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ACOUSTIC CONSULTANTS

NOISE IMPACT ASSESSMENT REPORT

STANDBY GAS GENERATION PLANT, PROTOS SITE, ASH ROAD, ELTON

REPORT REFERENCE NO. J004545-5109-ECE-03

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This report has been prepared based upon a scope of works and associated resources agreed between the client and Philip Dunbavin Acoustics Ltd (PDA). This report has been prepared with all reasonable skill, care and diligence and has been based upon the interpretation of data collected. This has been accepted in good faith as being accurate and valid at the time of the collection. This report has been based solely on the specific design assumptions and criteria stated herein.

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1.0 SUMMARY

At the request of Forsa Energy Gas Holdings Ltd a noise impact assessment has been undertaken for the proposed new Standby Gas Generator Plant at Protos, Ash Road, Chester.

The Assessment has been undertaken following the guidance contained within BS4142:2014 – 'Methods for rating and assessing industrial and commercial sound'.

The proposed development will comprise of 11 x 4.5MW standby gas generation plant and associated ancillary equipment. Based upon the noise emissions from the proposed plant we have undertaken noise modelling to assess the noise emissions at the nearest residential properties.

This predicted level has subsequently been compared with noise measurements undertaken at the site to assess the impact on the proposed scheme. Our assessment has indicated that the proposed plant will be 1 dB below the existing background sound level during the night-time period.

It is noted that the recommendations within BS4142:2014 indicate the following:

"A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

Where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on the context."

In accordance with the requirements of The National Planning Policy Framework (NPPF) and the Noise Policy Statement for England (NPSE) indicates that planning policies should 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. In addition the NPSE indicates that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development. However the NPSE indicates that this does not mean that such adverse effects cannot occur.

Based upon the estimated noise emissions provided within this report we would consider that the noise emissions from the new plant would not result in an adverse impact on the surrounding residential receivers.

