 6.8 - Key Species of Conservation Concern Registered during the Breeding and Wintering Bird Surveys (Keystone Ecology Ltd, 2012

Breeding Birds

6.4.7 Breeding species with any significant conservation designation are shown **in Table 6.8** denoted by Br. The breeding status for each is highlighted. In addition to the birds of medium (Amber) conservation concern (Eaton, 2009), or above, more widespread and common species were recorded and these are included in the full species list in **Appendix 6.1**. Drawing 121601/2/wor1 provided by Keystone Ecology Ltd is shown in **Figure 6.1** and presents the breeding bird survey results.

6.4.8 No Annex 1, Schedule 1 or Local BAP bird species were identified as breeding. 'Red' listed birds of conservation concern were limited to widespread species (Skylark, Song Thrush, Linnet and Yellowhammer) for which the local area has considerable similar habitat available. Amber listed species show a similar pattern.

6.4.9 Based on the findings described, the site is considered to be of low conservation value for its bird assemblage. The complement of breeding species on site is poor and the density of birds is low. This reflects the poor quality of habitats available for supporting a diverse range of bird species in the application area and the lack of bird breeding sites.

Wintering Birds

6.4.10 The wintering species with any significant conservation designation are shown in **Table 6.8** denoted by W. The on-site status for each is highlighted. In addition to the birds of Medium/Amber conservation concern, or above, more widespread and common species were recorded and these are included in the full species list in **Appendix 6.1**. Drawing 121601/2/wor2 provided by Keystone Ecology Ltd is shown in **Figure 6.2** and presents the wintering bird survey results.

6.4.11 In general the poor wintering bird populations reflect the exposed nature of the site. Of most significance is the presence of a large flock (600 - 700) of Lapwing (Vanellus vanellus) and an associated small number of Golden Plover (Apicaria pluvialis) (12 no.) in the area, but outwith the application area; these being UK Red and Amber listed species of conservation concern respectively. Lapwing is also included within the Local BAP. At the time of the Keystone Ecology Ltd survey the flock was located on land north of Cranberry Road, over the watershed and outside the buffer zone. However, their potential use of the application site cannot be completely discounted.

6.4.12 A small number of gulls were occasionally recorded during the vantage point surveys undertaken by Keystone; specifically Black Headed Gull (Chroicocephalus ridibundus), Herring Gull (Larus argentatus), Lesser Black-backed Gull (Larus fuscus) and Great Black-backed Gull (Larus marinus). The local reservoirs, Underbank, Midhopestones and principally Langsett, can hold large gull roosts in the winter.

6.4.13 The importance of the site to the conservation status of each species based on the Keystone Ecology surveys is shown in **Table 6.8**. The site is considered to be of importance at the level of the site only for all species except Lapwing where the application site may have local importance. This compounds the findings of the more extensive surveys undertaken in 2006/07 by Arcus for the five turbine array

that concluded that in terms of wintering and breeding birds the site was of "parish value" (Arcus, 2008).

Vantage Point Survey results

6.4.14 During six hours of summer vantage point surveys two target species were observed within the risk zone, Lapwing and Mallard (Anas platyrhynchos) (Keystone Ecology Ltd, 2012). Details of these observations are presented in **Table 6.9**.

Species	Conservation Status	Total flights	Max flock size	Total flight time at risk height (secs)
Lapwing	UKBAP BoCC Red listed	7	18	2490
Mallard	BoCC Amber listed	1	1	0

Table 6.9 - VP Survey Results for Target Species in the Breeding Season (Six hours observation) (Keystone Ecology Ltd, 2012)

6.4.15 Count data for secondary bird species observed within the viewshed are presented in **Appendix 6.1**. Six such species were recorded including gulls and typical upland farmland passerines. General numbers were low with the exception of Swallow (Hirundo rusticola) that was seen in flocks of 28, 32, 36, 45, 50 and 65.

6.4.16 During six hours of vantage point survey in the winter, four target species were recorded. Details of these observations are presented in **Table 6.8** (Keystone Ecology Ltd, 2012). Herring Gull (Larus argentatus) was present in the risk volume for around four minutes during three recorded flights; the birds probably moving towards the roost at Langsett reservoir.

Species	Conservation Status	Total flights	Max flock size	Total flight time at risk height (secs)
Herring Gull	EBL/UKBAP BoCC Red listed	3	2	250
Kestrel	BoCC Amber listed	1	1	75
Lapwing	EBL/UKBAP BoCC Red listed	5	5	75
Mallard	BoCC Amber listed	6	4	90

Table 6.10 - VP Survey Results for Target Species in the Winter Season (Six hours observation) (Keystone Ecology Ltd, 2012)

6.5 Impact Assessment and Conclusions

Impacts during Construction

Direct Impacts - Landtake

6.5.1 The scheme as proposed requires very limited landtake of terrestrial habitats although this will be slightly larger during the construction phase. All works will be restricted to arable or improved grassland fields. The proposed wind turbine footprint represents a very small fraction of the overall site area available for foraging and wintering birds within the study area. The access track follows field edges and does not necessitate crossing any field boundaries that provide nesting habitat for birds.

6.5.2 Displacement of species such as Skylark through loss of suitable habitat will be inconsequential to local populations as similar suitable habitat is widespread in the locality.

6.5.3 Landtake during construction will not affect the coherence of suitable bird habitats available and is not considered to cause any fragmentation of habitats. As such, landtake of bird habitat is not considered to be of significance to birds outwith the immediate zone of effect.

Indirect Impacts – Construction Noise and Dust

6.5.4 Construction noise and dust may cause temporary displacement of birds from the immediate area of the works. Noise and dust is an existing aspect of modern farming practice. Any disturbance will be short-term in duration and limited in extent. Therefore indirect impacts from construction noise and dust are not considered to be of significance to birds outwith the immediate zone of effects.

Indirect Impacts – Traffic

6.5.5 Traffic impacts during construction will have a temporary negative impact on the birds in the local construction area. Birds are highly mobile and collision with slow moving construction vehicles is unlikely. They are likely to relocate back to these areas following completion of works. As such temporary traffic impacts during the construction phase on bird species is considered to be significant to nature conservation within the immediate zone of effects only.

Indirect Impacts – Pollution of watercourses and ponds

6.5.6 As highlighted in the Ecology and Nature Conservation assessment (Chapter 7) and Hydrology assessment (Chapter 8) there are no anticipated impacts on water bodies in the area.

Impacts during Operation

Direct Impacts - Collision Risk

6.5.7 As a single turbine scheme in a non-sensitive location for birds, long-term vantage point survey programmes were not considered appropriate for the Spring Brook proposal (Keystone Ecology Ltd, 2012). Most concern with respect to bird collision risk is generally directed at raptor, wader and wildfowl species; none of which form a major part of the recorded site avifauna. Collision impacts of turbines on

passerine species are not in general considered to be of significance to nature conservation.

6.5.8 Keystone Ecology Ltd undertook reconnaissance surveys at times of peak anticipated bird activity. The key bird species evident, other than as fly-overs were Lapwing and Golden Plover. Both these species occur in the UK in greatest numbers in the winter and this is the case at Spring Brook. However, the Keystone field surveys highlighted that the Lapwing flock frequented land outside the turbine 500 m buffer zone and vantage point surveys only recorded five flights in six hours despite a flock of 500+ birds being in the area. This flock, that included a small number of Golden Plover, was not seen to intersect with the risk volume. During the summer vantage point surveys, seven flights were registered; recording 2490 seconds in the risk volume over the six hours of survey. This flock of 18 birds recorded in August will have represented a small post-breeding aggregation of local breeders and young birds although Lapwing does not appear to breed within a 500 m buffer zone of the turbine.

6.5.9 Flight data for other vulnerable bird groups including raptors, wildfowl and additionally gulls do not indicate that the site has any significance as a feeding, breeding, commuting or migratory route.

6.5.10 There is little evidence to suggest that the collision risk presented by the single Spring Brook turbine will be significant outwith the area of its immediate effects.

Indirect Impacts – Traffic

6.5.11 During operation, impacts from turbine related traffic are not anticipated to add significantly to the existing farm management and agricultural traffic already using the site. As such no impacts from operation phase traffic to birds are anticipated to occur.

Impacts during Decommissioning

6.5.12 Following decommissioning the land will be returned to arable/grazing agriculture and the site conditions with respect to birds are anticipated to revert to their current condition.

Indirect Impacts – Decommissioning Noise and Dust

6.5.13 Decommissioning noise and dust will temporarily negatively impact on the birds in the local works area. This will be limited to temporary displacement of birds to other locally available feeding areas and is considered to be significant within the immediate zone of effect only.

Indirect Impacts – Traffic

6.5.14 Traffic impacts during decommissioning will temporarily negatively impact on the birds in the local works area. This impact will be no more than short-term in duration and only be significant to bird species at the immediate zone of effect level. Birds are highly mobile and collision with slow moving construction vehicles is unlikely. They are likely to relocate back to these areas following completion of any works. As such temporary traffic impacts during the decommissioning phase on bird species is considered to be significant within the immediate zone of effect only.

Indirect Impacts – Pollution of Water Courses and Ponds

6.5.15 As highlighted in the Ecology and Nature Conservation assessment (Chapter 7) and Hydrology assessment (Chapter 8) there are no predicted impacts on any water bodies in the area.

Cumulative Impacts

6.5.16 One development may in itself not impact on a species or group of species however in combination with other actions elsewhere may do so. The Spring Brook single turbine will be more than 5 km from the nearest existing array. Cumulative impacts are, as a result, not considered significant.

6.6 Mitigation Requirements

6.6.1 The Wildlife and Countryside Act, 1981 (as Amended) protects all species of bird, their nests, eggs and young against death, injury and taking. Potential conflict should be avoided by undertaking site clearance work, in particular disturbance of grassland including field margins, outside the bird breeding season (early March to late August inclusive) where practicable.

6.6.2 If disturbance to potential bird nesting habitat, particularly during the construction phase that may last several weeks, cannot be reasonably avoided, a nesting bird survey should be undertaken by an appropriately trained and experienced ecologist prior to clearance works to determine that no nests are active.

6.6.3 If nesting birds are found at any time during these surveys or subsequent site clearance then vegetation clearance or management works in that immediate area must cease. The ecologist should then monitor the nest until all fledglings have left the nest.

6.6.4 Wintering Lapwing and Golden Plover favour mown grass or close grazed pasture as well as stubbles, fallow field and open farmlands. Therefore, consideration could be given to crop rotations favouring overwintering, longer, dense vegetation while providing more open crops away from the immediate turbine risk zone. Maintaining walls to limit ground-level views will also discourage flocks from loafing and feeding, as good sight lines for approaching predators are favoured.

6.7 Residual Impacts

6.7.1 No significant negative impacts to birds or their habitats are anticipated to result from the proposed scheme. Mitigation works, as outlined above can have a positive impact on the local habitats and their avifauna.

7 Ecology and Nature Conservation

7.1 Introduction

7.1.1 Ecus Ltd were commissioned by Whirlwind Renewables to undertake an Ecological Impact Assessment (EcIA) of the proposed turbine at Spring Brook ("the site") near Stocksbridge, South Yorkshire (OS Grid Ref SE24904 00359). The proposal is for the installation of a 79 m (to blade tip), 900 kilowatt (kW), monopole turbine and associated infrastructure. Keystone Ecology undertook an ecological appraisal of the site surveys in 2012 and data used from this appraisal has been included within this report and referenced accordingly. Data has also been used in this assessment from ecological survey and assessment at the site undertaken in 2006 - 2007 (Arcus, 2008) to accompany a planning application for a 15 MW five wind turbine scheme at Sheephouse Heights. That scheme was not consented.

7.1.2 The information gathered from ecological survey and data consultation undertaken by Ecus in 2013, together with the findings of the previous field surveys undertaken by Arcus and Keystone Ecology Ltd in 2006/7 and 2012 respectively, have been used to evaluate the ecological importance of the site and to assess potential impacts of the proposed single wind turbine scheme.

7.1.3 The assessment has been carried out in general accord with the Institute of Ecology and Environmental Management 'Guidelines for Ecological Impact Assessment' (IEEM, 2006).

7.2 Methodology

Definition of the Study Area

7.2.1 The survey undertaken by Ecus Ltd included the application area and the adjacent habitats termed the study area as shown in **Figure 7.1**.

Desk Study and Data Consultation

7.2.2 Initial data consultation was undertaken in August 2012 with Sheffield Biological Records Centre (SBRC) by Keystone Ecology Ltd, with additional consultation undertaken by Ecus Ltd with South Yorkshire Badger Group (SYBG) in April 2013.

7.2.3 Sheffield Biological Records Centre have provided, from within 500 m of the study area, records relating to any species protected by inclusion in:

- Schedule 5 or Schedule 8 of The Wildlife and Countryside Act 1981;
- Schedule 2 or Schedule 5 of The Conservation of Habitats and Species Regulations 2010;
- the list of species and habitats of principle importance for biodiversity conservation produced under Section 41 of The Natural Environment and Rural Communities Act 2006.

7.2.4 Sheffield Biological Records Centre also provided all bat species records originating from within 5 km of study area, and all records of noctule (Nyctalus noctula) and Leisler's bat (Nyctalus leisleri) originating from within 10 km of the study area. Citations for all non-statutory designated sites within 500 m of the study area were also supplied by SBRC.

7.2.5 South Yorkshire Badger Group provided all records of badger from within 1 km of the centre of the study area.

7.2.6 The Multi-Agency Geographical Information for the Countryside (MAGIC) website (Defra, 2002) was also consulted for information on statutory designated wildlife sites within 2.5 km of the site by Ecus Ltd in April 2013. All data received by data consultees is provided in **Appendix 7.1**

Extended Phase 1 Habitat Survey

7.2.7 An initial extended Phase 1 habitat survey of the study area (**Figure 7.1**) was undertaken by Keystone Environmental in July 2012. Ecus carried out an additional validation site visit in April 2013 to verify and update the Keystone Ecology Ltd Phase 1 Habitat survey.

7.2.8 Survey methodology followed the standard approach described within the Handbook for Phase 1 habitat survey – A Technique for Environmental Audit (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.

7.2.9 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 7.1**. Target notes are given in **Appendix 7.2**.

Badger Survey

7.2.10 During the ecological walkover survey undertaken in April 2013, signs of badger (Meles meles) activity were searched for within 30 m of the proposed scheme. Survey followed standard methodology detailed in Surveying Badgers (Harris, Cresswell, & Jefferies, 1989). This included survey for badger setts, along with survey of linear features and boundaries for signs of badger activity including dung pits, foraging marks, feeding signs and pathways.

Bat Survey

7.2.11 Data from bat surveys activity surveys undertaken between May and August 2006 by Arcus for the proposed five wind turbine scheme (Sheephouse Heights Wind Farm) (Arcus, 2007) and a single bat activity undertaken by Keystone Ecology Ltd in October 2012 were reviewed.

7.2.12 In addition an appraisal was carried out by Ecus Ltd in April 2013 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 (Hundt, 2012). The surrounding habitats were also recorded and evaluated for their suitability as foraging habitat for bats.

Amphibians

7.2.13 All waterbodies falling within the study area and within 500 m of the proposed footprint of works (as shown on an OS map 1:2500 scale) and not separated by a significant barrier to dispersal were assessed by licensed great crested newt surveyors (access permitting) using a Habitat Suitability Index (HSI) (Oldham, Keeble, Swan, & Jeffcote, 2000) for their potential to support great crested newts

(Triturus cristatus) by Ecus Ltd in April 2013. This approach identifies readily observable habitat features in an objective model, which provides an informed view of the value of a site for great-crested newt. Waterbodies are illustrated on **Figure 7.1**.

7.2.14 The great crested newt is a habitat specialist and its status in a given water-body is influenced by the existence of particular features (e.g. fish, heavy shading) and/or the absence of others (e.g. suitable terrestrial habitat within 500 m). The HSI provides a numerical value (ranging from 0 to 1) that indicates the suitability of a waterbody for great-crested newts. The higher the HSI score, the more suitable (or closer to optimum habitat conditions) the waterbody may be considered for great-crested newts. Habitat Suitability Index scores are given in **Appendix 7.3**.

Ecological Assessment Methodology

7.2.15 The value and sensitivity of ecological features was determined based on the guidance given in 'Guidelines on Ecological Impact Assessment' (IEEM, 2006). Individual ecological receptors (habitats and species that could be affected by the scheme) 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.

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

Valuation of Habitats

7.2.17 Some sites are automatically assigned a nature conservation value through designation and the reason for designation is taken into account in EcIA. Designated sites are considered at the following levels:

- International – Special Areas of Conservation (SAC), Special Protected Areas (SPA) and Ramsar Sites. World Heritage Sites also are 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) in England, Scotland or Wales and Areas of Special Scientific Interest (ASSI) in Northern Ireland.
- County or District – sites designated by Local Authorities.

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

- EC Habitats Directive 1992;
- Guidelines for the section of biological SSSI, 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).

7.2.19 In determining values of habitats consideration has also been given to habitat inventories published by Natural England in conjunction with critical appraisal of the size, status and quality of the habitat affected.

Valuation of Species

7.2.20 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:

- EC Habitats Directive 1992;
- The Conservation of Habitats and Species Regulations 2010;
- The Wildlife and Countryside Act 1981 (as amended);
- Natural Environment and Rural Communities Act 2006 (NERC Act); and
- Countryside and Rights of Way Act 2000 (CRoW Act).

7.2.21 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.

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

Sources and Magnitude of Impact

7.2.23 The key sources of impact to the nature conservation interests of the area resulting from the scheme may arise as direct and indirect effects.

7.2.24 Direct effects include habitat loss (landtake), where the severity of impact is directly related to the amount of habitat lost and the conservation value of that habitat.

7.2.25 Habitat fragmentation (severance of habitats and/or wildlife corridors linking them) is another potential direct effect of development activity. Fragmentation can affect the ability of species to move within the landscape, for example between habitats used for foraging and for shelter. Fragmentation can also lead to reduced genetic diversity and increase the likelihood of species being lost in the longer term.

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

7.2.27 Impacts may also be either temporary or permanent in nature. Temporary effects occur during the construction phase of a scheme 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 landtake of less sensitive habitats.

7.2.28 Landtake associated with the proposed scheme is considered to be permanent and some indirect effects may also be permanent.

7.2.29 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 ecological structure and function that enables the feature to be maintained in its present condition" (IEEM, 2006). 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.

7.2.30 In assessing the significance of impacts each impact 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. For the purpose of this assessment the significance of all potential impacts to habitats of local or higher conservation value has been undertaken.

7.2.31 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" (IEEM, 2006).*

7.2.32 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.

7.2.33 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 7.1**. Unless otherwise stated confidence levels are high.

Confidence level	Criteria
High	The predicted impact is either certain e.g. landtake 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.

Table 7.1 - Confidence levels

Limitations

7.2.40 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.

7.3 Planning Policy and Legislation

7.3.1 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)

7.3.2 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)

7.3.3 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 Conservation of Habitats and Species Regulations 2010.

Ramsar Convention on Wetlands

7.3.4 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)

7.3.5 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.

7.3.6 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.

7.3.7 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.

7.3.8 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

7.3.9 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 Conservation Regulations 2010 consolidate 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.

7.3.10 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.

7.3.11 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.

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

7.3.13 The NERC Act 2006 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 as the Section 41 and Section 42 lists respectively.

7.3.14 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

7.3.15 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.

Hedgerow Regulations 1997

7.3.16 Under the Hedgerow Regulations 1997, provision is made for the notification of "important" hedgerows. To qualify for notification, hedgerows must fulfil a range of criteria relating to their historical, landscape or wildlife character. In accordance with the Regulations, the intention to remove any hedgerow should be notified to the LPA via a hedgerow removal notice. The planning authority may issue a Hedgerow Retention Notice to prevent the loss of an "important" hedgerow. Where permission is granted to remove an "important" hedgerow, the LPA may impose conditions to mitigate the loss.

Central Government Policy, Strategic Plans and Development Control

National Planning Policy Framework

7.3.17 The National Planning Policy Framework (NPPF) (Department for Communities and Local Government, 2012) sets out the Government's planning policies for England and how these are expected to be applied and was brought into force on the 27th March 2012 (Department for Communities and Local Government, 2012). Section 11 of the NPPF deals with Conserving and enhancing the natural environment through 15 paragraphs and the most relevant to the proposed development are given below.

