Offshore Wind Power Limited

West of Orkney Windfarm Onshore EIA Report

Volume 2, Supporting Study 12: Noise Survey Report

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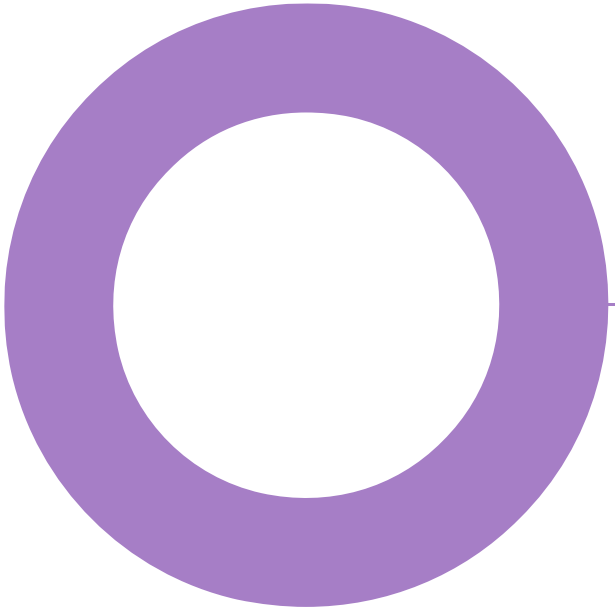
West of Orkney Windfarm

West of Orkney Windfarm Substation. Spittal, Caithness. Noise survey report.

ACOUSTICS
BASELINE NOISE SURVEY REPORT
HOARE LEA
REVISION 4 – 09 JUNE 2023



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Audit sheet.

Rev.	Date	Description of change / purpose of issue	Prepared	Reviewed	Authorised
1	17/01/2023	First version	SG	MMC	MMC
2	02/03/2023	Updated following comments received	SG	MMC	MMC
3	30/03/2023	Updated following comments received	SG	MMC	MMC
4	09/06/2023	Added policy/guidance section	SG	MMC	MMC

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Abbreviations.

Acronym	Definition
SHET-L	Scottish Hydro Electric Transmission plc.
THC	The Highland Council

Contents.

1. Introduction.

Hoare Lea LLP have been appointed to undertake a background noise survey in relation to the development of an offshore wind farm to the West of Orkney which will have an associated onshore grid connection near Spittal in Caithness.

This report sets out the existing noise climate and summarises the background survey undertaken at the proposed Caithness substation area of search for the onshore grid connection.

The methodology within BS 4142:2014 has been considered in the survey, to assist with determining prevailing background noise levels at the closest noise-sensitive receptors.

2. Site context.

The existing site was observed to be rural in nature, consisting primarily of empty fields, with localised agricultural use, and the existing SHET-L Spittal substation to the south of the proposed substation area of search. Figure 1 below illustrates the outline of the proposed development area of search overlaid onto the existing rural site area.