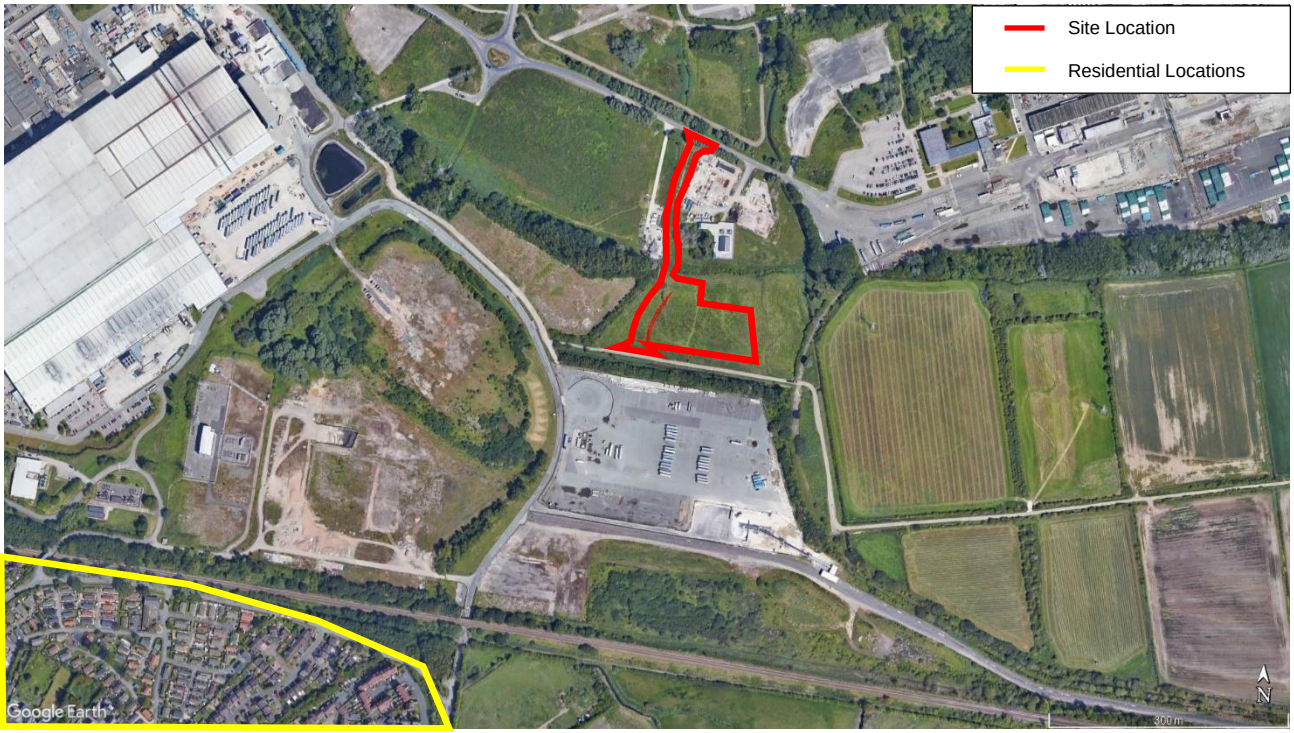
2.0 INTRODUCTION

The proposed development is for the construction of 11 x 4.5MW standby gas generators, located in Protos Site, Ash Road, Elton.

The local area around the proposed site is of existing industrial use and open fields. The nearest residential receptors to the site are approximately 430m to the southeast of the site. The nearest residential properties to the site are those on Mimosa Close.

The proposed site layout showing the location of the site and surrounding local area including the closest residential receivers are shown in Figure 1 below.

Figure 1. Proposed Site Location with Nearest Residential Receiver



3.0 NOISE ASSESSMENT CRITERIA

3.1 National Planning Policy Framework (NPPF)

National Planning Policy is guided by the National Planning Policy Framework (NPPF) updated in July 2021. With regard to Noise the Framework states the following;

Planning policies and decisions should contribute to and enhance the natural and local environment by:

- *preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability.*

  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:

- *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;*

- *identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.*

The terms '*significant adverse impact*' and '*adverse impact*' are defined in the explanatory notes of the 'Noise Policy Statement for England (NPSE) which states;

There are two established concepts from toxicology that are currently being applied to noise impacts, for example, by the World Health Organisation. They are:

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.

Extending these concepts for the purpose of this NPSE leads to the concept of a significant observed adverse effect level.

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur.

The notes also offer an explanation of the term 'other adverse impacts' as follows;

… refers to the situation where the impact lies somewhere between LOAEL and SOAEL. It requires that all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also taking into account the guiding principles of sustainable development (paragraph 1.8). This does not mean that such adverse effects cannot occur.

It should be noted that no specific noise limits for LOAEL and SOAEL have yet been specifically defined; however guidance from other acoustic standards may be employed to determine suitable levels within the overall principal of the National Planning Policy Framework.

3.2 Planning Practice Guidance – Noise

The UK Planning Practice Guidance on noise offers further guidance on the typical levels which constitute the NOEL, LOAEL and SOAEL and is reproduced in the table below;

Table 1. Planning Practice Noise Level Guidance

Perception	***Examples of Outcomes***	***Increasing Effect Level***	***Action***
Not present	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 perceived 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 BS4142:2014

The effect of plant noise emissions on the nearest noise sensitive residences can be assessed in accordance with BS4142:2014+A1:2019 – '*Methods for rating and assessing industrial and commercial sound*'.

The standard describes a method of determining the level of a noise of commercial or industrial nature, together with procedures for assessing the impact of such a noise outside nearby noise sensitive areas.

The standard provides a procedure for comparing the noise from commercial sources with background noise levels in the absence of the commercial noise and determining the likely impact of the noise on noise sensitive areas.

In accordance with BS 4142 the background noise level is the typical A-weighted sound pressure level at the assessment position that is exceeded for 90% of a given time interval (L_{A90}). The specific noise level is the equivalent continuous (L_{Aeq}) sound pressure level at the assessment position produced by the noise source over a given time interval.

