

Elwy Solar Energy Farm

ENVIRONMENTAL STATEMENT APPENDIX 8.1 NOISE ASSESSMENT

P19-2023 | JULY 2020

NOISE ASSESSMENT

PROPOSED ELWY SOLAR ENERGY FARM ON LAND AT GWERNIGRON FARM, THE ROW, ST ASAPH

SOLARCENTURY

JULY 2020

Revision	Prepared By	Date
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1. Introduction

LF Acoustics Ltd have been appointed by Solarcentury to undertake an operational noise assessment for a proposed solar energy storage park to be located on land at Gwernigron Farm to the north of the A55, St Asaph.

The main solar farm would be located on the land north of the A55 and to the west of St Asaph Road. An energy storage facility proposed within the site, would be located along the southern site boundary, adjacent to the A55.

The following section of this report presents an overview of the relevant standards and guidelines applicable when assessing noise from this type of facility. Section 3 provides a description of the site, its surroundings and proposed operation, with an assessment of the existing noise environment provided in Section 4. The calculation and assessment of noise levels associated with the operation of the solar farm is provided in Section 5. Finally, Section 6 provides a summary of the assessment.

2. Standards and Guidelines

A description of the noise units referred to in this report is provided in Appendix A.

2.1. British Standard BS 4142

BS 4142 [1] is the British Standard for rating and assessing noise of a commercial or industrial nature and is the appropriate standard to consider to assess noise associated with the operation of the proposed plant and equipment.

BS 4142 is a comparative standard in which the estimated noise levels from the proposed development are compared to the representative / typical background noise level from existing uses.

BS 4142 relates the likelihood of adverse impacts to the difference between the Rating Level of the noise being assessed and the background noise level.

The background noise level is the L_{A90} noise level, usually measured in the absence of noise from the source being assessed, but may include other existing industrial or commercial sounds. The background noise levels should generally be obtained from a series of measurements each of not less than 15 minute duration.

The Rating Level of the noise being assessed is defined as its L_{Aeq} noise level (the 'specific noise level'), with the addition of appropriate corrections should the noise exhibit a marked impulsive and/or tonal component or should the noise be irregular enough in character to attract attention. The extent of the correction is dependent upon the degree of tonality or character in the noise and is determined either by professional judgement, where the plant is not operational at present, or by measurement.

Where the noise is tonal in nature, the standard imposes the following corrections when assessing the rating level:

- +2 dB for a tone which is just perceptible;
- +4 dB where the tone is clearly perceptible; and
- +6 dB where the tone is highly perceptible.

Methods for identifying whether noise is tonal in nature are provided within BS 4142.

Where noise exhibits other sound characteristics that are neither tonal or impulsive, nor intermittent, though otherwise readily distinctive against the residual acoustic environment (e.g. road traffic in this locality), the Standard advises a correction of +3 dB can be applied.

During the daytime, the specified noise levels are determined over a reference time interval of 1 hour, with a 15 minute reference period adopted when assessing night-time noise.

If the Rating Level of the noise being assessed exceeds the background level by 10 dB or more BS 4142 advises that there is likely to be an indication of a significant adverse impact, depending upon context. A difference between background level and Rating Level of around 5 dB is likely to be an indication of an adverse impact, depending upon context. The lower the Rating Level is, relative to the background noise level, the less likely the specific source will have an adverse or significant adverse impact. Where the Rating Level does not exceed the background noise level is an indication of a low impact, depending upon context.

The assessment method outlined above is intended for the assessment of external noise levels and is not intended to assess the extent of impact at internal locations.

Where the initial assessment of impact, based upon an assessment of the external noise levels, needs to be modified due to the context, all pertinent factors should be taken into account, including:

- The absolute level of sound;
- 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; and
- The sensitivity of the receptor and whether the premises will already incorporate measures to ensure good internal and/or external acoustic conditions.

2.2. British Standard BS 8233

British Standard BS 8233 [2] provides guidance on sound insulation and noise reduction for buildings.

For residential premises, the guidance advises for steady external noise sources, levels of noise internally not exceeding 30 dB $L_{Aeq, 8 \text{ hour}}$ within bedrooms at night are desirable, with a level of 35 dB $L_{Aeq, 16 \text{ hour}}$ representing a desirable standard of noise within living rooms and bedrooms for resting purposes during daytime periods.

Externally within gardens and amenity spaces, the guidance recommends a general limit of 50 dB $L_{Aeq, T}$.

2.3. World Health Organisation Guidelines

The World Health Organisation guidance for community noise [3] provides additional guidance upon potential effects in relation to noise.

The guidance advises:

- few people are moderately annoyed by noise levels of below 50 dB L_{Aeq} during the daytime;
- for a good night's sleep, noise levels within bedrooms should not exceed 30 dB L_{Aeq} , with individual noise events not exceeding 45 dB L_{Amax} ; and
- special attention should be given to noise sources in an environment with low background noise levels and to noise sources with low frequency components.