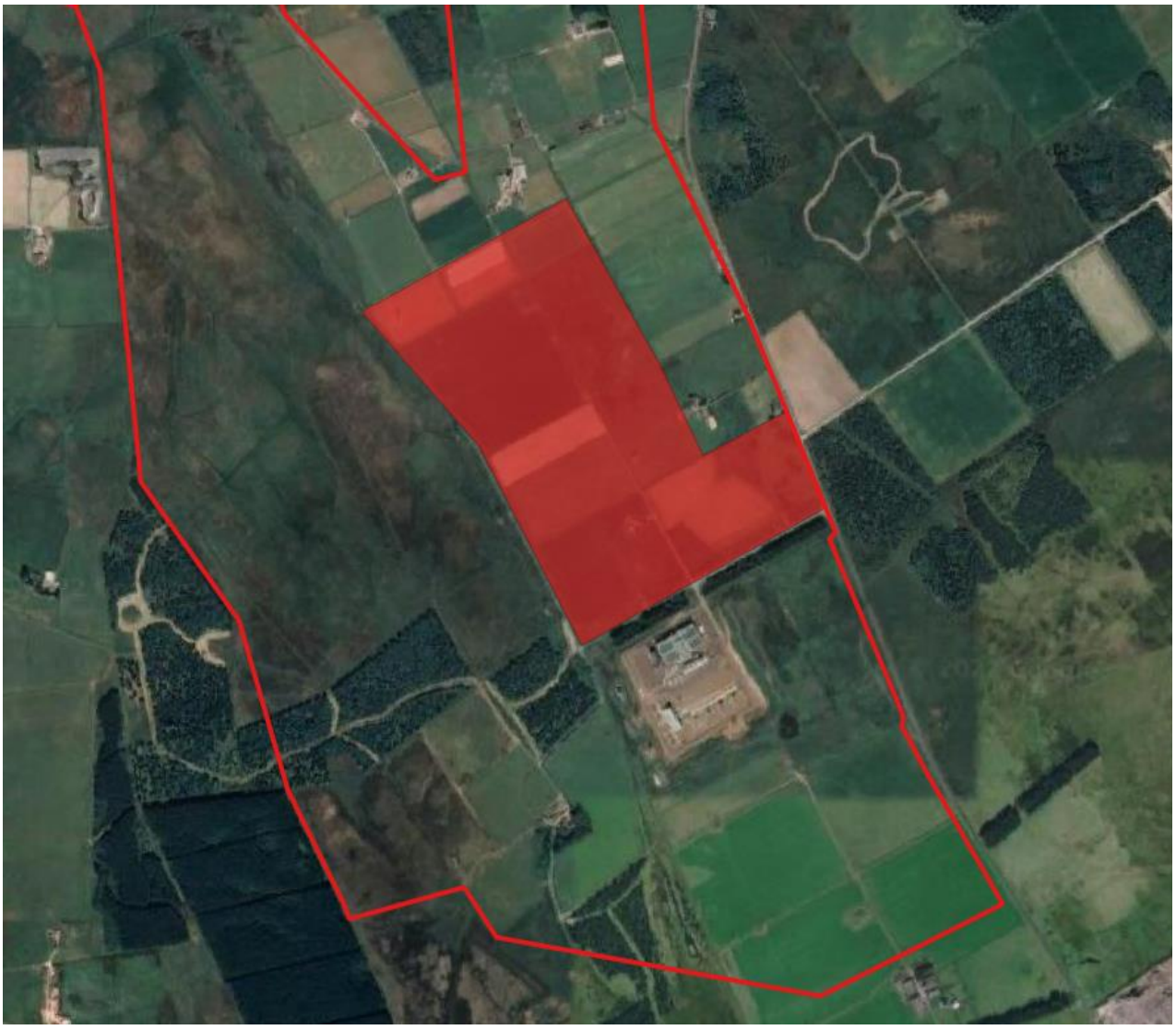


Figure 1: Site context showing the Caithness onshore substation area of search (red polygon) and onshore cable search area (red line) for the proposed development site.

3. Relevant policy and guidance and consultation.

3.1 Legislation

The Environmental Protection Act 1990 (Her Majesty's Stationery Office (HMSO), 1990) defines the powers for local authorities to investigate and control statutory nuisance from noise.

Local authorities also have powers under the Control of Pollution Act (CoPA) 1974 (HMSO, 1974) to control noise and vibration from construction activities. Specifically, Section 60 of the CoPA provides the Local Authority with the power to impose at any time operating conditions on the development site. Section 61 allows the developer to negotiate a set of operating procedures with the Local Authority prior to commencement of site works.

Notwithstanding these powers, the aim of the planning system is to minimise and control where required construction and operational noise levels from commercial developments.

3.2 Planning Policy and Advice on noise

National Planning Framework (NPF) 4 (Scottish Government, 2023) outlines key policy links with regards to land use and development of land in the north of Scotland and rural areas. Specific policies include: policy 11 which notes that impacts of renewable and low-carbon developments on communities and individual dwellings include noise, and that these proposals need to demonstrate how these impacts are addressed. Policy 23 notes that developments likely to raise unacceptable noise issues would not be supported. However, NPF 4 provides no specific advice on noise.

Similarly, the Highland-wide Local Development Plan (HwLDP) (The Highland Council (THC), 2012) includes specific policies related to noise: Policy 67 requires consideration of noise generation on building occupants. Policy 72 considers noise as one form of pollution and requires an assessment demonstrating how significant pollution can be avoided and, if necessary, mitigated. In this case as well, no further detailed guidance is provided.

Planning Advice Note PAN1/2011 provides general advice on the role of the planning system in preventing and limiting the adverse effects of noise without prejudicing investment in enterprise, development and transport. PAN1/2011 provides general advice on a range of noise related planning matters, including references to noise associated with both construction activities and operational wind farms.

PAN1/2011 and the Technical Advice Note (TAN-Noise) accompanying PAN1/2011 note that construction noise control can be achieved through planning conditions that limit noise from temporary construction sites, or by means of the Control of Pollution Act (CoPA) 1974 (as set out above). For detailed guidance on construction noise and its control, the Technical Advice Note refers to British Standard BS 5228. TAN-Noise also references BS 4142 as appropriate guidance for assessing the noise impact of proposed noise generating developments on residential properties.

Planning Advice Note PAN50 'Controlling the Environmental Effects of Surface Mineral Workings' gives guidance on the environmental effects of mineral working. The main document summarises the key issues with regard to various environmental effects relating to surface mineral extraction and processing such as road traffic, blasting, noise, dust, visual intrusion etc. In addition, several annexes to the main document have been published which consider specific aspects in more detail: Annex A, 'The Control of Noise at Surface Mineral Workings' and Annex D 'The Control of Blasting at Surface Mineral Workings'.

3.3 British Standard 5228:2009 'Noise control on construction and open sites'

As noted above, for detailed guidance on construction noise and its control, TAN-Noise refers to British Standard BS 5228 'Noise control on construction and open sites', Parts 1 to 4 but confirms that the updated version of this standard, published in January 2009 is relevant when used within the planning process. The 2009 version consolidates all previous parts of the standard into BS 5228-1: 2009 (amended 2014) (BS 5228-1) for airborne noise and BS 5228-2: 2009 (amended 2014) (BS 5228-2) for ground-borne vibration. These updated versions have therefore been adopted as the relevant versions upon which to base this assessment.

