YARDLEY ROAD SOLAR FARM

NOISE IMPACT ASSESSMENT

Acoustics Report A2283 R01b

3rd June 2025

Report for:	Yardley Road Solar Farm Ltd
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1 Introduction

Ion Acoustics is appointed by Yardley Road Solar Farm Ltd to advise on operational noise associated with a proposed solar farm west of the A508, north-east of Pottersbury, Northamptonshire (the 'Proposed Development'). Solar farms are not generally considered to be noisy and often no noise is audible beyond the boundary of the site. Nevertheless, a noise impact assessment (this report) has been produced in order to determine the noise impact at the nearest residential locations. Acoustic modelling, using IMMI noise mapping software (2025), has been used to predict noise levels. This report sets out the assessment and demonstrates that noise from the Proposed Development can meet noise limits set to protect residential amenity at the nearest noise-sensitive locations.

In addition, some noise can occur during the construction phase from the construction of access tracks, hard standings, and cable routing. The installation of the panels themselves and from transport movements on the local roads. Any construction noise however will be temporary and will occur during daytime hours which will be limited by the local authority.

2 Scheme Details

2.1 Site Location

The site is located on agricultural land approximately 178m to the north-east of Pottersbury. The A508 runs along the east of the site, approximately 19m at its closest point, and village of Yardley Gobion is approximately 119m to the north. The A5 is to the south and west. Figure 1 shows the red line boundary (the site boundary) and the selected assessment positions (AP1 etc) and Figure 2 shows the site in context of the wider area.

Figure 1 – Principal Site location showing Site boundary and assessment positions, (c) Google

The selected assessment positions are also detailed in Table 1 below together with the approximate Ordnance Survey Grid location and the distance from the site boundary.

Table 1 - Noise sensitive receptors

ID	Description	Easting	Northing	Approx. Distance to site boundary (m)
AP1	Beech House	476691	243542	129
AP2	1-2 Beech House Drive	476521	243542	189
AP3	1A Beech House Drive	476323	243466	155
AP4	3 Beech House Drive	476352	243440	191
AP5	1 Church End	476250	243412	172
AP6	29-50 Eastfield Crescent*	476640	244319	96
AP7	51-77 Eastfield Crescent*	476623	244319	108
AP8	The Cottage Dovecot	477213	242998	152
* The dwelling closest to the Site boundary has been selected to be representative of noise at this location				

The closest properties are on Eastfield Crescent, approximately 96m north from the Site boundary. Other residential properties within the wider area are at a greater distance compared to the dwellings here. Therefore, if the noise limit is met at the nearest residential receptors, they will also be met at all other noise sensitive receivers.