Certain acoustic features can increase the impact over that expected from a simple comparison between the specific noise level and the background level. Where such features are present, these are considered by adding corrections to the specific noise level.

The corrections are applied based on whether the following features occur, or are expected to be present. The correction values can either be determined subjectively, or by various objective measurement procedures.

- The noise contains a distinguishable, discrete, continuous tone (whine, hiss, screech, hum, etc.). 0 – 6 dB penalty
- The noise contains distinct impulses (bangs, clicks, clatters, or thumps).
- 0 – 9 dB penalty.
- The noise is irregular enough to attract attention. 0 – 3 dB penalty.
- Other features. 0 – 3 dB penalty.

From the addition of the above penalties where appropriate the rating level is established, this being the value that is compared with the background noise.

According to BS 4142 an initial estimate of the impact is given for a rating level of:

- 10 dB(A) or more above the background is an indication of significant adverse impact, depending on the context.
- 5 dB(A) above the background is an indication of an adverse impact, depending on the context.
- where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on the context.

The above initial assessment may then be modified depending on the context to take into account. Typical considerations when assessing context is as follows:

- The absolute level of the sound.
- The character and level of the residual sound compared to the character and level of the specific sound.
- The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:
    1. Façade insulation treatment
    2. Ventilation and / or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and
    3. Acoustic screening

3.4 WHO Guidelines for Community Noise

In 1999, the WHO (World Health Organisation) published Guidelines for Community Noise, stating the following internal noise levels are applicable to dwellings.

Table 2. WHO Guidelines for Community Noise criteria

Specific Environment	Critical Health Effect(s)	L_{Aeq} dB	Time Base (hours)*
Outdoor living area	Serious annoyance, daytime and evening	55	16
	Moderate annoyance, daytime and evening	50	16
Outside Bedrooms	Sleep disturbance, window open (outdoor values) night time	45	8

* Typically taken to be daytime/evening - 07:00 – 23:00 hours, and night time 23:00 – 07:00 hours.

WHO guidelines state, 'To protect the majority of people from being seriously annoyed during the daytime, the outdoor sound level from steady, continuous noise should not exceed 55 dB L_{Aeq} on balconies, terraces and in outdoor living areas. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound level should not exceed 50 dB L_{Aeq}.'

4.0 BACKGROUND SOUND SURVEY DETAILS

4.1 Survey Times and Dates

The ambient noise measurements were made between 14:45 on the 31st July 2023 and 14:00 on the 1st August 2023.

4.2 Equipment Used

Throughout the survey measurements were undertaken with a NTi XL2 sound level meter. The meter is a precision grade Class 1 accurate sound level meter (as per BS EN 61672-1: 2002). The meter was set to A-Weighted and fast response and measured continuously with 15-minute and 1-second time periods. The meter was calibrated directly before any measurement took place and immediately afterwards and no significant drift was observed. Calibration certificates are included within Appendix C attached to this report.

The equipment used is detailed as follows:

Table 3. Equipment List

Equipment Type	Make	Model	Serial Number	Calibration Certificate Reference	Calibration Date
Sound Level Meter	NTi	XL2	A2A-04169-D2	05641/2	04/03/2022
Calibrator	Rion	NC74	34615257	06105/2	01/02/2023

The meter was located within an environmental case that included and all weather wind shield to protect the microphone from rain and high winds.

4.3 Weather

31st July – 1st August 2023

Temperature: 13 - 21°C
Wind Speed: 0 – 3 m/s
Wind Direction: At the start of the survey wind direction was variable due to low wind speeds until 23:00 where wind speeds were consistently Westerly.
Cloud Cover: Overcast
Precipitation: Some rain between 2:45 – 3:30pm and between 6:15 – 7:00pm on the 31st August 2023. No further rain was noted during the remainder of the survey.

Wind speed and wind direction data has been based upon a logging anemometer located at the site. The logging results are detailed within Appendix B attached to this report.

4.4 Measurement Positions & Procedure

Measurements were undertaken at one position on the site. The microphone was mounted 1.5m above ground and at least 3.5m from any reflecting surface. A range of statistical noise indicators was measured, including L_{Aeq} and L_{A90}. Measurements were setup to log every 15 -minutes.

