5 NOISE

5.1 Introduction

This chapter assesses potential impacts and resulting significance of effects of the Proposed Development, as described in Chapter 2, upon the existing noise environment as well as the site's suitability for its proposed use with regard to noise.

The main noise sources from the Proposed Development are associated with the proposed Battery Energy Storage Site (BESS) located in the west of the site. The BESS will comprise 48 Sungrow battery storage units and 8 Sungrow STS inverter units in an open-air layout, as well as a DNO substation. The batteries will store electrical energy at times of high supply/low demand and release energy at times of low supply/high demand.

This chapter must be read in conjunction with the full Noise Impact Assessment (NIA), accompanying appendices and figures, which are provided in Appendix 5.1.

This chapter summarises the findings of the NIA and includes the following:

Consultation with South Holland Council (SHC) to agree the scope and approach of the assessment;

Modelling prediction of operational noise using proprietary software CadnaA;

Evaluation of predicted noise levels in accordance with British Standard BS4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound; and

Specification of Mitigation Measures, if required.

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5.2 Legislative Framework, Policy and Guidance

5.2.1 Legislation

For a development of this nature, there is no specific all-encompassing legislation relating to the standards associated with noise emission/effects. Noise legislation, where it does exist, tends to be either EU-derived and focussed on specific items of noise-emitting plant or on more general nuisance, such as that addressed by the provisions of the Environmental Protection Act 1990 (UK Government, 1990).

5.2.1.1 Environmental Protection Act 1990

Section 79 of the Act defines statutory nuisance with regard to noise and determines that local planning authorities have a duty to detect such nuisances in their area and, where a complaint of a statutory nuisance is made to it by a person living within its area, to take such steps as are reasonably practicable to investigate the complaint.

The Act also defines the concept of "Best Practicable Means" (BPM):

- 'practicable' means reasonably practicable having regard among other things to local conditions and circumstances, to the current state of technical knowledge and to the financial implications;
- the means to be employed include the design, installation, maintenance and manner and periods of operation of plant and machinery, and the design, construction and maintenance of buildings and structures;
- the test is to apply only so far as compatible with any duty imposed by law; and
- the test is to apply only so far as compatible with safety and safe working conditions, and with the exigencies of any emergency or unforeseeable circumstances.

Section 80 of the Act provides local planning authorities with powers to serve an abatement notice requiring the abatement of a nuisance or requiring works to be executed to prevent their occurrence. It is a potential defence against failure to comply with an abatement notice where BPM were used to prevent or counteract the effects of the nuisance.

5.2.2 Planning Policy

5.2.2.1 National Planning Policy Framework (NPPF)

The NPPF (Department for Communities and Local Government, 2021) provides planning guidance for local planning authorities in England. The NPPF states that planning policies and decisions should aim to:

- Prevent 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;
- 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;
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;
- Avoid noise from giving rise to significant adverse noise impacts on health and quality of life as a result of new development; and
- Mitigate and reduce to a minimum adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life.

With regard to the avoidance of significant adverse effects on quality of life, the NPPF references the Noise Policy Statement for England (2010).

5.2.2.2 Noise Policy Statement for England (NPSE)

The NPSE determines levels of impacts with reference to key phrases, which it defines as follows:

- **NOEL – No Observed Adverse Effect Level**; the level below which no effect can be detected; below this level, there is no detectable effect on health and quality of life due to the noise.
- **LOAEL – Lowest Observed Adverse Effect Level**; the level above which adverse effects on health and quality of life can be detected.
- **SOAEL – Significant Observed Adverse Effect Level**; the level above which significant adverse effects on health and quality of life occur.

The NPSE provides the following guidance regarding the SOAEL:

"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times."

And:

"Increasing noise exposure will at some point cause the SOAEL boundary to be crossed. Above this level the noise causes a material change in behaviour such as keeping windows closed for most of the time or avoiding certain activities during periods when the noise is present. If the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout. Such decisions must be made taking account of the economic and social benefit of the activity causing the noise, but it is undesirable for such exposure to be caused.

5.2.3 Guidance

5.2.3.1 BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound

BS4142:2014 describes methods for rating and assessing sound from industrial or commercial premises. The methods detailed in the standard use outdoor sound levels to assess the likely effects on people inside or outside a residential dwelling upon which sound is incident.

The standard provides methods for determining the following:

- Rating levels for sources of industrial and commercial sound;
- Ambient, background and residual sound levels; and
- The audibility of tones in sound: 1/3 octave method.