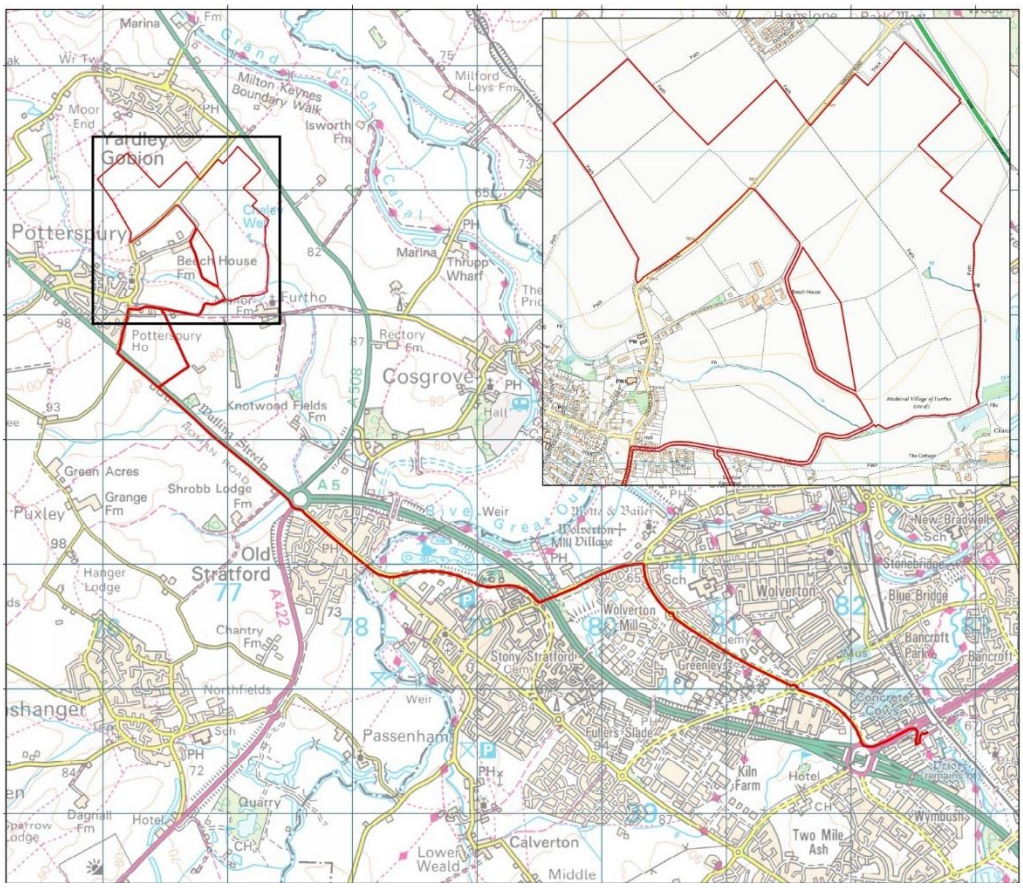

Figure 2 - Site in context of wider area

2.2 Proposed Development Layout

The Proposed Development consists of 12 fields containing solar panels with 125 string inverters distributed throughout behind the panels and 11 solar transformers distributed around the Site. These are the only noise sources of interest. The layout is shown in Figure 2 with the locations of the string inverters and transformers.

