PREMIER FOODS SOLAR

NOISE ASSESSMENT FOR PLANNING

Acoustics Report A2055 R01a

31st August 2023

Report for:	Premier Foods PLC c/o Tor&Co 3 Edmund Gardens 117 Edmund Street Birmingham B3 2HJ FAO Neil Trollope
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Contents

1 Introduction

Ion Acoustics is appointed by Tor&Co on behalf of Premier Foods PLC to carry out a noise assessment for a proposed solar farm for the Premier Foods Bakery in Carlton, Barnsley.

Solar farms are not normally considered noisy. However, various electrical components, such as inverters and transformers, can emit low noise levels. A desktop assessment (this report) has been prepared to describe potential noise impacts at the nearest noise-sensitive receptors (dwellings). Computer noise modelling has been used to calculate operational noise levels at the receptors. Predicted operational noise levels from the development are compared with noise limits derived from baseline surveys carried out by other consultancies.

A glossary of acoustic terms is given in Appendix A.

2 Proposed Scheme Details

2.1 Site Layout

The development is located in a field off Shaw Lane next to Premier Foods Bakery which is to the south-west. However, there is housing to the west and east. There is also a proposed housing development north-east of the site that will also be included in this assessment.

A satellite image of the site is given in Figure 1 with the red line boundary and the assessment positions (AP1, etc.) considered in this report. The assessment positions do not include every residential property. However, the worst-case receptors have been included. Figure 1 also includes the proposed housing development highlighted in blue, and indicative assessment positions for the housing development (PP1, etc.).

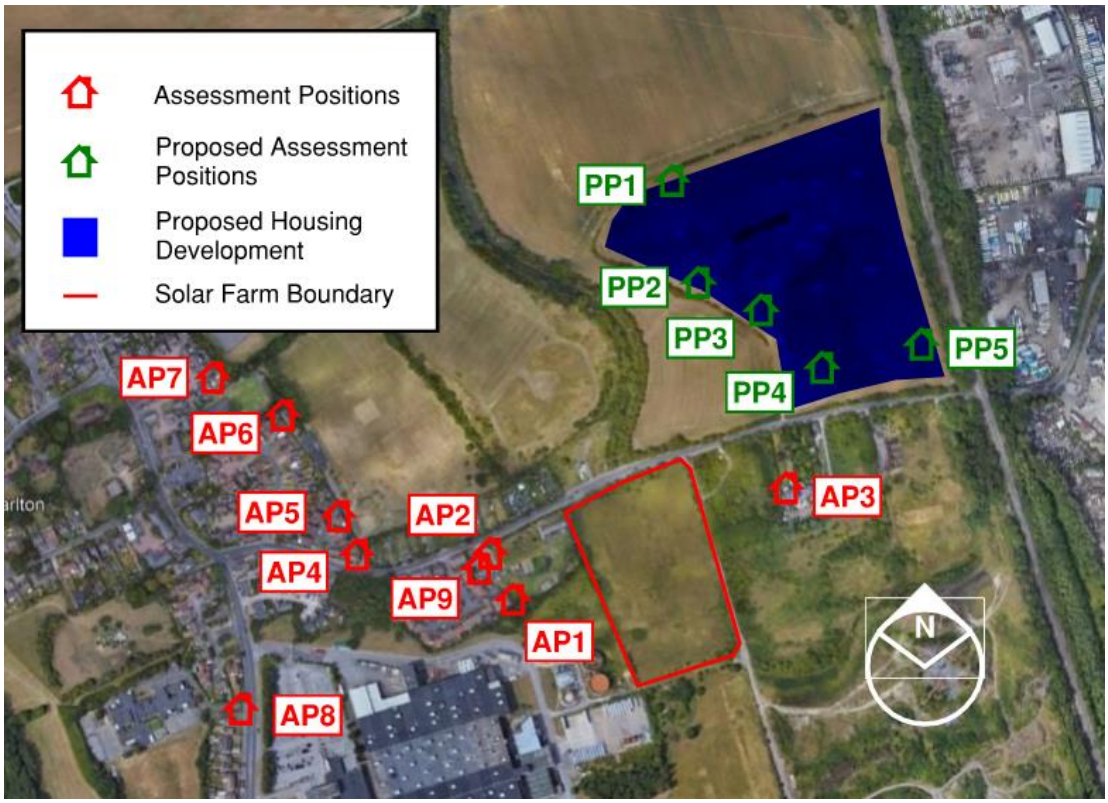

Figure 1 – Satellite image of the proposed location © Google

The assessment positions are also shown below in Table 1 include houses with the approximate OS grid coordinates and the distance to the nearest sound source.