7.3.18 Paragraph 9 states that *"Pursuing sustainable development involves seeking positive improvements in the quality of the built, natural and historic environment, as well as in people's quality of life, including (but not limited to)… moving from a net loss of bio-diversity to achieving net gains for nature…"*

7.3.19 Paragraph 109 states that *"The planning system should contribute to and enhance the natural and local environment by: protecting and enhancing valued landscapes, geological conservation interests and soils; recognising the wider benefits of ecosystem services; minimising impacts on biodiversity and providing net gains in biodiversity where possible, contributing to the Government's commitment to halt*

the overall decline in biodiversity, including by establishing coherent ecological networks that are more resilient to current and future pressures;…"

7.3.20 Paragraph 113 states that *"Local planning authorities should set criteria based policies against which proposals for any development on or affecting protected wildlife or geodiversity sites or landscape areas will be judged. Distinctions should be made between the hierarchy of international, national and locally designated sites, so that protection is commensurate with their status and gives appropriate weight to their importance and the contribution that they make to wider ecological networks".*

7.3.21 Paragraph 114 states that LPAs should *"set out a strategic approach in their Local Plans, planning positively for the creation, protection, enhancement and management of networks of biodiversity and green infrastructure".*

7.3.22 Paragraph 116 states "Planning permission should be refused for major developments in these designated areas except in exceptional circumstances and where it can be demonstrated they are in the public interest. Consideration of such applications should include an assessment of:

the need for the development, including in terms of any national considerations, and the impact of permitting it, or refusing it, upon the local economy;

the cost of, and scope for, developing elsewhere outside the designated area, or meeting the need for it in some other way; and

any detrimental effect on the environment, the landscape and recreational opportunities, and the extent to which that could be moderated".

7.3.23 Paragraph 118 *"When determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principles:*

- *if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;*
- *proposed development on land within or outside a Site of Special Scientific Interest likely to have an adverse effect on a Site of Special Scientific Interest (either individually or in combination with other developments) should not normally be permitted. Where an adverse effect on the site's notified special interest features is likely, an exception should only be made where the benefits of the development, at this site, clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of Sites of Special Scientific Interest;*
- *development proposals where the primary objective is to conserve or enhance biodiversity should be permitted;*
- *opportunities to incorporate biodiversity in and around developments should be encouraged;*
- *planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland*

and the loss of aged or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss; and

- *the following wildlife sites should be given the same protection as European sites:*
    - *potential Special Protection Areas and possible Special Areas of Conservation;*
    - *listed or proposed Ramsar sites; and*
    - *sites identified, or required, as compensatory measures for adverse effects on European sites, potential Special Protection Areas, possible Special Areas of Conservation, and listed or proposed Ramsar sites."*

7.3.24 Paragraph 119 states that *"The presumption in favour of sustainable development (paragraph 14) does not apply where development requiring appropriate assessment under the Birds or Habitats Directives is being considered, planned or determined".*

UK Biodiversity Strategy

7.3.25 At the tenth meeting of the Conference of the Parties to the Convention on Biological Diversity held in Nagoya, Japan (Secretariat of the Convention on Biological Diversity (SCBD), 2013) the 193 parties included in the Convention on Biological Diversity (CBD) agreed The Strategic Plan for Biodiversity 2011-2020 (Secretariat of the Convention on Biological Diversity (SCBD), 2013).

7.3.26 This strategy is transcribed, through European policy (European Commission, 2013), into UK policy. In addition to the NPPF, the main UK policy document on biodiversity conservation is the UK Post-2010 Biodiversity Framework (Four Countries' Biodiversity Group, 2012), an element of which is the strategy for England (Defra, 2011).

7.3.27 Biodiversity 2020: A strategy for England's wildlife and ecosystem services describes an ecosystem services approach to nature conservation, and encourages the establishment of Local Nature Partnerships (LNPs) and Nature Improvement Areas (NIAs).

7.3.28 There are currently 48 recognised LNPs who's function is to promote an ecosystem approach to nature conservation at a local level. Crucially, these LNPs may cross administrative boundaries and join up on cross-boundary issues.

7.3.29 There are currently 12 NAIs, which are areas identified as having the potential for landscape scale action to restore ecological connectivity and ecosystem function. NAIs may include sites subject to statutory and non-statutory designation for nature conservation, and their enhancement is facilitated through national and local planning policy.

Habitat and Species Policy

7.3.30 The UK Post-2010 Biodiversity Framework succeeds the UK Biodiversity Action Plan (JNCC, 1994), which was administered by the UK Biodiversity Partnership. Although the UK Biodiversity Partnership no longer operate the lists of priority species and priority habitats that they maintained have been used in creating the List of Habitats and Species of Principal Importance in England, which is a statutory

requirement under Section 41 of The Natural Environment and Rural Communities (NERC) Act 2006. Section 40 of the same Act makes it a requirement for all public bodies, including Local Planning Authorities, to have regard to the conservation of biodiversity when carrying out their normal functions. The Section 41 list is intended as a guide to decision-makers in England.

7.3.31 Where Local Biodiversity Action Plans (LBAPs) have been produced by Local Authorities and are maintained, these remain in force.

Local Planning Policy

7.3.32 The Regional Strategy for Yorkshire and Humber, in respect of all policies that formerly applied within the Barnsley Local Authority District, was revoked on 22nd February 2013. All planning policies relevant to this application are contained within the Core Strategy of the Barnsley Local Development Framework (LDF), or are individual saved policies from the now largely replaced Barnsley Unitary Development Plan (UDP).

7.3.33 The Core Strategy policy, Policy CSP 36 Biodiversity and Geodiversity, is of potential relevance to this application. The policy wording is provided below.

> *"Development will be expected to conserve and enhance the biodiversity and geological features of the borough by:*
>
> *protecting and improving habitats, species, sites of ecological value and sites of geological value with particular regard to designated wildlife and geological sites of international, national and local significance, ancient woodland and species and habitats of principal importance identified in Section 74 of the Countryside and Rights of Way Act 2000 and in the Barnsley Biodiversity Action Plan*
>
> *maximising biodiversity and geodiversity opportunities in and around new developments*
>
> *conserving and enhancing the form, local character and distinctiveness of the river corridors of the Dearne and Dove as natural floodplains and important strategic wildlife corridors*
>
> *Development which may harm a biodiversity or geological feature will not be permitted unless effective mitigation and/or compensatory measures can be ensured."*

7.3.34 The UDP consists of several volumes. Volume 1 contains several saved policies that apply throughout the Barnsley Local Authority District. Of these policies only Policy GS18 is relevant to nature conservation. The policy wording is provided below.

> *"Any development which may adversely affect, directly or indirectly, a local nature reserve, a natural heritage site, ancient woodland, a regionally important geological site or other nature conservation sites identified on the proposals maps, will not be approved unless it can be clearly demonstrated that there is a case for the development which outweighs the case for safeguarding the conservation interest of the site after available measures to avoid, mitigate or compensate for any adverse affects have been taken into account, in which case the council will seek to*

minimise the adverse impact and/or secure compensatory provision including, where appropriate, through planning conditions or obligations."

7.3.35 Volumes 2 to 13 relate to each of the 12 Community Areas within Barnsley Local Authority District. The study area is within the Western Rural Community Area, which is referred to in Volume 13. Of the policies contained in Volume 13 of the Barnsley UDP, only Policy WR13 is potentially relevant to this application. Policy WR13 states that certain designated sites "will be safeguarded from development which would cause disturbance, pollution and other damage". The policy also lists statutory and non-statutory designated nature conservation sites that are covered by the policy. None of these sites are within the study area.

7.4 Baseline Condition

Study Area Description

7.4.1 The Phase 1 Habitat map of the study area is included as **Figure 7.1**. The study area is approximately 48 ha in area and consists of a series of fields demarked by dry stone walls. The predominant habitat type within the study area is improved grassland, although some fields consist of semi-improved grassland or have been recently ploughed (at the time of survey). The study area also includes ponds, a wet flush, a predominantly dry stream and an area of broadleaved woodland.

7.4.2 The land surrounding the study area is predominantly agricultural grassland, with wooded areas to the west and south, and Underbank Reservoir beyond the woodland to the south.

7.4.3 The application area is illustrated on **Figure 1.2** and comprises a smaller area of grassland approximately 1.4 ha in area, which is set within the wider study area. The habitats present within the application area and wider study area are described below.

Designated Sites

Statutory Designated Sites

7.4.4 South Pennine Moors Special Area of Conservation (SAC) is located approximately 2.3 km to the south west of the application area. The habitats and species for which this site is designated are shown in **Table 7.2**. Special Area of Conservation is an international designation made under the EC Habitats Directive (92/43/EEC) and the South Pennine Moors SAC is considered to be of international importance to nature conservation in respect of its European designated features. The South Pennine Moors SAC is also designated as Phase 1 of the South Pennine Moors Special Protection Area (SPA) which is dealt with in Chapter 6 due to its designation for ornithological interest.

Habitats Directive Annex I Habitat	Status
European dry heaths	SAC Primary Selection Feature
Blanket bogs	SAC Primary Selection Feature
Old sessile oak woods with Ilex and Blechnum in the British Isles	SAC Primary Selection Feature
Northern Atlantic wet heaths with Erica tetralix	SAC Qualifying Feature
Transition mires and quaking bogs	SAC Qualifying Feature
Habitats Directive Annex II Species	Status
None	n/a

Table 7.2 - European designated features of South Pennine Moors SAC

7.4.5 Two Sites of Special Scientific Interest are located within 2 km of the Application area. These comprise Spring Meadows, Alderman's Head & Cow Croft Meadows Site of Special Scientific Interest (SSSI), which is located approximately 1.3 km to the west of the application area and The Dark Peak SSSI, which is located approximately 1.9 km to the south of the application area.

7.4.6 Spring Meadows, Alderman's Head & Cow Croft Meadows SSSI is designated for its species rich unimproved neutral grassland habitats. The Dark Peak SSSI is designated for its upland habitats, including blanket bog and heathland, and for the bird assemblages these support. The Dark Peak SSSI underpins the SAC and SPA designations described above. Spring Meadows, Alderman's Head & Cow Croft Meadows SSSI is considered to be of importance to nature conservation at a national level.

Non-statutory Designated Sites

7.4.7 Two Natural Heritage Sites (NHS) and one Local Nature Site (LNS) are present within 1 km of the Study Area. Natural Heritage Sites are designated by Barnsley Metropolitan Borough Council, whilst LNSs are designated by Sheffield City Council. Both of these designations are non-statutory and the protection they receive is through the appropriate planning policy documents.

7.4.8 Underbank Reservoir Local Nature Site (LNS) is located approximately 500 m to the south of the study area and is designated primarily for its standing water and ancient woodland habitats.

7.4.9 Brock Holes NHS is located approximately 400 m to the north west of the Study Area and comprises the largest block of heathland/acid grassland mosaic in the district. Other habitats present within the NHS include woodland, neutral grassland and mire habitats. Hollin and Spring Woods NHS is located 800m from the Study Area and comprises two areas of ancient semi-natural woodland dominated by birch and oak.

7.4.10 Non-statutory designated sites are typically of importance to nature conservation at a local to county level. Based on the information received from consultees in respect of these sites they are considered most likely to be of importance at up to a district level.

Habitats

Improved Grassland

7.4.11 The predominant habitat within the study area is improved grassland, which comprises approximately 36 ha of the 48 ha study area and the whole of the application area. This vegetation community is dominated by perennial rye-grass (Lolium perenne) with abundant red clover (Trifolium pratense) and frequent white clover (Trifolium repens).

7.4.12 The improved grassland habitat present on site is species poor and vegetation communities of this type are common and widespread both nationally and within the local area. Improved grassland is not a habitat of Principal Importance as included on Section 41 of the NERC Act and the habitats present within the application area and wider study area are not considered to be of importance to nature conservation outwith their zone of immediate influence.

Semi-improved Grassland

7.4.13 Several fields within the study area support semi-improved grassland, which comprises approximately 10 ha of the wider study area, but does not occur within the application area. This habitat is more diverse than the improved grassland and supports abundant perennial rye-grass, Yorkshire fog (Holcus lanatus), cock's-foot (Dactylis glomerata) and locally frequent bent-grasses (Agrostis spp.). Wavy hair-grass (Deschampsia flexuosa) is locally abundant on more acidic soils and tufted hair-grass (Deschampsia cespitosa) is locally abundant in wetter areas.

7.4.14 Typical herbs include abundant to locally frequent common chickweed (Stellaria media), occasional red clover, white clover, daisy (Bellis perennis) and willowherbs (Epilobium spp.), and rare occurrences of dock (Rumex cf. obtusifolius) and dandelion (Taraxacum officinale agg.).

7.4.15 Semi-improved grassland is not included as a habitat of principal importance within Section 41 of the NERC Act. It is common both within the local area and nationally, and the example within the study area is comprised of common species of limited intrinsic nature conservation value. Semi-improved grassland within the study area is considered to be of value to nature conservation within its zone of immediate influence only.

Bare Ground

7.4.16 At the time of survey a single field within the wider study area had been recently ploughed and supported only remnant semi-improved grassland vegetation, as described above, at the margins. Bare ground is not as a habitat of principal importance within Section 41 of the NERC Act and is considered to be of value to nature conservation within the zone of immediate influence only.

Ponds, Flushes and Watercourses

7.4.17 Two ponds and a wet flush were recorded within or immediately adjacent to the study area (**Figure 7.1**).

7.4.18 Pond 1 is a shallow pond adjacent to Sheephouse Farm outwith the wider study area and approximately 130 m from the application area. This shallow pond has a surface area of approximately 200 m2 and is dominated by soft rush (Juncus effuses) and creeping bent-grass (Agrostis stolonifera), with very little open water. Pond 2 is a concrete sided shallow pond located approximately 250 m to the east of the application area dominated by algae and with some creeping bent-grass.

7.4.19 These ponds are both eutrophic and of poor quality in terms of their intrinsic nature conservation value. However ponds are included as a habitat of Principal Importance in Section 41 of the NERC Act and the ponds present within and adjacent to the study area will contribute to the wider habitat diversity. Although these ponds are eutrophic and of poor quality, ponds are included in the NERC Act Section 41 list of habitats of principal importance. As ponds in general are not readily recreated, these ponds should be considered to be of local importance due to their potential value to nature conservation.

7.4.20 The flush habitat is located around an area marked as a well on the Ordnance Survey map within the study area approximately 125 m from the application area. This habitat supported only those plant species of the semi-improved grassland that are able to tolerate continually waterlogged conditions and had limited botanically diversity. This habitat does not qualify as an upland flush, which is a NERC Act Section 41 habitat, and this feature is considered to be of value to nature conservation within the zone of immediate influence only.

7.4.21 The 1:25,000 scale Ordinance Survey map shows watercourses at the eastern side of the study area outwith the application area. On inspection the northern portions of the watercourses, before the confluence, were found to be ploughed out minor drainage ditches. Below this the watercourse consisted of a substantially dried up cobble bottom stream through a steep sided ravine with only small isolated pools of water remaining. Whilst watercourses are included in the rivers category within the NERC Act Section 41 list, due to the lack of water and ploughed out sections of the watercourse this habitat within the study area is considered to be of value to nature conservation within the zone of immediate effect only. Should this feature hold water as a seasonally wet watercourse it has the potential to be of interest to nature conservation up to a local level.

Broad-leaved Woodland and Trees

7.4.22 An area of broad-leaved woodland exists within the ravine through which the dry watercourse flows (**Figure 7.1**). This woodland is dominated by mature ash (Fraxinus excelsior) and sycamore (Acer pseudoplatanus) with occasional oak (Quercus sp.).

7.4.23 This area of woodland is small in extent and comprised tree species that are common both locally and nationally. The area immediately surrounding the study area also supports significantly larger areas of woodland. The woodland within the study area does not fall within the various woodland categories included in the NERC Act Section 41 list. This woodland is considered to be of value to nature conservation within the zone of immediate influence only.

Species

Amphibians

7.4.24 No records of great crested newt within 500 m of the site were supplied by SBRC, although the data consultation did provide records of common toad (Bufo bufo) and common frog (Rana temporaria).

7.4.25 The waterbodies within 250 m of the application area, identified using an OS (1:25,000 scale) Ordnance Survey map, have been assessed for their potential to support great crested newts using the Habitat Suitability Index (HSI) by Ecus Ltd in April 2013. The results of the HSI calculation are included as **Appendix 7.3**. Pond 1 is assessed as being of average suitability for supporting great crested newts, while Pond 2 is assessed as being of poor suitability for supporting great crested newts.

7.4.26 The habitats within the vicinity of the waterbodies are highly managed and of low botanical diversity. The identified ponds lack habitat connectivity as the fields are bounded by stone walls and separated by improved grassland field.

7.4.27 However, given that Pond 1 was considered to provide average suitability for supporting great crested newts, amphibian presence/absence survey was commissioned in May 2013. The results of this survey will be provided as an addendum to the Environmental Statement upon completion. However, initial visits have not recorded great-crested newt using the ponds.

Bats

7.4.28 **Table 7.3** lists the species of bat for which records were supplied by SBRC from within 5 km of the study area.

Bat Species	Records within 5 km
Myotis brandti (Brandt's Bat)	✓
Myotis daubentoni (Daubenton's Bat)	✓
Myotis nattereri (Natterer's Bat)	✓
Myotis spp.	✓
Nyctalus leisleri (Leisler's Bat)	✓
Nyctalus noctula (Noctule)	✓
Nyctalus spp.	✓
Pipistrellus pipistrellus Common pipistrelle)	✓
Pipistrellus pygmaeus (Soprano pipistrelle)	x
Plecotus auritus (Brown long-eared bat)	✓

Table 7.3 - Bat species recorded within the study area

7.4.29 Surveys undertaken by Arcus (Arcus, 2007) detailed within the Environmental Statement which accompanied the planning application for a five turbine wind scheme at Sheephouse Heights in 2007 recorded low numbers of bats present in scattered locations between monthly surveys undertaken between May and August 2006. The bat species recorded were predominately common pipistrelle (Pipistrellus pipistellus) with a single possible Myotis sp., bat recorded in the July survey visit. The majority of recordings were made by bats foraging along the edges of wooded areas, along roads and around farm buildings. No bats were recorded foraging along stone wall field boundaries (Arcus, 2007). Arcus reported that bat populations within the study area were low and no bat roosts were recorded.

7.4.30 Keystone Ecology Ltd undertook a further bat activity survey in early October 2012. Overall Keystone Ecology reported a moderate level of common pipistrelle activity and low levels of other bat species including Nyctalus which was recorded at the northern portion of the study area (Keystone Ecology Ltd, 2012). Survey indicated that the majority of bat activity within the study area was associated with specific habitat features within and adjacent to the study area, as opposed to the open fields (Keystone Ecology Ltd, 2012). These data support that recorded by Arcus in 2006 between May and July 2006 which suggested low levels of predominately pipistrelle bat activity largely associated with woodland edge features and low recorded activity of high risk bat species such as Nyctalus over the surveys.

7.4.31 The application area does not include trees with features likely to be of interest to foraging and commuting bats and no such features are present within 200 m of the proposed turbine location. The lack of any such features and low levels of activity recorded in bat surveys on the site mean that the application area is not considered likely to be of importance to foraging/commuting bats outwith its zone of immediate influence.

Badgers

7.4.32 Consultation with the Sheffield Badger Group by Ecus Ltd in 2013 provided several records of active badger setts within 2.5 km of the study area although no record was from the application area. The data provided by SBG have been omitted from this report due for confidentially reasons but can be provided upon request.

7.4.33 No signs of badger activity or occupation were recorded by Ecus during survey within 30 m of the application area. There are no hedgerows or woodland within 30 m of the proposed scheme, all field boundaries are formed by stone walls.

7.4.34 Whilst it cannot be ruled out that foraging badgers resident within the wider area may use the site from time to time, due to the absence of any badger signs, the application area is not considered to be of importance to foraging badger outwith the immediate zone of influence[17].

Brown Hare

7.4.35 No records of Brown hare (Lepus europaeus) supplied by SBRC however this species was recorded during the walkover survey undertaken by Ecus Ltd. Brown hare is included in the Section 41 list of species of principle importance in England.

7.4.36 The grassland habitats within the study area provided suitable foraging habitat for brown hare and the study area as a whole is a substantial resource for foraging hare. The study area is considered to be of value to brown hare at a local level.

Other protected species

7.4.37 No signs of any other species protected under UK or European nature conservation law were recorded from the application area at the time of survey. The habitats within the application area are not considered to be botanically or structurally diverse enough to support populations of invertebrates of nature conservation concern. The nearest watercourse is approximately 170 m to the east of the application area and due to the low levels of water is not considered likely to support populations of white-clawed crayfish (Austropotamobius pallipes), water vole (Arvicola amphibius) or otter (Lutra lutra). The habitats within the application area are dominated by improved grassland which is sub-optimal for supporting populations of reptiles species and as such reptiles are not considered likely to be a receptor with respect to this scheme.