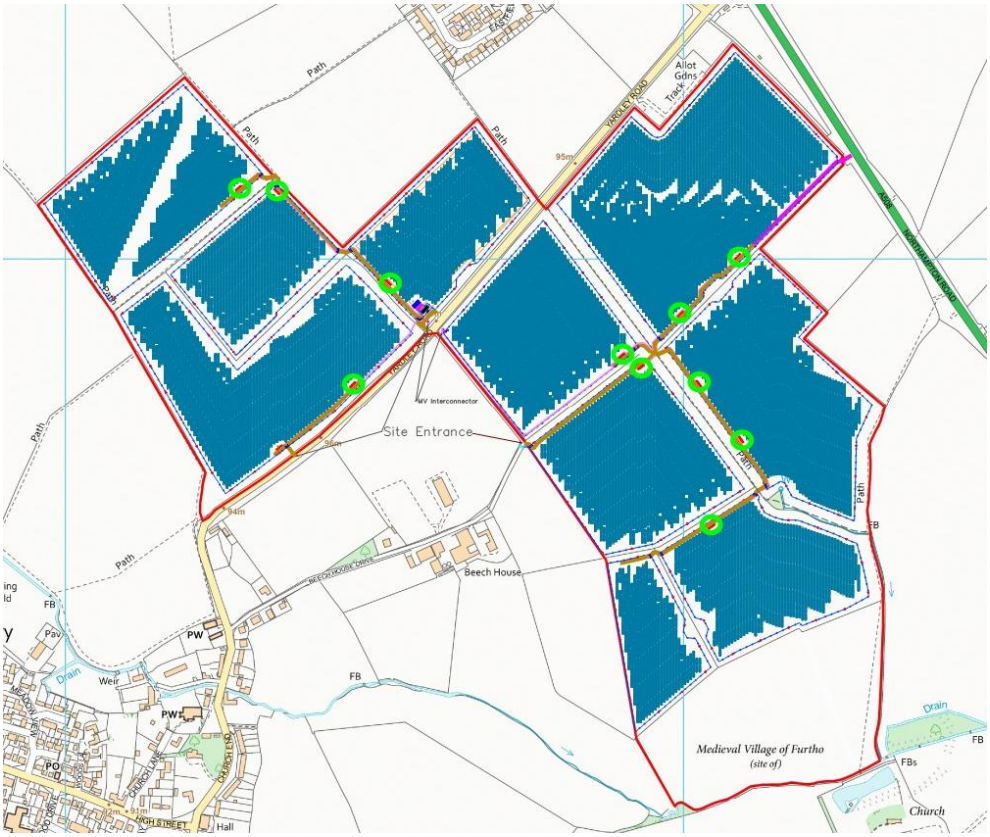

Figure 3: Layout with inverters as white dots on blue background, transformers circled in green.

3 Planning Conditions and other Guidance on Noise

3.1 National Planning Policy Framework (NPPF)

In 2012 the National Planning Policy Framework (NPPF) (2024) replaced a number of Planning Policy Statements with a single document which is intended to promote sustainable development. The last major revision of the NPPF was in December 2024 and certain aspects of the guidance changed. A further update was made in February 2025.

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:

187. 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. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

198. 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 tranquil 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) (2010) sets out the Government's policy on environmental, neighbourhood and neighbour noise for England. The policy sets out three aims:

- *"avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *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, define numeric criteria for the NOEL, LOAEL or SOAEL. Instead, it is recommended in the NPSE that the limits of each effect level should be defined for each situation and location. The WHO 'Guideline for Community Noise' (2011)and BS 8233:2014 (2014) recommend internal noise design targets for habitable rooms for the avoidance of negative health effects and to promote quality of life.

3.3 Planning Practice Guidance – Noise (Web Publication)

Further planning guidance is available online. 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. The hierarchy table is shown below in Table 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

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

The planning guidance referred to above does not include specific criteria. However, the standard method for assessing noise of an industrial nature affecting housing, is British Standard BS 4142 'Method for rating and assessing industrial and commercial sound' (2019). 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 acoustic characteristics such as distinguishable tones, impulsiveness, intermittency or other acoustically significant characteristics. 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 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.

BS 4142 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 around L_{A90} 30dB or 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."*

For this assessment, absolute limits are proposed. These have been set sufficiently low to protect amenity during operational hours irrespective of the background noise.

3.5 BS 8233:2014 and WHO criteria

British Standard BS 8233: 2014 (2014) and the World Health Organisation (WHO) (2011) provide absolute noise limits to protect residential amenities. 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 WHO guideline 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 of 1m from the façade. Therefore, the equivalent free-field night-time limit would be approximately 3dB lower, 42 dB L_{Aeq}.

The daytime limits apply to relatively anonymous noises without character and are commonly applied to traffic noise.

3.6 BS ISO 9613-2 Attenuation of sound during propagation outdoors

BS 4142 requires the use of a validated method to calculate sound levels and ISO 9613-2 (2024) is given as an example. The standard has been updated and adopted as a British Standard: BS ISO 9613-2: 2024. The calculation method allows noise levels to be predicted for short-term downwind conditions, i.e. for wind blowing from the noise source towards residential properties. The standard considers a number of attenuation factors including distance loss, atmospheric absorption, ground and barrier effects. The computer model used for the operational noise predictions implements this standard.

4 Noise Assessment Details

A noise model has been constructed using IMMI noise modelling software to predict noise levels to the nearest noise-sensitive receptor locations. Within the modelling software, propagation of noise has been calculated in accordance with BS ISO 9613-2:2024 (2024) 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), unless in specific areas where hard ground can be assumed (Tarmacked roads, bodies of water, etc). As the solar panels are tracking panels these have been included as hard ground within the model;
- Ambient air temperature of 10°C and 70% Relative Humidity;
- Barrier and screening influence calculated in accordance with BS ISO 9613-2; and
- Topographical data from Ordnance Survey

The input source data for the model is described below. The exact equipment for use on the site has not yet been decided. Therefore, example noise data from typical equipment has been used in assessment. Should alternative plant or manufacturers be selected, it must be selected to achieve the same noise limits.

4.1 PV Inverters

125 Sungrow SG350HX string inverters are selected for the project and will be distributed throughout the site. The inverters are mounted beneath the panels.