BS 5228-1 provides guidance on a range of considerations relating to construction noise including the legislative framework, general control measures, example methods for estimating construction noise levels and example criteria which may be considered when assessing the associated impacts.

BS 5228-1 describes methods for predicting construction noise levels on the basis of reference data for the emissions of typical construction plant and activities. These methods include for the calculation of construction

traffic along access tracks and haul routes and also for construction activities at fixed locations. The prediction method accounts for factors including screening and soft ground attenuation.

Similarly, BS 5228-2 provides general guidance on legislation, prediction, control and assessment criteria for construction vibration.

3.4 British Standard 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound.

The British Standard 4142:2014+A1:2019 provides an objective method for rating the significance of impact from industrial and commercial operations. It describes a means of determining sound levels from fixed plant installations and determining the background sound levels that prevail on a site.

The assessment of the impacts is based on comparison of the rating level ($L_{Ar,Tr}$) from the proposed operations with the pre-existing background sound level (L_{A90}).

The standard does not give a definitive method for determining the background sound level but instead, as a commentary, states that *"the objective is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during particular time periods"*.

Clause 8.1.4, which discusses the monitoring duration, states *"there is no "single" background sound level as this is a fluctuating parameter. However, the background sound level used for the assessment should be representative of the period being assessed."* As a note to this clause the following commentary is given on obtaining a representative backgrounds sound level:

"To obtain a representative background sound level a series of either sequential or disaggregated measurements ought to be carried out for the period(s) of interest, possibly on more than one occasion. A representative level ought to account for the range of background sound levels and ought not automatically to be assumed to be either the minimum or modal value."

This method is only applicable for external noise levels. The scope of the method for assessing industrial and commercial sound is clearly defined in Section 1 of the Standard; music, entertainment and people are included in the list of noise sources not intended to be assessed by the method.

The rating level is defined objectively as the specific source noise level in question (either measured or predicted) with graduated corrections for tonality (up to +6 dB), impulsivity (up to +9 dB), intermittency (+3 dB) and other sound characteristics (+3 dB) which may be determined either subjectively or objectively, if necessary.

The background sound level is subtracted from the rating level and the difference used to assess the impact of the specific noise source:

- A difference of around +10 dB is likely to be an indication of a significant adverse impact, depending on context;
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on context; and
- A difference of +0 dB or less is an indication of the specific sound source having a low impact, depending on the context.

The "context" in the above statements refers to a fundamental requirement of BS 4142: this requires consideration not only of the difference between rated levels of background but also of several contextual factors, including the character and level of the sound, receptor sensitivity and the absolute level of the noise.

3.5 Consultation.

Consultation was made with the Environmental Health Team at The Highland Council (THC) on 10th November 2022, outlining the proposed assessment methodology. A response was received via email on 18th November from dealing officer Philip Dent, showing agreement with the methodology, providing that the proposals and noise assessment demonstrated compliance with their requirements in relation to electrical substations.

Relevant requirements of THC at this stage include carrying out the assessment in accordance with *BS 4142:2014+A1:2019*, and including a noise survey of the background ($L_{A90,T}$) ambient noise ($L_{Aeq,T}$), and third octave band spectrum levels to determine the existing noise level in the area and at any nearby properties likely to be affected by the noise.

Furthermore, the Scoping Report response from THC requested that the assessment should demonstrate that operational noise from the substation site must not exceed 30 dB in the 100Hz one third frequency band, and that the rating level of noise (from plant, machinery or equipment installed or operated) must not exceed the current background level at noise sensitive premises (dwellings). The 100 Hz frequency band has been requested as it is the predominant frequency for transformers. As such results will be considered at the 100Hz third octave frequency band.

4. Acoustic survey.

A series of acoustic survey measurements have been undertaken at the site to quantify the existing background noise climate in the area. Locations of the acoustic survey measurements are shown in Figure 2.

4.1 Methodology.

The acoustic survey included one long-term unattended and three short-term attended measurements at nearby noise sensitive residential receptors. Two short-term attended measurements were also undertaken in proximity of the existing SHET-L Spittal substation. The unattended survey measurements were undertaken from Tuesday 6th to Tuesday 20th December 2022. The attended survey measurements were undertaken during the daytime on Tuesday 20th December 2022 to supplement the longer-term data acquired.

The long-term measurement location LT1 was chosen as it is relatively set back from the A9, the main noise source in the area, and is considered representative of the quietest levels likely to be experienced at the nearest noise sensitive receptors in each direction around the site. The nearest noise sensitive receptors are located at the monitoring positions LT1 (north), ST1 (east), ST2 (south) and ST3 (west/south-west), which can be seen in Figure 2.

The noise loggers used were setup to measure third octave band spectrum levels (unweighted), in addition to broadband (A-weighted) levels, so that results could be considered at the 100Hz third octave band frequency, as requested during consultation. Measurements were made under free-field conditions. A rain gauge was installed on site with the long-term logger, measuring rainfall each 15-minute period for the duration of the measurements.

