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PROPOSED BATTERY ENERGY STORAGE SCHEME AT WHITLEY SOLAR FARM, ASHCOTT

NOISE IMPACT ASSESSMENT

Technical Report: R9367-1 Rev 1

Date: 7th March 2022

For: Whitley Solar Park (Ashcott Farm) Ltd
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1.0 INTRODUCTION AND BACKGROUND

1.1 Whitley Solar Park (Ashcott Farm) Ltd is applying for planning permission for the development of a battery energy storage scheme (BESS) on land at Whitley solar farm near Ashcott. 24 Acoustics Ltd has been instructed to undertake an assessment of the noise impact arising from the operation of the BESS to accompany the planning application.

1.2 The assessment has been undertaken following background noise surveys at a receptor close to the proposed scheme and acoustic modelling of the noise emission from the scheme to predict operational noise levels at nearby residential properties.

1.3 All sound pressure levels quoted in this report are in dB relative to 20 µPa. All sound power levels are quoted in dB relative to 10^{e-12} Watts. A glossary of the acoustic terminology used in this report is provided in Appendix A.

2.0 SITE DESCRIPTION AND PROPOSED DEVELOPMENT

2.1 The Whitley solar farm is located approximately 1 km east of Ashcott. The surrounding area comprises rural farmland with small numbers of residential properties around the site.

2.2 There is an existing solar farm on the site. It is proposed to install a battery energy storage scheme.

2.3 The proposed development comprises 6 battery storage containers, 1 associated transformer and 6 inverter units.

2.4 It should be noted that the noise emission of the plant is variable, depending upon cooling requirements. This noise impact assessment has been based upon the noise output of the plant at 100% duty.

2.5 The nearest residential properties to the site and associated plant are detailed as follows:

No.	Name / Address	OSGB36 Grid Reference	Approx. Distance from Plant
1	Whitley Wood Farm	ST 44661 37187	200 m
2	Autumn Leaves	ST 45258 36956	400 m
3	Whitley Farm	ST 45208 36870	380 m
4	Summerwell	ST 45245 36702	500 m
5	186 Main St	ST 45413 36274	930 m
6	Lynch Farm	ST 45049 36122	900 m
7	Stable Cottage	ST 44163 36395	880 m
8	Broadlea Lodge	ST 44008 36694	870 m
9	Charity Farm	ST 43746 36952	1000 m
10	14 Glebeland Cl	ST 43758 37057	1100 m
11	Ashcott Farm	ST 43798 37184	1000 m
12	20 High St	ST 43894 37287	970m
13	Charlton House	ST 44046 37309	780 m
14	Dodds House	ST 44088 37295	820 m
15	Short Breach	ST 44360 37246	500 m
16	Little Whitley	ST 44448 37400	525 m

Table 1 - Receptor Locations (Distances are to closest item of power conversion plant)

2.6 Figure 1 provides an aerial image of the site and receptor locations.

3.0 STANDARDS AND GUIDANCE

NPPF and NPSE

3.1 The National Planning Policy Framework (NPPF) [Reference 1], revised in July 2021, states (paragraph 185) in relation to noise that planning policies and decisions should aim to:

> Mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development − and avoid noise giving rise to significant adverse impacts on health and the quality of life;
>
> Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason;

3.2 The NPPF refers to the Noise Policy Statement for England (NPSE) [Reference 2] which is intended to apply to all forms of noise, including environmental noise, neighbour noise and neighbourhood noise. The NPSE sets out the Government's long-term vision to 'promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development' which is supported by the following aims.

> Avoid significant adverse impacts on health and quality of life;
>
> Mitigate and minimise adverse impacts on health and quality of life.

3.3 The NPSE defines the concept of a 'significant observed adverse effect level' (SOAEL) as 'the level above which significant adverse effects on health and quality of life occur'. The following guidance is provided within the NPSE:

> "It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available."

3.4 The Planning Practice Guidance (PPG) was updated in 2019 [Reference 3]. This is written to support the NPPF with more specific planning guidance. The PPG reflects the NPSE and states that noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. It also states that opportunities should be taken, where practicable, to achieve improvements to the acoustic environment. The PPG states that noise can over-ride other planning concerns but should not be considered in isolation from the other economic, social and environmental dimensions of the proposed development.

3.5 The PPG expands upon the concept of SOAEL (together with Lowest Observable Adverse Effect Level, LOAEL and No Observed Effect Level, NOEL) as introduced in the NPSE and provides a table of noise exposure hierarchy for use in noise impact assessments in the planning system.