[17] Environmental Management 'Guidelines for Ecological Impact Assessment' (IEEM, 2006)

Invasive Plant Species

7.4.38 No invasive plant or animal species listed on Schedule 9 of the Wildlife and Countryside Act (1981) (as Amended) were recorded on the day of the survey.

7.5 Impacts during Construction

7.5.1 The proposed development is a single turbine wind scheme with associated infrastructure, including access track, temporary construction compound, crane hard standing and electrical control building.

7.5.2 The construction phase of the scheme will require limited temporary and permanent landtake of land within the development footprint. The effects of the construction phase of the development on individual ecological receptors are assessed below.

Designated Sites

Statutory Designated Sites

7.5.3 The South Pennine Moors SAC is located over 2.3 km of the application area and none of the habitats for which the SAC is designated are present within the footprint of the proposed works or within the wider study area. No other mechanism by which impacts to these habitats could occur has been identified and the proposed scheme is not anticipated to result in impacts to the designated features of the SAC.

7.5.4 Spring Meadows, Alderman's Head & Cow Croft Meadows SSSI is located over 1 km from the scheme and is designated for its species-rich grassland habitats. The grassland habitats to be lost during construction are very species poor and do not qualify under the SSSI criteria. The Dark Peak SSSI is designated for its upland habitats, none of which occur within footprint of works. As such landtake of habitats by the proposed scheme will not adversely affect Spring Meadows, Alderman's Head & Cow Croft Meadows SSSI or The Dark Peak SSSI and no other mechanism by which impacts to these habitats could occur has been identified.

Non-statutory Designated Sites

7.5.5 Of the habitats for which Underbank Reservoir LNS, Brock Holes NHS and Hollin and Spring Woods NHS are designated, only woodland and grasslands occur within the boundary of the study area and only grasslands occur within the application area

7.5.6 The improved grasslands within the footprint of works are highly managed and do not have sufficient botanical diversity to qualify as a LNS or NHS. Landtake of grassland habitats required as a result of the proposed scheme is not considered to result in an overall loss of the local resource of the grasslands for which these sites are designated. The proposals do not require landtake of any woodland habitats. No other mechanism by which impacts to the habitats of the non-statutory designated sites could occur has been identified.

Habitats

Improved Grassland

7.5.7 Landtake associated with the proposed development will comprise entirely landtake of improved grassland habitats. Landtake of approximately 0.4 ha of this habitat will be required during the construction phase of the development.

7.5.8 Improved grassland is botanically poor, commonly occurring and easily recreated. Similar habitats are abundant both nationally and in the local area. Landtake of this habitat on the scale that would occur during the construction phase of the proposed scheme would not result in impacts to nature conservation that are significant outwith the area of their immediate effects.

Semi-improved Grassland

7.5.9 No semi-improved grassland is present within the application footprint and no impacts to this habitat are anticipated to result from the scheme as proposed.

Bare Ground

7.5.10 No loss of bare ground is anticipated to result from the proposed scheme and no impacts to this habitat are anticipated.

Ponds, Flushes and Watercourses

7.5.11 No loss of ponds, flushes or watercourses are required under the proposals, and none of these features are within the application area or its immediate vicinity. No direct impacts to these habitats are anticipated to occur as a result of the proposed development.

7.5.12 Whilst there is some theoretical potential for impacts, the separation from the construction footprint and the nearest wetland habitat is over 150 m and, providing that Best Site Practice (CIRIA, 2001) is followed, the risk of such an event occurring is considered to be very low and no significant impacts to the habitats present are anticipated to result from the construction of the scheme.

Broad-leaved Woodland and Trees

7.5.13 No loss of or disturbance to broad-leaved woodland or trees are anticipated to result from the construction of the scheme as proposed. No impacts to the habitats are anticipated.

Species

Amphibians

7.5.14 Amphibian survey of waterbodies within 250 m of the footprint of works is currently being undertaken to confirm whether the protected amphibian species great-crested newt are present within the vicinity of the proposed scheme.

7.5.15 The findings of surveys will be provided in an addendum to this report once the full suite of surveys is completed. However, initial survey visits using industry standard techniques have not recorded great-crested newts in any of the ponds surveyed.

7.5.16 Whilst it is recognised that surveys to determine the presence of a protected species should not be conditioned it should be noted that disturbance associated

with the proposed development that may have potential to affect great-crested newt if present in these ponds would be limited to minor temporary disturbance associated with the construction of the proposed access track and minor semi-permanent land take.

7.5.17 The areas of potential newt habitat that would be affected by the proposed works would be minimal and the ponds are located approximately 240 m from the footprint of works. This is approaching the outer limit of the core terrestrial range for great-crested newt and given the small scale of disturbance that would occur within this area the potential for significant impacts to the favourable conservation status of newts to result from the proposed construction works is low even if this species should be present.

7.5.18 This initial appraisal will be updated upon completion of great crested newt surveys in an addendum to the ES.

Bats

7.5.19 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 (improved grassland 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 negligible importance to foraging bats and is not considered significant to nature conservation.

Badgers

7.5.20 The study area and immediate vicinity include habitats suitable for foraging badger and badgers are known to be resident within 2.5 km of the proposed scheme. However, landtake 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 and therefore landtake of potential badger foraging habitat is not considered to be of importance to nature conservation outwith the zone of immediate effects.

Brown Hare

7.5.21 Brown hare are included in the Section 41 list of species of principle importance in England, indicating that this species is threatened at the national level. Although the study area is considered to be of local importance for this species, the landtake of the small extent of improved grassland within the application area is considered to result in an impact to brown hare within the zone of immediate influence only.

7.6 Impacts during Operation

7.6.1 The main environmental changes that will occur during the operational phase of the proposed development relate to the rotation of the turbine blades. The potential for the operation of the turbines to result in significant impacts to ecological receptors is discussed below.

Designated Sites

7.6.2 No mechanism by which the operational phase of the wind turbine could directly or indirectly on designated features of statutorily or non-statutorily sites has been

identified. No impacts to these sites are anticipated to be associated with the operational phase of the proposed scheme.

Habitats

Improved Grassland

7.6.3 On completion of the construction works, any temporary landtake of this habitat caused by the erection of the turbine will revert back to improved grassland fields. No further impacts to this habitat are anticipated during the operation of the proposed wind turbine.

Semi-improved grassland

7.6.4 This habitat is located outwith the application area and no significant adverse impacts to this habitat are anticipated to result from the operation of the proposed wind turbine.

Bare Ground

7.6.5 No significant adverse impacts to this habitat are anticipated to result from the operation of the proposed wind turbine.

Ditches and Watercourse

7.6.6 This habitat is located outwith the footprint of the scheme and no significant adverse impacts to this habitat are anticipated to result from the operation of the proposed wind turbine.

Ponds, Flushes and Watercourses

7.6.7 This habitat is located outwith the application area and no significant adverse impacts to this habitat are anticipated to result from the operation of the proposed wind turbine.

Broad-leaved Woodland and Trees

7.6.8 This habitat is located outwith the application area and no significant adverse impacts to this habitat are anticipated to result from the operation of the proposed wind turbine.

Species

Amphibians

7.6.9 Its is not anticipated that significant adverse impacts to amphibians will result from the operation of the proposed wind turbine, should they be present. This assessment will be verified following completion of the amphibian surveys and provided as an addendum to the ES.

Bats

7.6.10 As a group, bats, which forage on the wing, are potentially at risk from operational wind turbines. Impacts typically occur due to barotraumas, or injury to the lungs, caused by bats flying through the low pressure zone behind a passing wind turbine blade.

7.6.11 The summary of survey results indicates that the study area as a whole supports moderate activity of common pipistrelle and low levels of activity of other bat species and that activity by pipistrelle bat species is largely in association with the woodland edge habitat rather than across open fields.

7.6.12 In accordance with the NE Technical Information Note (TIN051) (Natural England, 2009), pipistrelle bat species are considered to be at medium risk of collision with the proposed wind turbines and this represents only a low risk at the population level due to the common status of this species throughout the UK, relative to other bat species.

7.6.13 The turbine location has ensured a minimum of a 50 m standoff between the swept area of the turbine blade and the 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. The woodland in which trees with potential to support roosting bats are located is located approximately over 350 m from the proposed wind turbine. The nearest building to the proposed turbine is Sheephouse Farm located approximately 250 m to the west of the proposed wind turbine. As such the proposed turbine location is sited outside the recommended exclusion zones for higher risk bat species provided by Natural England.

7.6.14 Due to the location of the proposed wind turbine from suitable bat foraging and roosting features and the small size of the swept area it is considered highly unlikely that the proposed scheme 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. Whilst it cannot be entirely ruled out than an individual bat may from time to time be affected by an operational wind turbine, based on the current proposals and recorded levels of at activity within the application area, operation of the proposed wind turbine is not considered to be of significance to foraging/commuting bats outwith the immediate zone of effects.

Badgers

7.6.15 Operation of the proposed wind turbines, with the exception of the occasional maintenance vehicle, is not anticipated to result in disturbance at ground level and therefore operation of the proposed wind turbines will not directly impact upon badgers. No significant impacts to this species are expected to occur as a result of operation of the proposed scheme.

Brown Hare

7.6.16 Operation of the proposed wind turbines, with the exception of the occasional maintenance vehicle, is not anticipated to result in disturbance at ground level and therefore operation of the proposed wind turbines will not directly impact upon brown hare. Maintenance vehicle movement is restricted to the access tracks and brown hare are sufficiently mobile to avoid vehicles moving at slow speeds. No significant impacts to this species are expected to occur as a result of operation of the proposed scheme.

7.7 Impacts during Decommissioning

7.7.1 The decommissioning phase of works will comprise the removal of the turbine and associated infrastructure and reinstatement of the habitats present.

7.7.2 The impacts will be broadly similar to the construction phase in terms of disturbance and broadly the reverse of the construction phase in relation to landtake.

7.7.3 The nature and magnitude of disturbance predicted is not anticipated to result in significant adverse impacts to any of the nature conservation receptors present.

7.7.4 The potential for the decommissioning phase of the proposed development to affect great-crested newt will be confirmed following completion of surveys. However as with the construction phase the extent of any potential disturbance will be very limited and it is considered very unlikely that significant impacts to the favourable conservation status of any great-crested newts that may be resident in ponds on the site would occur.

7.8 Cumulative Impacts

7.8.1 One development may in itself not impact on a species or group of species however in combination with other actions elsewhere may do so. The Spring Brook single turbine will be more than 5 km from the nearest existing array. Cumulative impacts are, as a result, not considered significant.

7.9 Mitigation Measures

Designated sites

7.9.1 No impacts to designated sites are anticipated and no mitigation in respect of these sites is anticipated to be required.

Habitats

7.9.2 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

Amphibians

7.9.3 Any mitigation required in respect of amphibians will be included within an addendum to this Environmental Statement upon completion of survey.

7.9.4 There is potential for some level of mitigation to be required if great0crested newts are found to be present within the ponds. However, in view of the limited- nature and extent of disturbance and the distance of the footprint of works from the ponds there is potential that mitigation proposals could utilise unlicensed avoidance measures and a development licence would not necessarily be required.

Bats

7.9.5 No significant impacts to bats are predicted to result from the proposed scheme. In the unlikely event that bats are found on site during construction works should be halted in the immediate area and an appropriately licensed ecologist consulted immediately.

7.9.6 Consideration could be given to undertaking post-construction monitoring in relation to bat activity in the vicinity of the turbine in line with current Best Practice. Details of any such monitoring could be developed under a planning condition.

Badgers

7.9.7 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. Given that badgers are a highly mobile species it is recommended that prior to decommissioning works commencing a pre-decommissioning check is undertaken to determine whether badgers are present in close proximity to the works in accordance with relevant legislation at the time.

Brown Hare

7.9.8 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.

7.10 Conclusions

7.10.1 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.

7.10.2 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.

7.10.3 Amphibians: Surveys to determine the presence/absence of amphibians are currently been undertaken and the results of this study and impact assessment will be provided as an addendum to the Environmental Statement. However, significant impacts to the protected amphibian species great—crested newt are considered unlikely on the basis of existing information.

7.10.4 Badgers: No direct impacts to badgers or badger setts are anticipated to occur from the proposed development. However, badgers may 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. All trenches should be left over night with a means for badgers to escape.

7.10.5 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 will be maintained in accordance with the Natural England guidelines.

7.10.6 Other protected species: No evidence of other protected species was recorded on the day of survey. No significant impacts to any such species are anticipated to result from the scheme as proposed.

7.10.7 In summary the majority of the potential effects of the proposed scheme are predicted to be neutral (i.e. no detectable effect) or of *no significance outside zone of immediate effect*[18].

[18] Environmental Management 'Guidelines for Ecological Impact Assessment' (IEEM, 2006)

8 Hyrdology and Hydrogeology

8.1 Introduction

8.1.1 This chapter assesses the hydrological and hydrogeological effects of the proposed wind turbine during construction, operation and decommissioning. Elements of the proposal assessed include the wind turbine, access tracks, construction compound and electrical control building. Reference is also made to the ecological chapter where appropriate.

8.1.2 This chapter contains the following sections:

- Methodology - describing both the methods used in baseline surveys and in the assessment of the significance of effects;
- Baseline Description - a description of the hydrology and hydrogeology of the site based on the results of surveys, desk information and consultations;
- Potential Effects - identifying the ways in which the site could be affected by the proposed windfarm;
- Mitigation - a description of measures recommended to off-set potential effects;
- Residual Effects - an assessment of the significance of the effects of the development, after mitigation measures have been implemented;
- Summary table; and
- Statement of Significance.

8.2 Methodology

Assessment Methodology

8.2.1 This assessment has involved the following:

- Review of consultation responses from relevant statutory and non-statutory bodies from previous Sheephouse Heights proposal;
- Desk study, including review of available maps and published information;
- Site walkover;
- Evaluation of potential effects;
- Evaluation of the significance of these effects; and
- Identification of measures to avoid and mitigate potential effects.

Review of Consultation Responses

8.2.2 Information was provided by a range of organisations for the previous Sheephouse Heights assessment. These are summarized in **Table 8.1** below.

Consultee	Key Points in Response
The Metereological Office	Information provided on meteorological conditions at Sheephouse Heights and regional climatic averages.
Environment Agency	Information provided on flood risk, watercourse designations.
Barnsley Metropolitan Borough Council	Information provided on private water supplies.
The British Geological Survey	Details on solid and drift geology, and groundwater.
Yorkshire Water	Information provided on potable water supplies.

Table 8.1 Summary of Sheephouse Heights consultation responses

Desk Study

8.2.3 The desk study included:

- Identification of catchments, watercourses, springs and water features;
- Review and collation of data provided through consultations;
- Review and collation of flood plain information and water quality data; and
- Review and compilation of soils, geological and hydrogeological information.
- Reference was made to the following sources of information:
- The British Geological Survey 1:50,000 Series Solid and Drift Edition (sheet 86);
- Hydrogeological Map of England and Wales 1:625,000, 1977;
- The Ordnance Survey 1:25,000 Landranger Map (Sheet 110);
- Water Framework Directive (2000/60/EC). The Water Framework Directive (WFD) establishes a framework for the protection, improvement and sustainable use of all water environments;
- CIRIA Environmental Good Practice on Site (C502) (1999). C502 provides guidance on how to avoid causing environmental damage when on a construction site; and
- CIRIA Control of Water Pollution from Construction Sites (C532) (2001). 0532 provides guidance on how to plan and manage construction projects to control water pollution.

Site Walkover

8.2.4 A site walkover was carried out in April 2013 to visually inspect surface water features and to obtain an understanding of the local topography and hydrological regime.

8.3 Assessment of Significance

8.3.1 The significance of the potential effects of the proposed wind turbine has been classified by taking into account sensitivity and magnitude, and combining these with the likelihood of an event occurring.

8.3.2 The sensitivity of the receiving environment can be defined as its ability to absorb an effect without perceptible change and can be classified as either low, moderate or high. These are dependent on factors such as the quality of local receiving waters; their purpose (e.g. whether used for drinking, fisheries); and existing influences; etc.

8.3.3 The magnitude includes the timing, scale, size and duration of the potential effects resulting from the proposed wind turbine. The magnitude of potential effects can be classified as negligible, minor, moderate or major.

8.3.4 The significance of the unmitigated effect is therefore defined as follows:

	Sensitivity		
Magnitude	Low	Moderate	High
Negligible	Negligible	Negligible	Negligible
Minor	Negligible	Minor	Medium
Moderate	Minor	Medium	Medium
High	Minor	Medium	Major

Table 8.2 - Unmitigated Signficance Criteria

8.3.5 The likelihood of an event occurring is then included, and classified as unlikely, possible or likely.

8.3.6 Finally, the residual (or overall) significance after mitigation is a function of the unmitigated significance combined with the likelihood of an event occurring (with mitigation taking place); as shown below:

	Likelihood		
Unmitigated Significance	Unlikely	Possible	Likely
Negligible	Negligible	Negligible	Negligible
Minor	Negligible	Negligible	Minor
Medium	Negligible	Minor	Medium
Major	Minor	Medium	Major

Table 8.3 - Mitigated Significance Criteria

8.3.7 Conclusions will therefore state whether residual significance will be major, medium, minor or negligible, once appropriate mitigation has been implemented. This assessment relies on professional judgment to ensure that the impacts are appropriately assessed. Impacts of medium significance or greater are considered significant in terms of the EIA Regulations.

8.4 Baseline Description

Topography and Land use

8.4.1 The site is located approximately 1.3km to the north east of the village of Midhopestones and 10km to the south west of Barnsley. The site location and layout are shown in **Figures 1.1 and 1.2**, respectively.

8.4.2 The 1:50,000 Ordnance Survey Landranger Map (Sheet 110) shows the turbine envelope to lie in an elevated plateau rising from elevations of approximately 270m AOD to 330m AOD.

8.4.3 Topography is broadly defined by 2 ridges sloping from north to south towards tributaries of Underbank Reservoir. The majority of the land is used for livestock grazing. Habitats are described in detail in the Ecology chapter.

8.4.4 Surface water courses are illustrated on **Figure 8.1**.

Solid Geology

8.4.5 The British Geological Survey 1:50,000 Series Solid and Drift Edition (sheet 86) shows the main part of the site is underlain by Grenoside sandstone rocks from the Carboniferous period, identified as 'medium grained sandstone current bedded at the top and massive below'. It is noted that below the Grenoside sandstone layer lies a shale layer containing Grenoside Sandstone Coal. Approximately 38m below the Grenoside Sandstone lies Greenmoor rock. A fault pair, striking northeast to southwest in direction, lies in the eastern section of the site.

Superficial Geology

8.4.6 The British Geological Survey 1:50,000 Series Solid and Drift Edition (sheet 86) shows superficial deposits are absent in the main section of the application

boundary, indicating bedrock is at or near to the surface. In other areas the dominant superficial geology comprises of residual soil materials from the in situ breakdown of the rock. Minor areas of Alluvium appear beyond the south of the site boundary.

Hydrogeology

8.4.7 The Hydrogeological Map of England and Wales 1:625,000 (1977), shows the site to be underlain by the Yordale Series and Coal Measures consisting of rhythmic sequences of shales, sandstones, coals and limestones. Mine waters from coal measures tend to be ferruginous and acidic. Where available, groundwater can support a yield up to 5-10 I/s in favourable areas.

Climate

8.4.8 The Hydrogeological Map of England and Wales 1:625,000 (1977), shows the Average Annual Rainfall to be 635mm to 716mm per annum. The Meteorological Office report regional Average Annual precipitation for Sheffield to be 824.7mm per annum (1971 to 2000).

Hydrology

8.4.9 **Figure 8.1** shows the main surface water courses and their associated catchments. Several watercourses lie in the vicinity of the site. Cotefield Beck (approximately 170m from the wind turbine) and Spring Brook (approx. 500m) lie to the east and drain towards Underbank Reservoir. During the site visit no flow was observed at either Cotefield Beck or Spring Brook, suggesting they are intermittent or seasonal watercourses.

8.4.10 Two smaller watercourses, Small Clough and Jenkin Clough, lie approximately 380m and 590m, respectively, to the south west of the wind turbine and drain towards Underbank reservoir.

8.4.11 Two ponds also exist within the vicinity of the site and area shown in **Figure 8.1**.

8.4.12 In terms of hydrological regime, steeper sections of brooks will naturally respond more quickly to rainfall. Watercourses within the vicinity of the proposal are on a moderate incline or are relatively flat and slow flowing and the steeper sections tend to be lower down the hill, further from the site. Watercourses closer to the site are therefore likely to have more capacity to absorb rainfall, with corresponding slower response rates.