A room with a closed window typically provides a sound reduction between outside and in of around 30 dB(A). Assuming a room with an open window the reduction in noise levels between outside to in is reduced to between 10 – 15 dB(A). On this basis and assuming a bedroom with an open window, during the night-time the WHO guidance indicates that external noise levels should remain below 40 – 45 dB L_{Aeq} to maintain the restorative processes of sleep.

The WHO produced additional noise guidance in relation specifically to night-time noise in 2009 [4], which is generally considered to be the most noise sensitive period. This report provides a description of the no observed adverse effect level (which is equivalent to a No Observed Effects Level, NOEL) and advises for night-time noise (which is considered to be the most sensitive period of the day) that this concept is less useful, as the adversity of effects are less clear. Instead, it advises the use of the observed effects thresholds, above which an effect starts to occur or shows itself to be dependent upon the exposure level.

The guidance is presented in terms of external and internal recommendations to minimise any potential adverse effects. Externally, the guidance advises that an average night-time noise level L_{night} (the $L_{\text{Aeq, 8 hour}}$) of 40 dB is equivalent to the Lowest Observed Adverse Effect Level (LOAEL) and advises this guideline value is recommended for the protection of public health from night-noise. However, below this level there was no change in the small number of awakenings identified and hence a reason for considering that the NOEL was not an appropriate descriptor in noise terms for identifying adverse effects and hence recommend the use of the observed effects threshold as an appropriate descriptor to identify the potential for the onset of adverse effects.

The guidance, however, advises that an external night-time noise level of 30 $L_{\text{Aeq, 8 hour}}$ would be equivalent to the NOEL, as their research indicated that there were no detectable effects on sleep observed below this level.

The potential for Significant Observed Adverse Effects (SOAEL) were identified to occur at levels considerably above 40 dB $L_{\text{Aeq, 8 hour}}$.

3. Site Description and Identification of Potentially Affected Dwellings

The layout of the proposed solar park and surrounding noise sensitive properties is indicated on Figure 1.

There are a number of residential properties surrounding the site, as indicated on Figure 1, located principally along St Asaph Road to the east, the A55 to the south and Nant Y Faenol Road to the west.

The solar farm would cover the majority of the site, as indicated on Figure 1. The solar panels would not generate any noise during operation. Several banks of panels would be connected to string inverters, which would be positioned beneath the panels. There would be around 400 inverters required, spread across the site. The string inverters would be actively cooled, by small fans located within the equipment housing, which would operate during periods of peak power generation.

The energy storage facility would be located within the south western corner of the site, adjacent to the A55. A number of options for the location of this facility were considered, however, the proposed location was identified, due to the proximity to the A55 and it is the nearest side of the site to the grid connection. The energy storage facility would contain a number of battery banks, housed within containers and a number of energy storage inverters.

The energy storage facility would be operational on a 24 hour basis. Noise levels would be at a maximum during periods whilst the batteries were being charged, either during the daytime from solar, or overnight, when electricity prices are low and discharged during peak periods when energy was being supplied, typically during breakfast and early evening. During periods of supply and charging, the cooling systems within the inverters and battery containers would be operational to maintain appropriate temperatures. At other times, noise levels would be lower, as the requirement to cool the equipment would reduce.

4. Baseline Noise Assessment

Due to the effect of the of the global Coronavirus pandemic, it has not been possible to undertake reliable noise monitoring at the present time upon which to establish typical baseline noise data, as the present restrictions have resulted in many businesses either being closed or operating at reduced capacity, with considerable reductions also in road traffic, in addition to restrictions on personnel travelling to conduct the surveys.

Alternative methods to derive the typical background noise levels have therefore been utilised, in accordance with the current Institute of Acoustics guidance [5]. The guidance advises that the professional will need to consider whether alternative sources of information in respect of sound levels can reasonably be used.

Noise levels in the vicinity of the site are principally influenced by road traffic travelling along the A55 and St Asaph Road. The A55 is the main trunk road across north Wales and remains busy during the day and night.

A review of recent planning applications for the surrounding area, which may provide relevant noise data identified a site directly to the west of the Application Site on Land East of Bodelwyddan (Application Ref. 40/2013/1585/PO). This planning application was accompanied by a noise assessment, which presented the results of attended day and night-time noise monitoring at locations adjacent to the A55 and at more remote locations to the north. Whilst the measurements were obtained in 2010, they are considered to provide representative data in respect of the prevailing background noise levels, under normal conditions, albeit potentially marginally lower than at present under normal conditions, attributable to increases in road traffic flows during the past 10 years. In terms of background (L_{A90}) noise levels, the measurements obtained at that time are likely to represent worst case conditions.

The closest monitoring position to the A55 was taken at a distance 35 metres to the north of the A55. This location was considered to be representative of the dwellings situated close to the A55 and potentially along St Asaph Road. Measurements at this location were obtained during a daytime, evening and overnight period, with the results extracted from the previous report provided below.