3.6 In general terms it is considered that a noise impact with an effects level which is lower than SOAEL is acceptable (providing the effect is mitigated to a minimum). There is currently, however, a major discontinuity between the above guidance and objective technical criteria for use in planning noise impact assessments.

3.7 For this site, it is considered that the appropriate standard for use in assessing noise impact is British Standard 4142:2014 [Reference 4].

BS 4142:2014+A1:2019 - Methods for Rating Industrial and Commercial Sound

3.8 BS 4142:2014+A1:2019 provides a method for rating the effects of industrial and commercial sound on residential areas.

3.9 The standard advocates a comparison between the representative measured L_{A90} background noise level and L_{Aeq} noise level from the source being considered. For rating purposes if the noise source is tonal, intermittent or otherwise distinctive in character, a rating correction should be applied.

3.10 The standard states that a difference between the rating level and the background level of around +10 dBA is an indication of a significant adverse impact, depending on the context and a difference of around +5 dBA is likely to be an indication of an adverse impact, also depending on the context. Where the rating level does not exceed the background noise level, this is an indication of the specific sound source having a low impact (depending upon the context).

3.11 BS 4142 requires the noise impact to be assessed depending on the context. In relation to situations where background noise levels are low, 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".

4.0 BACKGROUND NOISE SURVEY

Methodology

4.1 Background noise survey was undertaken between 6th and 12th January 2022 at the following key location:

Location 1 – Adjacent to Dodds House, at OS coordinates ST 44088 37295.

4.2 The monitoring location is considered representative of other properties in the vicinity of the site given that the background noise levels are likely controlled by traffic noise from Bath Road and Taunton Road to the south.

4.3 The following instrumentation was used during the surveys:

1 x Rion NL-52 grade Class 1 accuracy sound level meter;

Brüel and Kjær Type 4231 precision acoustic calibrator.

4.4 The instrumentation was configured to measure continuously and store overall A-weighted statistical parameters including L_{Aeq}, L_{Amax} and L_{A90} (all measured on fast response) in 5-minute intervals. Measurements were made in accordance with BS 7445: 1991 'Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use' [Reference 5].

4.5 The sound level meter was equipped with environmental microphone and windshield. The microphone was installed approximately 1.5 metres above local ground level under free-field conditions. The instrumentation was powered by external batteries and stored in a weatherproof case. The calibration of the instrumentation was checked before and on completion of the measurements and no significant drift was found. The calibration of all 24 Acoustics' equipment is traceable to National Standards.

4.6 Weather conditions throughout the survey period were generally dry. Wind speeds were generally less than 5 m/s. Periods considered to have been adversely affected by weather conditions have been removed from the analysis.

Results

4.7 The measured noise levels are shown graphically in Figure 3 and summarised below in Table 2. 24 Acoustics defines the 'typical' level as the average minus 1 standard deviation.

Period	Sound Pressure Level (dB)			
	Daytime 07:00 – 23:00		Night-time 23:00 – 07:00	
	Average $L_{A90,1hr}$	Typical $L_{A90,1hr}$	Average $L_{A90,15min}$	Typical $L_{A90,15min}$
Thursday 6/01/2022	*42.6	*37.2	33.7	29.6
Friday 7/01/2022	39.6	35.3	33	28.8
Saturday 8/01/2022	41.8	39.3	32.2	28.3
Sunday 9/01/2022	36.9	34.1	31.2	26.5
Monday 10/01/2022	41	37	32.3	27.4
Tuesday 11/01/2022	34.2	29.4	31.2	27
Wednesday 12/01/2022	41.9	39.3	--	--
Representative	--	36	--	28

Table 2 - Measured Levels at Location 1 (* denotes incomplete measurement period)

5.0 CALCULATIONS AND ASSESSMENT

5.1 The dominant sources of noise for the proposed scheme are the cooling systems for the battery storage containers, as well as the associated Inverters.

5.2 The proposed battery storage containers are LUNA 2000 2.0MWH supplied by Huawei. The sound power levels stated by the manufacturer are shown below in Table 3.

