

DRAGONFLY
acoustics



Earthmill Limited
Pule Hill Farm, Thurgoland
DC0932 – R1
Wind Turbine Noise Assessment

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1.0 INTRODUCTION

Earthmill Limited has appointed Dragonfly Acoustics to carry out a noise assessment relating to the proposed installation of one 36.4 metre high (to hub) wind turbine on land forming part of Pule Hill Farm, Thurgoland.

It is understood that the noise assessment is required to establish the noise levels at the nearest noise sensitive receptors due to the operation of the proposed turbine and to assess the impact of those noise levels against the requirements of ETSU-R-97, *“The Assessment and Rating of Noise from Wind Farms”*.

Whilst every effort has been made to ensure that this report is easy to understand, it is technical in nature; to assist the reader, a glossary of terminology is included in Appendix A.

2.0 SITE DESCRIPTION

2.1 Site Conditions

It is proposed to install one 'Endurance E3120' 50kW wind turbine on land forming part of Pule Hill Farm, Thurgoland. The turbine will be 36.4 m high to the hub centre.

From the manufacturer's noise data the 'Endurance E3120' Turbine has a Sound Power Level of 94.8dB L_w at a wind speed of 10m/s.

The proposed turbine location is shown in Appendix B.

There is one financially interested (FI) residential property situated in the vicinity of the proposed location of the turbine:

- Financially Interested Property (FI) – located approximately 340m from the proposed location of the turbine.

There is one residential property, with no financial interest in the proposed turbine, situated in the vicinity of the proposed location. This Noise Sensitive Receptor (NSR) is located as follows:

- Noise Sensitive Receptor (NSR) – located approximately 330m from the proposed location of the turbine.

The FI property and the NSR are shown in Appendix B.

3.0 GUIDANCE

Dragonfly Acoustics considers that the guidance detailed in ETSU-R-97 should be taken as the appropriate guidance on the assessment of noise impact for a noise source of this type, also taking account of the latest guidance published by the Institute of Acoustics.

The National Planning Policy Framework, published in March 2012, sets out the Government's objectives with respect to renewable energy sources for England. With respect to wind farm noise it states, in Section 97:

To help increase the use and supply of renewable and low carbon energy, local planning authorities should recognise the responsibility on all communities to contribute to energy generation from renewable or low carbon sources. They should:

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

**In assessing the likely impacts of potential wind energy development when identifying suitable areas, and in determining planning applications for such development, planning authorities should follow the approach set out in the National Policy Statement for Renewable Energy Infrastructure (read with the relevant sections of the Overarching National Policy Statement for Energy Infrastructure, including that on aviation impacts). Where plans identify areas as suitable for renewable and low-carbon energy development, they should make clear what criteria have determined their selection, including for what size of development the areas are considered suitable.*

The Overarching National Policy Statement for Energy Infrastructure (EN-1), published in July 2011, states in Section 5.11.6 (Noise and Vibration):

Operational noise, with respect to human receptors, should be assessed using the principles of the relevant British Standards and other guidance.

Further information on assessment of particular noise sources may be contained in the technology-specific NPSs. In particular, for renewable (EN-3) and electricity networks (EN-5) there is assessment guidance for specific features of those technologies. For the prediction, assessment and management of construction noise, reference should be made to any relevant British Standards and other guidance which also give examples of mitigation strategies.

The National Policy Statement for Renewable Energy Infrastructure (EN-3), published in July 2011, states in the following sections (Onshore Wind Farm Impacts – Noise and vibration):

Section 2.7.55

The method of assessing the impact of noise from a wind farm on nearby residents is described in the report, 'The Assessment and Rating of Noise from Wind Farms' (ETSU-R-97). This was produced by the Working Group on Noise from Wind Turbines Final Report, September 1996 and the report recommends noise limits that seek to protect the amenity of wind farm neighbours. The noise levels recommended by ETSU-R-97 are determined by a combination of absolute noise limits and noise limits relative to the existing background noise levels around the site at different wind speeds.

Therefore noise limits will often influence the separation of wind turbines from residential properties.

Section 2.7.56

The applicant's assessment of noise from the operation of the wind turbines should use ETSU-R-97, taking account of the latest industry good practice.

This should include any guidance on best practice that the Government may from time to time publish.

This provides clear guidance that the assessment of wind farm noise should reference only ETSU-R-97 and should take account of current best practice when undertaking assessments.

For the purposes of this desktop assessment it is assumed that the background noise levels are very low, and therefore the noise criteria for low noise environments are to be used. Noise source levels for the wind turbines should be taken from manufacturer's noise data.

3.1 ETSU-R-97

ETSU provides a framework for the measurement of wind farm noise and gives indicative noise levels thought to offer a reasonable degree of protection to wind farm neighbours. Planning Policy Statement 22 states when assessing the suitability of sites for a renewable energy project "The 1997 report by ETSU for the Department of Trade and Industry should be used to assess and rate noise from wind energy development".

