THREE OAKS RENEWABLE ENERGY PARK

NOISE ASSESSMENT FOR PLANNING

Acoustics Report A1884 R01C

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1 Introduction

Ion Acoustics is appointed by Engena to undertake a noise impact assessment of the proposed Three Oaks Renewable Energy Park on land near Haisthorpe in the East Riding of Yorkshire. The facility comprises, solar panels, a single distribution network operator (DNO) substation, battery storage containers, associated electrical equipment, including inverters and transformers, and a standby diesel generator.

Solar farms are not normally considered noisy and the panels themselves do not generate any significant noise. However, various electrical components, such as inverters and transformers, and the HVAC units (heating ventilation and air-conditioning) provided for the battery containers can emit relatively low levels of noise. As such, a desktop assessment (this report) has been prepared to describe the noise impact at the nearest noise sensitive receptors (dwellings). Computer modelling has been used to calculate operational noise levels at the receptors. This report demonstrates that noise from the renewable energy facility will not result in any loss of amenity for nearby residents.

2 Scheme Details

2.1 Site Location

The proposed site is located on land to the north-west of Haisthorpe, west of Bridlington. The redline boundary of the site and the nearest assessment locations are shown below.

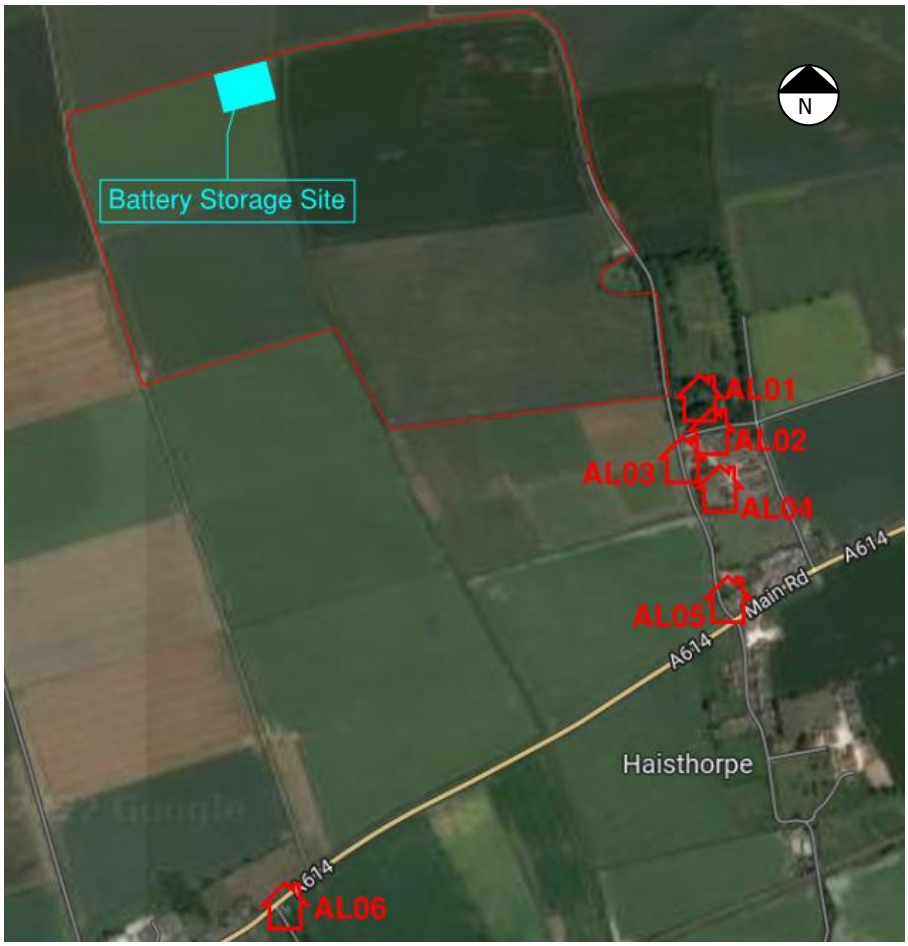

Figure 1 – Site Layout and Nearest Receptors

The assessment locations chosen to represent the nearest residential receptors are identified in Table 1 below. This includes an approximate OS grid co-ordinate and the approximate distance to the security fencing of the site.

Table 1: Noise Assessment Locations

Assessment Location	Easting	Northing	Approx. Distance to security fencing of the site (m)
AL01 Haisthorpe Hall	512677	464996	92
AL02 Rose Cottage	512670	464934	117
AL03 Home Farm	512623	464880	132
AL04 White House Farm	512710	464810	222
AL05 Breeze Farm	512733	464620	414
AL06 Safety Cottage	511861	463999	958

2.2 Proposed Renewable Energy Park

The proposed development is for a renewable energy park including battery storage area as shown below in Figures 2 and 3. This will comprise the following noise generating equipment.

For the solar farm

- 167 String inverter units; and,
- 6 power transformer units.

For the battery storage

- 22 Containerised Battery Units each with 4 HVAC units;
- 22 Battery Inverters;
- 1 Standby Diesel Generator; and
- A single Distribution Network Operator (DNO) transformer station located to the east of the battery site.

The string inverters are distributed across the site but installed behind the panels. The panels therefore shield noise from the string inverters to some extent. The orientation of the panels ensures there is most shielding to the south whereas other directions are less shielded. The Computer Model includes the panels as shielding elements, so the effect of the shielding is included in the model.