Definitions of the above terms are listed below:

L_{Aeq}: The equivalent A-weighted noise level containing the same energy within the measured time period.

L_{A90}: This is a statistical parameter that is equivalent to the noise level that is exceeded 90% of the measurement period.

The measurement location is highlighted within the following figure:

Figure 2. Measurement Location

5.0 MEASURED RESULTS

A summary of the noise level measurements is given below. The levels presented in the tables have been rounded to the nearest decibel. The L_{Aeq} levels are the logarithmic average of the measured noise levels. The L_{A90} levels have been shown as a minimum to maximum range. Please note that the periods where rainfall were identified have been removed from the assessment.

Table 4. Measurement Position Baseline Noise Levels

Period	$L_{Aeq,T}$ (dB)	Range of $L_{A90,15mins}$ (dB)
Day (0700 – 2300)	58	43 – 48
Night (2300 – 0700)	49	41 – 47

5.1 Derivation of Background Sound

In accordance with the requirements of BS4142 the determination of background is not simply to ascertain a lowest measured background sound level, but rather to quantify what is typical during relevant time periods. Within BS4142 is states the following:

"8.1.4 The monitoring duration should reflect the range of background sound levels for the period being assessed. In practice, 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.

NOTE 1 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."

Figures 3 – 4 below show the statistical analyses of the results within the separate measurements periods:

Figure 3: Statistical Analysis During the Day

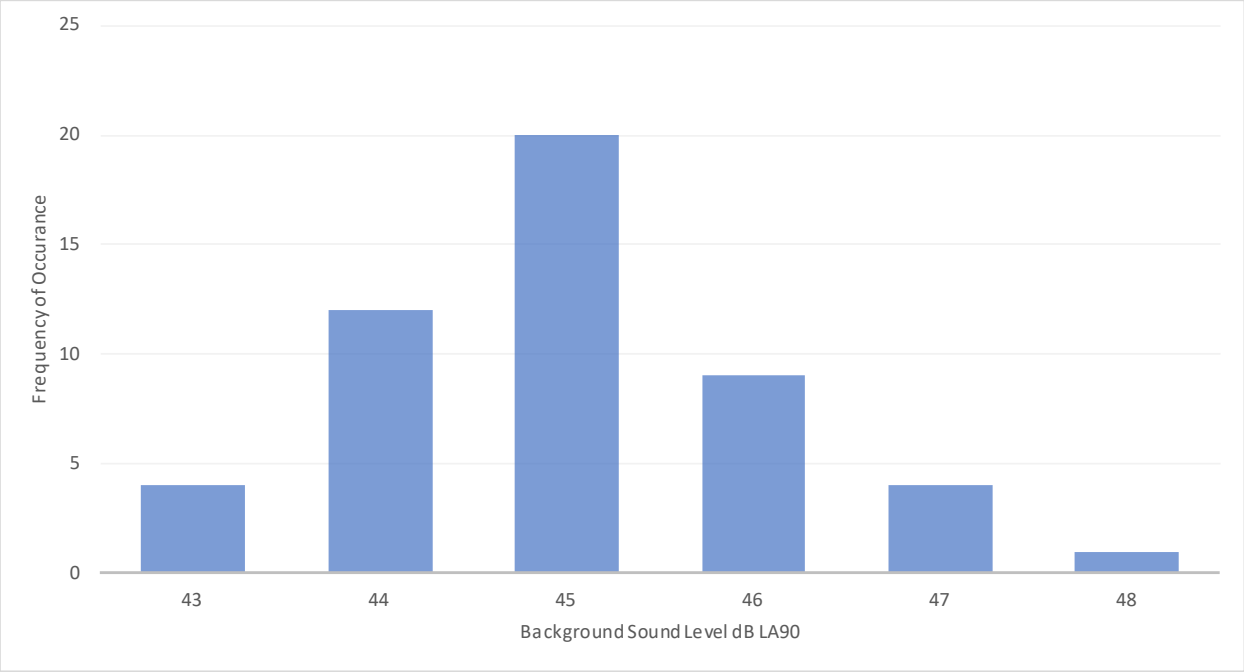
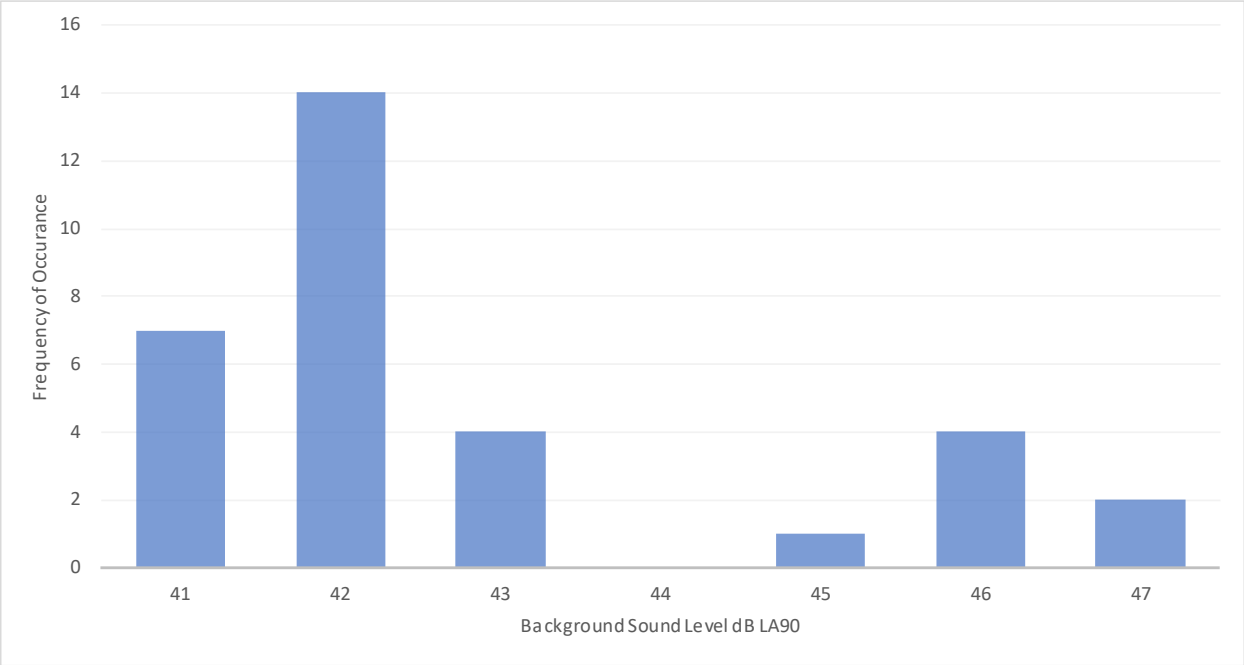


Figure 4: Statistical Analysis During the Night



Based upon the above figures I would consider that the representative background sound would be 45dB(A) during the day and 42dB(A) during the night.

5.2 Description of Background Sound

It was observed that the consisted of distant traffic, distant industrial noise and vehicle traffic on the surrounding road network.