8.4.13 Although no surface water flow was observed during the site walkover, surface water courses appear to be relatively continuous, with no obvious blockages evident.

8.5 Assessment of Potential Effects

Surface Water Morphology

8.5.1 From what was observed on-site, morphology is relatively typical of trellised drainage network water courses, which are flatter in their upper reaches and become increasingly steep and faster flowing as they progress down slope.

Designations

8.5.2 No statutory designations exist in proximity to the development site. However, several tributaries of Underbank Reservoir dissect the site. Clearly, therefore, emphasis will need to be given to protecting the integrity of watercourses in proximity to the development, particularly by mitigating against impacts during construction.

Fisheries

8.5.3 Previous consultation responses highlighted the importance of local fisheries as salmonid feeder rivers, particularly the River Don. Wind farm construction, if poorly controlled, can lead to increased run-off, sedimentation, compaction, and changes to soil flow patterns. In this instance, run-off would drain in accordance with the existing surface run-off regimes on site, predominantly towards Cote Field Beck and then on towards the Little Don river. In light of this, appropriate mitigation measures will be taken to reduce the possibility of sediment directly entering watercourses.

Water Supplies Public and Private

8.5.4 Previous consultation responses indicated that there are no private water supplies within 2km of the site.

Flooding

8.5.5 There are no active floodplains, either on or nearby the site. The Environment Agency has no records of flooding within the site boundary and has indicated that the site lies outwith of high and medium flood risk probability zones. It is noted that infrequent flooding has occurred approximately 1.5km to the south west of the site, during heavy and prolonged precipitation events. These are considered for construction, operation and decommissioning.

8.6 Potential Construction Effects

Access Tracks and Cabling

8.6.1 Approximately 700m of new access track of approximately 4.5m wide running width, with additional widening at bends and for passing places. No watercourse crossings are proposed.

8.6.2 Access tracks can lead to increased run-off, sedimentation, compaction, and changes to soil flow patterns. Run-off would drain in accordance with the existing surface run-off regimes on site, predominantly towards Cote Field Beck and Small Clough.

8.6.3 Such potential impacts can be mitigated against, however, it is possible that under certain circumstances, such as during heavy rainfall, they may still occur. In order to ensure that the worst-case has been considered, therefore, these potential impacts are classed as "Possible".

Compound and Storage Areas

8.6.4 The proposed compound (approximately 40m X 40m) is in the northern section of the site, adjacent to the road, some 380m from Cote Field Beck, the nearest watercourse.

8.6.5 The construction compound would be used in part for fuel storage and re-fuelling, and would be equipped with the necessary bunding. It would also have a car parking area, offices, welfare facilities and a materials storage area.

8.6.6 Potential impacts would be similar as for access tracks above, and these can be mitigated against. Again, however, it is possible that under certain circumstances, they may still occur, and so to ensure a worst-case has been considered, they are classed as "Possible".

Chemical Pollution

8.6.7 Potential risks include the spillage or leakage of chemicals, unset cement, foul water, fuel or oil, during use or storage on site. These pollutants have the potential to adversely affect soils, water quality, and groundwater, and hence impact on the biodiversity of receiving watercourses.

8.6.8 Infrastructure is proposed within the catchments or Small Clough and Cote Field beck. They could therefore be at risk from a pollution incident during construction, if managed improperly. All surface water courses and surface water bodies are considered to be of high sensitivity, particularly given the proximity to Underbank reservoir.

8.6.9 Again, potential impacts can be mitigated against; however, accidental spillages cannot be absolutely ruled out and, in order to ensure the worst-case has been considered, are classed as "Possible".

Erosion and Sedimentation

8.6.10 Erosion and sedimentation can occur from excavations, ground disturbance and poor design of drainage ditches. Sediment entering watercourses has the potential to affect flood storage capacity, water quality, and ecology. Clearly therefore, if unmitigated, increased sedimentation could have an indirect impact on local brooks, and ultimately the receiving river systems such as Underbank reservoir.

8.6.11 The magnitude of such impacts is considered to be moderate, but potential impacts can be mitigated against, particularly through best practice in the design and construction of the site.

8.6.12 Despite this, and in order to ensure that the worst-case is assessed, they are still classed as "Possible".

Impediments to Flow

8.6.13 No watercourse crossings or any engineering works within 50m of any watercourse are proposed, therefore impediments to watercourse flow are classed as “Unlikley”.

Compaction of Soils

8.6.14 Construction of access tracks and movement of construction traffic can lead to compaction of the soil. This can reduce soil permeability, potentially leading to increased run-off and increased erosion. The site geology is generally of low permeability and has gently sloping topography, so the effects of compaction would not result in a significant increase in runoff. Furthermore, the affected area is relatively small in relation to the unaffected area. For these reasons, the magnitude of this impact will be minor

Migration of Pollutants from Contaminated Land

8.6.15 There are no known areas of contaminated land on the site. Should potentially contaminated land be encountered during excavations, however, this would be tested and disposed of in line with appropriate guidelines and legislation.

Increase in Runoff

8.6.16 Increased run-off has the potential to influence a range of factors discussed in this section (sedimentation, chemical pollution, soil flow changes, etc), particularly in relation to surface water courses (see below). The increase in hardstanding can increase the volume and rate of localised surface run-off. The impermeable nature of the underlying geology, however, means there will be limited infiltration and relatively high run-off rates, which suggests that the increase in hardstanding is unlikely to have a significant effect.

Surface Water Courses

8.6.17 Surface water run-off has the potential to directly enter nearby surface water courses and water bodies (detailed previously), and to indirectly reach off-site surface water courses such as Underbank reservoir.

8.6.18 No infrastructure or engineering works are proposed within 50m of a watercourse, therefore there are no direct pathways for pollutants or additional sediment to enter watercourses and no surface run-off from the worked areas of the site will flow directly into a watercourse during normal operations.

8.6.19 Despite this, it is possible that under certain circumstances, such as during heavy rainfall, surface water impacts may still occur. In order to ensure that the worst-case has been considered, these potential impacts are classed as "Possible".

8.7 Potential Operational Effects

8.7.1 Potential medium and long term effects associated with site infrastructure such as access tracks, turbine bases and hardstanding could potentially include:

- Increased run-off rates and volume;
- Further erosion and sedimentation;
- Alterations to natural flow pathways; and
- Increased pollution risk.

8.7.2 These effects have been discussed in relation to the construction phase, and as there would be significantly less activity during operation, the magnitude and likelihood of these is thus reduced. This will be further ensured through best practice design and construction, such as cross drainage, use of shallow drainage ditches, prevention of blockages, adherence to a pollution prevention plan (PPP) and maintenance of access tracks during the operational life of the wind farm.

8.8 Potential Decommissioning Effects

8.8.1 The potential effects of the de-commissioning phase are also similar and generally less than those outlined above in construction, and are not repeated here.

8.9 Mitigation Measures

8.9.1 Mitigation measures are referred to in the preceding discussion, and are broadly divided into those which will be "embedded" into the design of the site and those which will be implemented through best practice (and a Pollution Prevention Plan).

"Embedded" Mitigation Measures

8.9.2 Impacts on watercourses have been minimised through design by avoiding the need for any watercourse crossings or any engineering works near to watercourses by the introduction of a 50m buffer between infrastructure and any watercourses.

8.9.3 In order to ensure the development does not lead to increased surface water run-off, construction methods will follow best practice and Sustainable Drainage System (SuDS) features will be incorporated into the design of the project. These will include:

- tracks and hardstandings will be constructed of permeable crushed stone;
- the camber of tracks will encourage surface water to drain to the up-slope drainage ditch;
- drainage from the hardstanding area will be encouraged by the construction of a slight fall in gradient across the hardstanding area; and
- catch ditches and possibly surface water collection and infiltration sumps shall be constructed to collect, control and disburse waters in a safe and controlled manner through the underlying strata.

8.9.4 A suitable Pollution Prevention Plan (see below) will be implemented to avoid potential impacts on surface water courses.

Best Practice (Pollution Prevention Plan)

8.9.5 Best Practice will be followed in all aspects of construction and operation, specifically through a Pollution Prevention Plan (PPP). The PPP will set out measures to be employed to avoid or mitigate against potential impacts for all phases of the development, and will also include an Incident Plan to be followed, should pollution occur. A nominated person will have specific responsibility for implementation of the PPP.

8.9.6 Method statements will also be applied, which will follow the principles laid out in relevant Environment Agency Pollution Prevention Guidelines (PPGs). Environmental requirements detailing environmentally safe working procedures and standards covering the principles set out in the PPGs will be supplied to the main contractor as part of the tender documentation and other contractors prior to construction.

8.9.7 Specific mitigation measures for construction and decommissioning are listed in **Table 8.4**. The table also provide an overall analysis of the significance of the effects during construction, both pre and post mitigation. This is based on the preceding discussion, and demonstrates that with the appropriate mitigation, the residual significance of all effects will be minor (or lower).

8.10 Residual Effects

8.10.1 As indicated above, the residual significance of all effects will be minor (or lower).

8.11 Summary of Effects

8.11.1 The effects are summarised in the previous tables, with residual significance for all issues being assessed as minor (or lower) for construction, operation and decommissioning.

8.12 Statement of Significance

8.12.1 This chapter has assessed the likely significance of effects of the development on hydrology and hydrogeology. Following adoption of the proposed mitigation measures (particularly through the implementation of "embedded" measures, best practice during construction including a Pollution Prevention Plan), Spring Brook Wind Turbine has been assessed as having the potential to result in effects of a minor significance or lower. Given that impacts of medium significance or greater are considered significant in terms of the EIA Regulations, the potential effects on hydrology and hydrogeology are considered to be not significant.

Activity	Impact	Receptor	Sensitivity	Mitigation	Before Mitigation		After Mitigation	
					Magnitude	Significance	Likelihood	Residual Significance
Access tracks and cabling	Increased run-off	Watercourses and fisheries	High	Tracks and hardstandings will be constructed of permeable crushed stone; Camber of tracks will encourage surface water to drain to the up-slope drainage ditch; Drainage from the hardstanding area will be encouraged by the construction of a slight fall in gradient across the hardstanding area; and Catch ditches and possibly surface water collection and infiltration sumps shall be constructed to collect, control and disburse waters in a safe and controlled manner through the underlying strata.	Moderate	Medium	Possible	Minor
	Erosion and sedimentation	Watercourses and fisheries	High	As (a) – (d)	Moderate	Medium	Possible	Minor
	Brook flow impediments	Watercourses and fisheries	High	Complete avoidance of watercourse crossings	Moderate	Medium	Unlikely	Minor
	Soil flow changes	Soils	High	As (a) – (e) Drainage cross pipes and water bars	Moderate	Medium	Possible	Minor

	Soil loss and compaction	Soils	High	As (a) – (f)	Moderate	Medium	Possible	Minor
Crane pads and other hardstandings	As (1)	As (1)	As (1)	As (a) – (f)	As (1)	As (1)	As (1)	As (1)
Activities involving chemical handling and storage	Pollution	Watercourses and fisheries	High	As (a) – (f) Storage in bunded compound Disposal via registered waste carrier Off-site concrete bathing	Moderate	Medium	Possible	Minor
	Pollution	Groundwater	High	As (a) – (e) As (g) – (i)	Moderate	Medium	Possible	Minor
	Pollution	Soils	High	As (a) – (e) As (g) – (i)	Moderate	Medium	Possible	Minor

Table 8.4 - Summary of Construction Impacts

9 Heritage Statement

9.1 Introduction

9.1.1 The purpose of this Chapter is to assess the proposed development in terms of its potential effects upon the Cultural Heritage resource of the site and surrounding area. Cultural heritage resources assessed include Scheduled Ancient Monuments and listed buildings. An assessment has also been made of the potential for archaeological deposits to exist within the site itself.

9.1.2 The assessment has been desk based and was undertaken in 2013 by The Energy Workshop (TEW). It has drawn on readily available documentary and cartographic evidence, to inform the baseline condition of the site.

9.2 Scope

9.2.1 The assessment has drawn on the existing English Heritage online database of Scheduled Ancient Monuments (SAMs) and listed buildings. All documented listed buildings within 5km of the proposed turbine have been identified and assessed. There are no SAMs within 2.5km of the site.

9.2.2 The potential for indirect effects on the settings of listed buildings has only been considered where the potential for intervisibility between a building and the proposed turbine exists.

9.2.3 Historic mapping on the old-maps.co.uk website dating back to 1855 has also been reviewed, to identify any other potential monuments which may have been previously recorded in the vicinity of the site.

9.2.4 The potential for direct and indirect effects on the identified listed buildings and the wider archaeological resource is identified and appropriate mitigation to address any potential impacts, which could result from the construction and operation of the turbine, is identified.

9.3 The Assessment of Potential Effects

9.3.1 Potential effects on cultural heritage receptors can take the form of direct (physical) and indirect (largely visual) impacts. The assessment of physical effects considers direct effects upon features of cultural heritage interest, whether known sites or unknown buried archaeology, which are in danger of being disturbed or destroyed. Physical impacts are likely to occur during construction and decommissioning, and are permanent and irreversible.

9.3.2 The impacts of constructing the project are discussed in Section 9.12, Potential Construction Effects.

9.3.3 Data on potential sites was collated from the online 'Heritage List' held and managed by English Heritage. Early Ordnance Survey mapping of the site dating back to 1855 were also reviewed using the old-maps.co.uk website. The site of the proposed turbine has not altered noticeably since 1855, with the current pattern of field boundaries and farmsteads seemingly unchanged since this date.

Desk-based Assessment

9.3.4 This assessment has sought to identify all scheduled archaeological and historical sites, monuments and buildings within 5km of the proposed turbine, equating to the geographical area within which the turbine would be a potentially significant visual feature. In addition, all non-scheduled sites and potential sites, identified by the Sites and Monuments Register within 1km of the proposed turbine, have also been identified.

9.3.5 The closest listed structure to the proposed turbine location is the grade II 'Take Off Stone, 378m to the northwest. There are no other listed buildings, scheduled monuments or SMR records within 900m of the proposed turbine and it is therefore considered that no such sites or structures are at risk of physical damage during the construction of the project.

9.3.6 Where relevant the existing screening of cultural heritage features by natural topography, forest and woodlands has also been taken into account.

9.3.7 No detailed consideration of potential impacts from noise or shadow flicker (see Chapter 9 of this ER) has been undertaken for Cultural Heritage features, since no significant above ground or built heritage features exist within or immediately adjacent to the site to receive any such impacts.

9.3.8 A review of historical OS mapping on the old-maps.co.uk website dating back to at least 1865 has not identified any additional evidence of archaeological sites in the vicinity of the site, which could subsequently have been lost.

Zone of Theoretical Visibility

9.3.9 The ZTV used to inform this assessment has been calculated from tip height to ground contours. **Figure 5.1a** reproduces a 'flat ground' ZTV which does not allow for the potential additional screening effects of woodland and built up areas. It also illustrates the viewpoint locations used in the VIA. **Figure 5.1b** does, however, take into account the additional screening effects of larger areas of woodland and settlements. It does, however, not take into account the further screening effects of smaller copses, individual trees and hedgerows, buildings or minor topographical features such as hedgerow banks and sunken lanes. The ZTV is calculated to reflect visibility at approximately 2m above ground level and is further explained in Chapter 5.

9.3.10 In considering effects using this methodology, it should be remembered that the ZTV is a theoretical construct, based upon a fairly crude base terrain model. It therefore represents a "worst case scenario" and in reality visual effects may be substantially less than suggested.

9.3.11 In the following lists of heritage receptors, potential receptors where the ZTVs indicate that there would not be potential visibility of the turbine, the text naming the receptor in question is 'greyed out'. In other words it would not be possible to see the proposed turbine from receptors which are listed in grey.

9.3.12 The ZTV's are included as **Figures 5.1a and 5.1b**.

9.4 Site Description

9.4.1 The site and proposed layout, as revised, are described fully in Chapter 2 Project Description. No previously unrecorded archaeological features were noted on or near the site during site visits.

9.5 Potential Receptors

9.5.1 Potential heritage receptors, which have been assessed, include Scheduled Ancient Monuments, Listed Buildings, Conservation Areas and Registered Historic Parks and Gardens within 5km of the proposed turbine, and also non-scheduled sites listed in the Sites and Monuments Register within 12km of the proposal.

Scheduled Ancient Monuments

9.5.2 There are six Scheduled Ancient Monuments within 5km of the proposed turbine. Of these, the ZTV indicates that only two (189 and 190) could have potential visibility of the proposed turbine, as indicated in **Table 9.1** below.

Number	MON ID	Name	Distance (km)
189	SY1279	GLASS FURNACE, BOLSTERSTONE	2.9
190	27213	WAYSIDE CROSS SOUTH OF HARTCLIFF ROAD	2.25
191	29920	WORTLEY TOP FORGE	4.3
192	34714	WATER POWERED BLOOMERY, IRON FORGE AND ROLLING MILL AT LOW FORGE	4.2
193	13249	EWDEN BECK ROUND BARROW CEMETERY AND CROSS-DYKE	3.9
194	13250	EWDEN BECK RING-CAIRN	3.8

Table 9.1 - SAMs within 5km

9.5.3 Beyond 5km, but less than 6km to the southeast, are Iron Age and Roman quern workings on Wharncliffe Rocks and Romano-British settlements at Finkle Street.

Sites and Monuments Records

9.5.4 There are 5 sites within 1km of the proposed turbine, which are identified on the South Yorkshire SMR (on Heritage Gateway). Each of these is also a grade II listed building. The sites are identified on the **Figure 9.1** and are listed in **Table 9.2** below:

MON ID	Description
1191616	TAKE OFF STONE APPROXIMATELY 250 METRES SOUTH OF JUNCTION WITH MOSSLEY ROAD, MORTIMER ROAD
1191457	GUIDE POST AT JUNCTION WITH DYSON COTE LANE
1151116	MILESTONE APPROXIMATELY 400 METRES WEST OF JUNCTION WITH UNDERBANK LANE
1315036	BARN APPROXIMATELY 30 METRES TO WEST OF UNDERBANK HALL
1191506	STABLE RANGE APPROXIMATELY 30 METRES NORTH WEST OF UNDERBANK HALL

Table 9.2 - SMRs witih 5km

Historic Gardens and Designed Landscapes

9.5.5 There are no designated Historic Parks or Gardens within 5km of the proposed turbine. The closest are the historic gardens and parkland of Wortley Hall (grade II), 5.9km to the east and Wentworth Castle (grade I), 7.1km to the east (**Figure 5.1c**).

Conservation Areas

9.5.6 There are five Conservation Areas within 5km of the proposed turbine. These are listed below:

- Bolsterstone (Sheffield/Peak District) – 4km
- Midhopestones (Sheffield) – 1.145km
- Hoyland Swaine (Barnsley) – 4.4km
- Thurlstone (Barnsley) – 3.3km
- Pennistone (Barnsley) – 2.4km

9.5.7 There is no predicted visibility of the proposed turbine from the Hoyland Swaine, Thurlstone and Pennistone Conservation Areas, and only very limited predicted visibility from Bolsterstone. There would be relatively extensive visibility of the proposed turbine from the more open parts of the Midhopestones Conservation Area which encompasses a number of open fields associated with the character of the village.

Listed Buildings

9.5.8 There are a total of 188 listed buildings within 5km of the proposed turbine, although only one lies within 1km of the project. Of these, 2 are listed Grade I and 5 are listed Grade II*. The remaining 181 are listed Grade II.

9.5.9 Of the 188 listed buildings, 57 lie within the predicted zone of theoretical visibility, although, in practice, existing vegetation and buildings will afford a further level of screening. In the following tables, listed buildings from where there is not predicted to be any visibility of the turbine are highlighted in grey. Turbines from where the ZTV predicts visibility are listed in the standard text colour.

9.5.10 The closest listed structure to the proposed turbine location is the grade II 'take off stone', 378m to the northwest, which signifies the point at which a horse to help wagons up the hill could be taken off and sent back down to the bottom of the hill. Listed buildings within 5km of the proposed turbine location fall into the following categories:

9.5.11 The ZTV illustrates that the proposed turbine is not predicted to be visible from any of the above grade II* and grade I buildings and structures, with the exception of the grade II* Church of Saint James in Midhopestones. In practice, however, there are a number of mature trees to the northeast of the church, which will significantly screen potential views of the turbine from the church and its surrounding churchyard.