Measured Sound Power Level (dB)								
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dBA
84	86	85	83	80	76	72	68	85

Table 3 - Octave Band Sound Power Levels for Huawei BESS Container

5.3 The proposed inverters are Type 215KTL manufactured by Huawei. The manufacturer states a sound power level of 76.9 dBA. The dominant source of noise on the inverters is the active cooling system. During the night-time period (i.e. before 07:00), the cooling system will not run. The manufacturer has stated that the sound power level of the inverters without the cooling systems running will be similar to that of the 105KTL-H1 inverters. The sound power level of the 105KTL-H1 inverters is 61.9 dBA, and this has been used for the night-time noise level assessment.

5.4 The proposed BESS transformers will be manufactured by Huawei, with a sound power level of 62.2 dBA (the datasheet is shown in Appendix B). The octave band spectrum for a typical transformer has been taken from Table 11.27 of Bies & Hansen 'Engineering Noise Control' [Reference 6], described below in Table 4.

Sound Power Level (dB)								
63 Hz	125 Hz	250 Hz	500 Hz	1 kHz	2 kHz	4 kHz	8 kHz	dBA
65	67	62	62	56	51	46	39	62

Table 4 - Octave Band Sound Power Levels for Solar Transformer

5.5 Given the propagation distances, the BESS containers, inverters and transformers have been modelled as point sources with a height of 1.5 m above local ground level.

5.6 The predicted noise levels have been calculated using IMMI noise mapping software. The propagation methodology of ISO 9613 [Reference 7] has been used which takes into account the effects of geometric divergence, acoustics screening/reflection and atmospheric and ground absorption. Buildings close to Whitley Wood Farm have been included in the model, as these will have a significant impact on noise propagation from the proposed plant.

5.7 The calculations have assumed an ambient temperature of 10°C and relative humidity of 70%. Downwind propagation conditions have been assumed throughout. A ground absorption factor of G=0.75 (where 0 is hard ground and 1 is soft ground) has been used. Predictions have been made at heights of 1.5 m and 4 m.

5.8 The results of the acoustic model are shown graphically in Figures 4 and 5 as noise contour maps and summarised below in Table 5.

No.	Name / Address	Predicted Sound Pressure Level (dBA)	
		Daytime (1.5 m height)	Night-time (4 m height)
1	Whitley Wood Farm	32	32
2	Autumn Leaves	26	27
3	Whitley Farm	26	27
4	Summerwell	26	26
5	186 Main St	20	20
6	Lynch Farm	20	20
7	Stable Cottage	20	20
8	Broadlea Lodge	20	20
9	Charity Farm	18	18
10	14 Glebeland Cl	18	18
11	Ashcott Farm	18	18
12	20 High St	19	19
13	Charlton House	20	20
14	Dodds House	21	21
15	Short Breach	25	25
16	Little Whitley	25	25

Table 4 - Predicted Noise Levels at the Nearest Receptors

Assessment

5.9 The predicted noise levels from the proposed scheme have been assessed in accordance with BS 4142:2014+A1:2019, with the results of the assessment shown below in Tables 6 and 7 (for daytime and night-time respectively).

5.10 Noise emission from the scheme is not expected to have any characteristics that would attract a rating penalty under BS 4142:2014+A1:2019 at the receiver locations. Low frequency noise from all plant is predicted to be lower than the threshold of hearing.

Receptor	Background Noise Level (dB $L_{A90,1hr}$)	Noise Rating Level (dB L_{Aeq})	Rating over Background (dB)
Whitley Wood Farm	36	32	-4
Autumn Leaves	36	26	-10
Whitley Farm	36	26	-10
Summerwell	36	26	-10
186 Main St	36	20	-16
Lynch Farm	36	20	-16
Stable Cottage	36	20	-16
Broadlea Lodge	36	20	-16
Charity Farm	36	18	-18
14 Glebeland Cl	36	18	-18
Ashcott Farm	36	18	-18
20 High St	36	19	-17
Charlton House	36	20	-16
Dodds House	36	21	-15
Short Breach	36	25	-11
Little Whitley	36	25	-11

Table 5 - BS 4142 Daytime Noise Impact Assessment

Receptor	Background Noise Level (dB $L_{A90,15min}$)	Noise Rating Level (dB L_{Aeq})	Rating over Background (dB)
Whitley Wood Farm	28	32	+4
Autumn Leaves	28	27	-1
Whitley Farm	28	27	-1
Summerwell	28	26	-2
186 Main St	28	20	-8
Lynch Farm	28	20	-8
Stable Cottage	28	20	-8
Broadlea Lodge	28	20	-8
Charity Farm	28	18	-10
14 Glebeland Cl	28	18	-10
Ashcott Farm	28	18	-10
20 High St	28	19	-9
Charlton House	28	20	-8
Dodds House	28	21	-7
Short Breach	28	25	-3
Little Whitley	28	25	-3

Table 6 - BS 4142 Night-time Noise Impact Assessment

5.11 It should be noted that the assessment is based on the plant operating at 100% duty, which would only occur under peak demand. Noise levels are expected to be noticeably lower when the plant is not operating at full duty.