Table 1: Noise Assessment Positions

Assessment Position	Approximate OS Grid Coordinates, (E, N)	Distance to the Nearest Sound Source (m)
AP1 – 23 Highgrove Court	437068, 409964	120
AP2 – 59 Shaw Lane	437039, 410003	120
AP3 – 105 Shaw Lane	437367, 410085	205
AP4 – 2 Park Side	436902, 410008	250
AP5 – 4 Park Side	436875, 410065	275
AP6 – 20 Ivy Farm Close	436826, 410160	350
AP7 – 18 Far Lawns	436739, 410194	435
AP8 – 270 Fish Dam Lane	436770, 409832	445
AP9 – 3 Highgrove Court	437023, 409995	135
PP1	437252, 410417	385
PP2	437258, 410321	300
PP3	437325, 410269	280
PP4	437390, 410204	290
PP5	437515, 410241	420

2.2 Scheme Details

The proposed development includes the following noise-generating equipment:

- Three Huawei SUN2000-330KTL-H1 String Inverters
- A single 3000kVA Ground Mounted Transformer

These items are the operational noise sources of interest. The nature of solar farms is such that electricity is only generated during daylight hours. Electricity generation may extend in times considered part of the night during the summer, i.e. early mornings before 0700hrs. Note that the early morning periods during spring and summer 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 when most people would be trying to sleep.

The string inverters will be installed behind the westernmost solar panels. Therefore the panels would shield some noise from the string inverters. The orientation of the panels ensures the most shielding to the south, whereas other directions are less shielded. The shielding effect of the panels is included in the computer model.

A site layout plan is presented in Figure 2 below. The inverter locations are shown along with the transformer location.