9.5.12 Of the 181 grade II buildings within 5km of the proposed turbine, the ZTV indicates that there would be potential visibility from 56. It is notable, as discussed in more detail below, that there is no predicted visibility from any of the 22 listed buildings in the Penistone, Thurlstone and Hoylandswaine Conservation Areas.

9.5.13 All Listed Buildings within 5km of the proposed turbine are identified on **Figure 9.1** according to category and described below.

Listed Buildings Within Conservation Areas

9.5.14 Of the 188 listed buildings within 5km of the proposed turbine, 37 are situated within the conservation areas, identified in Section 9.9 above. Each of these listed groupings are described in more detail below:

Bolsterstone

9.5.15 The Bolsterstone conservation area lies 4km to the southeast of the proposed turbine. It contains five listed buildings, which are listed in **Table 9.3** below, and is located on the edge of the area from where there is predicted visibility of the turbine. **Figure 5.11** (Viewpoint 5) reproduces a photomontage viewpoint from a position on a public footpath just to the north of the village and is representative of potential views from the northern edge of the Conservation Area.

9.5.16 Potential views of the turbine from within the Conservation area, and from the listed buildings within the Conservation Area, are predicted to be screened by other buildings and trees within and around the village.

Name	Grade	Listing Date	LB ID
BOLSTERSTONE STOCKS	II	08/08/1985	335485
CASTLE COTTAGE	II	17/11/1964	335489
CHURCH OF ST MARY	II	25/04/1969	335484
K6 TELEPHONE KIOSK AT JUNCTION WITH WALDER'S LANE	II	31/12/1987	382367
PORTERS LODGE, BOLSTERSTONE CASTLE	II	17/11/1964	335493

Table 9.3 - Listed Buildings in Bolsterstone

Hoylandswaine

9.5.17 The Hoylandswaine Conservation Area lies 4.4km to the north of the proposed wind turbine. The ZTV indicated that there is no predicted visibility of the proposed wind turbine from any part of the Conservation Area, which contains a single listed building, nor from any of the listed buildings in the vicinity of the village.

Name	Grade	Listing Date	LB ID
HOYLAND SWAIN OUTBUILDING RANGE IN GARDEN OF NUMBER 355	II	02/09/1988	334126

Table 9.4 - Listed Buildings in Hoylandswaine

Midhopestones

9.5.18 The Midhopestones Conservation Area is located 1.15km to the southwest of the proposed wind turbine. It contains 10 listed buildings including the grade II* Church of Saint James, previously discussed in Paragraph 9.10.4 above, where it was observed that there are a number of mature trees to the northeast of the church, which will significantly screen potential views of the turbine from the church and its surrounding churchyard.

9.5.19 The ZTV indicates that there is predicted visibility of the proposed turbine from the Conservation Area and its constituent listed buildings, and Viewpoint 1 (**Figure 5.3**) reproduces a predicted view of the turbine, which is shown to lie within a group of existing pylons, from a position on Chapel Lane with open views out from the centre of the Conservation Area.

9.5.20 While there would be open visibility of the proposed turbine from the more open areas and roads within the Conservation area, visibility from within the scattered groups of listed buildings which lie within the Conservation Area would be screened to an extent by other structures and trees.

9.5.21 Visibility of the turbine from the northern edge of the Conservation Area, and from the cluster of listed buildings adjacent to and including Midhopestones Bridge, and along the Little Don, would be significantly screened by topography, by existing woodland both along the River and by Sheephouse Wood.

9.5.22 The photomontage reproduced from Viewpoint 1 indicates that there would be relatively clear visibility of the proposed turbine from open areas within the Conservation Area.

Name	Grade	Listing Date	LB ID
CHURCH OF ST JAMES	II*	25/04/1969	335349
NEW HOUSE	II	08/08/1985	335390
BARN AND COWHOUSE ON EAST SIDE OF FARMYARD AT THE OAKS FARM	II	19/12/1975	335401
THE OAKS FARMHOUSE	II	19/12/1975	335400
SMALL HOUSE TO SOUTH WEST OF BARN	II	11/02/1976	335383
SMITHY AT JUNCTION WITH OAKS LANE	II	08/08/1985	335391
BARN, COWHOUSE AND FORGE	II	08/08/1985	335384
STONECROFT COTTAGE	II	11/02/1976	335381
COWHOUSE ADJOINING NORTH WEST CORNER OF MIDHOPE HALL FARMHOUSE	II	08/08/1985	335380
CLUB INN	II	08/08/1985	335389

Table 9.5 - Listed Buildings in Midhopestone

Penistone

9.5.23 The Penistone Conservation Area lies 2.4km to the north of the proposed wind turbine. The ZTV indicates that there is no predicted visibility of the proposed wind turbine from any part of the Conservation Area, which contains 13 listed buildings, nor from any other listed buildings in the village outwith the Conservation Area including buildings along, and bridges over, the River Don upstream of Thurgoland.

Name	Grade	Listing Date	LB ID
CHURCH OF ST JOHN	I	23/06/1965	334075
CROSS BASE, IN CHURCHYARD, APPROXIMATELY 5 METRES WEST OF WEST DOOR OF CHURCH OF ST JOHN	II	27/04/1988	334078
104 AND 106 HIGH STREET	II	27/04/1988	334050
ROBERT MARTIN GRAVESLAB IN CHURCHYARD APPROXIMATELY 1 METRE WEST OF SOUTH PORCH OF CHURCH OF ST JOHN	II	27/04/1988	334079
1 AND 3 MARKET STREET	II	23/06/1965	334081
8 MARKET STREET	II	27/04/1988	334083
K6 TELEPHONE KIOSK IN FRONT OF CHURCH	II	27/04/1988	334098
LAMP STANDARD IN CHURCHYARD APPROXIMATELY 2 METRES SOUTH OF SOUTH PORCH OF CHURCH OF ST JOHN	II	27/04/1988	334077
5 AND 7 MARKET STREET	II	27/04/1988	334082
MIDLAND BANK AND BANK CHAMBERS	II	27/04/1988	334093
MILESTONE BUILT INTO NORTH WALL OF CHURCHYARD AT SE 247033	II	27/04/1988	334042
CROSS AND SHAFT, IN CHURCHYARD APPROXIMATELY 10 METRES SOUTH OF SOUTH PORCH OF CHURCH OF ST JOHN	II	27/04/1988	334076
JANE GREAVES GRAVESLAB IN CHURCHYARD, APPROXIMATELY 2 METRES EAST OF CHANCEL DOOR OF CHURCH OF ST JOHN	II	27/04/1988	334080

Table 9.6 - Listed Buildgins in Penistone

Thurlstone

9.5.24 The Thurlstone Conservation Area lies 3.3km to the north northwest of the proposed wind turbine. As was the case with nearby Penistone, the ZTV indicates that there would be no visibility of the proposed wind turbine from any part of the Conservation Area, with the possible exception of its northern edge, nor from the eight listed buildings within its boundary. There is also no predicted visibility from any of the listed buildings in Millhouse Green, Hill Side and Ecklands, or those along the Don upstream to the west.

Name	Grade	Listing Date	LB ID
MILESTONE OPPOSITE JUNCTION WITH TOWNGATE	II	27/04/1988	334074
4 ROCK SIDE	II	27/04/1988	334086
BARN AT REDMINSTER COTTAGE	II	27/04/1988	334105
26 AND 28 TOWNGATE	II	19/04/1982	334107
REDMINSTER HOUSE	II	27/04/1988	334104
9 INGBIRCHWORTH ROAD	II	27/04/1988	334055
44, 46 AND 48 MANCHESTER ROAD	II	27/04/1988	334073
15, 17 AND 19 TOWNGATE	II	27/04/1988	334106

Table 9.7 - Listed Buildings in Thurlstone

Listed Buildings outside Conservation Areas

9.5.25 There are 144 listed buildings within 5km of the proposed turbine which lie outwith Conservation Areas. Of these, the ZTV, reproduced as **Figure 5.1b**, predicts that some 47 would have potential visibility of the turbine before the further additional screening effects of other buildings, vegetation, walls and minor topographical features are taken into account.

9.5.26 There are several clusters of listed buildings within 2km of the proposal from where there is predicted to be visibility of the turbine. The closest of these clusters is the group of listed buildings centered on Underbank Hall 1km to the southeast. In practice, however, this cluster at Underbank is completely surrounded by mature woodland and potential views of the turbine from the buildings and their environs would be largely screened. There would be some visibility from the listed buildings at Snowden Hill 1.3km to the east but here there would, again, be at least partial screening of the proposal due to the presence of a number of large agricultural sheds. The proposed turbine would not be visible from the two listed buildings at Dean Head further to the east.

9.5.27 **Figure 5.5** reproduces the predicted visibility of the proposed turbine from a point 1.5km to the south, representative in terms of distance of views from Snowden Hill, the western end of Stocksbridge and the group of listed buildings on the A616, north of the Midhopestones Conservation Area, although in practice visibility from these groupings will, again, be largely screened by woodland and other buildings.

9.5.28 The listed Hunshelf Hall and the listed stocks at Green Moor lie to the east of the proposed turbine at a distance of around 2.5 to 3.5km. Direct visibility of the proposed turbine from these locations would not be significant again due to the effects of intervening screening from farm buildings, field boundaries and vegetation.

9.5.29 Stocksbridge is a largely modern settlement but does include clusters of listed buildings relating to former farmsteads and industry, some of which are potentially mediaeval in origin. Some of these buildings in the southern and more elevated parts of Stocksbridge, including the cluster around Pot House Farm and its associated SAM, and to the west of the settlement, command relatively open views to the north, which would include views of the proposed turbine at a distance of 2 to 4 km. The existing built environment does, however, provide an element of screening of direct views.

9.5.30 There is predicted to be potential visibility of the turbine from the group of listed buildings at Upper Midhope some 3.5km to the west. Viewpoint 3 (**Figure 5.7**) reproduces a predicted view of the turbine from a location 3.8km to the north, which presents a comparable view of how it could appear from Upper Midhope at this distance.

9.5.31 The village of Langsett lies 3.7km directly west of the proposed turbine in the bottom of the Little Don Valley. No open views of the proposed turbine from the listed buildings in the village are predicted due to the presence of screening woodland, particularly along the A616.

9.5.32 There are a number of scattered listed buildings to the north of Penistone, Oxbridge and Thurgoland some 4 to 5km from the turbine, centered on Royd, Royd Moor and Scout Dyke. Viewpoints 7 and 8 (**Figures 5.15 and 5.17**) reproduce predicted views from this area and distance. No significant effects on the settings of these buildings are predicted.

9.5.33 To the south of the site, at a distance between 3 and 5km from the turbine, the effects of intervening topography would prevent visibility of the turbine from areas south of Bolsterstone including Ewden Village, buildings along the Ewden Beck, and from large parts of the Peak District National Park. As stated earlier there is predicted to be very limited visibility of the turbine from Bolsterstone itself.

9.5.34 Other isolated listed buildings within 5km and outwith significant groupings chiefly consist of distance markers, boundary stones and farmhouses and associated barns. Most of these benefit from at least partial screening from field walls, vegetation and, in the cases of farmsteads, modern farm buildings and surrounding trees and shelterbelts.

9.5.35 All listed buildings within 5km of the proposed turbine are listed in **Appendix 9.1**, including those with and without theoretical visibility of the proposed wind turbine.
.

9.6 Archaeological Potential

9.6.1 As stated above, there are no SAMs within 2km of the site. The closest SAM, a wayside cross south of Hartcliff Road, lies 2.25km to the northwest

9.6.2 The Sites and Monuments Register records a number of sites within 1km of the proposed turbine, each of which is also a Grade II listed building.

9.6.3 Three of these are wayside distance markers and two relate to post-mediaeval buildings associated with Underbank Hall. There are no records of postulated sites, find sites or known sites of former structures or archaeological features.

9.6.4 The development footprint is relatively limited, compared to the area of the site. The largest impact will come from the construction of the crane pad, and the excavation for the turbine foundation.

9.7 Potential Construction Effects

9.7.1 No effects are anticipated from construction upon any nationally important designated or non-designated cultural heritage features.

9.7.2 The development is not predicted to have any impact on the settings of any scheduled archaeological sites.

9.7.3 On the basis of the absence of archaeological records from within or adjacent to the site, it is considered that there is, therefore, only limited potential for unknown archaeological remains to survive in the vicinity of the proposed turbine with the potential to be disturbed during construction. If encountered, any unknown archaeological remains are likely to be of mediaeval or post mediaeval date, are likely to be associated with agricultural or industrial activities and are likely to be of local or regional importance.

9.7.4 Due to the limited nature of the footprint of the project, the construction phase is unlikely to cause total loss or major damage to any nationally important remains. The construction of the turbine is considered to have a low potential to cause damage to locally or regionally important remains, if present. Potential effects are considered to be minor.

9.8 Potential Operational Effects

9.8.1 No direct effects on the archaeological resource would result from the operation of the turbine.

Scheduled Ancient Monuments

9.8.2 There would be no significant effects on any Scheduled Ancient Monuments. The only SAMs with direct views of the proposed turbine within 5km are the potentially mediaeval wayside cross at Hartcliff Road, 2.25km to the northwest, and a former Glass Works at Pot House Farm in Stockbridge (identified as being at Bolsterstone in the listing itself), 2.9km to the southeast. Viewpoints 11 and 12 (**Figures 5.23 and 5.24**) reproduce views of the turbine at comparable distances, illustrating how, at this distance, significant screening is afforded by features within the landscape. It is considered that both of these SAMs are sufficiently distant from

the proposed turbine to prevent the proposal from having any adverse effect on the setting of either.

Conservation Areas

9.8.3 There would be no predicted effects in the Hoylandswaine, Thurlstone or Penistone Conservation areas, or on the listed buidings within them; and only limited effects on the Bolsterstone Conservation Area and its listed buildings.

9.8.4 Some potentially significant effects on the Midhopestones Conservation Area are predicted, particularly from the open areas between groups of buildings. Visibility from listed buildings within the Conservation Area will be limited to a varying extent by screening from both other buildings and from trees, particularly in the case of the Church of St James. There are, therefore, not predicted to be any significantly adverse effects on any of the listed buildings at Midhopestones.

Listed Buildings

9.8.5 Of the 188 listed buildings within 5km of the proposed turbine, there would be potential visibility of the turbine from around 57 including those in Conservation Areas. Due to the effects of topography there would be no significant visibility from the significant clusters of listed buildings in and around Penistone and along the River Don, including the important cluster, which also includes two SAMs, around Wortley Top Forge and Low Forge. Similarly, topography screens potential visibility from other clusters of listed buildings along the Little Don at Underbank Hall, Dean Head, the northern part of Midhopestones and Langsett.

9.8.6 Within 2km of the proposed turbine, there is predicted visibility of the proposed turbine from a cluster of listed buildings at Snowden Hill to the east. Viewpoint 2 provides a view of the turbine from a location 1.41km to the south, adjacent to the Underbank Reservoir. This is at a comparable distance from the turbine as Snowden Hill and shows how the turbine would appear as a clear and prominent landscape feature at this distance. In practice, however, a number of large agricultural sheds and surrounding trees around the listed buildings at Snowden Hill provide a significant level of screening, even at this close distance. Potential effects on the listed buildings and their settings within the group are, therefore, not considered to be harmful.

9.8.7 Also within 2km, there would be potential visibility of the turbine from listed buildings within the Midhopestones Conservation Area. In practice, however, the screening effects of existing buildings and trees would significantly reduce predicted impacts on the settings of the listed buildings, particularly from the Little Don Valley. Viewpoint 1 (**Figure 5.3**) reproduces a predicted view of the turbine from an open section of Chapel Lane within the Midhopestones Conservation Area, illustrating how the turbine would be a significant feature on the horizon, but would not be out of proportion with the landscape or the existing electricity infrastructure which shares the ridge. No significant harm on Midhopestones is, therefore, predicted.

9.8.8 There is predicted to be some potential visibility of the proposed turbine from the group of listed buildings at Upper Midhope, principally from the eastern end of the hamlet, which commands an open and extensive view down the Little Don Valley. Viewpoint 3 (**Figure 5.7**) reproduces a predicted view of the turbine from nearby location at a comparable distance which indicates that, at this distance, the turbine

would not be a significant feature in the landscape and would not cause harm to the settings of the listed buildings in the hamlet.

9.8.9 Other listed buildings within 2km of the proposed turbine, which have predicted visibility of the turbine, are relatively limited in number. No significantly adverse impacts are predicted due to the small scale of the proposal, the presence of screening features in the landscape and the relatively open character of the landscape in which the turbine would be located.

9.8.10 Beyond 2km and up to 5km, potential effects would be further reduced, principally by topographical screening but also, again, by the scale of the proposal. The various photomontages illustrate that beyond 3km, the turbine is not a significant landscape feature. Between 2 and 3km, there are a number of significant clusters of listed buildings at Penistone, around Pot House Farm in Stocksbridge and along the Hunshelf Bank. As previously highlighted, there is no predicted visibility from Penistone, only limited visibility from the other locations, due to the screening effects of trees and other buildings, particularly in Stocksbridge.

9.9 Mitigation

9.9.1 No recorded historic features will be directly affected by the construction of the development.

9.9.2 A watching brief will be carried out during construction, where significant groundworks are expected.

9.9.3 It is anticipated that the extent and scope of the proposed archaeological recording programme will be agreed with Barnsley Borough Council before construction commences, and implemented in response to an appropriate planning condition.

9.10 Conclusions

9.10.1 No direct effects are anticipated upon archaeological features within the site, although some measures are proposed to ensure that the potential for buried remains to be encountered is addressed.

9.10.2 No harmful effects on the settings of any scheduled ancient monuments or listed buildings outwith the site are predicted.

9.10.3 Any potential effects upon settings are considered temporary, lasting only for the consented life of the turbine, and are fully reversible upon decommissioning.

10 Traffic and Transport

10.1.1 This chapter describes the proposed delivery route for turbine components and estimates the likely volume of traffic associated with construction.

10.2 Proposed Delivery Route

10.2.1 The proposed delivery route for abnormal loads is as follows:

- it is intended that the turbine will be landed at Hull (or another port, suitably connected to the trunk road system);
- then transported via the trunk road and motorway network to M1 junction 37;
- then west along the A628 towards Penistone;
- then south east along the A629;
- then south along Bower Lane through Oxspring, turning right along Sheffield Road, then left down Roughbirchwood / Back Lane;
- then right along Cranberry Rd and left into the site entrance.

10.2.2 The proposed delivery route for other construction traffic (concrete etc.) is as follows:

- exit M1 at junction 36;
- then travel west along the A616 towards Stocksbridge and Manchester;
- then turn right and travel east along the A628 towards Penistone;
- then turn right along Hartcliff Road;
- then continue along Cranberry Rd and right into site entrance.

10.2.3 Both routes are shown below in **Figure 10.1** , included below.

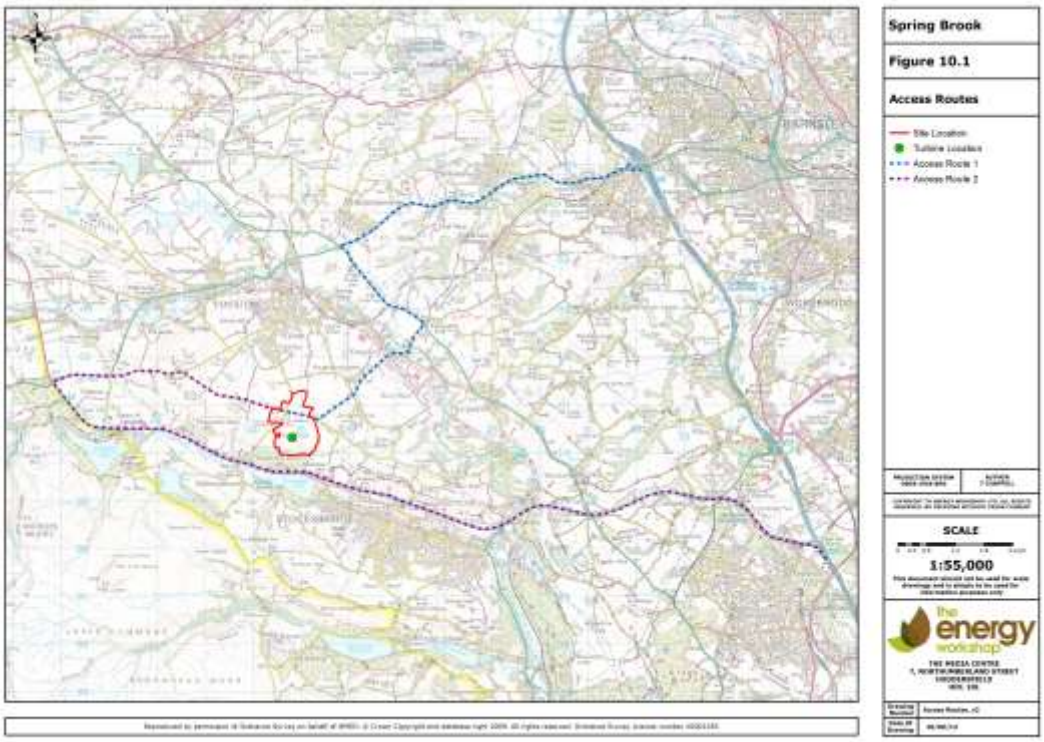


Figure 10.1 - Transport Access Routes

10.2.4 An assessment of potential delivery routes for the abnormal loads (turbine components and crane) was undertaken by a transport engineer from the manufacturer of the candidate turbine, EWT, on 18th February 2013.