The weather during the long-term logger setup was cold, with cloud cover and a slight breeze. The weather for the short-term attended measurements and collection of the logger was cold and sunny, with occasional windy periods. Weather conditions were considered suitable for the purpose during part of the measurement period. Some periods of rain, high winds and snow were experienced during the long-term survey, as would be expected for the area at this time of year. Where there have been such periods of unsuitable or atypical weather, the corresponding data has been removed from the analysis.

The local noise climate was observed to consist of occasional road traffic on the nearby A9 to the east, intermittent road traffic on the nearby C1014 to the north (which runs from the A9 to Halkirk), and other low-level distant traffic noise. When traffic passes on the A9 it is very noticeable, as the road is at ground height or slightly elevated along the extent of the site. Natural sources such as low-level birdsong and low-level wind noise were also observed. Overall, the levels of noise observed were consistent with the rural nature of the site.

The farmer at the long-term logger location LT1 (Milton Farm) advised that he uses a tractor daily between the hours of 09:00 – 10:00 to collect a hay bale from the south-west corner of the farm, and travels along the track which runs to the north of the field where the logger was placed, however this activity only takes around 5-10 minutes maximum, and on inspection it hasn't affected the levels measured.

During a site check on Wednesday 7th December between 11:00 -11:30, surveyors were noted to be in attendance on the wider site, approximately 200m to the south-east of the logger location, undertaking trial pit works. This is understood to be low-level activity using a digger, with the works lasting a maximum of two hours. Nothing was audible at the logger location during the site visit. It is understood that the surveyors returned to site on Friday 9th December for further works. Inspection of the results shows that the trial pit works are not considered to have influenced the measurements.

All survey equipment was field calibrated at the start and end of each set of measurements with no drift in level observed. The measurement instrumentation used is listed in Appendix A attached.

4.2 Results.

Time history plots of the long-term unattended measurements taken at LT1 for the measured broadband levels (A-weighted) and for the third octave frequency band 100Hz (unweighted) can be found in Appendix B attached,