The nature of solar farms is such that electricity is only generated during daylight hours. This may extend into times considered to be part of the night (that is early mornings before 07:00 hours) and during evenings (after 19:00 hours) during the summer. Note that the early morning periods would often coincide with the dawn chorus. The solar farm would not be operational at the quietest times of the night, nor during the late evening (10pm to Midnight) when most people would be trying to get to sleep.

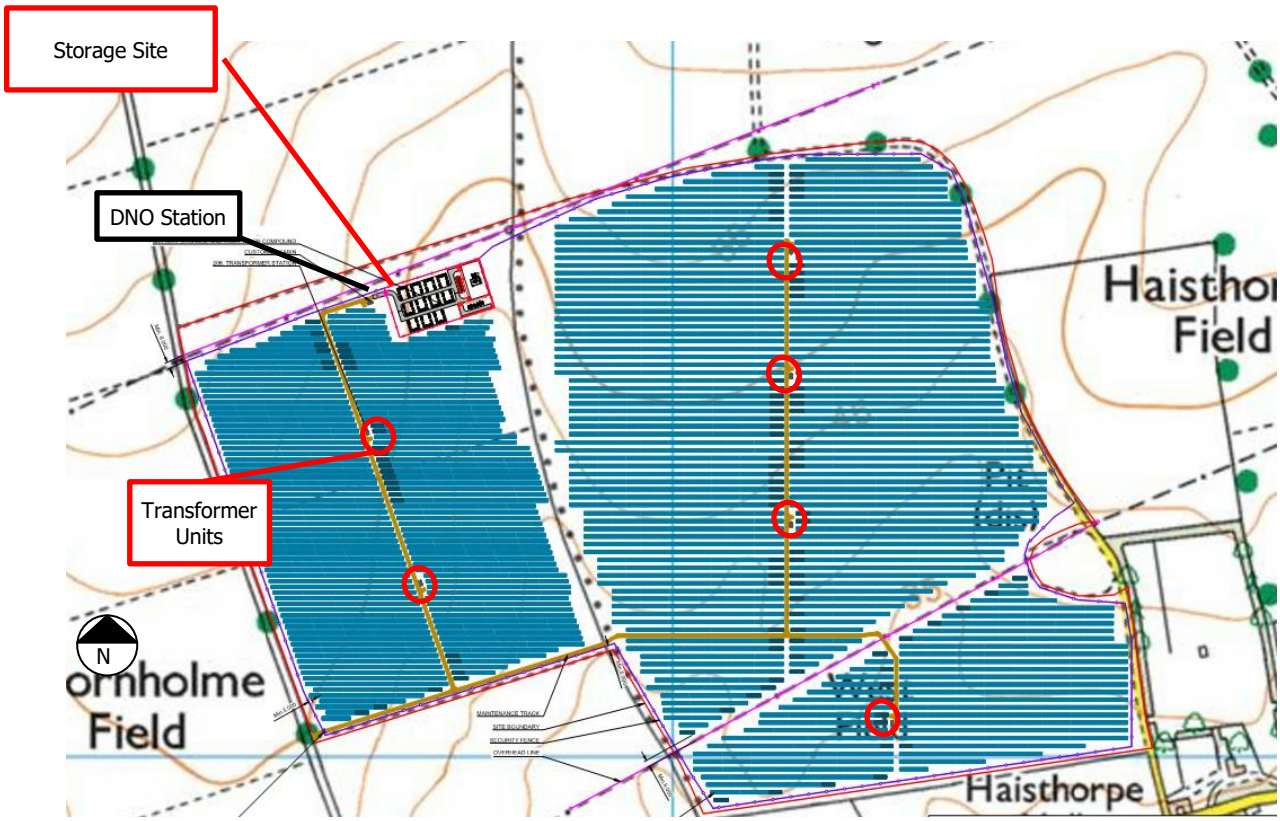

Figure 2: Proposed Site Layout (Transformer Units circled in red)