ETSU recommends that noise levels at the nearest noise sensitive receptor should be limited to 5dB(A) above background noise levels.

For locations with low noise levels, ETSU recommends that noise levels be limited to the range 35dB(A) to 40dB(A) during the daytime and 43dB(A) during the night time.

It is considered that this site is subject to low noise levels, with background noise levels below 35dB(A) at all times.

Where a single wind turbine is to be installed, or where there are very large separation distances between the turbines and the nearest noise sensitive property, ETSU considers that an absolute noise limit for the wind turbine of 35dB $L_{A90, 10min}$ offers sufficient protection to amenity such that no measurement of actual background noise is required. ETSU considers that for the purposes of calculation the $L_{A90, 10min}$ can be considered to be 1.5 to 2.5dB below the L_{Aeq} at the same position.

Where a property is under the ownership of persons considered to have a 'financial interest' in the development of the wind turbine the lower fixed limits at the property due to the operation of the

turbine can be increased to 45dB daytime and night time, with consideration given to higher limits above background noise level where the occupier has a financial involvement.

3.2 ISO 9613

The noise level predictions have been undertaken in accordance with the noise prediction framework set out in ISO 9613-2 *“Acoustics – attenuation of sound during propagation outdoors- Part 2 General method of calculation”*.

The noise prediction model assumes that wind turbines act as elevated spherical point sources, with the noise level reducing by 6dB for every doubling of distance from the noise source. The model takes into account the distance between the turbine and the receptors and the amount of attenuation due to ground effect and atmospheric absorption.

The model assumes downwind propagation, i.e. a wind direction that assists the propagation of noise from the source to all receptors and that the ground type is a combination of soft and hard ground.

4.0 ASSESSMENT

4.1 Assessment of Noise from Proposed Wind Turbine

Predicted noise level calculations have been completed for the nearest noise sensitive receptors.

The manufacturer's noise data indicates that the 'Endurance E3120' 50kW turbine is predicted to produce a Sound Power Level of 94.8dB L_w at a wind speed of 10m/s.

Using this data the calculations within this assessment have been undertaken at a wind speed of 10m/s.

The resultant noise levels (L_{Aeq}) have been calculated following the guidance in ISO 9613 and the guidance from the IOA Bulletin Mar-Apr 2009. The calculated noise levels and comparison with the ETSU guidance are therefore as follows:

Table 4.1
Noise Level from Proposed Wind Turbine (L_{Aeq}), free-field, dB

Receptor	Slant Distance Between Turbine and Receptor in m	Distance Correction	Ground Absorption	L_{Aeq} at Nearest Noise Sensitive Receptor	L_{90} at Nearest Noise Sensitive Receptor	ETSU Criteria		
						Daytime	Night time	Single Turbine ($L_{A90,10min}$)
FI	341	-58.7	-1.4	34.7	32.7	45	45	--
NSR	332	-58.4	-1.3	35.1	33.1	35-40	43	35

For the Financially Interested property (FI) the calculated turbine noise level is below the daytime and night time noise criteria recommended by ETSU.

For the Noise Sensitive Receptor (NSR) the calculated turbine noise level is below the daytime and below the night time noise criteria recommended by ETSU.

It is considered that the predicted noise levels from the proposed turbine will satisfy all of the noise limits specified by ETSU and the Local Authority.

5.0 CONCLUSION

Earthmill Limited has appointed Dragonfly Acoustics to carry out a noise assessment relating to the proposed installation of one 36.4 metre high (to hub) wind turbine on land forming part of Pule Hill Farm, Thurgoland.

It is understood that the noise assessment is required to establish the noise levels at the nearest noise sensitive receptor due to the operation of the proposed turbine and to assess the impact of those noise levels against the requirements of ETSU-R-97, *“The Assessment and Rating of Noise from Wind Farms”*.

For the Financially Interested property (FI) the calculated turbine noise level is below the daytime and night time noise criteria recommended by ETSU.

For the Noise Sensitive Receptor (NSR) the calculated turbine noise level is below the daytime and below the night time noise criteria recommended by ETSU.

It is considered that the predicted noise levels from the proposed turbine will satisfy all of the noise limits specified by ETSU and the Local Authority.

6.0 CLOSURE

This report has been prepared by Dragonfly Acoustics with all reasonable skill, care and diligence, and taking account of the manpower and resources devoted to it by agreement with the client. Information reported herein is based on the interpretation of data collected and has been accepted in good faith as being accurate and valid.

This report is for the exclusive use of Earthmill Limited; no warranties or guarantees are expressed or should be inferred by any third parties. This report may not be relied upon by other parties without written consent from Dragonfly Acoustics.

Dragonfly Acoustics disclaims any responsibility to the client and others in respect of any matters outside the agreed scope of the work.