These may be used for assessing sound from proposed, new, modified or additional sources of sound of a commercial or industrial nature or to assess the suitability of introducing a receptor near an existing commercial or industrial site.

The standard makes use of the following terms:

- Ambient sound level, $L_a = L_{Aeq,T}$ – the equivalent continuous sound pressure level of the totally encompassing sound in a given situation at a given time, usually from multiple sources, at the assessment location over a given time interval, T.
- Background sound level, $L_{A90,T}$ – the A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90 percent of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.
- Specific sound level, $L_s = L_{Aeq,Tr}$ – the equivalent continuous sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T.
- Rating level, $L_{Ar,Tr}$ – the specific sound level plus any adjustment for the characteristic features of the sound.
- Residual sound level, $L_r = L_{Aeq,T}$ – the equivalent continuous sound pressure level at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound, over a given reference time interval, T.

The standard determines the degree of noise impact by comparison of the background noise level at noise sensitive receptors (NSRs) in the absence of the industrial or commercial facility (the specific source) with the ambient sound level when the specific source is operational.

Where particular characteristics such as tones, intermittency or impulsivity are present in the noise emissions of the specific source and perceptible at the receptor, the standard requires that “penalties” be added to the specific sound level to account for the increased annoyance that these can cause.

The following evaluation impact significance identifiers are provided in the standard, in which the difference between the specific sound level and measured background level are considered:

The greater the difference, the greater the magnitude of impact;

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact;
- A difference of around + 5 dB is likely to be an indication of a low adverse impact;
- The lower the rating level, relative to the measured background level, the less likely that the specific sound source will have an adverse (or significant adverse) impact; and
- Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact.

The standard also makes the following comments:

1. *“Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.*

   The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

   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.

   Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

2. *The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific*

sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/ or commercial nature is likely to be perceived and how people react to it.

3. *The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:*
   - *(i) Facade insulation treatment;*
   - *(ii) ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
   - *(iii) acoustic screening."*

Whilst the latest revision of BS 4142 does not provide definition of low or very low background and rating levels an earlier (1997) version considered that background levels of 30 dBA and rating levels of 35 dBA could be considered low. Numerous studies by Moorhouse, Berry, Flindell, etc for the Health Protection Agency and for Defra (referenced within the Further Reading Section of BS 4142) and supported by the recent ANC Working Group report on BS4142 application conclude that impacts at rating levels below 35 dB are unlikely. At night, particularly, where potential sleep disturbance is the key issue, a rating level of below 35 dB results in internal levels significantly below the WHO guideline values.

5.2.3.2 British Standard 5228: 2009+A1:2014 Code of Practice for Noise and Vibration Control on Construction and Open Sites, Part 1

BS5228-1:2009+A1:2014 provides guidance on the assessment of noise effects during the redevelopment of a site, including procedures for estimating noise levels from construction activities and vibration attributable to vibratory rolling and piling activities. The guidance does not define acceptable limits. However, it does provide potential methods for assessing the significance of noise effects, which should be defined on a site-specific basis. BS 5228:2009 also provides guidance on minimising potential effects through the use of mitigation and the adoption of Best Practicable Means (BPM).

5.2.3.3 ISO 9613: Attenuation of sound during propagation outdoors, Part 1 and Part 2

ISO 9613 describes a method for calculating the attenuation of sound during propagation outdoors in order to predict the levels of environmental noise at a distance from a variety of sources. The method predicts the equivalent continuous A-weighted sound pressure level under meteorological conditions.

5.3 Summary of Consultation

A summary of consultation undertaken as part of the NIA is provided in Table 5.1.

Table 5.1 - Summary of consultation undertaken

Organisation	Contact/Date	Comment / Issues Raised	Actions
SHC Environmental Health Officer (EHO)	Steve Branson SHC EHO – 27/01/2023	Phone call to discuss proposed assessment methodology	Discussed the initial predicted levels and scoping out a noise survey
SHC Environmental Health Officer (EHO)	Steve Branson SHC EHO – 27/01/2023	Email response confirming acceptance of proposed assessment methodology	No action required

Full details of consultations undertaken are presented in Appendix A of Appendix 5.1.

5.4 Extent of the Study Area

The study area considered in the assessment comprises a buffer 300 m beyond the Proposed Development red line boundary, as shown in Appendix 5.1 - Drawing 1. This includes the closest existing noise sensitive receptors (NSRs).

Existing NSRs considered in the NIA are listed in Appendix 5.1 – Section 1.3 and shown in Appendix 5.1 – Drawing 1.