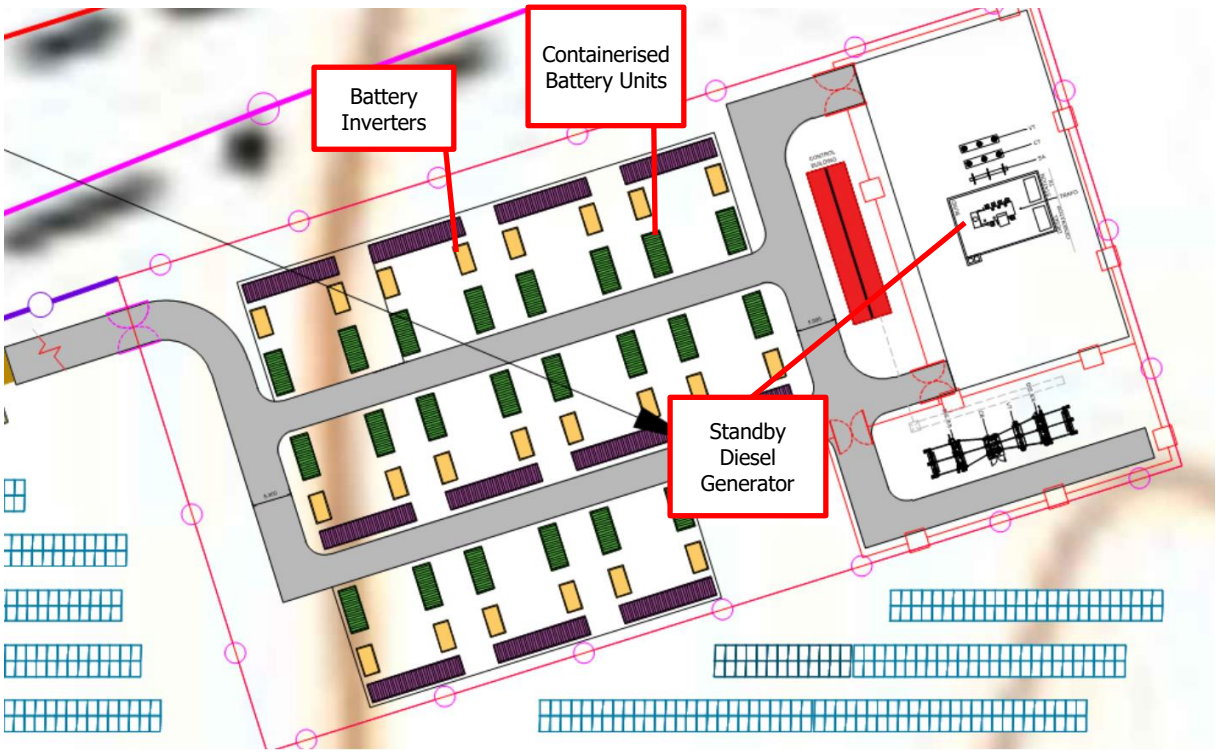

Figure 3: Proposed Layout of Three Oaks Renewable Energy Park Battery Storage Area

The battery units would typically operate (discharge) at periods of peak demand. This is typically dark winter evenings when people have returned from work. The batteries would be charged during periods of low demand or when the solar farm is at peak capacity. Note however the facility is required to be available on a 24-hour basis so that it is available to stabilise the grid when required. As such it could operate at any time.

The standby generator is only provided to power in the unlikely event of a grid failure occurring while the batteries were discharging so that the HVAC units for the battery containers would continue to operate.

3 Planning Policy and Other Guidance on Noise

3.1 National Planning Policy Framework (NPPF)

In 2012 the National Planning Policy Framework (NPPF) replaced a number of Planning Policy Statements with a single document which is intended to promote sustainable development. The NPPF was revised in July 2021[1] and certain aspects of the guidance changed.

The NPPF sets out the Government's planning policies for England. The document is generally not prescriptive and does not provide noise criteria. Instead, it places the onus on local authorities to develop their own local plans and policies. Sections of the NPPF relating to noise are stated below:

174. Planning policies and decisions should contribute to and enhance the natural and local environment by:

e) preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.

185. Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;

3.2 Noise Policy Statement for England (NPSE)

The Noise Policy Statement for England (NPSE)[2] sets out the Government's policy on environmental, neighbourhood and neighbour noise for England. The policy has three aims:

- *"avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*

[1] https://www.gov.uk/government/publications/national-planning-policy-framework--2
2 Noise Policy Statement for England (DEFRA) available at:
https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/69533/pb13750-noise-policy.pdf

- *where possible, contribute to the improvement of health and quality of life.*

The NPSE introduces the following terms which are also used in the NPPF:

"NOEL – No Observed Effect Level

This is the level below which no effect can be detected. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur."

However, neither the NPSE nor the NPPF Planning Practice Guidance defines numeric bounds for NOEL, LOAEL or SOAEL. The boundary of each effect level should be defined for each situation and location.

Further Government planning advice is available online[3]. The online guidance refers to the NPPF and NPSE and presents a noise assessment hierarchy table to provide further information on the boundaries between NOEL, LOAEL and SOAEL. This is shown below in Table 2.

[3] See https://www.gov.uk/guidance/noise--2

Table 2: Noise Assessment Hierarchy Table

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not noticeable	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present and not intrusive	Noise can be heard, but does not cause any change in behaviour, attitude or other physiological response. Can slightly affect the acoustic character of the area but not such that there is a change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present and intrusive	Noise can be heard and causes small changes in behaviour, attitude or other physiological response, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a small actual or perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present and disruptive	The noise causes a material change in behaviour, attitude or other physiological response, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Present and very disruptive	Extensive and regular changes in behaviour, attitude or other physiological response and/or an inability to mitigate effect of noise leading to psychological stress, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

3.3 Local Authority Guidance

We are not aware of any specific local authority guidance from the East Riding of Yorkshire on noise relating to solar farms or battery storage facilities for this site. However it is expected that the national guidance above and BS 4142 would be used when considering the planning application.

3.4 BS 4142: 2014 +A1: 2019 – Assessment Principles

The standard method for assessing noise of a commercial or industrial nature affecting housing, is British Standard BS 4142 "Method for rating and assessing industrial and commercial sound". A BS 4142 assessment is typically made by determining the difference between the industrial noise under consideration and the background sound level as represented by the L_{A90} parameter, determined in the absence of the industrial noise. The L_{A90} parameter is defined as the level exceeded for 90% of the measurement time, representing the underlying noise in the absence of short duration noise events such as dog barks or individual cars passing.