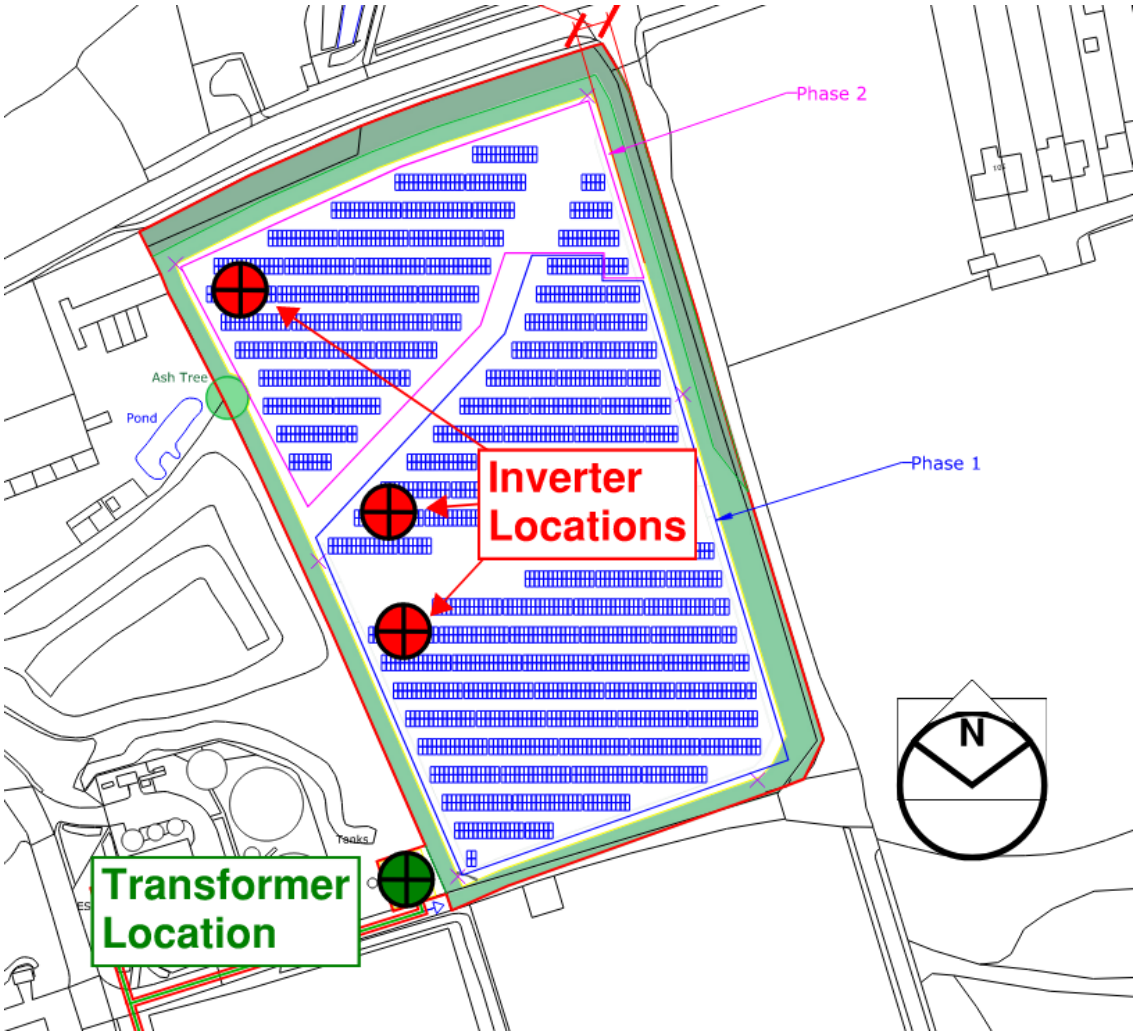

Figure 2 – Site Layout Plan

3 Planning Policy and Other Guidance on Noise

3.1 National Planning Policy Framework (NPPF)

In 2012 the National Planning Policy Framework (NPPF) replaced several Planning Policy Statements with a single document to promote sustainable development. The NPPF was revised in July 2021[1], and specific 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 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 developments 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.

1 https://www.gov.uk/government/publications/national-planning-policy-framework--2

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 impact 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*
- *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. The hierarchy table is shown below in Table 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
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 BS 4142:2014 +A1: 2019 – Assessment Principles

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". 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}. Still, 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 the 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 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 several 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 context and the noise impact.

3.4 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. The criteria are detailed in Table 3 below.

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

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 level would be approximately 3dB lower, 42 dB L_{Aeq}. The limits are thought to apply to quasi-steady relatively anonymous noises without character such as traffic noise.

3.5 Noise Limits

Noise from the existing bakery is understood to be regulated by the Environmental Agency (EA) as part of a permitting process. However, we are not aware of any specific numerical limits set by the EA. Furthermore, we are not aware of any specific noise limits which would be set by Barnsley Council for this type of facility. However, in accordance with BS 4142, it is appropriate to compare operational noise levels from the solar farm with the typical background noise level, L_{A90}. Setting limits at parity with the typical background will ensure a low impact in accordance with BS4142:2014 (depending on the context).

4 Baseline Noise Survey

A baseline survey has not been conducted by Ion Acoustics for this site. However several surveys by other consultants have been conducted and their reports reviewed. The monitoring positions used by other consultants are shown below in Figure 3.