5.12 Table 6 shows that the BS 4142 rating levels for noise from the proposed BESS fall below the measured daytime background noise levels at all locations, which is an indication of a low noise impact.

5.13 Table 7 shows that the BS 4142 rating levels for noise from the proposed BESS fall at or below the measured night-time background noise levels for the majority of receptor locations. However, the rating level exceeds the measured night-time background noise level at the closest residential property by 4 dBA. This is considered acceptable for the following reasons:

The difference is less than +5 dB, which is the level at which BS 4142 states as the likely level at which an adverse impact will occur (depending on the context).

The exceedance of background noise levels is predicted at only one property. Therefore, the extent of the impact is small.

The absolute noise level is low (28 dB L_{Aeq}). BS 4142 states that absolute levels are likely more relevant when background noise levels and rating noise levels are low, and this is especially true at night.

The battery container cooling systems would be unlikely to operate at full duty during the night-time, when ambient temperatures are lower. Noise levels are expected to be noticeably lower when the plant is not operating at full duty.

5.14 Given the above, it is considered that noise arising from the proposed BESS would be acceptable and there should be no reason to refuse planning permission on grounds of noise.

6.0 CONCLUSIONS

6.1 Whitley Solar Park (Ashcott Farm) Ltd is applying for planning permission for the development of a battery energy storage scheme (BESS) on land at Whitley Solar Farm near Ashcott. 24 Acoustics Ltd has been instructed to undertake an assessment of the noise impact arising from the operation of the BESS to accompany the planning application.

6.2 The assessment has been undertaken following background noise surveys at a receptor close to the proposed scheme and acoustic modelling of the noise emission from the scheme to predict operational noise levels at nearby residential properties.

6.3 A comparison of the predicted noise levels has been made with the measured background noise levels in accordance with BS 4142:2014+A1:2019.

6.4 The assessment indicates that noise arising from the operation of the proposed BESS would be acceptable at all residential locations for daytime and night-time periods.

REFERENCES

1. Department for Communities and Local Government. The National Planning Policy Framework (NPPF), 2021.

2. Noise Policy Statement for England, Defra, 2010.

3. Planning Practice Guidance, Department of Communities and Local Government, July 2019.

4. British Standards Institution. British Standard 4142: Methods for Rating Industrial and Commercial Sound, 2014+A1:2019.

5. British Standards Institution. British Standard 7445: Description and measurement of environmental noise Part 2 - Acquisition of data pertinent to land use, 1991.