The industrial noise under consideration is assessed in terms of the ambient noise level, L_{Aeq}, but a character correction penalty can be applied where the noise exhibits certain characteristics such as distinguishable tones, impulsiveness or, if the noise is distinctively intermittent. The ambient noise level, L_{Aeq} is defined as the steady-state noise level with the same energy as the actual fluctuating sound over the same time period. It is effectively the average noise level during the period. The industrial noise level (L_{Aeq}) with the character correction (if necessary) is known as rating level, L_{Ar}, and the difference between the background noise and the rating level is determined to make the BS 4142 assessment. The standard then states:

a) *"Typically, the greater the difference, the greater the magnitude of the impact.*

b) *A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context.*

c) *A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context.*

d) *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

The standard outlines a number of methods for defining appropriate 'character corrections' to determine the rating levels to account for tonal qualities, impulsive qualities, other sound characteristics and/or intermittency.

The standard also highlights the importance of considering the context in which a sound occurs. The standard indicates that factors including the absolute sound level, the character of the sound, the sensitivity of the receptor and the existing acoustic character of the area should be considered when assessing the noise impact. The absolute sound level is of particular importance where the measured background sound levels are low, which is typically taken as L_{A90} 30dB and below. In regard to low sound levels, the standard states:

"Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night."

3.5 BS 8233: 2014 and WHO criteria

British Standard BS 8233: 2014[4] and the World Health Organisation (WHO) also provide external noise criteria to protect residential amenity. These are detailed in Table 3 below.

Table 3: WHO / BS 8233: 2014 Guideline Noise Levels

Location	Critical Health Effect	07:00 to 23:00	23:00 to 07:00
Outside Bedroom Windows	Sleep Disturbance (Windows Open)	--	45dB $L_{Aeq,\ 8hours}$ (1)
Amenity Spaces (Gardens / Patios)	Moderate Annoyance Serious Annoyance	50dB $L_{Aeq,\ 16\ hours}$ (2) 55dB $L_{Aeq,\ 16\ hours}$ (2)	--
Notes: (1) From WHO Community Noise Guidelines (1999) (2) BS 8233: 2014 and WHO Community Noise Guidelines			

The daytime limits apply to relatively anonymous noises without character and are commonly applied to traffic noise. The WHO night-time threshold of 45 dB $L_{Aeq,\ 8hr}$ represents an 8-hour L_{Aeq} outside noise-sensitive rooms to prevent sleep disturbance. The WHO limit is a level at 1m from the façade. Therefore, the equivalent free-field level would be approximately 3dB lower, that is 42 dB L_{Aeq}.

3.6 Absolute Noise Level Assessment

In instances of low rating noise levels, BS4142 indicates that assessment in line with absolute noise limits might be as, or more, appropriate than a relative assessment.

To ensure the proposed development is not a significant or prohibiting factor in achieving the relevant WHO night-time values at sensitive residential receptors, noise generated by the development would need to be approximately 10dB below the guidance levels in Table 3.

For this application, where predicted noise levels are low, it has not been considered necessary to carry out a background noise survey. Instead a target of 32 dB L_{Aeq} (free field) is proposed for the sensitive time of the night at residential receptors. This is set to ensure that sleep is protected while people are trying to get to sleep.

During the daytime, even in rural areas, occasions when the background noise would be less than 30 dB L_{A90} would be rare. To avoid adverse impacts and in accordance with BS 4142, the rating level of the noise should not exceed a level of 5dB above the background noise (subject to context). Therefore, assuming a minimum daytime background noise level of 30 dB(A), the rating level should not exceed 35 dB L_{Ar}.

3.7 Standby Generator Noise Limits

The battery storage area includes a standby diesel generator. This generator will be operational during routine testing (during daytime working hours only) and under exceptional circumstances to facilitate equipment cooling during grid failures. Noise limits for the diesel generator have been set.

As it is not a regular noise source, the diesel generator has not been included in the main operational assessment.

[4] British Standards Institution (2014) BS 8233:2014: Guidance on sound insulation and noise reduction for buildings

Instead, to ensure the operation of the diesel generator does not result in an adverse noise impact it is suggested that a limit of 45 dB(A) at the closest noise sensitive receptors should be set. In this case, the closest existing noise sensitive receptor is AP1 Haisthorpe Hall which is approximately 980m to the north-east of the proposed location of the standby generator.

3.8 Noise Targets

For the assessment presented in this report, the following noise targets are proposed:

- Daylight Operation (including 05.00 to 07.00 hours) 35 dB L_{Ar}
- Night-time (Sensitive Hours Only) 32 dB L_{Ar}
- Diesel Generator: 45 dB L_{Ar}

4 Operational Noise Predictions

A computer noise model has been constructed using the IMMI[5] noise modelling software to calculate the operational noise levels to the nearest noise-sensitive receptor locations. Within the modelling software, propagation of noise has been calculated in accordance with ISO 9613-2[6] with the following input parameters:

- Downwind propagation (noise levels under crosswind and upwind conditions will be less);
- Soft ground between the noise source and the receiver locations (G = 1.0),
- Ambient air temperature of 10°C and 70% Relative Humidity; and,
- Barriers and screening influence including the effect of the solar panels calculated in accordance with ISO 9613-2.

The input source data for the model is described below. The equipment details have been taken from manufacturer's data and from library data used on previous assessments. In the event that different equipment is specified, it will be designed to the same noise limits.

4.1 Noise Data

The solar panels feed in to 167 string inverter units which are distributed across the site. There are six containerised transformer units distributed along the access tracks. The battery units are within a separate compound to the north of the site and comprise 22 containerised battery units with 22 separate power conversion systems (inverters and transformers). Export to the distribution network occurs via a DNO Transformer located to the east of the battery compound.