Information from Sungrow provides noise data for various operational scenarios. Sound power levels for 100% duty and 70% duty, are presented in Table 4 below. Further information is provided in Appendix A.

Table 4: Octave band spectra of SG 350HX inverter unit

Operation	Sound Power Levels in Octave Bands, Hz dB							dB L_{WA}
	63	125	250	500	1000	2000	4000	
100%	80.0	75.4	74.1	73.9	81.7	27.7	73.5	**83.6**
70%	71.1	66.5	65.0	72.8	73.8	63.8	84.6	**76.1**

The inverters have been distributed across the site in a manner as advised by Yardley Road Solar Farm Ltd. The inverter placement is shown in Figure 2 above. The closest inverter is approximately 134m from the receptor representing 29-50 Eastfield Crescent.

Yardley Road Solar Farm Ltd have advised that the typical operational scenario for the string inverters is at 70% duty, and that the inverters would only typically operate at 100% duty infrequently during the day. Therefore, for this assessment the sound power data for 70% duty has been considered as the typical operating condition.

4.2 Distributed Transformers

Yardley Road Solar Farm Ltd have indicated that a Sungrow Medium Voltage Station (MVS) will likely be used as distributed transformers around the site as indicated in Figure 2. A specific model is yet to be decided upon, however, data for a MVS9000-LV has been provided which has a specified sound power level of 65 dB L_{WA}. This value has been selected in order to represent a worse-case scenario of the transformer operating at maximum capacity and therefore represents a conservative assessment. The data for this unit is presented in Appendix A.

4.3 Proposed operational noise limits

The solar farm will operate during the hours of daylight only. In the summer months, operation of the solar farm could begin in hours traditionally considered part of the nighttime period, specifically before 7am. However, this period is often associated with the dawn chorus when noise from bird song can be quite loud. The solar farm would not operate during the quietest time of night, nor when most people are trying to get to sleep, e.g. between 10pm and midnight.

The site is in between the A5 and the A508 roads and therefore traffic noise is likely to affect the noise climate especially during the day. However, noise levels are likely to fall during the evening and night and then increase after 5am.

In instances of low rating and background noise levels, BS4142 (2019) indicates that assessment in line with absolute noise limits might be more appropriate. In this case, a rating noise level limit

of 35 dB L_{Ar} (free-field) is proposed during operational hours for noise from the solar farm at residential receptors. This is well below the BS 8233:2014 (2014)threshold for outdoor amenity periods meaning background noise levels are likely to exceed this during the day. During the early hours of the morning, when the solar farm could operate in what is traditionally considered to be the night-time period, this limit is sufficiently low to protect sleep as it is well below the WHO sleep disturbance threshold discussed in Section 3.5 above.

5 Noise Assessment Results

A noise model has been constructed using IMMI noise modelling software to predict noise levels to the nearest noise-sensitive receptor locations. Within the modelling software, the propagation of noise has been calculated in accordance with BS ISO 9613-2:2024 (2024).

The results of the acoustic model are presented in the first instance as a noise contour plot in Figure 3 below.