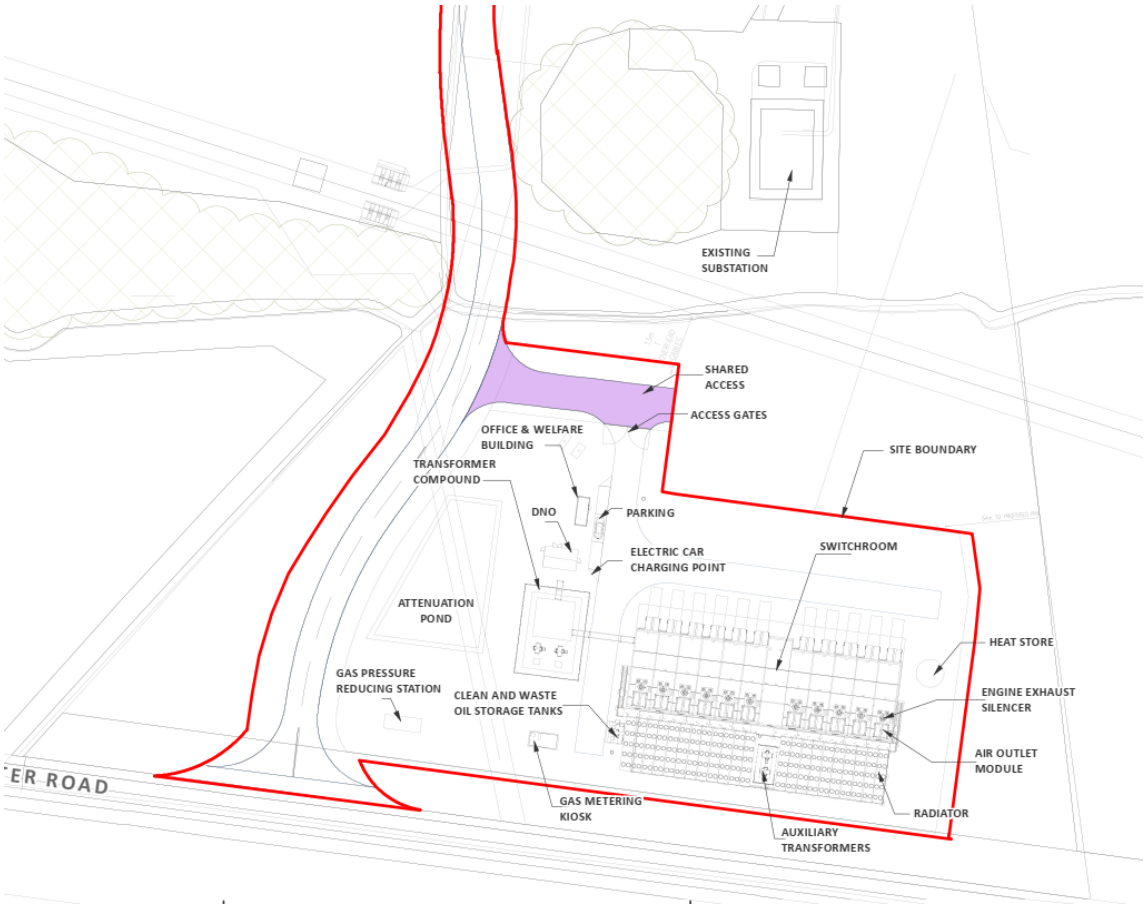
6.0 SPECIFIC NOISE LEVEL CALCULATION

The proposed scheme will consist of 11 x 4.5MW standby gas generation plant and associated ancillary equipment.

6.1 Proposed Site Plan

The proposed site plan is detailed within the following drawing:

Figure 5. Proposed Site Plan



6.2 Source Sound Power Levels

We have been provided with the following sound power levels for the proposed plant equipment:

Table 5. Sound Power Noise level spectra of above for input into noise model

Element	Qty.	Sound Power Level dB, Octave Band Centre Frequency Hz								Broadband dBA
		63	125	250	500	1k	2k	4k	8k	
Enclosed Engine	11	95	90	81	74	65	57	51	51	**78**
Air intake	11	101	99	90	87	84	80	80	85	**91**
Air outlet	11	102	102	93	84	81	78	79	85	**91**
Exhaust outlet	11	108	96	86	84	81	77	80	77	**89**
Radiator	22	-	86	87	86	88	86	82	73	**92**
Gas Skid	1	81	76	70	77	69	66	74	80	**82**
Transformer	1	82	87	86	86	80	75	70	63	**86**

6.3 Noise Propagation Calculations

Utilising the source sound power levels and the sound insulation properties described above we have utilised Soundplan Essential v2 noise modelling software.