These items will be the only significant noise sources at the site for normal operation. The sound power levels taken from library data used on previous Renewable Energy Park assessments are provided below.

It is known that inverters and transformers can produce tones. For the inverters, this would be generally high frequency tones which are readily dissipated by atmospheric absorption. Tonality penalties have been applied to the assessment where appropriate.

[5] IMMI noise mapping https://www.immi.eu/en/noise-mapping-with-immi.html
[6] ISO 9613-2: Acoustics – Attenuation of sound during propagation outdoors: Part 2: General method of calculation

HVAC Units for the Battery Containers

The battery units will be containerised and make no sound. However, HVAC units used to control the internal environment within the containers do generate some noise. As a worst case, it is assumed that each battery container would have four HVAC units mounted on the roof of each container.

Table 4 presents the octave band sound power level for each HVAC unit for two operating conditions relating to the external temperature.

Table 4: HVAC Units Sound Power Level Spectrum

Noise Source	Sound Power Levels in Octave Bands, Hz dB							Sound Power L_{WA}, dB
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	
HVAC Units – Higher Temp Operation	85.2	89.1	81.6	74.2	66.1	61.8	53.0	78
HVAC Units – Lower Temp Operation	80.5	85.1	76.6	69.2	61.1	56.8	48.0	73

The higher temperature noise levels detailed above represent the HVAC units operating at 100%. This is considered to be a rare occurrence, generally during extremes of temperature.

Battery Power Conversion System (PCS) Units

Data for a Power Electronics HEMK battery inverter has been used for the 22 PCS Units.

Table 5: Noise Data – Battery Inverter / Conversion Unit

Noise Source	Sound Power Levels in Octave Bands, Hz dB							Sound Power L_{WA}, dB
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	
Power Electronics Inverters	81.9	73.5	80.7	79.8	81.9	82.7	74.5	87

DNO Substation

The DNO station includes a number of items of plant which facilitate the connection to the distribution network. The most significant noise source is the large power transformer.

No specific information has been provided for the DNO transformer, therefore typical noise data from a similar solar farm site has been used in this assessment. The sound power level used within this assessment is summarised in Table 6 below.

Table 6: Noise Data – DNO Transformer

Noise Source	Sound Power Level (dB) in Octave Bands, Hz							Overall Sound Power, L_{WA} dB
	63	125	250	500	1000	2000	4000	
DNO Power Transformer	78.0	78.8	80.4	83.7	77.7	67.6	62.0	83.0

String Inverters

The scheme has been designed with 167 Huawei Sun2000 215KTL-H string inverters. No specific test report has been provided for these units and instead a level of 65 dB(A) at 1m has been used which is equivalent to a sound power level of 76 dB L_{WA} assuming spherical radiation. A test report is available for a smaller string inverter Huawei Sun2000 90-100KTL. This indicates much lower noise levels (55 dB(A) at 1m) but a higher value used in this assessment to present a worse case scenario.

Solar Transformers

For the 6 solar transformers a level of 70 dB(A) at 1m has been provided by the developer which is equivalent to a sound power level of 78 dB L_{WA}.

Standby Generator

The battery storage area includes a diesel generator. This generator will be operational during routine testing and under exceptional circumstances to facilitate equipment cooling during shut-downs in the case of loss of power to the site. No noise data for the diesel generator is available at present, based on the size of the site and the distance to the closest noise sensitive receptor (approximately 1000 m), a sound power level of 105 dB L_{WA} has been assumed. The diesel generator will be provided with an acoustic enclosure and be fitted with an exhaust silencer so that the total sound power level does not exceed 105 dB L_{WA}.

5 Operational Assessment

5.1 Modelling Scenarios

To carry out the assessment, three scenarios have been modelled as follows:

Daylight Hours with Solar Farm Operation:	String Inverters, Solar Transformers, DNO Substation, Containerised Battery Units in Higher Temperature Operating Mode and Battery Inverters
Night-time Sensitive Hours with Batteries Operating:	DNO Substation, Containerised Battery Units in Lower Temperature Operating Mode and Battery Inverters
Standby Diesel Generator Operation:	DNO Substation, Containerised Battery Units in Lower Temperature Operating Mode, Battery Inverters and Diesel Generator

The daylight operation therefore represents the worst-case with all sources (excluding the standby generator) operating at 100% duty (full power) and with the containerised battery units operating on the higher temperature cooling mode.

Although it is possible that the solar farm could operate in the early morning periods that would normally be considered to be part of the night, it would not operate at the most-sensitive periods of the night-time nor at 100% capacity.

Therefore, the night-time scenario considers only the battery units and associated inverters etc. At night there will be cooler temperatures, therefore it is assumed the HVAC units can operate in their quieter mode.

A scenario to assess operational noise associated with the standby diesel generator has been included. This scenario only includes the noise generating equipment that would be associated with the operation of the standby diesel generator, this being the diesel generator, the DNO substation, containerised battery units and the battery inverters.

5.2 Daylight Scenario

The noise predictions are presented in the first instance as a noise contour plot in Figure 4 below, showing the predicted specific noise levels (dB L_{Aeq}) and the nearest houses. The contours assume that all equipment is running at full capacity, which is only likely to occur in the middle of a sunny day when all plant is operating at 100%.