6. D. A. Bies & C. H. Hansen. Engineering Noise Control - Theory and Practice, 1988

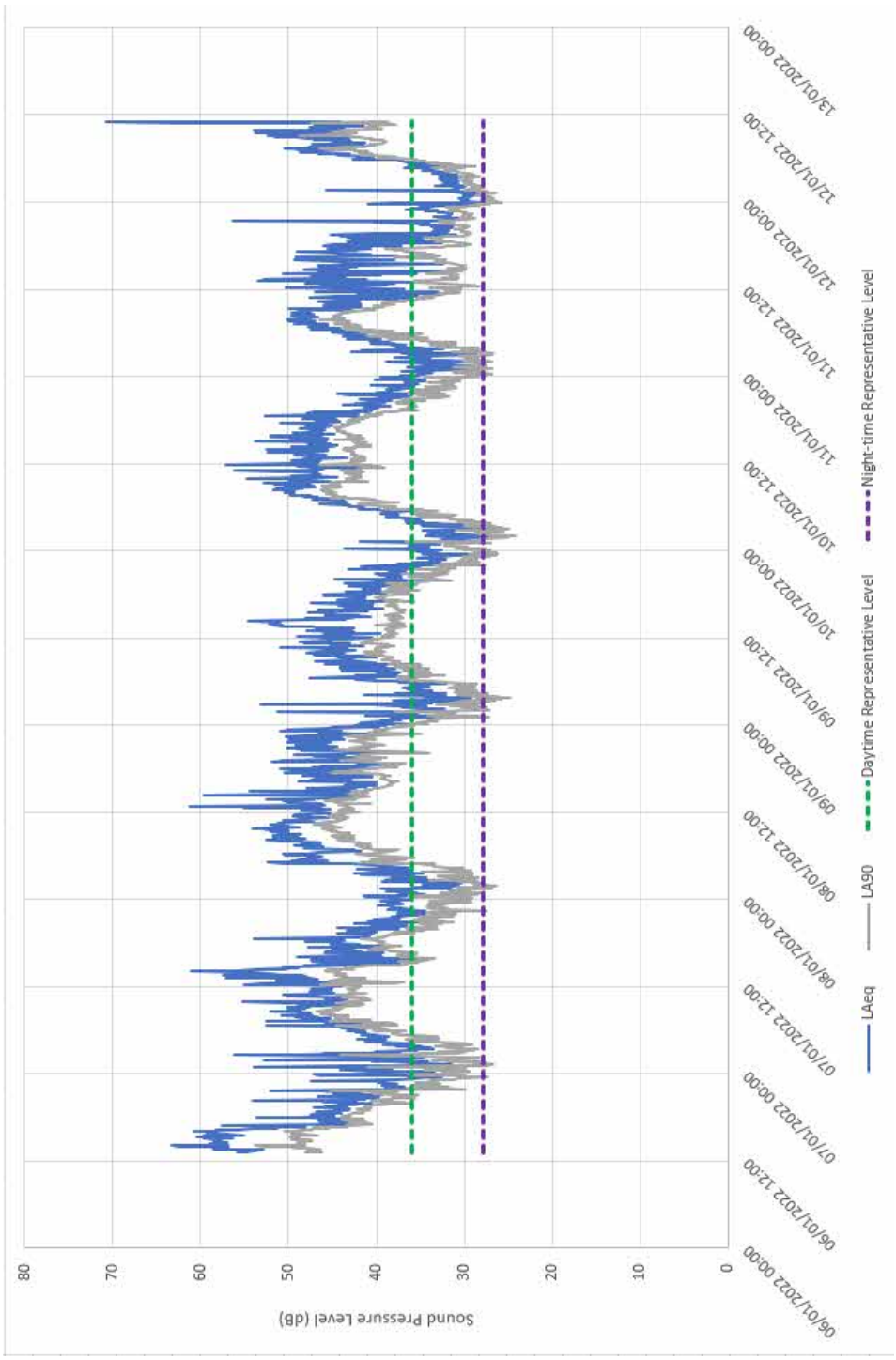
7. International Standards Organisation. ISO 9613, Acoustics - Attenuation of Sound During Propagation Outdoors, 1993.



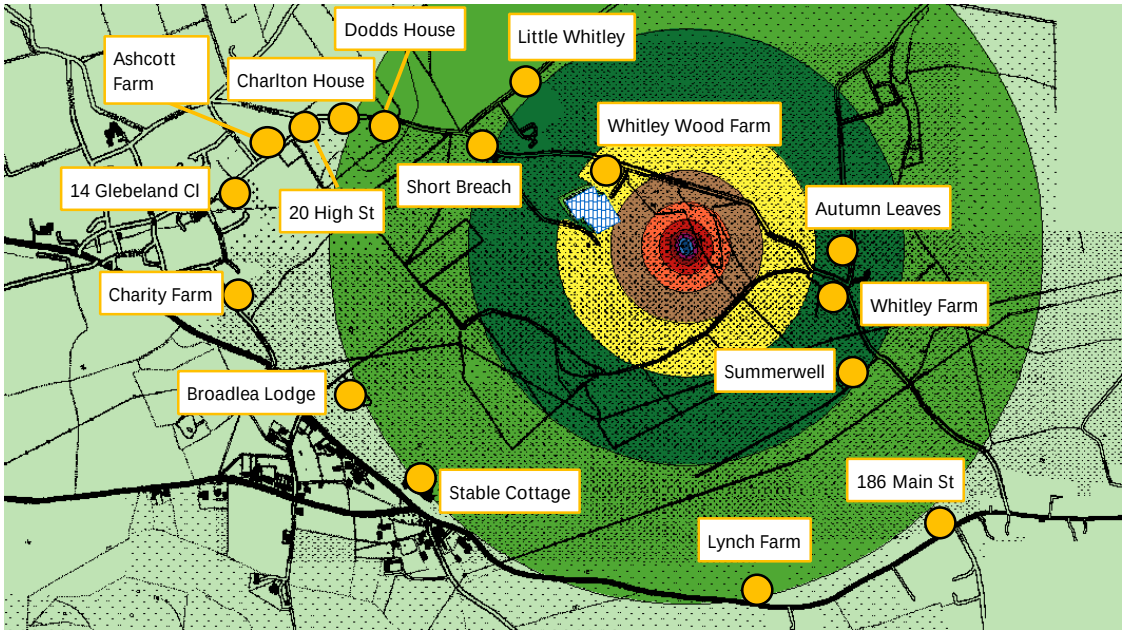
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Date: March 2022	Drawn By: AP	Job No: 9367