5.5 Effects Scoped Out

5.5.1 Construction Phase – Road Traffic

Construction traffic noise impacts at existing NSRs will be of short duration and can be limited by implementation of appropriate controls during the construction phase. Construction traffic noise is therefore anticipated to be of limited significance and has been scoped out of detailed assessment.

5.5.2 Construction Phase – Construction Activities

Details of the Proposed Development construction phases and likely construction plant are not available. This assessment assumes that good practice measures will be implemented during the construction phase, and notes that construction works will only take place during the following periods:

- 8am - 6pm Monday to Friday
- 8am - 1pm on Saturdays
- No work on Sundays or Bank Holiday

Construction phase noise impacts will be controlled by implementation of the mitigation measures set out in the construction and environmental noise management plan which forms part of the overall Construction Environmental Management Plan (CEMP) (Appendix 2.1) and is therefore scoped out of this assessment.

This chapter provides a qualitative evaluation following guidance contained in BS5228:2009+A1:2004 “ABC Method” and provides noise limits applicable to construction activities for the nearest NSRs.

5.6 Methodology

The methodology used to undertake the NIA is detailed in full in Appendix 5.1 - Section 3.

5.6.1 Evaluation Criteria

The evaluation criteria used in this assessment have been derived from appropriate guidance and are provided in Appendix 5.1 – Table 3.

5.6.2 Derivation of Applicable Limits to Construction Activities

As the baseline noise environment is rural, with a distinctive lack of anthropogenic noise, it is reasonable to assume that the baseline ambient level is below 65 dB during the daytime period. The construction phase noise limit for weekday daytimes and Saturdays, in accordance with the ABC method provided in BS 5228, is therefore Category A; 65 dB $L_{Aeq,T}$.

5.6.3 Assessment of Significance

The impact magnitude and effect significance have been determined following the criteria described in the assessment of potential effect significance section below.

5.6.3.1 Impact Magnitude and Effect Significance – Operational Noise

The significance of operational noise has been determined only with reference to BS4142 as follows:

- This assessment considers that compliance with the noise criteria at NSRs will demonstrate noise is “not significant”; and

- This assessment considers that operational noise levels above the noise criteria at NSRs will be "significant".

5.6.4 Method of Prediction

The method of prediction is detailed in full in Appendix 5.1 - Section 3.2.1

A noise model has been constructed within noise modelling software CadnaA to predict noise levels across the study area due to the Proposed Development. Predictions have been undertaken in accordance with BS4142 and the noise propagation method provided in ISO9613. The model considers the effect of screening provided by local topography and existing buildings in the study area.

5.6.5 Method of Evaluation

The method of evaluation is detailed in full in Appendix 5.1 - Section 3.3.

5.7 Baseline Conditions

5.7.1 Description of the Baseline Noise Environment

The baseline noise environment has been characterised by desk study. The noise environment is typical of a remote, rural environment in which anthropogenic noise is a minor contributor, and noise from natural sources, including bird calls, the wind, and wind-blown vegetation are the primary control on baseline noise levels. Anthropogenic noise is anticipated to be limited to road traffic on the Eastern Road and agricultural machinery.

5.8 Evaluation of Significant Effects

5.8.1 Construction Phase

The target noise levels at the closest NSRs in accordance with BS5228 and are provided in Table 5.2

Table 5.2 – Derivation of target levels, construction phase

NSR	Threshold Level, dB
NSR1	65
NSR2	65

This assessment assumes that construction noise impacts will be controlled by design, such as by production and implementation of a Construction Environmental Management Plan (CEMP). Noise effects during the construction phase have therefore been determined to be "not significant".

5.8.2 Operational Noise

The prediction and evaluation of operational noise levels due to the Proposed Development is detailed in full in Appendix 5.1 – Section 4.

Predicted rating levels are below the limiting value at all NSRs which is indicative (in accordance with the BS4142 guidance) of a minor impact.

5.9 Cumulative Effects

5.9.1 Construction

The assessment has considered those projects (set out in Chapter 1 – Introduction) that could potentially give rise to cumulative effects when considered with the Proposed Development. No cumulative effects are

anticipated during the construction phase. Should construction activity be proposed on adjacent sites, this assessment considers that use of appropriate controls on both sites would enable the proposed noise limits to be met. Cumulative noise effects are therefore considered to be “not significant”.

5.9.2 Operation

No cumulative effects are anticipated during the operational phase. There are no other existing or proposed noise generating developments in close proximity to the Proposed Development.

5.10 Mitigation

No specific mitigation is proposed. However, the Applicant has committed to meeting appropriate noise limits. Should noise levels due to the Proposed Development exceed the proposed noise limits then appropriate mitigation, such as a noise management plan, will be put in place.