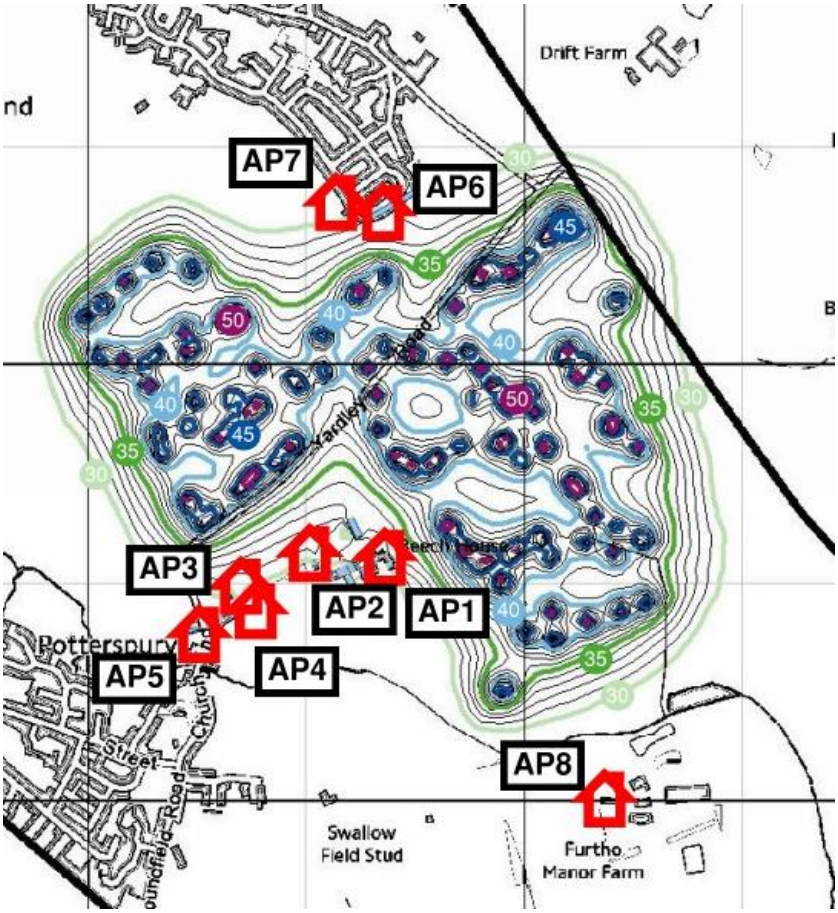

Figure 4: Indicative operation hours noise contour plot. Contours presented as L_{Aeq} dB.

To calculate noise levels from the inverters at the selected assessment positions, point receivers were placed in each of the locations highlighted in Figure 1. Where appropriate a receptor was placed at the height of an upper floor. The results of the acoustic model are presented in Table 5.

Electrical equipment such as inverters can produce audible tones although often they are relatively high frequency in nature and readily dissipated by distance and atmospheric absorption.

Analysis of the third-octave band data, which can be found in Appendix A, according to the objective method in Annex C of BS 4142: 2014 (2019) indicates that whilst there are some tonal artifacts associated with the string inverter noise, they are high enough in the frequency spectrum that these artifacts would be sufficiently absorbed and diffused by the existing terrain, the proposed solar panels, and atmospheric absorption. Therefore, no penalty has been applied.

Table 5: Predicted Noise Levels

Assessment Position	Predicted Daytime Specific Level, L_{Aeq} dB	Noise Limit, L_{Ar} dB	Difference Rating Level to Noise Limit, dBA
AP1 Beech House	**34**	**35**	**-1**
AP2 1 – 2 Beech House Drive	**32**		**-3**
AP3 1A Beech House Drive	**31**		**-4**
AP4 3 Beech House Drive	**29**		**-6**
AP5 1 Church End	**25**		**-10**
AP6 29-50 Eastfield Crescent*	**30**		**-5**
AP7 51-77 Eastfield Crescent*	**27**		**-8**
AP8 The Cottage Dovecot	**26**		**-9**

6 Uncertainty

BS 4142 (2019)requires an assessment of uncertainty. The prediction methodology in ISO 9613-2 (2024) is thought to be accurate to ±3dB but further uncertainty can occur in the source noise levels. The predicted noise levels assume that the string inverters are operating at 70% capacity, which is likely to be typical. This may be exceeded during the hottest periods of the day, but this will not happen during the more critical early morning or evening periods which are likely to be more sensitive in respect of the nearby residential locations.

To that end, uncertainty in the calculation is not considered to have a significant impact on the assessment outcome and noise levels are expected to be below the calculated value during the vast majority of operating of the site.

7 Conclusion

A noise impact assessment has been carried out for a proposed solar farm in Yardley, near Pottersbury. A noise limit of 35 dB L_{Aeq} has been proposed in order to protect residential amenities. Solar farms are not generally considered to be noisy and often no noise is audible beyond the site boundary.