Appendix A – Glossary of Terminology

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0dB (the threshold of hearing) to over 120dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Table A-1
Sound Levels Commonly Found in the Environment

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

Acoustic Terminology

dB (decibel) The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2×10^{-5} Pa).

dB(A) A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.

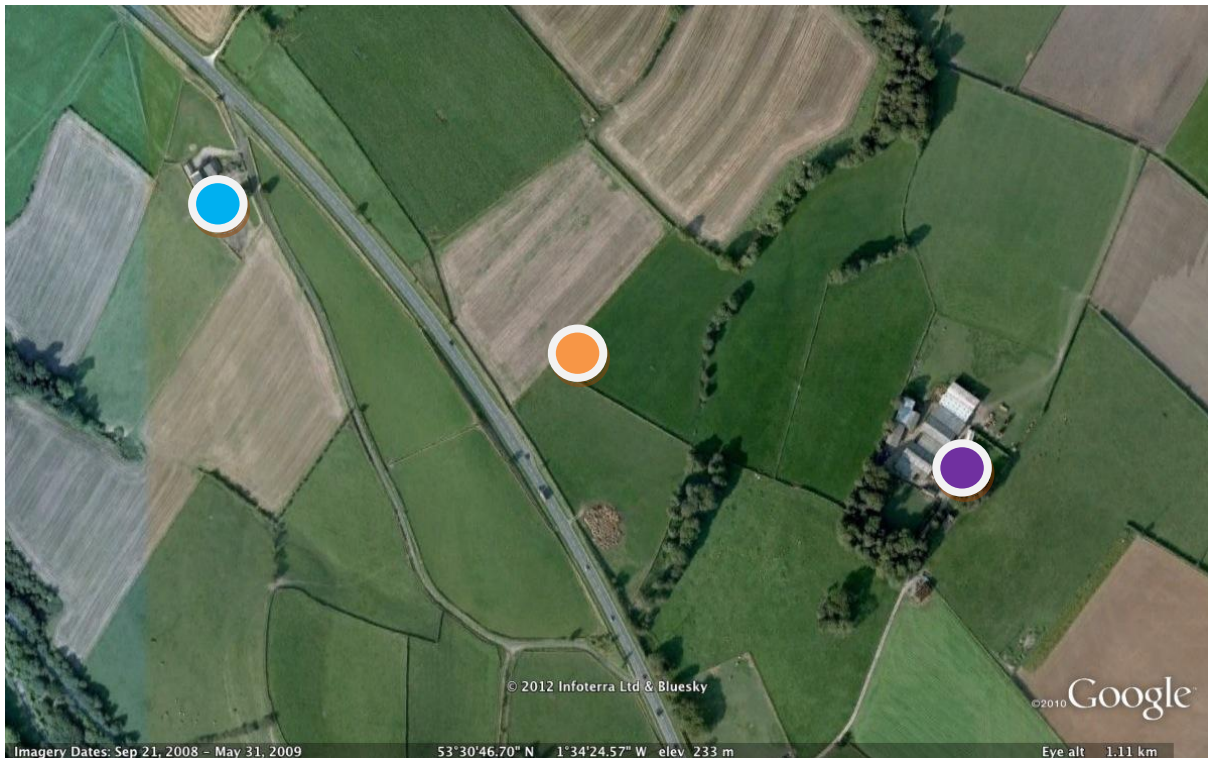
L_{Aeq} Defined as the notional steady sound level which, over a stated period of time, would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.




L_{10} & L_{90} If a non-steady noise is to be described it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the 'average maximum level'. Similarly, L_{90} is the 'average minimum level' and is often used to describe the background noise. It is common practice to use the L_{10} index when describing traffic noise.

L_{Amax} The maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{Aeq} noise level but will still affect the noise environment.

Appendix B – Turbine Location

Figure B-1
Turbine Location Plan



-  Nearest Financially Interested (FI) property
-  Nearest Noise Sensitive Receptor (NSR)
-  Approximate proposed 'Endurance E3120' 50kW turbine location

Appendix C – Limitations to this Report

This entails a physical investigation of the site with a sufficient number of sample measurements to provide quantitative information concerning the type and degree of noise and vibration affecting the site. The objectives of the investigation have been limited to establishing sources of noise and vibration material to carrying out an appropriate assessment.

The number and duration of noise and vibration measurements have been chosen to give reasonably representative information on the environment within the agreed time, and the locations of measurements have been restricted to the areas unoccupied by building(s) that are easily accessible without undue risk to our staff.

As with any sampling, the number of sampling points and the methods of sampling and testing cannot preclude the existence of “hotspots” where noise or vibration levels may be significantly higher than those actually measured due to previously unknown or unrecognised noise or vibration emitters. Furthermore, noise or vibration sources may be intermittent or fluctuate in intensity and consequently may not be present or may not be present in full intensity for some or all of the survey duration.