5.11 Residual Effects

5.11.1 Construction

No requirement for specific additional mitigation (beyond good practice measures) has been determined for the construction phase, therefore no additional mitigation is proposed, and residual effects remain unchanged, and are not significant.

5.11.2 Operation

No requirement for specific additional mitigation has been determined for the operational phase, therefore no additional mitigation is proposed, and residual effects remain unchanged, and are not significant.

5.12 Summary & Conclusion

An assessment of potential noise effects has been undertaken for the operational phase of the Proposed Development. Detailed assessment of noise effects from the construction phase has been scoped out on the basis that noise from these works will be limited in duration and confined to working hours agreed with SHC and can therefore be adequately controlled through planning condition, however, appropriate noise limits for have been identified.

The operational assessment has been undertaken in accordance with BS4142. The assessment has comprised prediction of operational noise levels, and evaluation in accordance with BS4142 and fixed limit criteria.

This assessment demonstrates the Proposed Development would operate within BS4142 derived criteria at NSRs. With reference to the NPPF and NPSE it can be considered that predicted noise levels due to the Proposed Development are below the LOAEL. The Applicant is committed to meeting the derived criteria and will put in place mitigation if required. Noise impacts associated with the Proposed Development are therefore “not significant”.

5.13 Limitations of the Assessment

Uncertainty exists in the context of the spectral characteristics of the sound power levels provided for the equipment). To minimise uncertainty the frequency spectrum for each item of equipment was chosen from ITPEnergised’s database of noise levels from previous projects for similar equipment items.

No noise survey has been undertaken, uncertainty in this regard has been addressed by assuming a low background level (30 dB) which is representative of a very rural area away from busy roads.

5.14 Non-Technical Summary

A noise impact assessment (NIA) has been undertaken for the Proposed Development.

The assessment has been undertaken to demonstrate compliance with criteria set out in relevant British Standards. It has been undertaken in accordance with BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound.

The baseline noise environment has been characterised by desk study. The noise environment is typical of a remote, rural environment in which anthropogenic noise is a minor contributor, and noise from natural sources, including bird calls, the wind, and wind-blown vegetation are the primary control on baseline noise levels. Anthropogenic noise is anticipated to be limited to road traffic on the Eastern Road and agricultural machinery.

Appropriate target noise levels have been derived for construction noise. Construction noise impacts will be controlled by design, such as by production and implementation of a Construction Environmental Management Plan (CEMP). Noise effects during the construction phase have therefore been determined to be “not significant”.

Noise modelling was undertaken to determine noise impacts from the Proposed Development at existing NSRs. Predicted noise levels have been evaluated in accordance with BS4142 and fixed limit criteria. Noise impacts at the closest existing NSRs have been determined to be “not significant”.

5.15 References

BSi. (1997). BS4142:1997 Method for Rating Industrial Noise Affecting Mixed Residential and Industrial Areas.

BSi. (2009/2014). BS 5228-1:2009+A1:2014: Code of Practice for Noise and Vibration Control on Construction and Open Sites, Noise.

BSi. (2013). BS61672-1:2013 Electroacoustics, Sound Level Meters Specifications.

BSi. (2014). BS4142:2014+A1:2019 Methods for Rating and Assessing Industrial and Commercial Sound.

BSi. (2014b). BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings.

DEFRA (2010) Noise Policy Statement for England (NPSE) – Publications – Department for Environment and Rural Affairs - Available at: http://www.defra.gov.uk/environment/quality/noise/

Gov.uk. 2012. National Planning Policy Framework - Publications - GOV.UK. [online] Available at: https://www.gov.uk/government/publications/national-planning-policy-framework--2

ISO. (1996). Acoustics. Attenuation of Sound During Propagation Outdoors - Part 2.

UK Government. (1990). Environmental Protection Act. Retrieved from https://www.legislation.gov.uk/ukpga/1990/43/contents

Table 5.3 – Summary of Effects

Description of Effect	Significance of Potential Effect		Mitigation Measures	Significance of Residual Effect	
	Significance	Beneficial/Adverse		Significance	Beneficial/Adverse
Construction					
Noise from construction traffic	Not significant	Adverse	None required	Not significant	Adverse
Noise from construction activities	Not significant	Adverse	Implementation of good practice during construction works	Not significant	Adverse
Operation					
Noise from operation of BESS	Not significant	Adverse	Applicant committed to meeting derived noise criteria	Not significant	Adverse