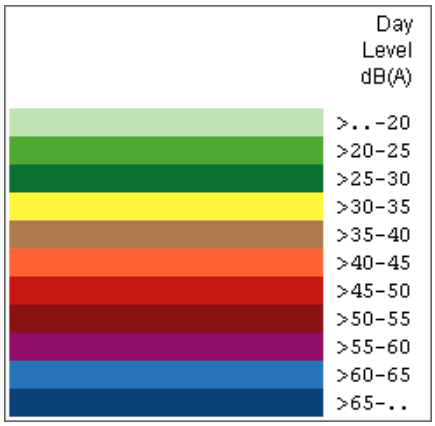


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Date: March 2022	Drawn By: AP	Job No: 9367

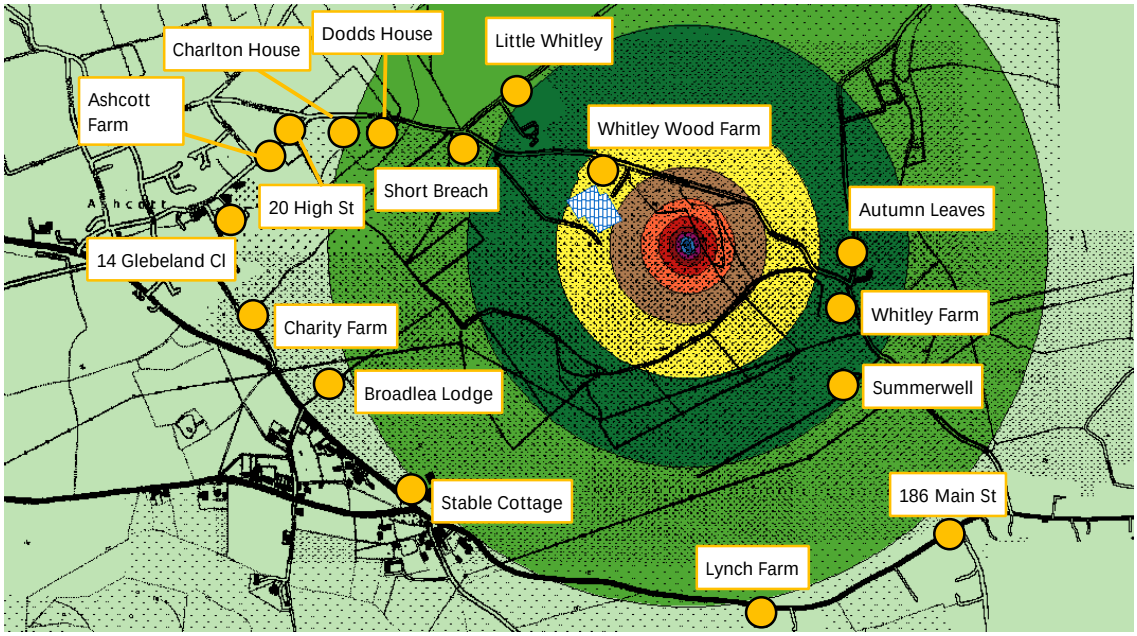


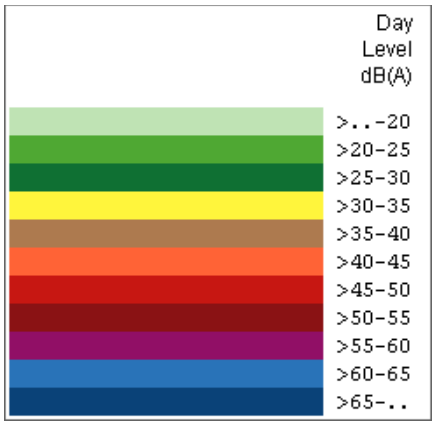
Project: Whitley Solar Park BESS	Title: Measured Noise Levels at Location 1		24Acoustics
DWG No: Figure 3	Scale: N.T.S.	Rev: -	
Date: March 2022	Drawn By: AP	Job No: 9367	