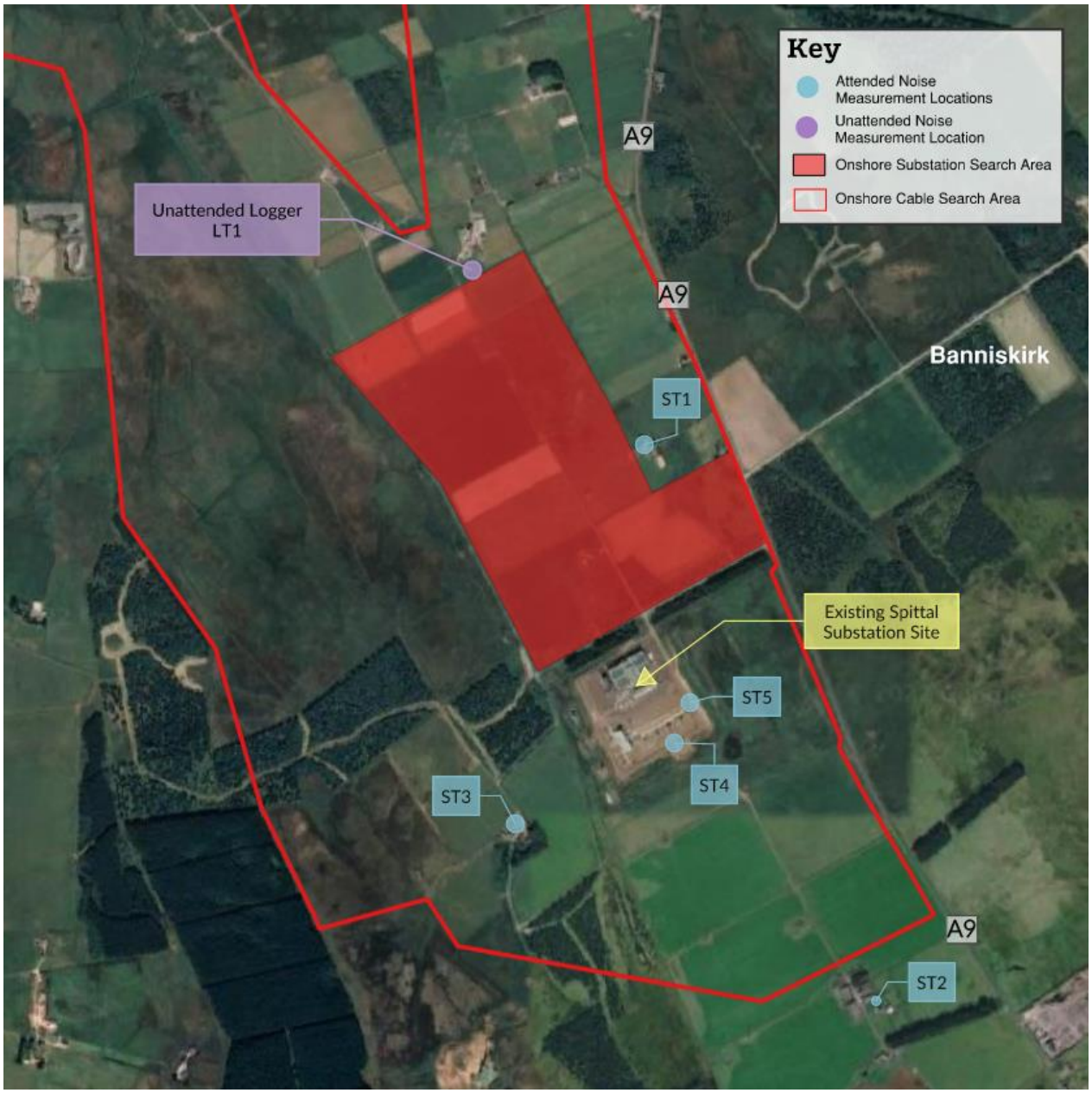


Figure 2: Acoustic survey locations: unattended measurement position (LT1) and attended measurement positions (ST1-5).

4.3 Background sound levels.

In line with the requirements of BS 4142, in order to "*quantify what is typical during particular time periods*", a statistical analysis of the measured background sound levels has been undertaken. The periods of interest have been taken as daytime (07:00 to 23:00) and night-time (23:00 to 07:00).

Assessment durations of 15-minutes are used for both day and night-time periods. A single $L_{A90,1h}$ measurement would always be higher than the lowest of the four 15-minute duration background sound levels it comprises. Therefore, this represents a conservative case.

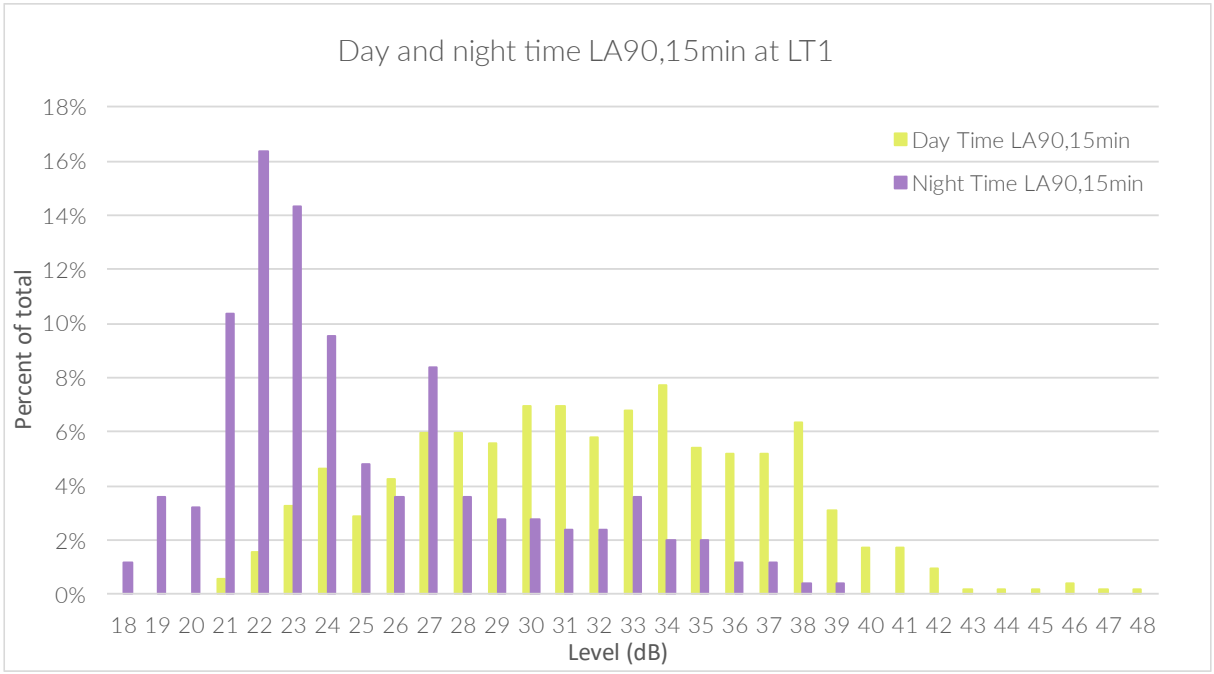


Figure 3: Statistical analysis of measured background noise levels at LT1 Milton Farm near Spittal (Unattended Position).