Calculations indicate that the typical operational noise condition would comply with the noise limit at the noise sensitive receptors. Information on the selected plant is provided in Appendix A. Based on this, there is no reason that planning permission should not be granted.

8 References

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Sungrow MV Transformers

Test report
Report Number: CN2367B6 003

TÜVRheinland®
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Rating characteristics of power transformer	
Mode	SFL-8850/33
Number of phase	3
Rated frequency [Hz]	50/60
Rated power [kVA]	8850
Rated voltage of HV winding [kV]	33
Rated voltage of LV winding [kV]	0.8/0.8
Rated current of HV winding [A]	154.8
Rated current of LV winding [A]	3193.5/3193.5
Vector groups	Dy11y11
Cooling system	ONAN
Voltage adjustment range at the HV side	33±2x2.5%
Power-frequency withstand voltage of HV winding [kV]	70
Power-frequency withstand voltage of LV winding [kV]	3
Lighting impulse withstand voltage of HV winding [kV]	170
Short circuit impedance between HV and LV in reference to the rated power [%]	9.5(±10%)
Load losses at 75°C at rated frequency of 50 Hz [kW]	≤80
No-load current at rated voltage and frequency [%]	0.4(+30%)
No-load losses at rated voltage and frequency [kW]	≤8.5
Sound power level based on ONAN cooling mode [dB]	65

Sungrow SG350HX

6	Running at 10% power, daytime	71.7
7	Running at 50% power under 75kVA, nighttime	71.8

3.3 Sound Power Level Test Result of SG350HX

(1) Sensor Location in the Test

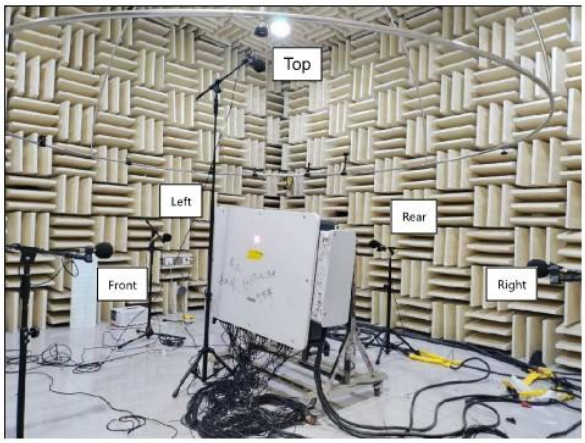

Fig. 3 Sensor Location in the Test

(2) Test Result

Tab. 6 Test Result of SG350HX

No.	Working Conditions	Sound power level/dB(A)
1	Running at 110% power, daytime	83.5
2	Running at 100% power, daytime	83.6
3	Running at 70% power, daytime	76.1
4	Running at 50% power, daytime	74.8
5	Running at 30% power, daytime	62.5

- SG350HX Running at 100% power, daytime-Sound Power Level, Octave Spectrum:

1/3 Octave (Hz)	Sound Pressure Level $\overline{L_pA}$, dBA	Sound Power Level L_{WA},dBA	1 Octave Sound Power Level L_{WA},dBA
25	-2.8	11.7	19.6
31.5	-3.7	10.7	
40	3.6	18.0	
50	12.1	26.6	40.5
63	13.9	28.3	
80	25.6	40.1	
100	28.6	43.1	49.0
125	30.1	44.6	
160	30.4	44.9	
200	37.8	52.3	66.2
250	44.8	59.3	
315	50.5	64.9	
400	53.6	68.0	78.5
500	53.5	68.0	
630	63.2	77.6	
800	55.5	70.0	78.1
1000	58.0	72.5	
1250	61.3	75.7	
1600	61.2	75.7	77.4
2000	54.7	69.1	
2500	55.1	69.6	
3150	55.3	69.8	74.1
4000	55.9	70.3	
5000	52.9	67.4	
6300	50.5	65.0	66.4
8000	45.4	59.9	
10000	39.9	54.3	
12500	35.7	50.1	65.6
16000	51.0	65.5	
20000	25.7	40.2	
Total Sound Power Level	*LWA =83.6dBA*		