10.2.5 The aim of this assessment was to identify a preferred route for transporting the abnormal loads that is technically feasible (without the need for major road works) while minimising potential disruption by avoiding settlements as far as possible.

10.2.6 Alternative routes were driven and potential pinch points, where either the road gradient or physical dimensions may prove impassable, were identified. Physical measurements were then taken to confirm whether either of these factors would prevent transport of key components.

10.2.7 Access Route 2 was initially identified as being the preferred route, however the road gradient at Hartcliff Hill was subsequently assessed as being impassable without special measures.

10.2.8 Potential pinch points along Access Route 1 were measured and found to be navigable. This was therefore confirmed as the preferred route for abnormal loads, with other construction traffic being routed along Access Route 2 in order to keep traffic movements through settlements to a minimum.

10.2.9 Temporary removal of street furniture may be required in places. It is proposed that, in the event planning permission is granted, a planning condition would require that a detailed Traffic Management Plan be submitted to and agreed in writing by the planning authority. This shall include details of the final access

route, road upgrading works, and any other works required to allow safe passage of the abnormal loads.

10.2.10 Concerns have been raised in consultation with Oxspring Parish Council in respect of potential road damage as a result of traffic movements. In order to address these concerns, it is proposed that a pre-construction condition assessment of the public roads to be used to access the site be carried out to the written satisfaction of the planning authority. Within one month of the completion of the development, a post construction condition assessment of the public roads which were used to access the site shall be clearly carried out and remedial works to repair any damage caused shall be clearly identified, including a timescale for its implementation. The works identified shall thereafter be carried out in full within the timescale thereby agreed.

10.3 Traffic Volumes

10.3.1 The main demand for road access will occur during the construction period when the workforce is at its peak and when equipment and materials, mainly stone and concrete, need to be delivered to the site. When the wind turbine is operational, the movements to and from the site will be negligible.

10.3.2 The wind turbine and associated works will be delivered as shown in **Table 10.1** below.

Component	Requirement	Further Info	Vehicle Movements	
			Single	Including Return
Plant and Equipment		General plant and equipment required to construct the turbine including a single digger and earth mover. Total of two deliveries assumed	2	4
Crane		A 400 - 500T telescopic crane is required for erection, with support loads and additional telescopic trailing crane.	5	10
New Access Track (700m required)	Stone (1.8T/m3 x 20T/HGV)	700m length x 4.5m width x 0.45m thickness = 1,418m3. With 10% contingency = 1,559m3 or 2,807T	140	280

	Geogrid (10 rolls/HGV)	Assuming geogrid is supplied in 50m x 5m rolls, for 700m, 14 rolls required	2	4
Hard Standing	Stone	35m x 32m x 0.45m x 2 =1,008m3 or 1,814T	91	182
	Geo-Grid	Area=1,600m2 250m2 per roll 1,600/250=7 rolls	1 (in addition to access track deliveries)	2 (in addition to access track deliveries)
Electrical Control Building	Foundation concrete (8m3/HGV)	The substation foundation dimension 5m x 10m (depth 0.4m) would require 20m3 concrete.	3	6
	Building	Estimate	10	20
Cable Trenches	Cable (500m a drum, 8 drums/HGV)	Approx 50m of cable trench between turbine and substation. 3 Phase so 150m	1	2
	Backfill sand (1.6T/m3. 20T/HGV)	50m x 0.45m x 0.25m = 5.6m3 or 9T	1	2
Foundation	Concrete (8m3/HGV)	Approx. 215m3 per foundation required	54	108
	Rebar and foundation embedments (20T/HGV)	The embedments bolt the turbine to the foundation and with the foundation rebar have a mass of appox. 30T	3	6
Soil Arisings (20T/HGV)		Assuming foundation of dimensions as shown in **Figure 2.2**, approx. 830m3 soil will be removed. Assuming wet soil density (2T/m3) = 1,660T. Top soil will	42	84

		be used in site restoration / farm use and a quantity of subsoil will be used for back fill. It is assumed that approx. half of what is excavated may require to be removed from site i.e. 830T		
Turbine Components	Tower Anchor	Single piece transported by HGV	1	2
	Generator	Single piece transported by HGV	1	2
	Nacelle & Hub	Tranported in small parts by single HGV	1	2
	Tower Sections	Two tower sections	2	4
	Fitting tools, rotor stand and lifting plate		1	2
Total			363	726

Table 10.1 - Traffic Volume

10.3.3 The typical construction programme is expected to take a total of 6 months. As can be seen from the above, deliveries are spaced throughout the period peaking in the second month. The highest level of traffic would be for the day on which the foundation would be cast in a single pour. This would require 54 HGV deliveries on each of these days, totalling 108 movements per day.

	ACTIVITY	TOTAL MOVEMENTS	PROGRAMME MONTH					
			1	2	3	4	5	6
Mobilisation	Delivery/Removal of plant, equipment and main crane	8	4					4
Site Access and Infrastructure	Construction of site access tracks and hardstanding areas	468	176	176	116			
	Construction of electrical control building	26			8	9	9	
	Trench excavation and cable laying	4				2	2	
Construction of Turbine Foundations	Excavation of foundations	0						
	Rebar and embedments installation	6			6			
	Concrete pouring	108				108		
	Concrete Curing							
Turbine Erection	Delivery and erection of turbine	22						22
	Internal electrical works and commissioning							
Site Restoration	Reinstatement of soils and disposal of excess	84						84
	Seeding of reinstated areas (as required)							
	Site access restoration (as required)							
TOTAL		726	92	88	72	119	11	110

Table 10.2 - Monthly Traffic Volumes

10.3.4 It is proposed that the movement of turbine components (primarily the turbine components) is restricted, wherever possible, to off-peak weekdays (10:00-15:00).

10.3.5 All abnormal sized wind turbine component vehicles will be capable of manual and automatic independent rear wheel steering, to allow for increased manoeuvrability if required.

10.3.6 The larger components and cranes will be delivered under escort to the site, possibly in convoy. It is envisaged that the escort will be provided by the haulage contractor, rather that the local police. The local police force will be notified of the movement of large wind turbine transporter vehicles prior to the event and their consent obtained. Local residents will also be notified.

10.3.7 The decommissioning of the turbine at the end of its life will follow a reversed construction process.

11 Noise Assessment

11.1.1 This chapter has been completed by The Energy Workshop Ltd.

11.1.2 **Appendix 11.1** contains the full assessment undertaken using specialist wind turbine noise software WindPro Decibel for quantifying and addressing noise from wind turbines.

11.1.3 The significant distance to dwellings and resulting desk top survey identified that noise would not affect the amenity of those closest to the proposed wind turbine. The assessments have been informed using measured background noise obtained in 2007 for the purposes of assessing the previous Sheephouse Heights proposal.

11.2 Policy, Legislation and Guidance

11.2.1 The following guidance, legislation and information sources have been considered in carrying out this assessment:

- Barnsley Core Strategy, September 2011;
- "ETSU-R-97: The Assessment and Rating of Noise from Wind Farms";

Barnsley Core Strategy

11.2.2 Barnsley Core Strategy Policy 40 requires development proposals to demonstrate that they are not likely to result directly or indirectly in an increase in various forms of pollution, including noise. The Council's screening opinion highlighted the potential for noise disturbance due to the proximity of residential properties.

ETSU-R-97

11.2.3 ETSU-R-97 provides a framework for the assessment and rating of noise from wind energy developments. It has become the accepted standard for wind farm developments in the UK, and the methodology has therefore been adopted for the present assessment.

11.2.4 ETSU-R-97 recommends the application of noise limits at the nearest noise-sensitive properties, to protect outside amenity and prevent sleep disturbance inside dwellings. It proposes that site-specific noise criteria are adopted based on the background noise. Noise from wind turbines and background noise both typically vary with wind speed. According to ETSU-R-97, wind farm noise assessments should therefore consider the site-specific relationship between wind speed and background noise, along with the particular noise emission characteristics of the proposed wind turbines. The noise limits defined in ETSU-R-97 relate to the total, cumulative effect of all noise from all wind turbines that may affect a particular property.

11.3 Prediction and Assessment of Wind Turbine Noise

11.3.1 ISO 9613-2[19] provides method in calculating the levels of wind turbine noise at receptor locations ("immission levels"), with the following specific measures:

- the turbine sound power levels should be stated, and whether these are measured levels, measured levels with an allowance for measurement uncertainty, warranted levels or generic level;
- the atmospheric conditions assumed should be stated, with 10°C and 70% Relative Humidity preferred;
- the ground factor assumed should be either:
  - G=0 (hard ground), together with measured sound power levels; or
  - G=0.5 (mixed ground), together with manufacturer's warranted sound power levels, or measured sound power levels plus an allowance for measurement uncertainty and a receiver height of 4.0m;
- barrier attenuation should not be included; and
- the predicted noise levels (LAeq,t) may be converted to the required LA90,10min by subtracting 2 dB.

11.3.2 The above procedure has been followed in the prediction of noise levels, with manufacturer's warranted sound power levels employed and a ground factor of G=0.5.

11.4 Noise Limits

11.4.1 ETSU-R-97 specifies the adoption of a limit of 5 dB(A) above the prevailing wind varying background noise level, modified by the use of fixed lower limits where background noise levels are low.

11.4.2 Separate noise limits apply for quiet day-time and night time, as outlined below.

11.4.3 Quiet daytime is defined in ETSU-R-97 as 18:00 – 23:00 every day, as well as 13:00 – 18:00 on Saturdays and 07:00 – 18:00 on Sundays. During these periods, the guidance prioritises the protection of outdoor amenity for residents, by applying noise limits that would not significantly affect the enjoyment of outdoor areas such as gardens.

11.4.4 In addition to the limit of 5 dB(A) above background, an allowance is included for a fixed limit to be applied at wind speeds or locations where background noise levels are low. Where the quiet daytime background noise level is less than 30-35 dB(A), 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 level.

[19] ISO 9613-2 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of Calculation".

11.4.5 The actual value chosen for the fixed lower limit within the 35-40 dB(A) range should depend upon the number of dwellings affected, the effect of noise limits upon the amount of energy generated and the duration and levels of exposure.

11.4.6 As a conservative approach, a fixed lower limit of 35 dB(A) has been adopted for this assessment.

11.4.7 Different standards apply at night, where sleep disturbance is the primary concern rather than the requirement to protect outdoor amenity[20]. Night-time is considered to be all periods between 23:00 and 07:00. A limit of 43 dB(A) is recommended for night-time at wind speeds or locations where the background noise level is less than 38 dB(A). Where background noise levels exceed 38 dB(A) the limit is set to 5dB(A) above the background noise level.

11.4.8 There is also provision for an increase in the fixed lower limit value where the occupier of the property has a financial interest in the proposed wind farm. 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.

11.4.9 As ETSU-R-97 specifies that the limits applied to a particular property relate to the cumulative effect of noise from all wind turbines, the increased limit for financial involvement has been applied to these properties in assessing the combined noise levels from the proposed development along with those from the other consented and operational wind turbines.

11.5 Baseline Conditions

11.5.1 The baseline data has been sourced from the Sheephouse Heights Wind Farm application. Due to the rural location and little development in the area, the background levels are unlikely to have changed.

11.5.2 The worst case scenario has been taken for all noise sensitive properties by assuming that the turbine is upwind of each calculation point. This will provide the highest noise levels.

11.5.3 Background noise levels were measured in 2007 at houses surrounding the site. Where there is no measured data for a dwelling, the worst case scenario has been assumed by using the quietest recorded data.

11.6 Assessment

11.6.1 The candidate turbine for the purpose of this assessment is the EWT DW54. **Table 11.1** shows the warranted levels provided by EWT, plus the tonal penalty found at 5m/s.

[20] Note that the limits apply to external noise levels, and have been chosen to prevent sleep disturbance indoors, assuming that bedroom windows are open.

10m Wind Speed (m/s)	Sound Power Level (Lwa dB(A))
5	97.0 (+2.5)
6	98.0
7	99.0
8	100.0
9	100.5
10	100.5

Table 11.1 - EWT DW54 Warranted Noise Emission Data

11.6.2 In practice, the choice of turbine for use on the site will be the subject of a tendering process, and therefore the type used may differ from that assessed in this report.

Sheephouse Farm

11.6.3 **Table 11.2** presents the noise limits, predicted noise levels and margins between the prediction and limits for the financially involved receptor at Sheephouse Farm. A negative margin indicates that the predicted noise level is lower than the limit.

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	32.9	34.9	37.5	40.6	43.9	47.1	49.8	51.3	50.9
Night-time	28.6	31.1	34.1	37.5	41.2	44.8	48.3	51.3	53.8
Noise Limits									
Daytime	45.0	45.0	45.0	45.6	48.9	52.1	54.8	56.3	55.9
Night-time	45.0	45.0	45.0	45.0	46.2	49.8	53.3	56.3	58.8
Predicted Overall Noise Level									
Sheephouse Farm	36.9	37.9	36.4	37.4	38.4	38.9	38.9	38.9	38.9
Daytime Margins									
Sheephouse Farm	-8.1	-7.1	-8.6	-8.2	-10.5	-13.2	-15.9	-17.4	-17.0
Night-time Margins									
Sheephouse Farm	-8.1	-7.1	-8.6	-7.6	-7.8	-10.9	-14.4	-17.4	-19.9

Table 11.2 - Operational Noise Assessment- Sheephouse Farm

Throstle Nest

11.6.4

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	32.5	34.1	36.1	38.6	41.4	44.1	46.5	48.2	48.6
Night-time	25.8	28.3	31.3	34.5	37.9	41.2	44.4	47.2	49.6
Noise Limits									
Daytime	37.5	39.1	41.1	43.6	46.4	49.1	51.5	53.2	53.6
Night-time	43.0	43.0	43.0	43.0	43.0	46.2	49.4	52.2	54.6
Predicted Overall Noise Level									
Throstle Nest	30.4	31.4	29.9	30.9	31.9	32.4	32.4	32.4	32.4
Daytime Margins									
Throstle Nest	-7.1	-7.7	-11.2	-12.7	-14.5	-16.7	-19.1	-20.8	-21.2
Night-time Margins									
Throstle Nest	-12.6	-11.6	-13.1	-12.1	-11.1	-13.8	-17.0	-21.8	-22.2

11.6.6 Table 11.3 presents the noise limits, predicted noise levels and margins between the prediction and limits for the receptor at Throstle Nest.

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	32.5	34.1	36.1	38.6	41.4	44.1	46.5	48.2	48.6
Night-time	25.8	28.3	31.3	34.5	37.9	41.2	44.4	47.2	49.6
Noise Limits									
Daytime	37.5	39.1	41.1	43.6	46.4	49.1	51.5	53.2	53.6
Night-time	43.0	43.0	43.0	43.0	43.0	46.2	49.4	52.2	54.6
Predicted Overall Noise Level									
Throstle Nest	30.4	31.4	29.9	30.9	31.9	32.4	32.4	32.4	32.4
Daytime Margins									
Throstle Nest	-7.1	-7.7	-11.2	-12.7	-14.5	-16.7	-19.1	-20.8	-21.2
Night-time Margins									
Throstle Nest	-12.6	-11.6	-13.1	-12.1	-11.1	-13.8	-17.0	-21.8	-22.2

Table 11.3 - Operational Noise Assessment- Throstle Nest

Dyson Cote

11.6.7

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	36.2	37.0	37.8	38.6	39.4	40.3	41.4	41.9	42.7
Night-time	28.8	29.6	30.9	32.9	35.3	38.3	41.5	44.5	47.1
Noise Limits									
Daytime	41.2	42.0	42.8	43.6	44.4	45.3	46.1	46.9	47.7
Night-time	43.0	43.0	43.0	43.0	43.0	43.3	46.5	49.5	52.1
Predicted Overall Noise Level									
Dyson Cote	23.8	24.8	23.3	24.3	25.3	25.8	25.8	25.8	25.8
Daytime Margins									
Dyson Cote	-17.4	-17.2	-19.5	-19.3	-19.1	-19.5	-20.3	-21.1	-21.9
Night-time Margins									
Dyson Cote	-19.2	-18.2	-19.7	-18.7	-17.7	-17.5	-20.7	-23.7	-26.3

11.6.9 Table 11.4 presents the noise limits, predicted noise levels and margins between the prediction and limits for the receptor at Dyson Cote.

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	36.2	37.0	37.8	38.6	39.4	40.3	41.4	41.9	42.7
Night-time	28.8	29.6	30.9	32.9	35.3	38.3	41.5	44.5	47.1
Noise Limits									
Daytime	41.2	42.0	42.8	43.6	44.4	45.3	46.1	46.9	47.7
Night-time	43.0	43.0	43.0	43.0	43.0	43.3	46.5	49.5	52.1
Predicted Overall Noise Level									
Dyson Cote	23.8	24.8	23.3	24.3	25.3	25.8	25.8	25.8	25.8
Daytime Margins									
Dyson Cote	-17.4	-17.2	-19.5	-19.3	-19.1	-19.5	-20.3	-21.1	-21.9
Night-time Margins									
Dyson Cote	-19.2	-18.2	-19.7	-18.7	-17.7	-17.5	-20.7	-23.7	-26.3

Table 11.4 - Operational Noise Assessment- Dyson Cote

Underbank

11.6.10

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	37.2	38.7	40.1	41.5	42.9	44.3	45.7	47.2	48.6
Night-time	29.9	31.4	33.4	35.6	38.1	40.6	43.0	45.2	47.2
Noise Limits									
Daytime	42.2	43.7	45.1	46.5	47.9	49.3	50.7	52.2	53.6
Night-time	43.0	43.0	43.0	43.0	43.1	45.6	48.0	50.2	52.2
Predicted Overall Noise Level									
Underbank	24.3	25.3	23.8	24.8	25.8	26.3	26.3	26.3	26.3
Daytime Margins									
Underbank	-17.9	-18.4	-21.3	-21.7	-22.1	-23.0	-24.4	-25.9	-27.3
Night-time Margins									
Underbank	-18.7	-17.7	-19.2	-18.2	-17.3	-19.3	-21.7	-23.9	-25.9

11.6.12 Table 11.5 presents the noise limits, predicted noise levels and margins between the prediction and limits for the receptor at Underbank.

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	37.2	38.7	40.1	41.5	42.9	44.3	45.7	47.2	48.6
Night-time	29.9	31.4	33.4	35.6	38.1	40.6	43.0	45.2	47.2
Noise Limits									
Daytime	42.2	43.7	45.1	46.5	47.9	49.3	50.7	52.2	53.6
Night-time	43.0	43.0	43.0	43.0	43.1	45.6	48.0	50.2	52.2
Predicted Overall Noise Level									
Underbank	24.3	25.3	23.8	24.8	25.8	26.3	26.3	26.3	26.3
Daytime Margins									
Underbank	-17.9	-18.4	-21.3	-21.7	-22.1	-23.0	-24.4	-25.9	-27.3
Night-time Margins									
Underbank	-18.7	-17.7	-19.2	-18.2	-17.3	-19.3	-21.7	-23.9	-25.9

Table 11.5 - Operational Noise Assessment- Underbank

Cranberry

11.6.13 Noise data was not collected at Cranberry House. To ensure the property is appropriately assessed, the lowest recorded noise data recorded has been used (this data was collected at Judd Field Farm).