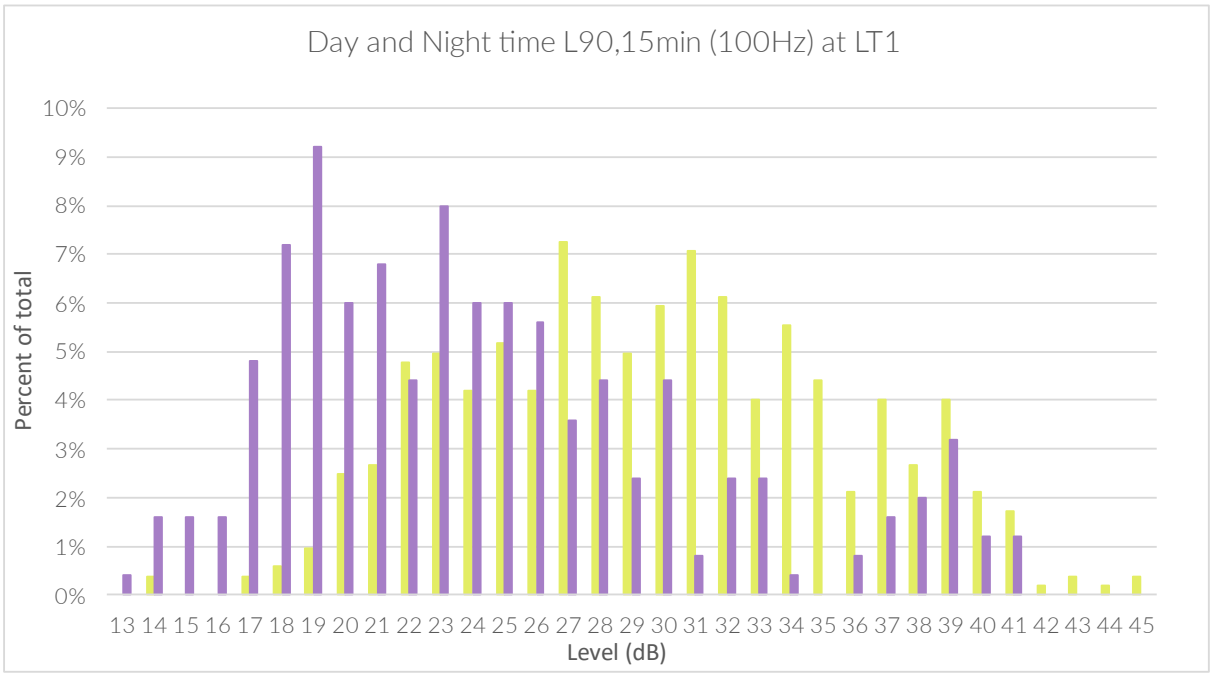


Figure 4: Statistical analysis of measured background noise levels for the 100Hz 1/3 octave band at LT1 Milton Farm near Spittal (Unattended Position).

The distributions of the measured noise levels are set out in Figure 3 above for A-weighted values, in Figure 4 for unweighted values at 100Hz. Using the above statistical analysis chart together with the time history chart included in Appendix B, given the context of the site, representative (typical lowest) background sound levels have been determined to represent each of the periods of interest. Results of this analysis are set out in Table 1 below for both A-weighted and unweighted 100Hz values.

Monitoring Location	Weighting	$L_{90,T}$ background noise level (dB) measurement period (T) result	
		Day	Night
LT1 – Milton Farm (north of site)	Broadband, A-weighted	27	22
	100Hz, unweighted	23	19

Table 1 - Representative L_{90} background noise levels (A-weighted) and 100 Hz 1/3 octave (unweighted) at LT1.

4.4 Attended measurements.

Short-term (ST) attended noise measurements were carried out at three further noise sensitive residential receptors neighbouring the site of the proposed substation search area (ST1 – ST3). Two 15-minute periods were captured per location during day-time hours on 20th December 2022.

In addition, spot measurements were undertaken at two locations along the perimeter of the existing SHET-L Spittal substation (ST4 and ST5). Shorter time periods were used at ST4 and ST5 due to the consistent nature of the external noise sources observed at the substation. Monitoring results are set out in Table 2.

Attended measurement position ID	Measurement period start time	Measured $L_{Aeq,15min}$ (dB)	Measured $L_{A90,5min}$ (dB)
ST1 – Achornhairle (east of site)	20/12/2022 11:00	43	36
	20/12/2022 11:15	48	41
ST2 – Spittal Mains (south of site)	20/12/2022 12:00	45	40
	20/12/2022 12:45	*50	*47
ST3 – Achanarras (south-west of site)	20/12/2022 13:30	43	36
	20/12/2022 13:45	42	35
Attended measurement position ID	Measurement period start time (and time period, T)	Measured $L_{Aeq,T}$ (dB)	Measured $L_{A90,T}$ (dB)
ST4 – Spittal Substation (southern perimeter)	20/12/2022 14:38 (19s)	42	40
ST5 – Spittal Substation (eastern perimeter)	20/12/2022 14:42 (26s)	41	40
	20/12/2022 14:44 (65s)	45	44
* Measurement affected by high wind			

Table 2: Attended survey results.

Comparison of the results of levels at ST1-3 in Table 2 with levels measured concurrently at the long-term location LT1, shows that similar levels or lower were measured at LT1. This shows that the long-term measurements are representative of the typical noise at the other noise sensitive properties, and where measured levels at LT1 are lower, this represents a conservative assumption. Any difference between measurements at ST1-3 and LT1 are also as expected, particularly when considering their respective distances from the A9. This was supported by on-site observations of the noise climate whilst undertaking measurements at each position, as being largely influenced by road traffic noise from the A9 to the east.

The exception was position ST2 at Spittal Mains to the south, which was influenced by high winds during the second measurement period.