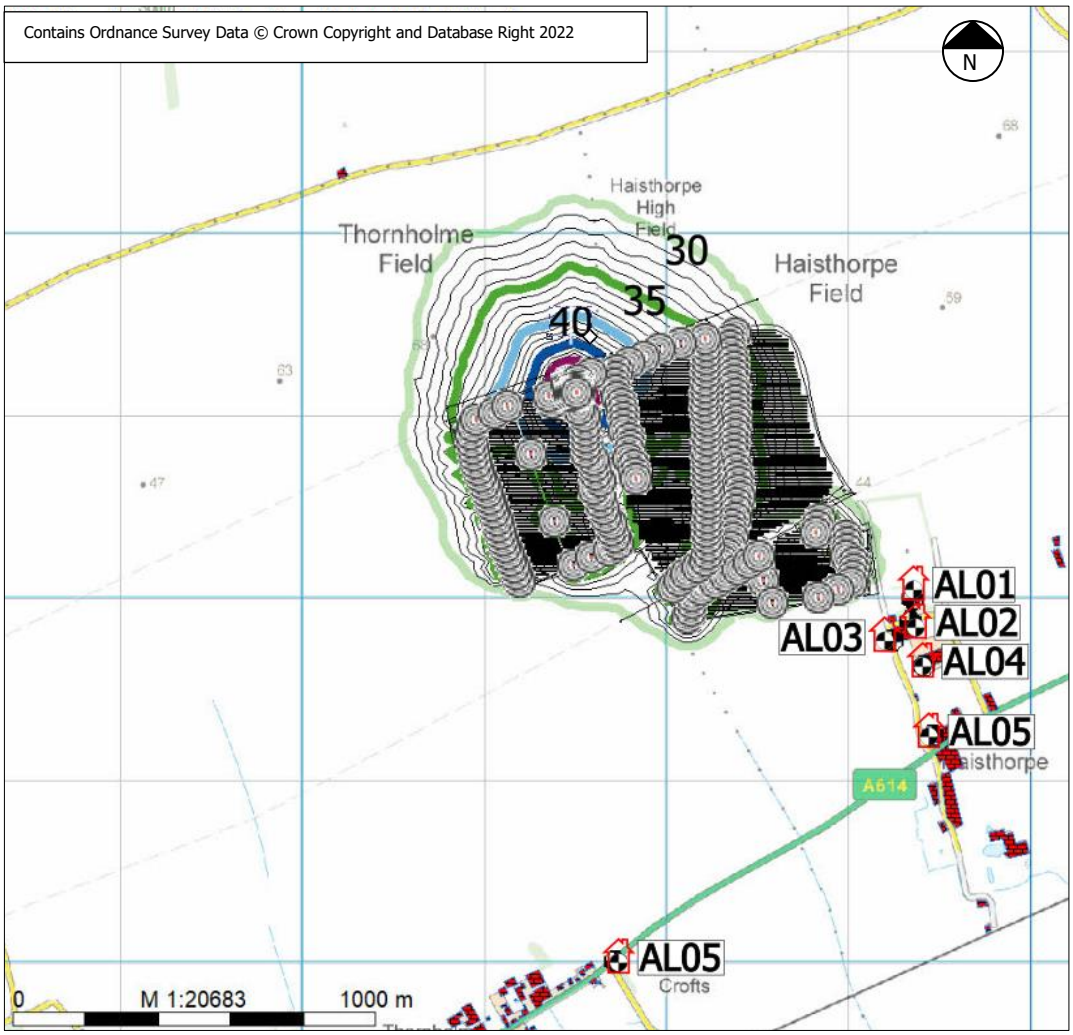

Figure 4: Indicative Noise Contour Plot, dB L_{Aeq}

As shown in Figure 4, the receivers fall below the 30 dB(A) contour line.

As indicated above, the inverter and transformer units may generate some tonal content therefore could warrant a rating level correction in accordance with BS4142. The predicted specific noise levels, presented in Figure 4 above demonstrate low predicted noise levels at the nearest receptors therefore any tonal content is likely to be masked to some degree by the prevailing ambient noise climate. However, a +2dB correction has been applied in the calculations below on the premise that any tonal content could be 'just perceptible'.

In addition to the above, the proposed solar farm will not generate any other identifiable characteristics i.e. intermittency, impulses and/or 'other' characteristics. To that end, no other character corrections have been applied in the calculation of the rating noise level. The specific noise level that has been calculated at the assessment points is shown below in Table 7.

Table 7: Daylight Noise Impact Assessment

Receptor Location	Predicted (Specific) level, dB L_{Aeq}	Rating level* dB L_{Ar}	Rating Noise Limit (ref Section 3.8) dB L_{Ar}	Difference, dB
AL01 Haisthorpe Hall	24	26	35	-9
AL02 Rose Cottage	19	21	35	-14
AL03 Home Farm	23	25	35	-10
AL04 White House Farm	21	23	35	-13
AL05 Breeze Farm	19	21	35	-14
AL06 Safety Cottage	16	18	35	-17
* Includes +2dB correction for potentially just audible tones, rounded to the nearest integer value				

The results presented in Table 7 indicate that the noise generated by the proposed solar farm and battery storage area is of a relatively low level in absolute terms for operation at maximum capacity and does not exceed the proposed noise target.

It is reiterated that; the noise levels assume all plant and equipment is operating at 100%. While it is possible that the solar equipment might be operational early in the morning it would not be operating at 100% and therefore the operational scenario presented above is unlikely to occur during the normal night period 23.00 to 07.00 and not when people are trying to get to sleep.