Date	Time	Duration (mins)	Noise Level (dB)		
			$L_{Aeq, T}$	L_{A10}	L_{A90}
02/08/2010	14:48	15	69	72	65
	15:03		69	71	64
	19:44		64	68	56
	20:00		65	68	56
03/08/2010	02:03	5	60	65	44
	02:08		59	63	45
	02:13		57	62	38

Further monitoring was obtained to the north, along Nant Y Faenol Road, adjacent to Llly Manyn. Again, attended measurements were obtained during the day, evening and night-time periods, with the following levels recorded.

Date	Time	Duration (mins)	Noise Level (dB)		
			$L_{Aeq, T}$	L_{A10}	L_{A90}
02/08/2010	16:08	15	47	47	42
	16:23		46	47	42
	20:23		44	45	41
	20:38		45	46	43
03/08/2010	01:21	5	41	43	39
	01:26		41	44	37
	01:31		42	45	39

Based upon the results of the monitoring, the following background noise levels have been assumed for the purposes of the present assessment, based upon the average levels monitored in 2010 at the two monitoring locations:

Dwellings Close to the A55

- Daytime – 64 dB L_{A90} ;
- Evening – 56 dB L_{A90} ; and
- Night-time – 42 dB L_{A90} .

Dwellings to the North Along St Asaph Road and Along Nant Y Faenol Road

- Daytime – 42 dB L_{A90} ;
- Evening – 42 dB L_{A90} ; and
- Night-time – 38 dB L_{A90} .

5. Calculation and Assessment of Noise from the Operation

5.1. Proposed Plant and Equipment

The site would be formed of two parts, the main solar farm and the energy storage hybrid park.

The solar panels would be spread across the site, as indicated on Figure 1. It is proposed to connect the solar panels to approximately 400 string inverters, which would be spread across the site. The inverters would be located alongside the panels and positioned away from the properties, to ensure noise levels associated with their operation were minimised. The inverters would be connected to a number of small substations, distributed across the site.

The inverters would have active cooling, which would only operate when the panels were generating, with the cooling fans temperature dependent, i.e. only operating at full speeds during periods of peak generation during the mid part of the day.

The energy storage hybrid park would be located within the southern part of the site, adjacent to the A55. This facility would contain a number of energy storage inverters and battery containers. The energy storage inverters would potentially operate on a 24 hour basis and charge the batteries either by solar or from the grid and when converting the stored energy for generation onto the grid. These inverters would be actively cooled, with the cooling fans operation whilst the inverters were working. The battery storage containers would incorporate HVAC equipment to ensure the correct temperature was maintained within the containers during charging and discharge cycles.

To minimise noise associated with the energy storage hybrid park, it is proposed to construct an absorptive acoustic fence to a height of 3 metres around the perimeter of the facility. The proposed mitigation will ensure that the inverters, which would be the main source of noise, are effectively screened from the surrounding residential properties.

Whilst the solar inverters would only operate during hours of daylight, the inverters associated with the operation of the energy storage would potentially operate on a 24 hour basis.

Source term noise levels for the proposed plant have been either been obtained from measurements obtained adjacent to similar equipment or from manufacturers specifications. The octave band source data used within the modelling is provided in Table 5.1 below.

Plant	Sound Pressure Level SPL [dB(A)]	Sound Power Level SWL [dB(A)]	Octave Band Sound Power Level SWL [dB]							
			63	125	250	500	1k	2k	4k	8k
Solar String Inverter	65 @ 1m	76	59	66	72	65	63	65	73	69
Substation transformer	61 @ 1m	71	67	63	82	76	66	55	41	38
Energy Storage Inverter	68 @ 1m	85	80	87	87	83	80	77	74	62
Battery Container HVAC Unit	43 @ 10m	76	55	60	64	68	70	70	67	66

Table 5.1 Source Term Noise Levels

5.2. Calculation of Noise Levels

As indicated above, the main noise generating element of the proposed development would be attributable to the operation of the inverters associated with the solar panels and energy storage facility.

Calculations have been made using SoundPlan, which implements the calculation methodology from ISO 9613-2 [6]. The calculations have taken account of the land formation around the site based upon Lidar mapping.

The string inverters, which would be small and located beneath the solar panels have been modelled as point sources, with the energy storage inverters and battery containers modelled as volume sources within the model, with the sound power distributed across each side and top of the equipment and assuming standard hemispherical radiation.

Calculations for the daylight periods have been prepared on the basis of all plant fully operational, which represents the likely worst case conditions during the peak daytime periods. This approach will provide an overestimate of the noise levels during the early morning and evening periods whilst the solar inverters would be operating at a lower power.

Calculations have also been made for the overnight period, during which time the energy storage equipment would potentially be operating, either charging from the grid or discharging during the early morning peak.

The operation of the cooling fans on the solar inverters and battery storage containers is temperature controlled, with the fans only operating at full speed during periods of peak operation or during periods of high temperatures. The cooling fans on the solar inverters would not normally operate during the early morning or later evening periods.

Noise levels have been calculated on the basis of the site layout indicated on Figure 1.

Figures 2 and 3 present the calculated operational noise levels for the periods of peak operation and associated with the overnight operation of the energy storage park in graphical format and additionally provide the calculated façade noise levels in numerical form at the properties potentially most likely to be affected by the operation of the site. The calculated noise levels at the potentially most affected properties are additionally summarised in Table 5.2 below.