The measurements at locations ST4/ST5, along the boundary of the existing SHET-L Spittal substation, showed levels only marginally higher than those measured at LT1, which indicates that noise emissions from the existing SHET-L Spittal substation were low, which is consistent with on-site observations that existing substation noise was not perceptible at any of the noise sensitive receptor measurement locations.

5. Summary and conclusion.

Hoare Lea LLP have been appointed to undertake a background noise survey in relation to the development of an onshore grid connection for an offshore wind farm, on land near Spittal, Caithness, in line with the methodology of BS 4142:2014.

Representative background noise levels for the unattended measurement position were determined for the day and night-time periods. The results of supplementary attended noise measurements, undertaken at other nearby noise sensitive residential receptors, showed that the long-term measurements were representative of the typical background noise environment at other neighbouring properties.

Appendix A: Acoustic survey equipment & Photos.

Equipment	Type	Serial Number	Last Calibrated
Sound Level Meter	Rion NL-52	00331819	11/01/2022
Pre-amplifier	Rion NH-25	21770	11/01/2022
Microphone	Rion UC-59	10813	11/01/2022

Table A1 - Sound level meter 1 – Long Term Logger position.

Equipment	Type	Serial Number	Last Calibrated
Sound Level Meter	Rion NL-52	00721003	05/09/2022
Pre-amplifier	Rion NH-25	22109	05/09/2022
Microphone	Rion UC-59	21944	05/09/2022

Table A2 - Sound level meter 2 - attended survey positions.

A field calibration was carried out at the start and end of the measurements, using:

Equipment	Type	Serial Number	Last Calibrated
Calibrator	Rion NC-74	34172705	23/11/2021

Table A3 – Calibrator.

A rain gauge was installed on site to gather rain data:

Equipment	Type	Serial Number
Rain Gauge	Campbell Scientific CR200 Datalogger	10465
	Davis Instruments 0.2 mm Tipping Bucket Rain Gauge: 7852	HLA 07

Table A4 – Rain Gauge.

Figure A1- Measurement Position LT1 (1 of 2) – unattended.

Figure A2- Measurement Position L1 (2 of 2) – unattended.

Figure A3- attended measurement position ST1.

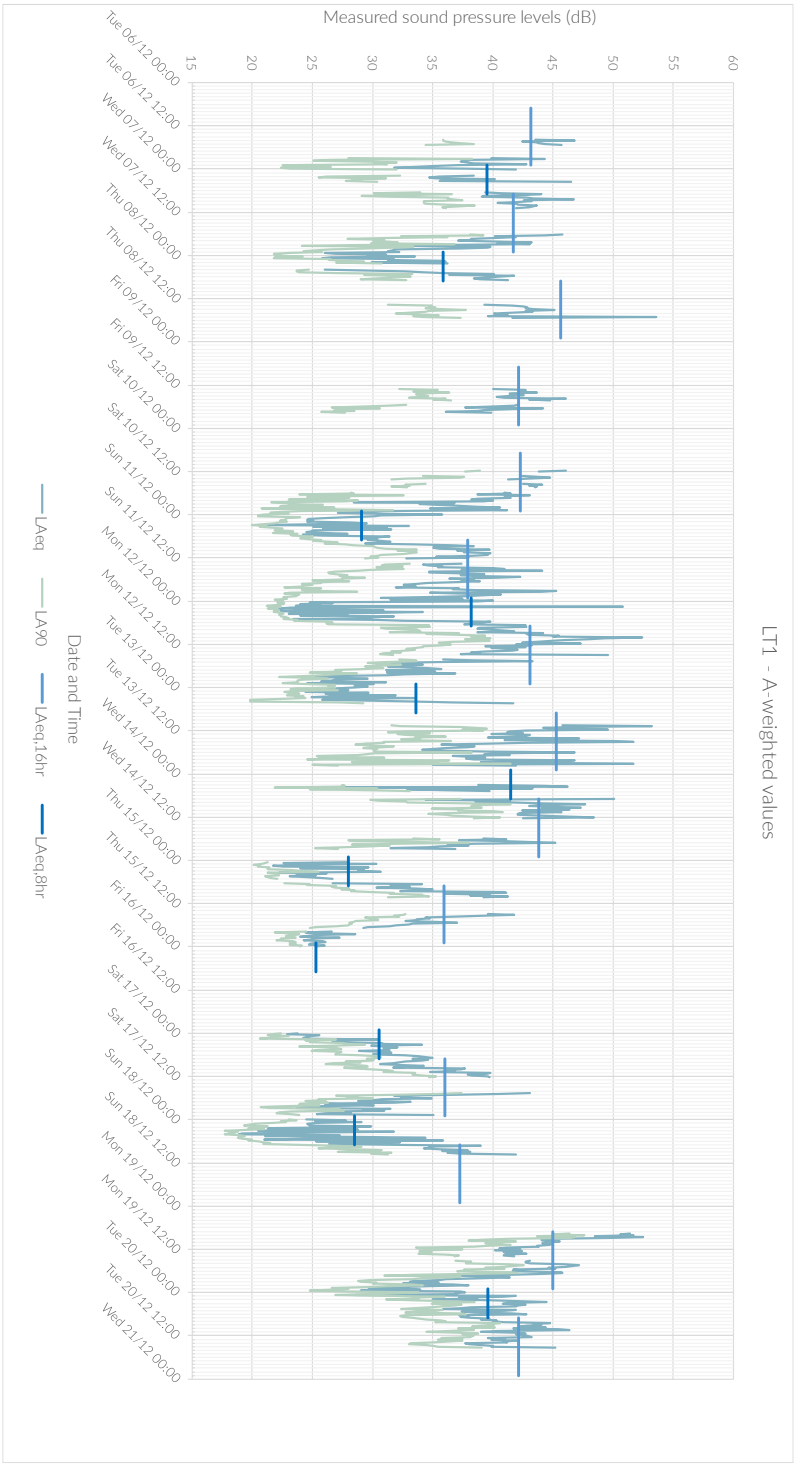
Figure A4- attended measurement position ST2.