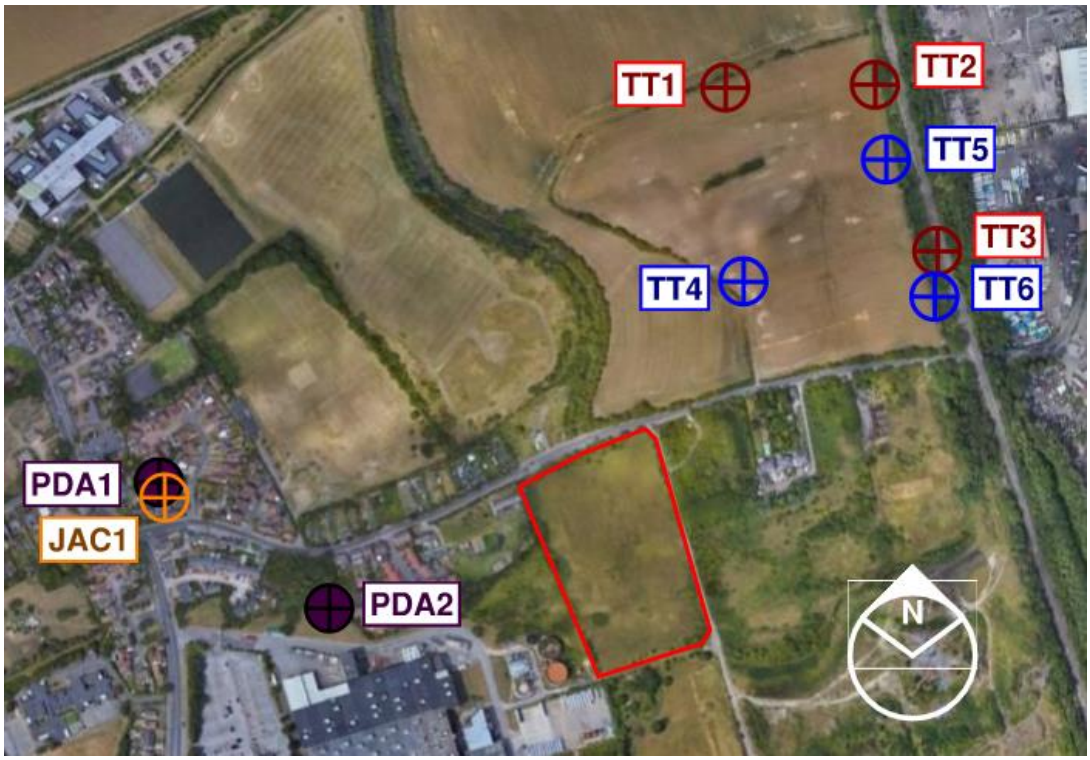

Figure 3 – the monitoring positions of surveys conducted by other consultants.

The three surveys that have been studied for this assessment are:

- Premier Foods – Noise Complaint Investigation (PDA Acoustics: J004159-5948-02, January 2023), monitoring positions PDA1 and PDA2 in purple;
- Shaw Lane – Noise Assessment for Proposed Residential Development (Tetra Tech: 784-B029129, January 2022), monitoring positions TT1 – TT3 in red (daytime) and TT4 – TT6 in blue (nighttime); and,
- Premier Foods – Noise Impact Assessment (Jacobs: B2410700-NIA20, November 2020), monitoring positions JAC1 in orange.

Noise Complaint Investigation – PDA Acoustics

PDA Acoustics conducted a survey at Carlton following a noise complaint. A sound level meter was set up at Ivy Farm Close (PDA1) to measure noise that was deliberately shielded from the roads. It was reported that the background noise level was $L_{A90,15mins}$ 38dB (as a modal value) during the daytime. Further measurements closer to the bakery were made at PDA2, approximately 50m north of Premier Foods loading bay, the lowest measured daytime background noise level in this position was $L_{A90,5mins}$ 47dB during the daytime. PDA2 provided data in 5-minute samples rather than 15-minute samples stipulated in BS 4142.

Noise Impact Assessment – Tetra Tech

A noise impact assessment was provided for the proposed development to the north-east currently under consideration in the planning system. This site has several monitoring locations and durations. The background noise level ranges from L_{A90} 38-44dB during the daytime and L_{A90} 36-43dB during the night-time.