Location	Calculated Façade Noise Level at First Floor Level [dB L _{Aeq,T}]	
	Full Daytime Operation	Overnight Energy Storage Park
Green Gates Farm	41	41
Dwellings on Cwttir Lane	38	37
Dwellings on Pant Glas	27	26
Dwellings in The Roe	33	27
Wern Bach	34	27
Clyn Derw Farm	31	21
Gwernigron Farmhouse	35	31
Dwellings on Nant Y Faenol Road	27	26

Table 5.2 Noise Levels Generated by Operation of Proposed Solar Farm

5.3. Assessment Criteria

As indicated previously, noise levels in the vicinity of the site are influenced by road traffic travelling along the A55 and St Asaph Road, throughout the day and night-time periods.

Whilst the energy storage park equipment would be operational on a 24 hour basis, the solar panels and associated string inverters would only be operational during daylight hours, typically between 05:00 – 21:00 hours during summer months.

To provide a worst case assessment therefore, the noise levels attributable to the full daytime operation have been assessed for daytime and the early morning (night-time) periods, in addition to the night-time assessment of the noise attributable to the operation of the energy storage park.

As indicated in Section 4, due to the current situation with Covid-19, it has not be possible to obtain reliable baseline data at this time and the assessment has therefore been based upon professional judgement of the noise environment in the surrounding area, based upon representative monitoring carried out for a site to the west, together with reference to absolute noise standards and guidance, which seek to ensure the operation would not result in adverse noise impacts.

An initial BS 4142 assessment has been carried out, based upon a comparison of the rating levels of noise attributable to the operation of the site against the background noise levels presented in Section 4, which seeks to demonstrate that the operation of the site would not result in adverse noise impacts at the neighbouring residential properties (i.e. ensuring that the rating level of noise does not exceed the prevailing background noise levels by more than 5 dB(A)). In addition, BS 4142 advises that the initial assessment should be considered within the overall context of the environment, which at this location is principally influenced by road traffic noise from vehicles travelling along the A55. To fully assess the noise associated with the operation, consideration has therefore been given to information contained within BS 8233 and by the WHO, which provides guidance on absolute noise levels to ensure potential adverse impacts are minimised.

BS 8233 advises for steady state external noise sources, it is desirable that the internal ambient noise level does not exceed a level of 35 dB $L_{Aeq,16 \text{ hour}}$ during the daytime period within living rooms and bedrooms and 30 dB $L_{Aeq, 8 \text{ hour}}$ within bedrooms at night. On the basis of an open window typically providing a sound reduction of between 10 – 15 dB(A), equivalent external levels below 45 dB $L_{Aeq, 16 \text{ hour}}$ daytime and 40 dB $L_{Aeq, 8 \text{ hour}}$ night-time, would seek to minimise any potential adverse noise impacts.

Additionally, for steady state noise, the WHO night-noise guidance advises that a level of 40 dB $L_{Aeq, 8 \text{ hour}}$ represents the Lowest Observed Adverse Effect Level (LOAEL) overnight, which is equivalent to the BS 8233 guidance for night noise, assuming an open window.

5.4. Assessment

With the exception of areas very close to the inverters (typically, within 25 metres), where high frequency noise from the operation of the inverters is likely to be clearly audible, the noise generated by the equipment would be principally associated with the operation of the cooling fans located on the inverters and battery storage containers.

At the large distances between the inverters and neighbouring properties, any high frequency components of the noise would be effectively mitigated, as the higher frequencies attenuate at a higher rate over distance compared to lower frequencies, thus resulting in noise which is broadband in nature at the properties.

Given that the fans operate at relatively slow speed, the character of the noise at the properties, if audible, would be similar to an air conditioning unit, which typically generate noise, which is not particularly tonal in nature, but would potentially be distinguishable against the existing noise environment which is principally influenced by road traffic, particularly overnight. On this basis and the fact that the inverters / associated equipment would be some distance from surrounding properties, it has been considered appropriate to apply a penalty of 3dB(A) for other characteristic sound in accordance with BS 4142 to determine the rating level of noise.

Uncertainties in the calculations have been considered. Given that the assessment has been based upon all plant and equipment fully operational, which is considered unlikely, particularly during the most sensitive early morning periods, the calculations are likely to have overestimated the noise levels at the dwellings and thus cover any uncertainty in the noise levels attributable to the operation of the plant or within the calculation methodology. It is additionally noted that the source data used represents the maximum design level for the plant.

An initial BS 4142 assessment has been undertaken, utilising the background noise levels presented in Section 4 for the daytime period, assuming full operational and night-time periods also assuming full operation and solely the operation of the energy storage facility. The assessment, undertaken for the potentially most affected properties is provided below.