In terms of the noise exposure hierarchy table (Table 2 above), noise generated by the renewable energy park would, at worst, be at the No Observed Adverse Effect Level: where noise may be audible but not result in a change in the quality of life. Therefore, no further mitigation is required in terms of noise.

5.3 Night-time Scenario

For the typical night-time scenario, only sources around the battery compound would be operating. These are far from residential areas and there will be only a negligible impact. The noise contour is shown below in Figure 5 .

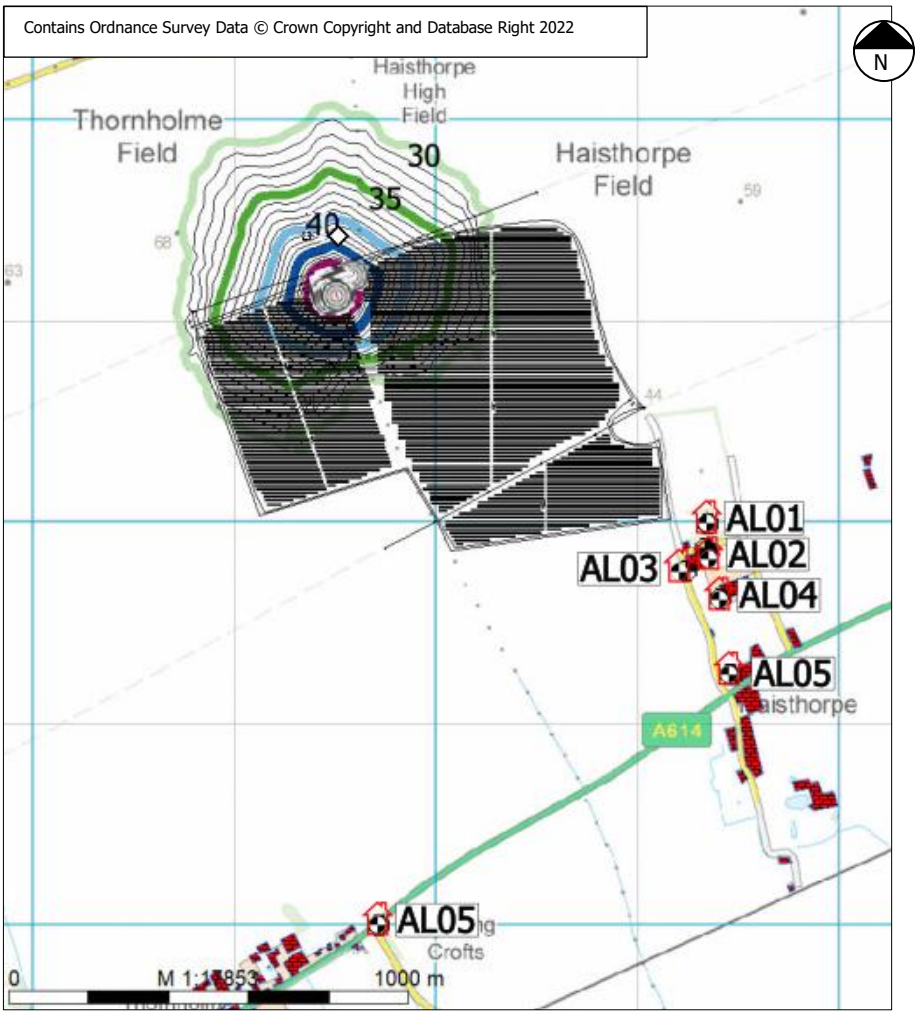

Figure 5: Indicative Night-time Noise Contour Plot, dB L_{Aeq}

As shown in Figure 5, the receivers fall below the 30 dB(A) contour line. In addition, the specific noise level has been calculated at the assessment points including +2dB correction which has been applied in the calculations below on the premise that any tonal content could be 'just perceptible'. The predicted noise levels are given in Table 8.

Table 8: Night-time Noise Impact Assessment

Receptor Location	Predicted (Specific) level, dB L_{Aeq}	Rating level* dB L_{Ar}	Rating Noise Target (ref Section 3.8) dB L_{Ar}	Difference, dB
AL01 Haisthorpe Hall	16	18	32	-14
AL02 Rose Cottage	15	17	32	-15
AL03 Home Farm	16	18	32	-14
AL04 White House Farm	14	16	32	-16
AL05 Breeze Farm	13	15	32	-17
AL06 Safety Cottage	12	14	32	-18
* Includes +2dB correction for potentially just audible tones, rounded to the nearest integer value				

The results presented in Table 8 indicate that the noise generated by the battery storage facility in operation is of at a very low level and is below the proposed night-time noise target.

In terms of the noise exposure hierarchy table (Table 2 above), noise generated by the proposed renewable energy park would, at worst, be at the no observed adverse effect level: where noise may be audible but not result in a change in the quality of life. Based on the results of the assessment and the guidance provided in Section 3, no further mitigation measures are required in terms of noise.

5.4 Standby Generator Operation

This scenario includes only the emergency operation of the sound sources associated with the battery storage area and the operation of the standby generator. These are far from residential areas and there will be only a negligible impact. The noise contour is shown below in Figure 6.