Noise Impact Assessment – Jacobs

Jacobs conducted a BS4142 noise impact assessment in response to the Environment Agency (EA) permit. Jacobs based their noise limit on a baseline noise survey completed in 2017 with an assumed a background noise level of L_{A90} 42dB and 38dB at JAC1 for daytime and night- time, respectively. Ambient noise levels are reported at Highgrove Court L_{Aeq} 62dB and L_{Aeq} 56dB, however, background noise levels (L_{A90}) are not given this position.

Summary of background noise levels

A summary of daytime background noise levels is shown below in Table 4.

Table 4: Summary of measured background noise levels (daytime)

Monitoring Positions	Measurement Period	Background noise level, L_{A90} dB
PDA1	Daytime (0700 – 2300), 25/11/22 - 02/12/22	38
PDA2	Daytime (0905 – 1450) 09/12/2022	47
TT1	Weekday Daytime (1208 – 1103) 19/07/2019 – 24/07/2019	43
	Weekend Daytime (0700 – 2300) 20/07/2019 – 21/07/2019	38

Monitoring Positions	Measurement Period	Background noise level, L_{A90} dB
TT2	Weekday Daytime (1130 – 1054) 19/07/2019 – 24/07/2019	42
	Weekend Daytime (0700 – 2300) 20/07/2019 – 21/07/2019	40
TT3	Weekday Daytime (1048 – 1118) 19/07/2019 – 24/07/2019	42
	Weekend Daytime (0700 – 2300) 20/07/2019 – 21/07/2019	40
JAC1	Daytime (0700 – 2300) Year 2017 (date not given)	42

The lowest background noise levels are L_{A90} 38dB measured by PDA Acoustics at Ivy Farm Close and Tetra Tech measured during the weekend daytime at TT1 (highlighted in green in Table 4). Provided the solar farm is compliant to this limit, there will be a low impact rating at receptors with higher background noise levels by default in accordance with BS4142.

Rather conveniently in respect of the possible night-time (early morning) operation of the Solar Farm, Tetra Tech measured noise levels in the early morning between 0502hrs – 0656hrs (considered night time) at positions TT4 – TT6 in Figure 3. Jacobs measured night time noise levels between 2300hrs – 0700hrs at JAC1, note that JAC1 is a shielded position from the roads and activity from the Premier Foods bakery, background noise levels are likely to be higher in other locations. A summary of these levels is given in Table 5.

Table 5: Summary one measured background noise levels (night time)

Monitoring Positions	Measurement Period	Background noise level, L_{A90} dB
TT4	15min (0502 – 0517) 23/07/2019	37.8
	15mins (0641 – 0656) 23/07/2019	41.9
TT5	15mins (0544 – 0559) 23/07/2019	38.8
	15mins (0559 - 0614) 23/07/2019	40.4
TT6	15mins (0524 - 0539) 23/07/2019	41.5
	15mins (0619 - 0634) 23/07/2019	43.0
JAC1	Night time (assumed 0700 – 2300) Year 2017 (date not given)	38

The night time and daytime background noise levels are reasonably similar, implying the noise climate of the area is reasonably steady throughout the day and night time periods. The similar levels may be due to noise associated with the bakery, but this is not known. Night-time background noise levels are equal to or greater than L_{A90} 38dB in each location.

Therefore, a noise limit of L_{Ar} 38dB will be applicable for both the daytime and night-time (early morning) periods.

5 Operational Noise Predictions

A noise model has been constructed using IMMI[5] 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 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), local ground and hard surfaces such as roads, car parks, and drive ways (G = 0.0),
- 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.

5.1 Noise Data

The noise data used in calculations are provided below for all noise sources in the model. Manufacturer's data for the equipment is provided in Appendix B. If different equipment is used, it will be necessary to check that noise levels can meet the same noise limits.

Distributed String Inverters

There are three string inverters proposed across the site. These are understood to be Huawei SUN2000-330KTL-H1 inverters. The string inverters are to be mounted on the underside of the westernmost solar panels. The manufacturer's data indicates a sound pressure level of L_{pA} 75dB at 1m. Assuming spherical radiation, this gives L_{WA} 86dB as an equivalent sound power level.

No octave band data is provided; therefore, a typical spectrum correction has been considered for the units, as shown below in Table 6.