Green Fates Farm and Dwellings South of the A55

	Assessment Period		
	Night-time (Energy Storage)	Night-time (Full Operation)	Daytime (Full Operation)
Specific Noise Level at Property	41	41	41
Acoustic Feature Correction	3	3	3
Rating Level at Property	44	44	44
Background Noise Level [dB L _{A90}]	42	42	64
Excess of Rating Over Background Level	+2	+2	-20
Likelihood of Impact	Indication of Low Impact	Indication of Low Impact	Indication of Low Impact

Table 5.3 BS 4142 Assessment – Green Gates Farm

The assessment above indicates that the operation of the solar farm and energy storage park would not result in any adverse noise impacts at this property.

During the daytime period, the initial BS 4142 assessment indicates a potential for a low impact, with noise levels attributable to the operation 20 dB(A) below the typical background noise levels.

During the night-time and early morning periods, when the energy storage park would be operational, the assessment indicates that there would still be the potential for a low impact, with the rating level 2 dB(A) above the prevailing background noise level. Considering absolute noise levels attributable to the operation overnight, with windows closed, noise levels internally

would still maintain a good standard of noise. With windows open, noise levels may be marginally above a good standard, when considered against the guidance within BS 8233. However, road traffic noise levels overnight are likely to remain of the order of 60 dB L_{Aeq} or above, thus 16 dB(A) higher than attributable to the operation of the site. Given the high levels of road traffic noise, it is unlikely that the operation of the site would generally be clearly audible at this property and thus any potential adverse noise impacts at the dwelling are considered to be very low and would not result in any significant adverse effects.

Noise levels at the dwellings along Cwttir Lane and Pant Glas would be influenced by similar road traffic noise levels to that at Green Gates Farm.

Noise levels attributable to the operation of the solar farm and energy storage park would be at least 3 dB(A) lower at these properties compared with the noise levels predicted at Green Gates Farm. An assessment against the requirements of BS 4142 at these properties would indicate a low impact during both day and night-time periods, with the rating noise levels not anticipated to exceed the prevailing background noise levels. On this basis, the operation would result in acceptable levels of noise at these dwellings with the proposed mitigation measures for the energy storage park implemented.

Dwellings Adjacent to St Asaph Road

Noise levels at the dwellings to the east of the solar farm would be principally attributable to the operation of the solar string inverters, as the energy storage facility is located some distance from the properties.

An assessment of the noise levels at these dwellings has been made for Wern Bach, where the highest noise levels were predicted. The initial BS 4142 assessment is provided below.

	Assessment Period		
	Night-time (Energy Storage)	Night-time (Full Operation)	Daytime (Full Operation)
Specific Noise Level at Property	27	34	34
Acoustic Feature Correction	3	3	3
Rating Level at Property	30	37	37
Background Noise Level [dB L_{A90}]	38	38	42
Excess of Rating Over Background Level	-8	-1	-5
Likelihood of Impact	Indication of Low Impact	Indication of Low Impact	Indication of Low Impact

Table 5.4 BS 4142 Assessment – Wern Bach

The initial BS 4142 assessment indicates the potential for a low impact at these properties, with rating noise levels attributable to the operation remaining below the prevailing background noise levels.

The operation of the solar farm at these properties would therefore result in acceptable noise levels and would not result in any adverse noise impacts.

Gwernigron Farm

Noise levels at this property would be influenced by noise associated with the energy storage facility and string inverters.

An assessment of the noise levels at this property is provided below.

	Assessment Period		
	Night-time (Energy Storage)	Night-time (Full Operation)	Daytime (Full Operation)
Specific Noise Level at Property	31	35	35
Acoustic Feature Correction	3	3	3
Rating Level at Property	34	38	38
Background Noise Level [dB L _{A90}]	38	38	42
Excess of Rating Over Background Level	-4	0	-4
Likelihood of Impact	Indication of Low Impact	Indication of Low Impact	Indication of Low Impact

Table 5.5 BS 4142 Assessment – Gwernigron Farm

The initial BS 4142 assessment indicates the potential for a low impact, with rating noise levels attributable to the operation remaining below the prevailing background noise levels.

The operation of the solar farm would therefore result in acceptable noise levels and would not result in any adverse noise impacts.

Dwellings Along Nant Y Faenol Road

These properties are located some distance to the north west of the proposed solar farm, with calculated noise levels remaining very low.

An assessment of the noise levels at these properties is provided below.

	Assessment Period		
	Night-time (Energy Storage)	Night-time (Full Operation)	Daytime (Full Operation)
Specific Noise Level at Property	26	27	27
Acoustic Feature Correction	3	3	3
Rating Level at Property	29	30	30
Background Noise Level [dB L _{A90}]	38	38	42
Excess of Rating Over Background Level	-9	-8	-14
Likelihood of Impact	Indication of Low Impact	Indication of Low Impact	Indication of Low Impact

Table 5.5 BS 4142 Assessment – Gwernigron Farm

The initial BS 4142 assessment indicates the potential for a low impact, with rating noise levels attributable to the operation remaining below the prevailing background noise levels during both the day and night-time periods.

The operation of the solar farm would therefore result in acceptable noise levels and would not result in any adverse noise impacts.

6. Summary

LF Acoustics Ltd were appointed by Solarcentury to undertake an operational noise assessment for a proposed solar and energy storage park to be located on land at Gwernigron Farm to the north of the A55, St Asaph.