11.6.14

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	29.8	31.5	33.3	35.4	37.5	39.7	41.9	44.0	46.0
Night-time	23.6	25.2	27.3	29.9	32.8	36.0	39.1	41.8	43.8
Noise Limits									
Daytime	35.0	36.5	38.3	40.4	42.5	44.7	46.9	49.0	51.0
Night-time	43.0	43.0	43.0	43.0	43.0	43.0	44.1	46.8	48.8
Predicted Overall Noise Level									
Cranberry	31.3	32.3	30.8	31.8	32.8	33.3	33.3	33.3	33.3
Daytime Margins									
Cranberry	-3.7	-4.2	-7.5	-8.6	-9.7	-11.4	-13.6	-15.7	-17.7
Night-time Margins									
Cranberry	-11.7	-10.7	-12.2	-11.2	-10.2	-9.7	-10.8	-13.5	-15.5

11.6.16 Table 11.6 presents the noise limits, predicted noise levels and margins between the prediction and limits for the receptor at Cranberry.

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	29.8	31.5	33.3	35.4	37.5	39.7	41.9	44.0	46.0
Night-time	23.6	25.2	27.3	29.9	32.8	36.0	39.1	41.8	43.8
Noise Limits									
Daytime	35.0	36.5	38.3	40.4	42.5	44.7	46.9	49.0	51.0
Night-time	43.0	43.0	43.0	43.0	43.0	43.0	44.1	46.8	48.8
Predicted Overall Noise Level									
Cranberry	31.3	32.3	30.8	31.8	32.8	33.3	33.3	33.3	33.3
Daytime Margins									
Cranberry	-3.7	-4.2	-7.5	-8.6	-9.7	-11.4	-13.6	-15.7	-17.7
Night-time Margins									
Cranberry	-11.7	-10.7	-12.2	-11.2	-10.2	-9.7	-10.8	-13.5	-15.5

Table 11.6 - Operational Noise Assessment- Cranberry

Sheephouse B

11.6.17

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	32.9	34.9	37.5	40.6	43.9	47.1	49.8	51.3	50.9
Night-time	28.6	31.1	34.1	37.5	41.2	44.8	48.3	51.3	53.8
Noise Limits									
Daytime	37.9	39.9	42.5	45.6	48.9	52.1	54.8	56.3	55.9
Night-time	43.0	43.0	43.0	43.0	46.2	49.8	53.3	56.3	58.8
Predicted Overall Noise Level									
Sheephouse B	34.2	35.2	33.7	34.7	35.7	36.2	36.2	36.2	36.2
Daytime Margins									
Sheephouse B	-3.7	-4.7	-8.8	-10.9	-13.2	-15.9	-18.6	-20.1	-19.7
Night-time Margins									
Sheephouse B	-8.8	-7.8	-9.3	-8.3	-10.5	-13.6	-17.1	-20.1	-22.6

11.6.19 Table 11.7 presents the noise limits, predicted noise levels and margins between the prediction and limits for the receptor at Sheephouse B.

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	32.9	34.9	37.5	40.6	43.9	47.1	49.8	51.3	50.9
Night-time	28.6	31.1	34.1	37.5	41.2	44.8	48.3	51.3	53.8
Noise Limits									
Daytime	37.9	39.9	42.5	45.6	48.9	52.1	54.8	56.3	55.9
Night-time	43.0	43.0	43.0	43.0	46.2	49.8	53.3	56.3	58.8
Predicted Overall Noise Level									
Sheephouse B	34.2	35.2	33.7	34.7	35.7	36.2	36.2	36.2	36.2
Daytime Margins									
Sheephouse B	-3.7	-4.7	-8.8	-10.9	-13.2	-15.9	-18.6	-20.1	-19.7
Night-time Margins									
Sheephouse B	-8.8	-7.8	-9.3	-8.3	-10.5	-13.6	-17.1	-20.1	-22.6

Table 11.7 - Operational Noise Assessment- Sheephouse B

Sheephouse C & D

11.6.20

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	32.9	34.9	37.5	40.6	43.9	47.1	49.8	51.3	50.9
Night-time	28.6	31.1	34.1	37.5	41.2	44.8	48.3	51.3	53.8
Noise Limits									
Daytime	37.9	39.9	42.5	45.6	48.9	52.1	54.8	56.3	55.9
Night-time	43.0	43.0	43.0	43.0	46.2	49.8	53.3	56.3	58.8
Predicted Overall Noise Level									
Sheephouse C&D	33.6	34.6	33.1	34.1	35.1	35.6	35.6	35.6	35.6
Daytime Margins									
Sheephouse C&D	-4.3	-5.3	-9.4	-11.5	-13.8	-16.5	-19.2	-20.7	-20.3
Night-time Margins									
Sheephouse C&D	-9.4	-8.4	-9.9	-8.9	-11.1	-14.2	-17.7	-20.7	-23.2

11.6.22 Table 11.8 presents the noise limits, predicted noise levels and margins between the prediction and limits for the receptor at Sheephouse C & D.

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	32.9	34.9	37.5	40.6	43.9	47.1	49.8	51.3	50.9
Night-time	28.6	31.1	34.1	37.5	41.2	44.8	48.3	51.3	53.8
Noise Limits									
Daytime	37.9	39.9	42.5	45.6	48.9	52.1	54.8	56.3	55.9
Night-time	43.0	43.0	43.0	43.0	46.2	49.8	53.3	56.3	58.8
Predicted Overall Noise Level									
Sheephouse C&D	33.6	34.6	33.1	34.1	35.1	35.6	35.6	35.6	35.6
Daytime Margins									
Sheephouse C&D	-4.3	-5.3	-9.4	-11.5	-13.8	-16.5	-19.2	-20.7	-20.3
Night-time Margins									
Sheephouse C&D	-9.4	-8.4	-9.9	-8.9	-11.1	-14.2	-17.7	-20.7	-23.2

Table 11.8 - Operational Noise Assessment- Sheephouse C & D

11.6.23 As can be seen in **Table 11.2 to**

	Wind Speed at 10m AGL (m/s)								
	4	5	6	7	8	9	10	11	12
	LA90, 10mins dB(A)								
Recorded Noise Levels									
Daytime	32.9	34.9	37.5	40.6	43.9	47.1	49.8	51.3	50.9
Night-time	28.6	31.1	34.1	37.5	41.2	44.8	48.3	51.3	53.8
Noise Limits									
Daytime	37.9	39.9	42.5	45.6	48.9	52.1	54.8	56.3	55.9
Night-time	43.0	43.0	43.0	43.0	46.2	49.8	53.3	56.3	58.8
Predicted Overall Noise Level									
Sheephouse C&D	33.6	34.6	33.1	34.1	35.1	35.6	35.6	35.6	35.6
Daytime Margins									
Sheephouse C&D	-4.3	-5.3	-9.4	-11.5	-13.8	-16.5	-19.2	-20.7	-20.3
Night-time Margins									
Sheephouse C&D	-9.4	-8.4	-9.9	-8.9	-11.1	-14.2	-17.7	-20.7	-23.2

11.6.25 Table 11.8, the predicted overall noise levels are lower than the limits (shown through the negative margin) and would therefore comply with requirements.

11.7 Summary and Conclusions

11.7.1 An assessment of the operational noise impacts of the proposed Springbrook project has been carried out in accordance with appropriate guidance (ETSU-R-97).

11.7.2 The conclusion of the operational noise assessment is that the noise levels at the nearest properties to the proposed turbine would not exceed the levels identified in ETSU-R-97.

12 Shadow Flicker

12.1 Introduction

12.1.1 Shadow Flicker is a specific phenomenon that only occurs inside buildings where the flicker appears through a narrow window opening. Planning guidance on Shadow Flicker attributable to wind projects is contained within the National Policy Statement for Renewable Energy Infrastructure (EN3) and the Companion Guide to the former Planning Policy Statement 22.

12.1.2 As stated in the National Policy Statement, where turbines have been proposed within 10 diameters of an existing occupied building, a shadow flicker assessment should be undertaken. Where the possibility of shadow flicker exists, mitigation can be utilised through the use of conditions.

12.1.3 For the proposed development, the assessment zone is 540m from the turbine as the EWT DW-54 has a rotor diameter of 54m.

12.1.4 Planning Guidance on Shadow Flicker is contained within PPS22. The relevant paragraph states:-

12.1.5 "Under certain combinations of geographical position and time of day, the sun may pass behind the rotors of a wind turbine and cast a shadow over neighbouring properties. When the blades rotate, the shadow flicks on and off; the effect is known as 'shadow flicker'. It only occurs inside buildings where the flicker appears through a narrow window opening. The seasonal duration of this effect can be calculated from the geometry of the machine and the latitude of the site. Although problems caused by shadow flicker are rare, for sites where existing development may be subject to this problem, applicants for planning permission for wind turbine installations should provide an analysis to quantify the effect. A single window in a single building is likely to be affected for a few minutes at certain times of the day during short periods of the year. The likelihood of this occurring and the duration of such an effect depends upon:

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

12.1.6 Only properties within 130 degrees either side of north, relative to the turbine can be affected at these latitudes in the UK - turbines do not cast long shadows on their southern side.

12.2 Possible Health Effects

12.2.1 The National Society for Epilepsy [21] provides the following information on photosensitive epilepsy (when seizures are triggered by certain frequencies of flashing lights or contrasting light and dark patterns such as stripes or checks).

- Around one in 131 people (0.75%) have epilepsy and of those people, up to one in 20 (5%) have photosensitive epilepsy.
- Between five and 30 cycles/flashes per second (hertz or Hz) are the common frequencies to trigger seizures, but this varies from person to person.
- While some people are sensitive at frequencies higher than 30Hz, it is not common to be sensitive below five hertz.

12.2.2 The Department for Energy & Climate Change (DECC) states that modern wind turbines do not cause flicker at frequencies greater than 1Hz (three blades and rotor speed less than 20 revolutions per minute (rpm)). This is well below the 2.4-3Hz found to be the threshold of concern with regards to sufferers from epilepsy.

12.2.3 In addition, the Companion Guide to English Planning Policy Statement 22: Renewable Energy includes some guidance on this matter. The Companion Guide states:

> *"Around 0.5% of the population is epileptic and of these around 5% are photo-sensitive. Of photosensitive epileptics less than 5% are sensitive to lowest frequencies of 2.5-3Hz, the remainder are sensitive only to higher frequencies. The flicker caused by wind turbines is equal to the blade passing frequency. A fast-moving three-bladed machine will give rise to the highest levels of flicker frequency. These levels are well below 2Hz. The new generation of wind turbines is known to operate at levels below 1Hz."*

12.2.4 The proposed wind turbines will operate at frequencies less than those capable of giving rise to this possible health effect. Flicker frequency is therefore of no substantial concern.

12.3 Methodology

12.3.1 The proposed turbine comprises of blades up to 27m long, giving a rotor diameter of 54m.

12.3.2 The closest distance between a dwelling and the proposed development (Sheephouse A) is approximately 280m.

12.3.3 The analysis was performed using the following assumptions.

- the Assessment Zone is within 540m of a turbine;
- windows have been orientated in the correct direction (measuring 2m by 2m), without any intervening shade or screening;

[21] The National Society for Epilepsy, www.epilepsynse.org.uk

- bright sunny days account for from 41% in the summer to 16% in the winter;
- the worst case of the turbine disc always facing the receptor;
- the turbine blades will be rotating for 85% of the time[22] , e.g. due to insufficient wind or routine maintenance;
- the likely incidence of shadow flicker will be between 14% and 35% (depending on time of year) of the maximum potential. This factor is used to estimate the number of days on which the phenomenon is likely to occur in practice; and
- there is an absence of local shielding features such as trees and buildings (conservative assumption). Terrain shielding, however, is modelled.

12.4 Results

12.4.1 **Table 12.1** shows the calculation area, potential receivers within the study area and the potential shadow flicker experienced. The contour lines (marked in black) show 50 hour intervals from 0 to 300 hours per year. Areas not shaded within the calculation zone do not receive shadows from the turbine.

12.4.2 Detailed calculations of shadow times were carried out for all dwellings within the study area and the results are summarised below in **Table 12.1**.

12.4.3 The results show that there are several potential receivers within the 540m assessment zone. The nearest house, Sheephouse A, falls well outside the umbra, where shadows are most dense, but within the calculated shadow zone. Further assessment on this dwelling, and others within the study area, can be found in section 12.5.

[22] Renewable UK, www.renewableuk.com

Dwelling	Name	Distance from Turbine (m)	Theoretical Days of Shadow Flicker (Days per Year)	Percentage Factor to Convert Theoretical to Realistic	Predicted Actual Days Shadow Flicker (Days per year)	Mean Episode Duration (minutes)	Obscuration of Sun (mean shadow density)	Approx time of Day (GMT)	Theoretical Total (Hours of Episodes per annum)	Corrected Realistic Total (Hours of Episodes per annum)	Time of Year
H1	Sheephouse A* (Financially Involved)	270	63	30.4%	19	36	98%	06:45	38.0	11.6	Mar/Apr; Aug/Sep
H2	Sheephouse B	357	46	29.3%	13	28	73%	07:00	21.3	6.2	Mar; Sep
H3	Sheephouse C & D	386	43	29.3%	13	25	67%	07:00	18.6	5.4	Mar; Sep
H4	Cranberry House (Financially Involved)	490	0	-	0	0	0%	-	0	0	-
H5	Throstle Nest	535	45	14.6%	7	21	49%	15:00	15.9	2.3	Dec/Jan

Table 12.1 - Summary of Results (Theoretical and Practical)

12.5 Detailed Results for Individual Receptors

Sheephouse A

12.5.1 This is situated a distance of 270m from the turbine and is financially involved in the application. The house is located to the West of the turbine, with windows to the rear facing the turbine. Any shadow flicker experienced will be between 06:15 and 07:30. It has been calculated that a theoretical shadow flicker amount of 38 hours per year could be experienced, however a more realistic value taking into account sunlight hours and turbine downtime would be 11.6 hours per year of shadow flicker. This predicted level of shadow flicker is below the 30 hours per year recommended guideline and so residential amenity is assured.

Sheephouse B

12.5.2 This is situated at a distance of 357m from the turbine. The dwelling is roughly north/south facing, therefore not square onto the wind turbine, and so will receive limited shadow flicker effects. The shadow flicker would be experienced in March and September, between 06:30 and 07:30 (although any one occurrence will be significantly shorter than this time frame). It has been calculated that a theoretical total of 21.3 hours per year may be experienced, with the more realistic calculated value to be in the region of 6.2 hours per year. This predicted level of shadow flicker is significantly below the 30 hours per year recommended.

Sheephouse C & D

12.5.3 These dwellings are situated in a converted barn at a distance of 386m to the proposed turbine. Similar to Sheephosue B, these dwellings are relatively north/south facing and will therefore experience limited shadow flicker effects (as the turbine is located to the west). Any shadow flicker experienced will be between 06:30 and 07:30 (although any single occurrence of shadow flicker will be significantly shorter than this time frame) and will occur in March and September. It has been calculated that a theoretical shadow flicker amount of 18.6 hours per year could be experienced, however a more realistic value taking into account sunlight hours and turbine downtime would be 5.4 hours per year of shadow flicker. This predicted level of shadow flicker is below the 30 hours per year recommended guideline.

Cranberry House

12.5.4 The dwelling at Cranberry is within the study area, although it is outside of any area of shadow flicker.

Throstle Nest

12.5.5 This is situated on the border of the study area at 535m from the proposed turbine. The shadow flicker would be experienced in December and January, between 14:30 and 15:30 (although any one occurrence will be significantly shorter than this time frame). It has been calculated that a theoretical total of 15.9 hours per year may be experienced, with the more realistic calculated value to be in the region of 2.3 hours per year. This predicted level of shadow flicker is significantly below the 30 hours per year recommended.

12.6 Conclusions

12.6.1 A shadow flicker assessment was undertaken based on a 540m Assessment Zone, demonstrating that several receptor locations may be exposed to weak shadow flicker resulting in potential impacts of low significance. Mitigation is unlikely to be required.

12.6.2 If complaints concerning shadow flicker were to arise and be shown to be a problem, mitigation measures could be implemented, including programming the turbine to switch off at times when shadow flicker may occur.

12.6.3 The frequency of any shadow flicker from the proposed turbine is outside of the range which is said to affect epileptics. No adverse health effects from shadow flicker are therefore predicted. Reflected light (flashing) from the wind turbine is not considered to be a significant issue.

13 Telecommunications, Television Reception and Aviation

13.1 Electromagnetic Interference

13.1.1 Wind turbines can cause Electromagnetic Interference (EMI) in two principal ways:

- Physical Interference: a scattering of signals leading to "ghosting" on TV screens.
- Electrical interference: can impact on communication equipment.

13.2 Microwave Links

13.2.1 Consultation was undertaken with providers and regulators of radiocommunication links to ensure the wind turbine would not compromise existing infrastructure.

13.2.2 Ofcom (the industry regulator) was consulted in January 2012 with regards to radiocommunication interference. They identified a number of telecommunication links within the vicinity that could potentially be affected.

13.2.3 Each of the telecommunication operators were consulted in respect of the links identified Ofcom. The outcome of these consultations is summarised below and consultation responses themselves are included at **Appendices 12.1 – 12.6**.

Operator	Response Date	Distance to turbine	Comments
BT	24 Sept 2012		No objection
Arquiva	9 Oct 2012		No objection
MII	24 Sep 2012	~850m	No objection
Atkins	24 Sep 2012		No objection
JRC	26 Oct 2012; 14 Nov 2012	~200m	No objection

Table 13.1 -- Summary of Responses

13.2.4 The location of the wind turbine proposed at Spring Brook does not have any impact upon known microwave links either crossing the site or in the vicinity of its location.

13.3 Television Interference

13.3.1 Analogue television (TV) signals may be affected by signal reflections, which can give rise to delayed image interference, known as "ghosting", where pale shadows appear next to the main picture on viewers' screens.

13.3.2 Digital TV signals are generally much better than analogue signals at dealing with reflections and digital TV pictures do not suffer from ghosting. The phasing out of analogue transmissions was completed in 2012, therefore no ghosting is predicted to occur as a result of the development.

13.3.3 While Digital TV signals are much better than analogue signals at dealing with reflections, these may sometimes occur in areas where the signals are weak. This postcode is predicted to receive a good terrestrial TV signal from the Emley Moor mast in the Yorkshire TV Region. No signal reflection interference is therefore predicted to occur.

13.3.4 Satellite TV reception is not generally affected by new structures, as satellite signals are received from a much higher elevation. Due to the way in which the signals are received, switching to digital satellite reception may be a mitigating solution in cases where terrestrial reception is blocked by a new development.

13.3.5 The extent of any effect on TV interference would only become apparent following the commissioning of the wind farm. In the event there was any impairment to viewing quality, this could be improved through a combination of the following:

- replace the existing aerials;
- re-tune the TV receivers;
- provide satellite TV; or
- provide a bespoke solution, such as a new low-powered transmitter, a cable network, a satellite receiver or a combination of these measures.

13.3.6 The switchover from analogue to digital TV signal has already been completed in the Barnsley area, therefore, the impact on analogue TV reception is considered to be of no significance.

13.3.7 The proposed scheme has the potential to affect TV reception. Following assessment and consultation, these potential impacts are considered to be of low significance. However, TEW would accept suitable planning condition(s) to resolve any issues with affected services and adopt appropriate mitigation where required.

13.4 Aviation Issues

13.4.1 Aeronautical issues are key to the development of wind turbines. The MOD, CAA and NATS were consulted with regards to the previous Sheephouse Heights proposal.

Consultee	Response to Previous Application	Comments
MoD	No objection	No concerns. If planning permission is granted inform DE of: the date construction starts and ends; the maximum height of construction equipment; if the turbines will be lit; and the latitude and longitude of every turbine.
CAA	No objection	No observations. May need to install aviation obstruction lighting if other elements of the aviation industry e.g. MoD or a local aerodrome suggests such a need. Requirement in the UK for all structures over 60 metres high to be charted on aviation maps.
Robin Hood Airport and Sheffield City Airport	No objection	Development unlikely to affect operations at Robin Hood Airport Doncaster Sheffield and Sheffield City Airport.
NATS	No objection	Only comment on full, formal planning applications. No objection raised to previous, much larger proposal.

Table 13.2 - Summary of responses to previous Sheephouse Heights proposal

13.4.2 No objections were received to the previous Sheephouse Height application. Since both the number and size of turbine proposed is greatly reduced, no impacts on aviation are therefore predicted.

14 Utilities

14.1 Consultation

14.1.1 Linesearch is a web based service that allows developers to search for utility infrastructure within a given radius. A Linesearch enquiry was undertaken on 23 May 2013 and identified National Grid as the only operator amongst their members with infrastructure within 750m of the turbine location (an area encompassing all of the proposed works).