Table 6: String Inverter Spectrum correction

Noise Source	Spectrum Correction (dB) in Octave Bands, Hz							Overall, dB L_{WA}
	63	125	250	500	1000	2000	4000	
Huawei SUN2000-330KTL-H1	-2.1	+1.5	-3.8	-5.8	-5.0	-5.2	-12.3	86.0

Transformer

It is understood that the site will have one 3000kVA KNAN ground-mounted transformer. A noise emission of L_{WA} 63dB has been provided. Again, a spectrum has not been given for the transformer; a typical spectrum correction has been assumed, shown in Table 7.

Table 7: Transformer Spectrum correction

Noise Source	Spectrum Correction (dB) in Octave Bands, Hz							Overall, dB L_{WA}
	63	125	250	500	1000	2000	4000	
Transformer	-5.0	-4.2	-2.6	+0.7	-5.3	-15.4	-21.0	63.0

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

5.2 Noise Contours

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

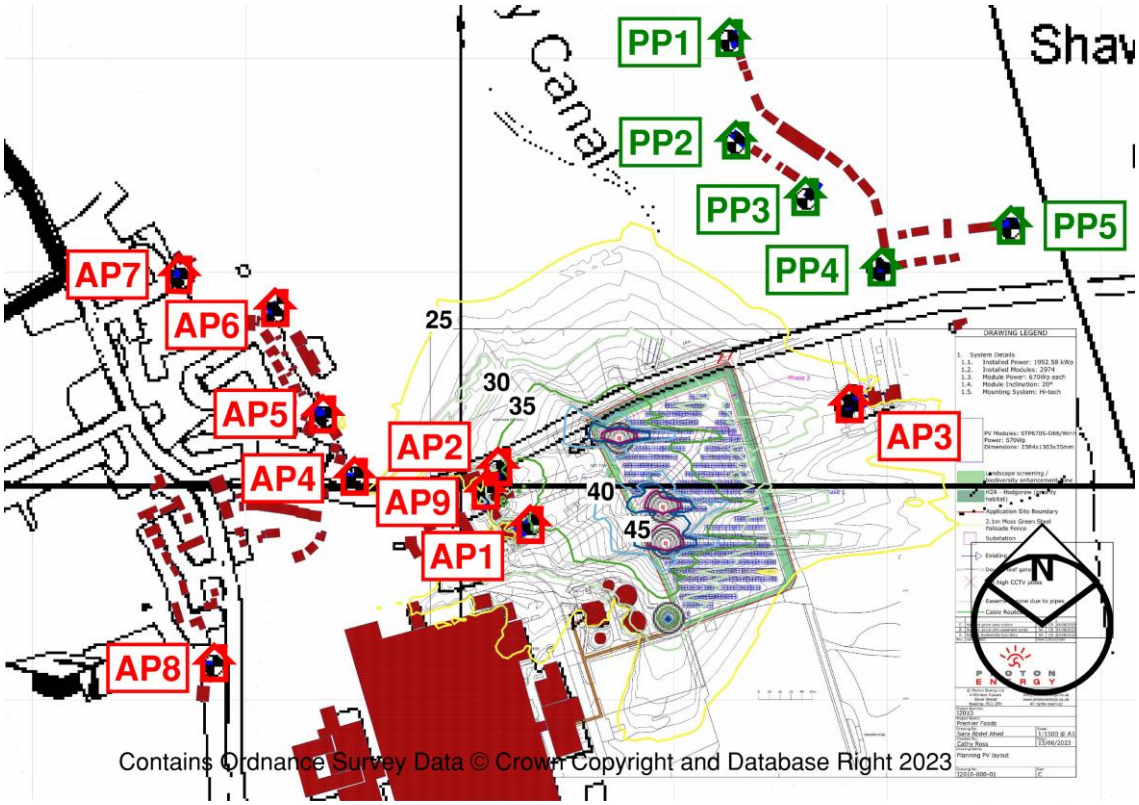

Figure 4: Indicative Daytime Noise Contour Plot, at 1.5m height dB L_{Aeq}

The major contour lines shown in Figure 4 range from 45dB(A) to 25dB(A). AP1 and AP2 have the highest predicted noise levels, approximately L_{Aeq} 36 dB. The rest of the Assessment Positions have predicted noise levels below L_{Aeq} 33 dB.