The main solar farm would be located on the land north of the A55 and to the west of St Asaph Road. An energy storage facility proposed within the site, would be located along the southern site boundary, adjacent to the A55.

This report has presented calculations and an assessment of the likely worst case noise levels to be generated by the operation of the solar farm and energy storage facility.

The calculated noise levels have been assessed against relevant standards and guidance, to ensure that noise associated with the operation of the facility does not result in occupants of nearby properties being adversely impacted.

The assessment concluded that the operation of the solar farm and energy storage facility would generate acceptable levels of noise at surrounding properties both during the day and night-time periods. Assessing the noise levels against relevant standards and guidance concluded that the operation of the plant and equipment within the site would not result in adverse noise impacts when assessed against the requirements of BS 4142.

References

1. British Standards Institute. Methods for Rating and Assessing Industrial and Commercial Sound. BS 4142:2014 +A1:2019.
2. British Standards Institute. Guidance on Sound Insulation and Noise Reduction in Buildings. BS 8233: 2014.
3. World Health Organisation. Guidelines for Community Noise. 1999. WHO Geneva.
4. World Health Organisation. Night Noise Guidelines for Europe. 2009.
5. Association of Noise Consultants / Institute of Acoustics. Joint Guidance on the Impact of COVID-19 on the Practicality and reliability of Baseline Sound Level Surveying and the Provision of Sound & Noise Impact Assessments. Version 4. 21st April 2020.
6. ISO. Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation. ISO 9613-2. 1996.