- BOC Limited (A Member of the Linde Group)
- BPA
- Centrica Energy
- ConocoPhillips UK Ltd
- Coryton Energy Co Ltd (Gas Pipeline)
- E-on UK Plc (Gas Pipelines Only)
- ESSAR
- Esso Petroleum Company Limited
- FibreSpeed Limited
- Geo Networks Limited
- Government Pipelines & Storage System
- HV Cables
- INEOS Manufacturing (Scotland and TSEP)
- Ineos Enterprises Limited
- LinesearchbeforeUdig Asset Owners
- Mainline Pipelines Limited
- Manchester Jetline Limited
- Marchwood Power Ltd (Gas Pipeline)
- NPower CHP Pipelines
- National Grid Gas and Electricity Transmission
- Oikos Storage Limited
- Perenco UK Limited (Purbeck Southampton Pipeline)
- Phillips 66
- Premier Transmission Ltd (SNIP)
- RWEnpower (Little Barford and South Haven)
- SABIC UK Petrochemicals
- Scottish Power Generation
- Shell Pipelines
- Star Energy

- Total UK (Finaline, Colnbrook & Colwick Pipelines)
- Wingas Storage UK Ltd

14.1.2 National Grid has high voltage power lines cross the site from east to west. These were identified early on and have been taken account of in siting the turbine by application of National Grid's Electricity Transmission Overhead Lines – Guidance, which states that "For proposed windfarms the separation distance between a turbine and overhead line shall generally be no less than three times the diameter of the turbine blade," [23] in this case 162m as shown in **Figure 4.1**.

14.1.3 The turbine is located some 270m from National Grid's overhead line.

14.2 Conclusion

14.2.1 No adverse impact on the infrastructure of utility operators is anticipated.

[23] *www.nationalgrid.com/NR/.../02APTElectricityOHLGuidanceV13.doc*

15 Socio-economic Impacts

15.1.1 This chapter was prepared by The Energy Workshop (TEW) and considers the social and economic impacts of the proposed development against evidence from a range of studies and sources. It also reviews any health and safety implications of the development.

15.2 Public attitudes to wind energy developments

15.2.1 A number of surveys have been carried out to canvas opinion from the public regarding wind farms. A MORI report commissioned by the Scottish Executive to survey the opinions of people living within 20km of ten Scottish wind farms, of between nine and 46 turbines. The conclusions were as follows:

- people living nearest to the wind farm are most positive (44% living within 5km say it has a positive effect, compared to 16% living 10-20km);
- 20% felt the wind farm had a broadly positive effect on the area (7% negative and 73% neither positive nor negative, or had no opinion);
- only 0.3% believed a wind farm was a shortcoming of the area (lack of amenities and poor public transport were the most popular); and
- 82% of people living within 20km of a wind farm supported an increase in the proportion of electricity generated in Scotland through the use of wind power over the coming 15 years, while just 2% felt there should be a reduction.
- In July 2003, a poll carried out amongst over 2,500 utility bill payers found that 74% were in favour of the Government's ambition to generate 20% of the UK's electricity from renewable sources by 2020 and of increasing the use of wind power throughout the UK .

15.2.2 In July 2006, the Wind Tracker survey of public opinion to wind energy in the UK revealed the following:

- 76% agreed wind farms are necessary to help meet current and future energy needs;
- 60% think the appearance of a wind farm is unimportant as wind power is necessary;
- 56% would be happy to have a wind farm in their local area (21% had no strong view); and
- 52% disagreed that wind farms are ugly or would be a blot on the landscape (21% had no strong view).

15.2.3 In March 2007, a study was carried out into UK attitudes to energy efficiency and alternative energy sources . It revealed the following:

- wind power is the source of energy that would be best for society (19.9% of consumers, second was solar at 17.9% and third most popular was nuclear at 10.5%);
- consumers perceived wind farms as a good solution to benefit the environment (18% thoughts wind farms were aesthetically pleasing versus 6.4% who viewed wind farms as an eyesore);

- 70.1% of respondents stated that they would be happy to have a wind farm located close by (compared with 17.3% who would not);
- 85.9% of respondents who had wind turbines in their local area expressed positive feedback (only 5.3% were opposed).

15.2.4 YouGov, on behalf of the Sunday Times, questioned 1696 members of the public in November 2011 with regard to their attitudes towards the UKs future energy provision. Of those interviewed 56% thought there should be more wind farms, 19% thought there should be less, 15% thought that current levels should be maintained and 9% were not sure. The same sample group were also asked about wind farm subsidies. 60% stated that they thought that it was right to subsidise wind farms to encourage more use of wind power, 26% thought it was wrong and 15% didn't know[24].

15.2.5 In 2010, Cardiff University commissioned IPSOS MORI to undertake a study into the public perceptions of Climate Change and Energy Futures in Britain. The study showed that 82% of people would probably or definitely vote in favour of building new wind farms in Britain with only 12% probably or definitely voting against[25].

15.2.6 An Ipsos Mori poll[26], commissioned by Renewable UK in April 2012, found that 66% of Britons were in favour and only 8% against when they were asked: "To what extent are you in favour or, or opposed to the use of wind power in the UK?". The full set of responses are reproduced below and represent a sample size of 1009 individuals:

- Strongly in favour of (wind power) 28%
- Tend to favour 38%
- Neither favour or oppose 22%
- Tend to oppose 5%
- Strongly opposed to 3%
- Don't know 4%

15.2.7 Another YouGov poll, commissioned by Scottish Renewables again in April 2012 asked 1041 Scottish adults to respond to the statement "I support the continuing development of wind power as part of a mix of renewable and conventional forms of electricity generation". The responses are listed below:

- Strongly agree 39%
- Tend to agree 33%
- Neither agree or disagree 11%

---

[24]http://cdn.yougov.com/cumulus_uploads/document/gm4jg0973n/Sunday%20Times%20Results%20111125%20VI%20and%20Trackers.pdf

[25] Spence, A., Venables, D., Pidgeon, N., Poortinga, W. and Demski, C. (2010). Public Perceptions of Climate Change and Energy Futures in Britain: Summary Findings of a Survey Conducted in January-March 2010. Technical Report (Understanding Risk Working Paper 10-01). Cardiff: School of Psychology.**and Christina Demski***

[26]http://www.ipsos-mori.com/Assets/Docs/Polls/renewable-uk-wind-power-topline-april.pdf

- Tend to disagree 8%
- Strongly disagree 7%
- Don't know 3%

15.2.8 The Department of Energy and Climate Change (DECC) set up a tracking survey in early 2012 to understand and monitor public attitudes to the Department's main business priorities. The survey runs four times a year and consists of one longer, annual survey and three shorter, quarterly surveys which focus on a subset of questions where we think attitudes might shift quickly or be affected by seasonal changes. Public attitudes related to Onshore Wind are shown in **Table 15.1**.

	On-shore wind				
	Wave 1 09/07201 2	Wave 2 18/09/20 12	Wave 3 03/12/2012	Wave 4 05/02/2013	Wave 5 30/04/20 13
Strongly support	26	19	20	21	24
Support	41	47	46	43	44
Neither support nor oppose	20	21	21	22	19
Oppose	7	8	8	10	7
Strongly oppose	5	4	3	4	4
Don't know	1	1	1	1	1
TOTAL SUPPORT	66	66	67	64	68
TOTAL OPPOSE	12	12	12	13	11

Table 15.1 DECC public attitudes survey results

15.2.9 BiGGAR Economics on behalf of RenewableUK and the Department of Energy and Climate Change (DECC), were commissioned to assess the Direct and Indirect Economic impacts of the commercial onshore wind sector in the UK in the decade to 2020. The analysis of the wider economic impacts also considered available evidence on the impact of onshore wind on the tourism sector. The report concluded that "there has been no evidence of actual negative impacts on tourism and recent research by VisitScotland[27] has confirmed earlier research that found that the presence of wind farms had no influence on decision making of the vast

[27] http://www.visitscotland.org/pdf/Revised%20Oct%2012%20%20Insights%20Wind%20Farm%20Topic%20Paper.pdf

majority of tourists." The report estimates that for every MW constructed, £7,500 is spent in the local economy on accommodation and on food and drink.

15.2.10 The 2011 Visit Scotland report analyses attitudes of 2000 visitor respondents specifically from Scotland and from across the UK. When asked whether "Wind farms spoil the look of the UK (Scottish) countryside", the results are shown below:

	UK Sample	Scotland Sample
Strongly disagree	28.2%	27.5%
Slightly disagree	23.9%	24.6%
Neither agree or disagree	29.3%	28.3%
Slightly agree	10.4%	10.6%
Strongly agree	8.3%	9.0%

Table 15.2 - Visit Scotland survey results

15.2.11 UK respondents were asked whether the presence of a wind farm would affect their decision about where to visit or where to stay on a UK holiday or short break: 80% stated their decision would not be affected with 20% claiming that it would be affected

15.2.12 The above attitude and opinion surveys clearly demonstrate that the deployment of wind energy in the UK continues to have strong public support.

15.3 Tourism

15.3.1 The landscape is an important element which contributes to reasons why people visit parts of the BMBC area, but there is no evidence from other parts of the country that the presence of wind farms in open countryside, often with at least local landscape designations, has resulted in harm to the tourist industry of that area.

15.3.2 There are often fears expressed in surveys about what the visual impacts of wind energy developments may be, but those fears have not been translated into loss of visitors once the wind farm is constructed. Since the mid-1990s, claims have been made that wind farms will damage tourism, especially given the reality that almost all sites are in the countryside and rural tourism is now a common element of the local economy, and yet despite the continued development of wind farms across the country, no evidence has come forward of effects in terms of a decline in numbers. Indeed, Cumbria and Cornwall, the English counties with the largest numbers of sites developed to date, have both experienced an increase in visitor numbers in recent years, with the total visitor numbers continuing to rise from the mid-1990s when many of the sites were first developed.

15.3.3 On this basis it is concluded that the operation of the Spring Brook project will not have a significant effect on tourism. Whilst visitors may note its presence, there is

no substantial evidence to indicate that it will affect either visitor numbers or visitor-spend within the area.

15.4 Socio-economic Effects

15.4.1 It is intended that, subject to confirming technical feasibility, the proposed development would provide power for the Darwin family's dairy with the remaining majority being exported to the electricity network for general use in the local vicinity. The milking system is currently powered by diesel generator. Replacing this system with one powered by wind will increase the sustainability of the Darwin's farming operations in both environmental and business terms.

15.4.2 The sale of the excess electricity will provide the Darwin family, who own the site a steady income, diversifying their current agricultural operation, which would support ongoing investment and management of the farm, with subsequent indirect benefits to the local economy.

15.4.3 In terms of wider economic and employment benefits, wind energy is the fastest growing energy sector in the UK, creating jobs with every megawatt (MW) installed. To date, over 4,000 jobs are sustained by companies working in the wind sector, and this is projected to increase as the industry grows. The Energy Workshop, which is as acting as the agent for this application, is a local company based in Huddersfield working exclusively in the wind energy sector. It has increased its staff size from five to ten within the last four years, taking on two graduate employees straight from university – an important contribution at a time when young people are struggling to gain employment.

15.4.4 The construction of the Spring Brook Wind Turbine would create an opportunity for direct economic benefits within the wider BMBC area. Opportunities will be taken to maximise the use of local labour sources and suppliers. Local sourcing of a contractor, materials and labour would provide valuable support and indirect job creation, all of which will provide a positive impact on the local economy.

Construction

15.4.5 Based on current turbine prices, the total capital cost of constructing the Spring Brook project would be around £1.5 million. In general, the groundworks and associated construction would comprise around 25% of the total capital cost, and the applicant would encourage local businesses to tender for the construction works. Therefore, the developer would be tendering locally for contracts worth around £375k.

Operation

15.4.6 Following completion of the project, the on-going servicing and maintenance will create the equivalent of 0.5 full-time job. Maintenance jobs and routine servicing of turbines should be carried out twice a year, with a main service at 12-monthly intervals and a minor service every 6-months.

15.5 Community Benefit

15.5.1 The landowner is keen that local residents also benefit from the project and therefore intends to donate a significant portion of the income, equivalent to

between £5,000 and £10,000 per year (index-linked) for community benefit, for the 30 year lifetime of the project.

15.5.2 It is intended that part of this fund will be used to offer those households closest to the proposal (located within 1.2km) discounted green electricity or a direct contribution towards their electricity bills of £150 per year (a discount of over 25% on the UK average electricity bill of £530 per year)[28].

15.5.3 The remainder of the fund will be made available to local groups and projects on application. The governance, criteria and eligibility for the fund will be determined in consultation with local parish councils.

[28] http://www.ofgem.gov.uk/Media/FactSheets/Documents1/household-bills.pdf

16 SUMMARY AND CONCLUSIONS

16.1.1 The Spring Brook Wind Turbine has been drastically reduced in scale from the previous Sheephouse Heights proposal, which was refused in 2008, and has been proposed at a scale which addresses the reasons for refusal of that scheme.

16.1.2 The Spring Brook Wind Turbine proposal has been carefully considered and assessed to ensure its design and location minimises environmental impacts and impact on local amenity.

16.1.3 UK Government Planning Policy and LDF Core Strategy are supportive of energy schemes as is being proposed at Spring Brook. The proposal has been assessed as being compliant with the requirements of the Core Strategy, having addressed the requisite criteria led policies for such development.

16.1.4 The visualisations illustrate that, although clearly visible and prominent in close views, the wind turbine does not dominate the view, becoming part of the wider view as distance increases from the proposed location. From these locations the wind turbine becomes part of the view as opposed to being a prominent feature within it.

16.1.5 The ecological and hydrological assessments have concluded that no significant impacts to the nature conservation value of the proposed development site or its ecological function are anticipated to occur outwith their immediate zone of effect.

16.1.6 No significant adverse effects on the ornithological interest of the site or the integrity of nearby protected areas are predicted to occur from the proposal.

16.1.7 No significant direct effects have been identified on archaeological features of the site, with measures proposed to ensure potential for unidentified remains be put into place.

16.1.8 The construction period for a wind turbine of six months is considered as a short-term period. The increase in vehicle numbers required in combination with the management of movements over the construction and delivery periods are considered as being of negligible significance.

16.1.9 The noise assessment concludes no impact to local amenity from noise generated by the wind turbine. This is due to the absence of dwellings within close proximity to the wind turbine. The nearest dwelling being located 270m from the nearest wind turbine.

16.1.10 For the same reasons as for noise, shadow flicker has been assessed as not being an issue for this proposal.

16.1.11 The MOD, CAA and NATS confirmed they had no objection to the previously proposed, much larger scheme at this location.

16.1.12 The proposed wind turbine would provide a further and diversified source of income, which would help secure the long-term prospects of Sheephouse Farm.

16.1.13 In addition to this, the site development would bring a limited demand for construction materials and related employment within the local area. Contracts to

the approximate value of £375,000 would be put out to tender. The operational phase will support the equivalent of one part-time job over the 30 years.

16.1.14 A community benefit package of between £5,000 and £10,000 per year, equivalent to £150,000 - £300,000 (in real terms) over the 30 year lifetime of the project, will reduce energy bills for those living closest to the wind turbine and has the potential to provide valuable funding support for local groups and community projects.

16.1.15 The visualisations indicate that the nature of the proposal, a single turbine with a 79m tip height, can be accommodated within this landscape and views.

17 REFERENCES

17.1.1 Barnsley Metropolitan Borough Council (2002) Barnsley Borough Landscape Character Assessment, ECUS & Land Use Consultants, http://www.barnsley.gov.uk/media/Development%20-%20Planning%20and%20Transportation/Planning%20Policy/LDF/preferred/underpinning_documents/Landscape%20Character%20Assessment.pdf

17.1.2 Bishop, I.D. (2002) Determination of thresholds of visual impact: the case of wind turbines, Environment and Planning B: Planning and Design 29(5) 707–718

17.1.3 Local Government Yorkshire and Humber (2011) Low carbon and renewable energy capacity in Yorkshire and Humber, Aecom, http://www.yourclimate.org/pages/low-carbon-renewable-energy-capacity-yh

17.1.4 The Landscape Institute & Institute of Environmental Management and Assessment (2002) Guidelines for Landscape and Visual Impact Assessment, Spon Press, London

17.1.5 Julie Martin Associates (2010) Landscape Capacity Study for Wind Energy Developments in the South Pennines, www.rochdale.gov.uk/PDF/2010-04-14_LDF_Land_Cap_Study_Wind_Energy_Dev_South_Pennines_Jan_2010.pdf

17.1.6 ODPM (2004) PPS22 Renewable Energy - Companion Guide, http://www.communities.gov.uk/documents/planningandbuilding/pdf/147447.pdf

17.1.7 Peak District National Park Authority (2008), Peak District Landscape Character Assessment, http://www.peakdistrict.gov.uk/publications/lca

17.1.8 SNH (2012) Assessing the Cumulative Impact of Onshore Wind Energy Developments, http://www.snh.gov.uk/docs/A675503.pdf

17.1.9 SNH (2009) Siting and Designing Windfarms in the Landscape, http://www.snh.gov.uk/publications-data-and-research/publications/search-thecatalogue/publication-detail/?id=1434

17.1.10 SNH (2006) Visual Representation of Windfarms: Good Practice Guidance, http://www.snh.gov.uk/publications-data-and-research/publications/search-thecatalogue/publication-detail/?id=846

17.1.11 University of Newcastle (2002) Visual Assessment of Windfarms Best Practice, Scottish Natural Heritage Commissioned Report F01AA303A, http://www.snh.org.uk/pdfs/publications/commissioned_reports/f01aa303a.pdf

17.1.12 Arcus, (2008) Sheephouse Heights Windfarm Environmental Statement. April 2008

17.1.13 British Ornithologists Union The British List - http://www.bou.org.uk/thebritishlist/British-List.pdf (last accessed 23rd April 2013)

17.1.14 Cramp, S, and Simmons, KEL, (eds). (2004) BWPi. Birds of the Western Palearctic interactive (BWPi) DVD-ROM) BirdGuides Ltd, Sheffield.

17.1.15 Eaton MA, Brown AF, Noble DG, Musgrove AJ, Hearn R, Aebischer NJ, Gibbons DW, Evans A and Gregory RD (2009) Birds of Conservation Concern 3: the population status of birds in the United Kingdom, Channel Islands and the Isle of Man. British Birds 102, pp296–341.

17.1.16 Institute of Ecology and Environmental Management (2006) Guidelines for Ecological Impact in the United Kingdom. IEEM July 2006.

17.1.17 Gilbert, G. Gibbons, DW and Evans J. (1998) Bird Monitoring Methods; a manual of techniques for key UK species. RSPB.

17.1.18 Marchant, JH (1983) BTO Common Bird Census Instructions. BTO, Tring.

17.1.19 Natural England (2010) Technical Information Note TIN069 Assessing the effects of onshore wind farms on birds 1st Edition January 2010.

17.1.20 National Planning Policy Statement (2012). Communities and Local Government. London.

17.1.21 Scottish Natural Heritage (2005) Survey methods for Use in Assessing the Impacts of Onshore Wind farms on Bird Communities.

17.1.22 Bat Conservation Trust. (2007). Bat Survey – Good Practice Guidelines, Bat Conservation Trust, London.

17.1.23 Biodiversity Reporting and Information Group (BRIG). (ed. Ant Maddock). (2010). UK Biodiversity Action Plan Priority Habitat Descriptions. 2010 ed. JNCC, Peterborough.

17.1.24 Harris, S., Cresswell, P. & Jefferies, D. (1989). Surveying for badgers. Occasional Publication of the Mammal Society No. 9. Mammal Society, Bristol.

17.1.25 Hopkins, J.J. & Buck, A.L. (1995). The Habitats Directive Atlantic Biogeographical Region – Report of Atlantic Biogeographical Workshop, Edinburgh, Scotland, 13th-14th October 1994: JNCC Report, No. 247. JNCC, Peterborough.

17.1.26 Institute of Ecology and Environmental Management (IEEM). (2006). Guidelines for Ecological Impact Assessment in the United Kingdom. IEEM, Winchester.

17.1.27 Joint Nature Conservation Committee. (2010). Handbook for Phase 1 habitat survey – a technique for environmental audit. 2010 ed. JNCC, Peterborough.

17.1.28 Keystone Ecology Ltd (2012) Spring Brook Bat Report. Keystone Ecology, Huddersfield

17.1.29 Keystone Ecology Ltd (2012) Spring Brook Ecological Appraisal Report. Keystone Ecology, Huddersfield

17.1.30 Natural England. (2009). Natural England Technical Information Note TIN059: Bats and single large wind turbines: Joint agencies interim guidance. Natural England, Peterborough.

17.1.31 Nature Conservancy Council (1989). Guidelines for selection of biological SSSIs. 1998 ed. JNCC, Peterbor