5.3 Predicted Noise Levels at Receptors

In addition to the noise contours, the model has been used to calculate specific noise levels at the third-party receptor locations shown with red house symbols above. These predicted levels have been used to evaluate the noise impact following the methodology detailed in BS 4142:2014.

As indicated above, the inverters may generate some tonal content and, therefore, could warrant a rating level correction in accordance with BS 4142. The predicted specific noise levels, presented in Table 8, demonstrate low noise levels at the nearest receptors. Therefore, any tonal content will likely be masked by the prevailing ambient noise climate. In this instance, a +2dB correction has been applied in the assessment as a worst case, assuming that any tonal content could be 'just perceptible'.

In addition, the solar farm does not generate any other identifiable characteristics, i.e. intermittency, impulses and/or 'other' characteristics. To that end, no further character corrections have been applied in calculating the rating noise level.

Table 8: Noise Impact Assessment

Receptor Location	Predicted (Specific) Level, dB L_{Aeq}	Character Correction (dB)	Rating Level*, dB L_{Ar}	Noise Limit, dB L_{Ar}	Difference, (dB)
AP1 – 23 Highgrove Court	36	+2	38	38	+/-0
AP2 – 59 Shaw Lane	36		38		+/-0
AP3 – 105 Shaw Lane	31		33		-5
AP4 – 2 Park Side	23		25		-13
AP5 – 4 Park Side	22		24		-14
AP6 – 20 Ivy Farm Close	23		25		-13
AP7 – 18 Far Lawns	18		20		-18
AP8 – 270 Fish Dam Lane	20		22		-16
AP9 – 3 Highgrove Court	33		35		-3
PP1	22		24		-14
PP2	25		27		-11
PP3	27		29		-9
PP4	27		29		-9
PP5	23		25		-13
** includes +2dB correction for potentially just audible tones*					

Table 8 above indicates that noise generated by the solar farm is of a low level in absolute terms for operation at full working capacity. The noise levels at AP1 and AP2 are the most affected, which have noise rating levels at parity with the background.

The noise levels at the facades of the receptors are well below BS8233 limits for sleep disturbance (Table 3).

It is reiterated that the daytime noise levels assume the site is running at full working capacity. While the solar equipment might be operational early in the morning, it would not operate at full duty. Therefore, the operational scenario presented above is unlikely to occur during the quietest time of night and not when people are trying to sleep (say from 10pm to midnight).

In terms of the noise exposure hierarchy table (Table 2), noise generated by the proposed solar farm would, at worst, be at the no observed adverse effect level: that is, where noise may just be audible but not intrusive and would not result in a change in the quality of life. No further mitigation measures are required based on the assessment results and the guidance provided in Section 3.

5.4 Uncertainty and Context

BS 4142 requires an assessment of uncertainty and context. The prediction methodology in ISO 9613-2 is considered accurate to ±3dB. However, conservative input assumptions are adopted, and downwind propagation is assumed. Noise levels for upwind and crosswind propagation will be lower.

The context of the area is that a small solar farm is being proposed with few noise sources adjacent to a commercial bakery.

Given the above, uncertainty does not significantly impact the overall assessment outcome.

6 Summary

A noise assessment has been carried out for the proposed Premier Foods solar farm in Barnsley.

Operational noise has been assessed against a noise limit of L_{Ar} 38 dB which has been derived by noise studies of the local area carried out by others. Operational noise levels have been calculated using manufacturer's data for the proposed source noise values of the proposed equipment to provide robust calculations of the proposed facility operating at full working capacity which is representative of a sunny day during the summer. Most of the time, the facility is expected to operate well below the calculated values.

Overall, the calculations for the operational noise levels indicate that noise from the facility would be low in absolute terms and comply with all noise limits.

Given the above, it is considered that there are no noise-related issues associated with Premier Foods Solar Farm that would prevent the development being given planning permission.