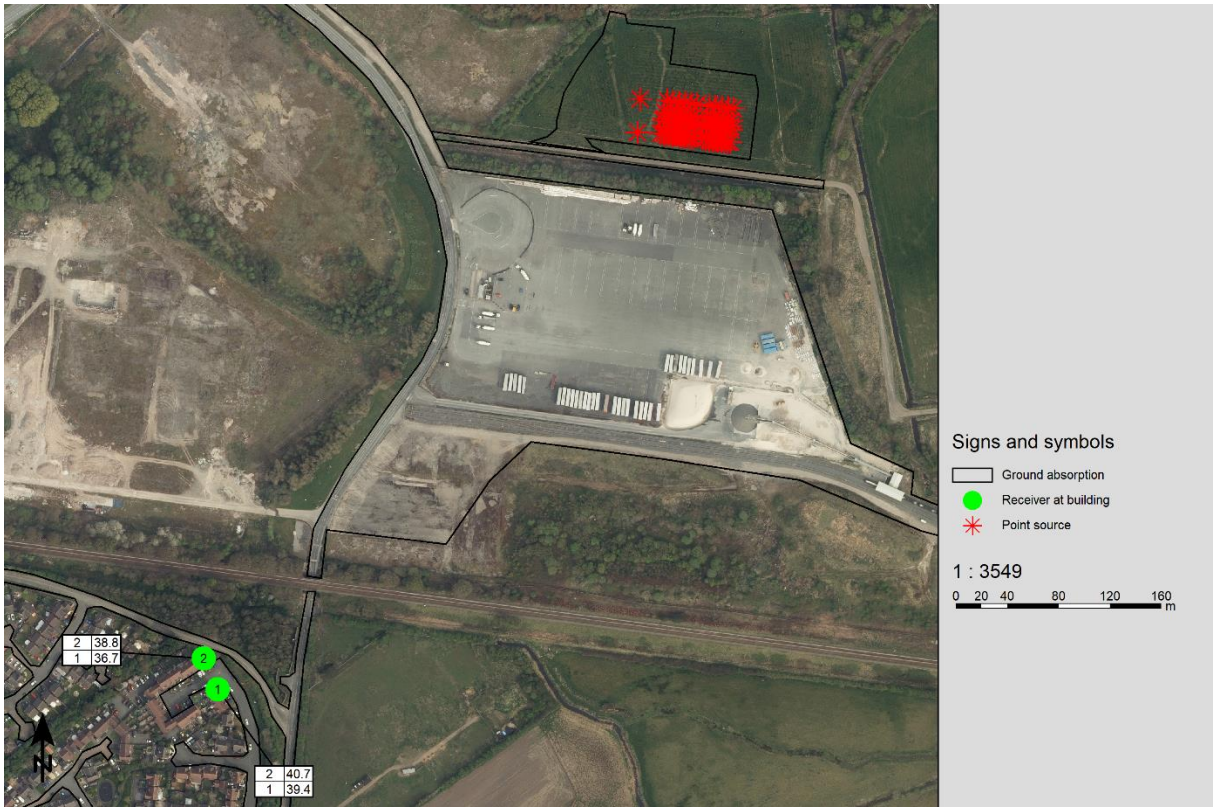
The software uses the method of ISO 9613 ‘Acoustics – attenuation of sound during propagation outdoors – general method of calculation’ and takes into account geometric spreading, ground effects,

air attenuation, barrier attenuation and reflections. The ground conditions between source and receiver are mixed between soft ground associated with fields and hard ground associated with the industrial areas. A ground absorption coefficient of 0 has been used representative of hard ground associated with the Proposed Development, other industrial areas. A ground absorption coefficient of 1 has been used to represent areas of vegetation and fields.

The gas powered engines are modelled as point sources with the exhausts at a height of 15m, the enclosed engines at a height of 3m, the air intake at a height of 3m, the air outlet at a height of 6m, the radiator at a height of 6m, the transformer at a height of 2m and the Gas skid at a height of 2m. The sound power levels and frequency spectra are as detailed in Section 5.2. It is assumed that all units will be operating continuously and simultaneously.