Figure A5- attended measurement position ST3.

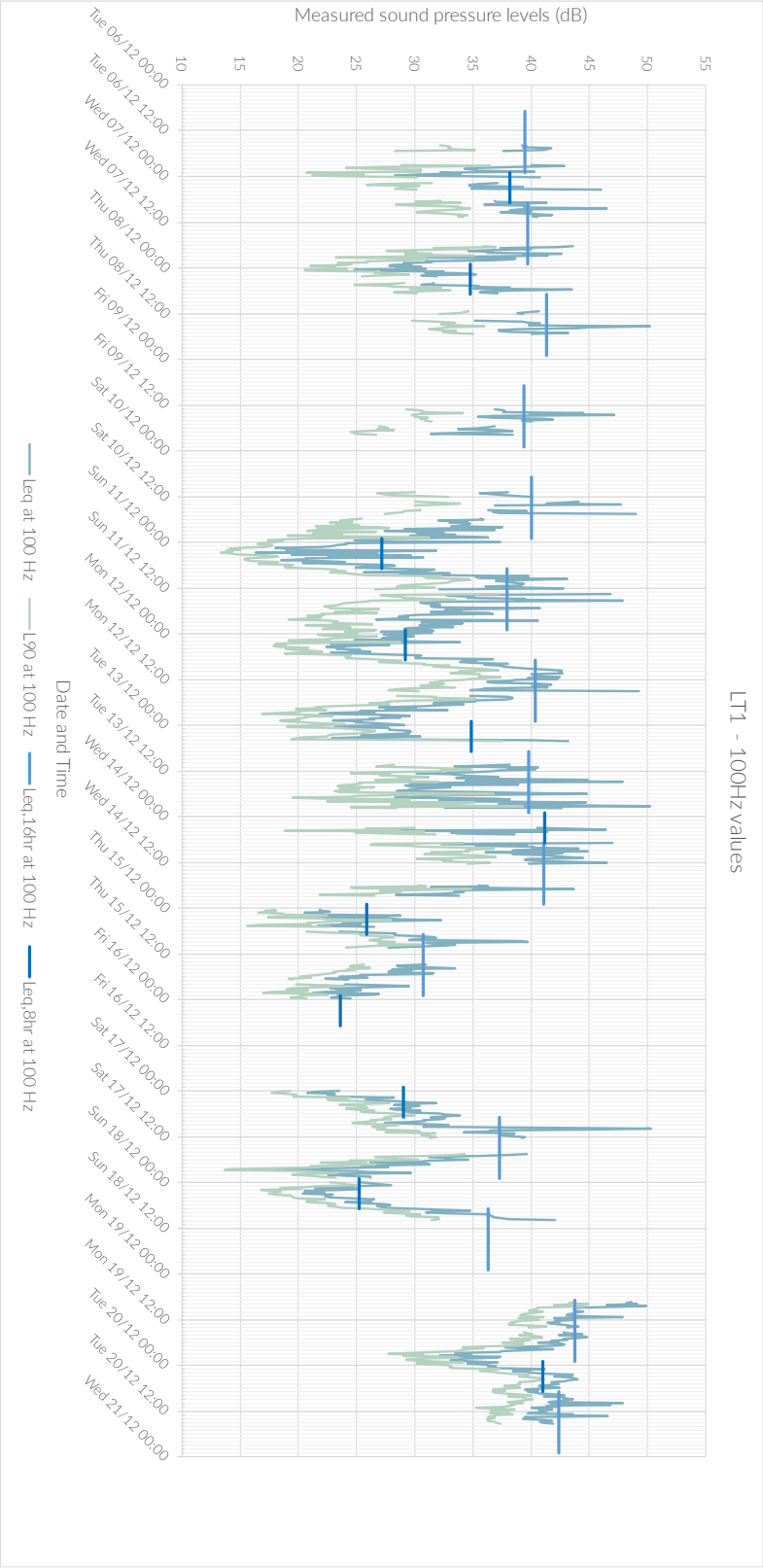
Figure A6- attended measurement position ST5.

Appendix B: Time history chart.

B.1 Unattended measurement position LT1 – A-weighted values.



B.2 Unattended measurement position LT1 – 100Hz values.



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