Figures

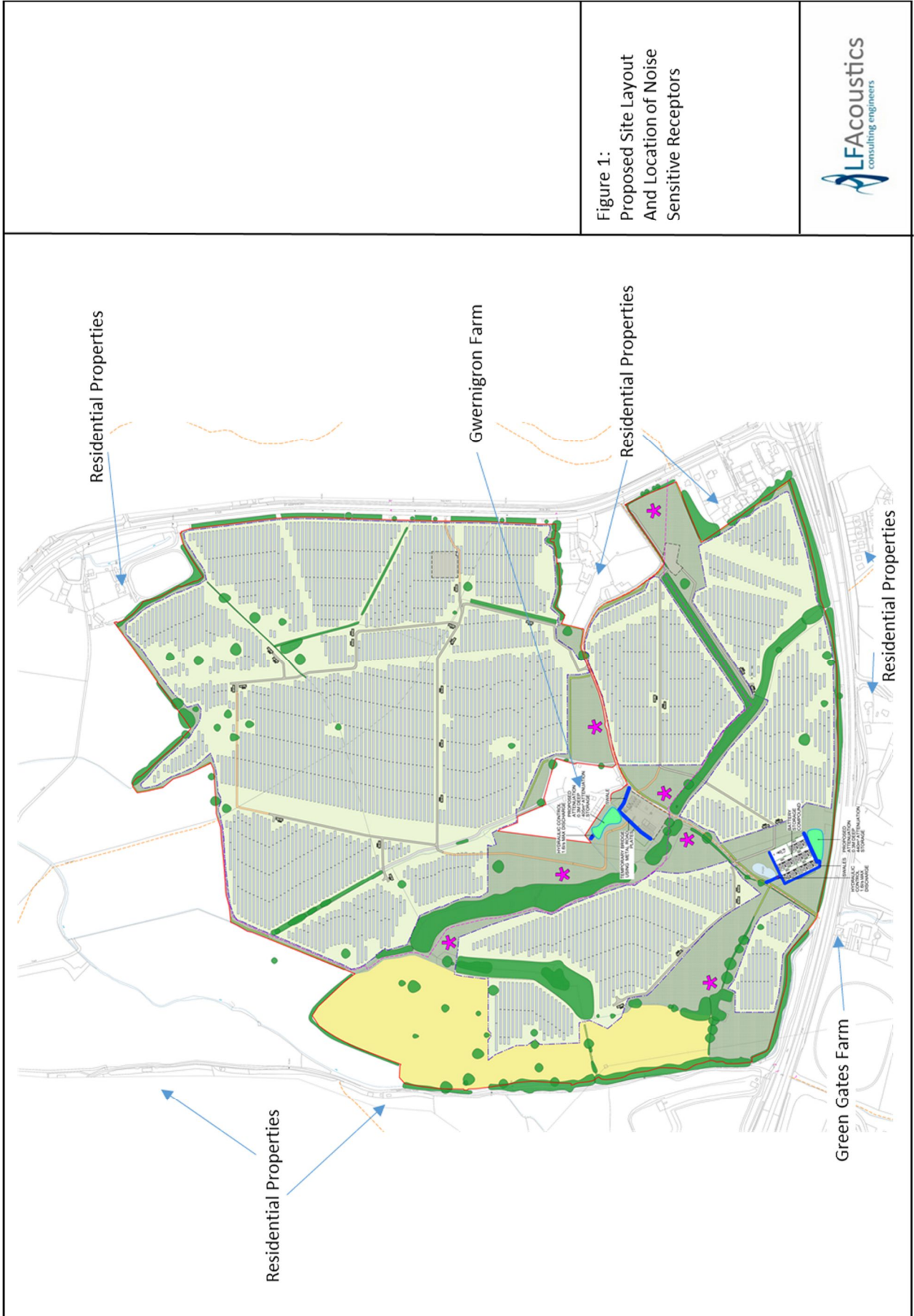
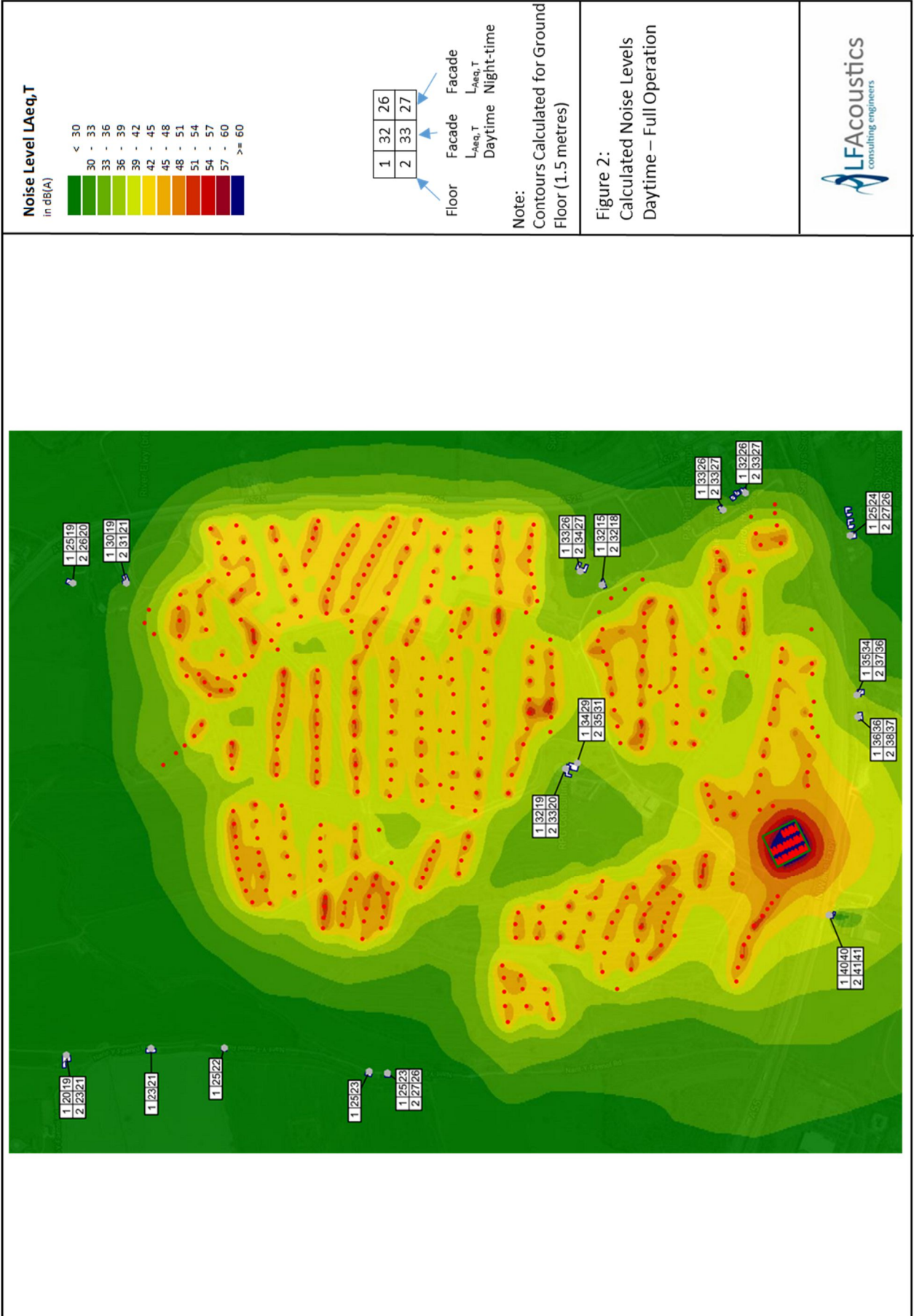
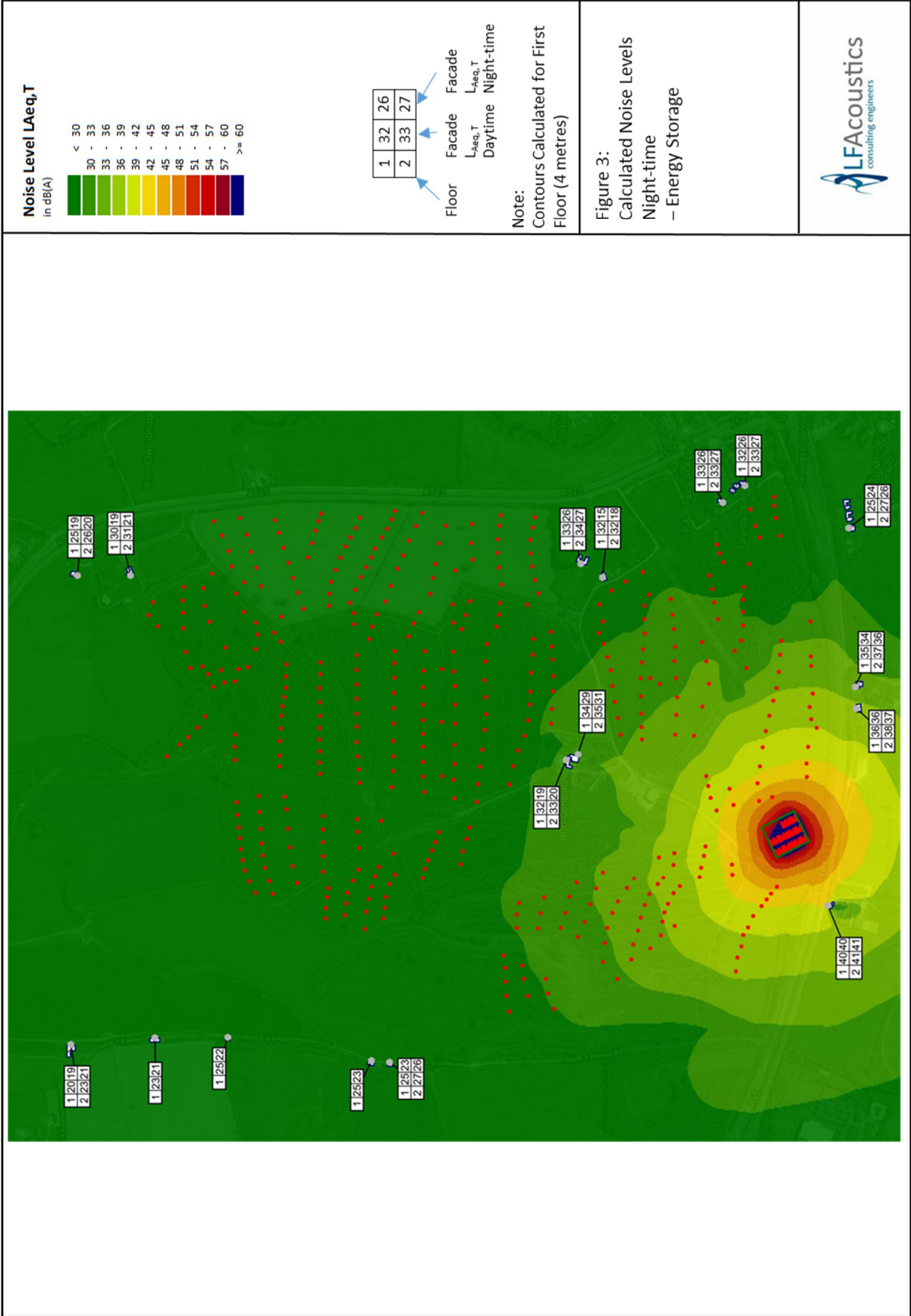