Glossary of Acoustic Terms

Decibel (dB) – The bel is the logarithm of the ratio of two powers, and decibel is 1/10 bel. The human ear responds logarithmically, and it is there expedient to deal in logarithmic units for acoustic values such as sound intensity.

A Weighting – A frequency weighted applied to the measured sound spectrum which corrects the level to simulate the frequency response of the hearing system to sound levels of varying frequencies.

L_{eq}– This is a quasi-average noise level which includes all the sound energy during the measurement period averaged out across the period. It is typically used to describe the ambient noise level. The A weighted value is the L_{Aeq}.

L_{90} – This is the level exceeded for 90% of the measurement period and indicates the steady underlying background noise level. The A weighted Level is the L_{A90}.

L_{pA} – This is an A-weighted sound pressure level.

L_{WA} – This is an A-weighted sound power level, which is the theoretical sum of energy of a noise source. A sound power level cannot be directly measured, only derived through measurements of sound pressure level.

Huawei SUN2000-330KTL-H1 String Inverter

HUAWEI

Noise Level of SUN2000 Inverter and LUNA2000 Energy Storage System 1

Huawei Technologies Co., Ltd. Huawei Industrial Base Bantian, Longgang
Shenzhen 518129
People's Republic of China

Subject: Application Note-Noise Level of SUN2000 Inverter and Energy Storage System

Revision History

Version 2.0 Dec. 2022

Applicable products and models

Listed in the table below.

Description

According to IEC62109 "Safety of power converters for use in photovoltaic power systems", noise level is part of safety requirement of inverters and nosie level conformity tests should be carried out. Huawei SUN2000 inverters strictly meet such requirements and have passed the test of noise level according to the standard and been awarded IEC62109 certificate. For energy storage system, similar requirement has also be described in IEC/EN62477 "Safety requirements for power electronic converter systems and equipment", and Huawei LUNA2000 energy storage system has passed the test of noise level according to this standard and been awarded IEC/EN62477 certificate. Detialed nosie level for each applicable inverter and energy storage system is listed in the table below.

Inverter type	Noise level	Equivalent environment
SUN2000L-2~5KTL	<=25 dB (Typical Condition)	 Library level/ Whisper in the ear
SUN2000-2~5KTL-L0	<=25 dB (Typical Condition)	
SUN2000-2~6KTL-L1	<=29 dB (Typical Condition)	
SUN2000-3~10KTL-M0/M1	<=29 dB (Typical Condition)	
SUN2000-12~20KTL-M0/M2	<=29 dB (Typical Condition)	
LUNA2000-5/10/15-S0	<=29 dB (Typical Condition)*	
SUN2000-12, 15, 17KTL-M5	<=45 dB (Typical Condition)	
SUN2000-20，25KTL-M5	<=50 dB (Typical Condition)	
SUN2000-30, 36, 40KTL-M3	<=50 dB (Typical Condition)	 Office level/ Normal discussion
SUN2000-33KTL-A, 36KTL	<=55 dB (Typical Condition)	
SUN2000-50KTL-M3	<=65 dB (Typical Condition)	
SUN2000-50/60KTL-M0	<=55 dB (Typical Condition)	
SUN2000-100/105KTL-H1	<=55 dB (Typical Condition)	
SUN2000-100KTL-M1	<=65 dB (Typical Condition)	 Factory level/ Loud and noisy talk
SUN2000-100KTL-M2	<=65 dB (Typical Condition)	
SUN2000-115KTL-M2	<=65 dB (Typical Condition)	
SUN2000-185KTL-H1	<=65 dB (Typical Condition)	
SUN2000-200KTL-H2/H3	<=65 dB (Typical Condition)	
SUN2000-215KTL-H0/H3	<=65 dB (Typical Condition)	
SUN2000-330KTL-H1/H2	<=75dB (Typical Condition)	

Note: Test condition: The tested equipment operates at rated power, and the test equipment is 1m right in front of the front-side of the tested equipment.

*LUNA2000 Noise Level 850V,5KW @1m at 30℃