Project: Whitley Solar Park BESS	Title: Daytime Predicted Noise Levels (1.5 m height)	
DWG No: Figure 4	Scale: N.T.S.	Rev: -
Date: March 2022	Drawn By: AP	Job No: 9367





Project: Whitley Solar Park BESS	Title: Night-time Predicted Noise Levels (4 m height)	
DWG No: Figure 5	Scale: N.T.S.	Rev: -
Date: March 2022	Drawn By: AP	Job No: 9367

APPENDIX A: ACOUSTIC TERMINOLOGY

Noise is defined as unwanted sound. The range of audible sound is from 0 to 140 dB. The frequency response of the ear is usually taken to be around 18 Hz (number of oscillations per second) to 18000 Hz. The ear does not respond equally to different frequencies at the same level. It is more sensitive in the mid-frequency range than the lower and higher frequencies and because of this, the low and high frequency components of a sound are reduced in importance by applying a weighting (filtering) circuit to the noise measuring instrument. The weighting which is most widely used and which correlates best with subjective response to noise is the dBA weighting. This is an internationally accepted standard for noise measurements.

For variable sources, such as traffic, a difference of 3 dBA is just distinguishable. In addition, a doubling of traffic flow will increase the overall noise by 3 dBA. The 'loudness' of a noise is a purely subjective parameter, but it is generally accepted that an increase/ decrease of 10 dBA corresponds to a doubling/ halving in perceived loudness.

External noise levels are rarely steady, but rise and fall according to activities within an area. In attempt to produce a figure that relates this variable noise level to subjective response, a number of noise indices have been developed. These include:

i) The L_{Amax} noise level

This is the maximum noise level recorded over the measurement period.

ii) The L_{Aeq} noise level

This is "equivalent continuous A-weighted sound pressure level, in decibels" and is defined in British Standard BS 7445 as the "value of the A-weighted sound pressure level of a continuous, steady sound that, within a specified time internal, T, has the same mean square sound pressure as a sound under consideration whose level varies with time".

It is a unit commonly used to describe construction noise and noise from industrial premises and is the most suitable unit for the description of other forms of environmental noise. In more straightforward terms, it is a measure of energy within the varying noise.

iii) The L_{A10} noise level

This is the noise level that is exceeded for 10% of the measurement period and gives an indication of the noisier levels. It is a unit that has been used over many years for the measurement and assessment of road traffic noise.

iv) The L_{A90} noise level

This is the noise level that is exceeded for 90% of the measurement period and gives an indication of the noise level during the quieter periods. It is often referred to as the background noise level and is used in the assessment of disturbance from industrial noise.

APPENDIX B: SUBSTATION TRANSFORMER SOUND POWER DATA

DEKRA

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ANNEX E, PAGE 1

16 **ACOUSTIC SOUND LEVEL**

Transformer serial number: 7987
Cooling method: ONAN

Sound level at no load condition		
Rated power of transformer	kVA	6500
No load loss of the transformer	W	4269
Rated voltage of the transformer (HV/LV1/LV2)	kV	33 / 0.6 / 0.8
Rated frequency	Hz	50
Tap position		3
Measured current	% In	/
Measured voltage	V	800
Measured points		13
Height of tank		2.51
1/2 of height	m	1.25
Length of prescribed contour	m	12.9
Distance between prescribed contour and principal radiating surface	m	0.3
Distance of microphones	m	0.99
Measurement surface (S)	m^2	36.5
Sound absorption area of the test room (A)	m^2	4175.8
Environmental correction (K)	dB	0.15
Average A-weighted background noise pressure level before measurement L_{bpA1}	dB	36.3
Average A-weighted background noise pressure level after measurement L_{bpA2}	dB	36.7
Uncorrected average A-weighted sound pressure level L_{pA0}	dB	47.1
Corrected average A-weighted sound pressure level L_{pA}	dB	46.6
Guaranteed A-weighted sound pressure level L_{pA}	dB	70.0
A-weighted sound power level L_{WA}	dB	62.2
Guaranteed A-weighted sound power level L_{WA}	dB	/

Position of microphones during sound level determination