Figure 1:
Proposed Site Layout
And Location of Noise
Sensitive Receptors





Appendix A

Noise Units

Decibels (dB)

Noise can be defined as unwanted sound. Sound in air can be considered as the propagation of energy through the air in the form of oscillatory changes in pressure. The size of the pressure changes in acoustic waves is quantified on a logarithmic decibel (dB) scale firstly because the range of audible sound pressures is very great, and secondly because the loudness function of the human auditory system is approximately logarithmic.

The dynamic range of the auditory system is generally taken to be 0 dB to 140 dB. Generally, the addition of noise from two sources producing the same sound pressure level, will lead to an increase in sound pressure level of 3 dB. A 3 dB noise change is generally considered to be just noticeable and a 10 dB change is generally accepted as leading to the subjective impression of a doubling or halving of loudness. A 5 dB change is generally considered to be clearly discernible.

A-weighting

The bandwidth of the frequency response of the ear is usually taken to be from about 18 Hz to 18,000 Hz. The auditory system is not equally sensitive throughout this frequency range. This is taken into account when making acoustic measurements by the use of A-weighting, a filter circuit which has a frequency response similar to the human auditory system.

Units Used to Describe Noises Which Change Their Level with Time

The Equivalent Continuous A-Weighted Sound Pressure Level ($L_{Aeq,T}$) is the principal measurement index for environmental noise. The $L_{Aeq,T}$ is defined as the A-weighted sound pressure level of the steady sound which contains the same acoustic energy as the noise being assessed over a specific time period, T.

The L_{A90} is the noise level exceeded for 90% of the measurement period. It is generally used to quantify the background noise level, the underlying level of noise which is present even during the quieter parts of the measurement period.

The L_{Amax} is the single maximum value that the A-weighted sound pressure level reaches during a measurement period. $L_{Amax F}$, or Fast, is averaged over 0.125 of a second and $L_{Amax S}$, or Slow, is averaged over 1 second. The measured L_{Amax} noise levels in this assessment are Fast.