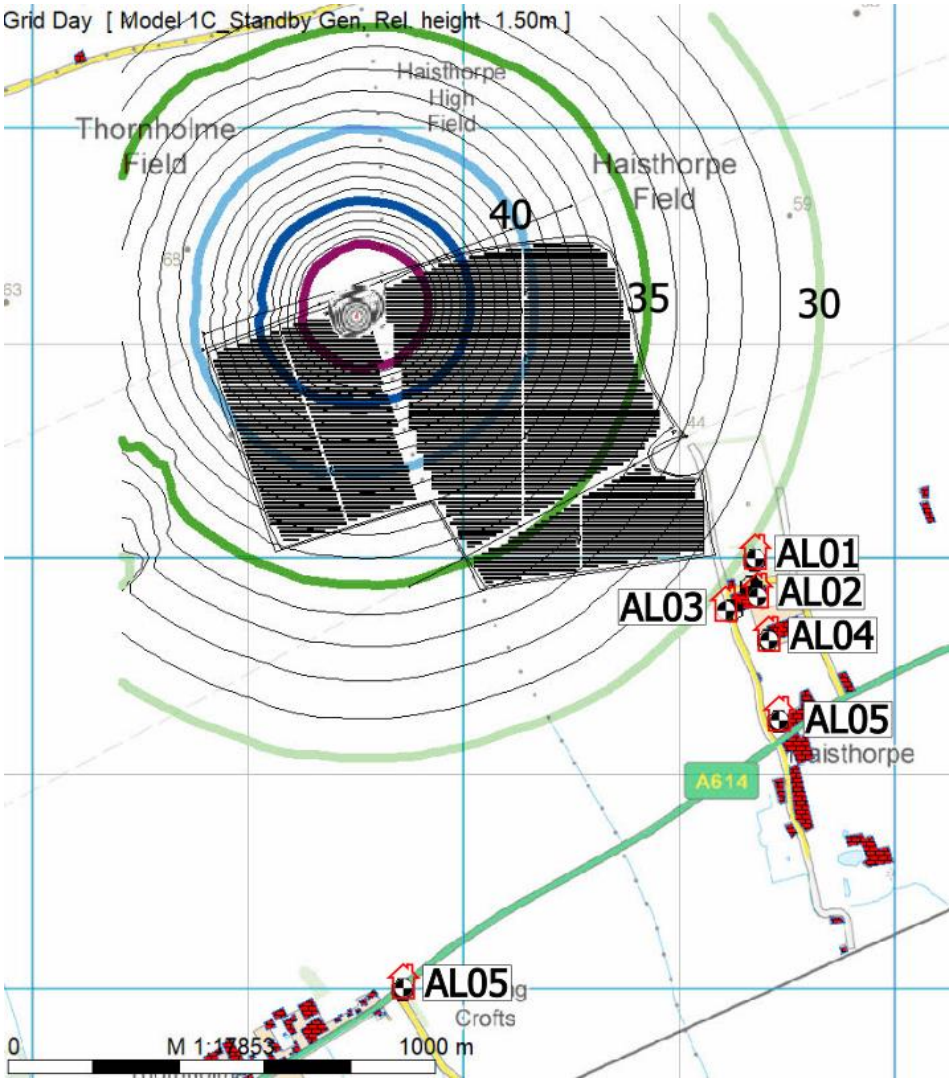

Figure 6: Indicative Contour Plot for the Standby Generator Operation Plot, dB L_{Aeq}

As shown in Figure 6, noise levels are below the 35 dB(A) contour line at all receptors. In addition, the specific noise level has been calculated at the assessment points identified in Table 1. The predicted noise levels including a +2dB tonal penalty are given in Table 9.

Table 9: Standby Generator Operation Noise Impact Assessment

Receptor Location	Predicted (Specific) level, dB L_{Aeq}	Rating level* dB L_{Ar}	Rating Noise Target (ref Section 3.8) dB L_{Ar}	Difference, dB
AL01 Haisthorpe Hall	30	32	45	-13
AL02 Rose Cottage	29	31	45	-14
AL03 Home Farm	29	31	45	-14
AL04 White House Farm	28	30	45	-15
AL05 Breeze Farm	27	29	45	-16
AL06 Safety Cottage	25	27	45	-18
* Includes +2dB correction for potentially just audible tones, rounded to the nearest integer value				

The results presented in Table 9 indicate that noise from the standby generator fall comfortably below the proposed 45 dB L_{Ar}. This will ensure there is no significant adverse impact. The standby generator will only be used during a power failure or for routine testing during working hours.

5.5 Uncertainty

BS 4142 requires an assessment of uncertainty and context. The prediction methodology in ISO 9613-2 is thought to be accurate to ±3dB but further uncertainty can occur in the source noise levels. The noise source data used is understood to represent the various plant items operating at 100% capacity which is only expected to occur during peak daytime periods.

Given the above, the assessment is considered to represent a worst-case assessment. To that end, uncertainty in the calculations and noise survey is not considered to have a significant impact on the assessment outcomes.

6 Summary

A noise impact assessment has been undertaken for a proposed Three Oaks Renewable Energy Park development on land to the north-west of Haisthorpe.

Operational noise limits have been established in accordance with BS 4142 to avoid adverse noise impacts. Overall, the calculations indicate that operational noise from the renewable energy park during the likely operating hours would be relatively low in absolute terms and an assessment using the Governments' planning guidance would indicate no observed adverse effect.

Given the above, it is considered that there are no noise-related issues associated with the proposed Three Oaks Renewable Energy Park which would prevent the granting of full planning permission.