The Soundplan model would suggest the following noise levels calculated at the closest noise sensitive receivers. Noise levels are calculated at 1.5m for the ground floor level and an additional 2.8m for the floors above.

Figure 6. Calculated Specific Noise Levels



Note: The tables presented within the figure relate to the ground floor and the first floor at each residential location.

7.0 NOISE IMPACT ASSESSMENT

7.1 Initial BS4142 Assessment

Based upon the modelling results described within Figure 6 and the Background Sound Level derived within Section 5 we have undertaken assessment of the noise impact of the Proposed Development. Please note as a worst case scenario this has been based upon the night-time derived background sound.

Table 6. Comparison of the Proposed Development with background sound levels during the night

Location	Predicted Specific Sound Level $L_{Aeq,T}$ (dB)	Rating Level L_{Ar} (dB)[1]	Representative Background $L_{A90(15\text{-}min)}$ (dB)	Difference between Rating Level and Background (dB)
Residential Receptors on Mimosa Close	41	41	42	-1

Notes:

1 Based upon third octave band data for the proposed engine model there is no indication that the proposed plant will emit prominent discrete tones. In addition, the specific noise level is below the background sound level and would likely be below the existing ambient sound climate. We would therefore consider that it is likely that the perceptibility of any potential tonal element will be further reduced due to masking noise provided by the existing noise climate. It is considered that the specific sound will not be characterised as impulsive and will not have any intermittency that will be readily distinctive against the residual acoustic environment. We would therefore consider that it would not be appropriate to apply penalties for potential acoustic features

It is noted that BS4142 indicates the following:

10 dB(A) or more above the background is an indication of significant adverse impact, depending on the context.

5 dB(A) above the background is an indication of an adverse impact, depending on the context.

Where the rating level does not exceed the background level, this is an indication of the specific sound source having a low impact, depending on the context.

As the assessment has indicated that the Rating Level is 1dB below the representative Background Sound Level in the worst case night-time period, in accordance with BS4142:2014 an initial assessment estimate impact would indicate that the specific sound will be below a level that is considered to be an adverse impact.

It should be noted however that that in accordance with BS4142:2014 this initial impact will need to be modified to account for context of the site.

7.2 Context

The BS4142 initial estimate is described above however BS4142 indicates that this initial estimate of impact needs to be modified for context. With reference to the context BS4142 indicates that the significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. BS4142 indicates that pertinent factors that could modify context would include: the absolute level of sound; the character and level of the residual sound compared to the character and level of the specific sound; the sensitivity of the receptor and whether dwellings or other premises used for residential purpose already incorporate design measurements that secure good internal and/or outdoor acoustic conditions.

It is noted that the location of the proposed site is on an area of industrial use with a number of industrial activities within the surrounding area. We would therefore consider that the character of the specific sound would be similar to the existing noise climate.

However it is noted that the Proposed Development are for standby generators that will only operate during peak periods of electricity demand which would correspond to daytime hours only. Should the generators be required to operate, the predominant usage will be during the winter months and peak times of use during the afternoon/evening between 1600 and 1800.

Whilst the Proposed Development can operate at any time of the day or night the likelihood of the facility being required to start up at night-time is extremely low as peak demand does not occur overnight.

We would therefore consider due to the standby nature of the generation on the site and the unlikely occurrence of the Proposed Development operating at night would reduce the impact.

7.3 Discussion

It is noted that the NPPF requires that significant adverse impacts due to a new development should be avoided and other adverse impact should be mitigated and reduced to a minimum. Based upon the above assessment it is concluded that the sound levels arising from the operations of the Proposed Development will not result in an adverse impact and will therefore comply with the requirements of the NPPF.

8.0 UNCERTAINTY

BS4142 indicates that an assessment of noise impact should consider uncertainty within the assessment. This uncertainty can arise from: uncertainty in measurements; uncertainty in sound emission and sound power level; and uncertainty in calculation method.

8.1 Uncertainty in Measurements

It is noted that the instrumentation used for the assessment, it conforms to Class 1 accuracy in accordance with IEC 61672. In addition, the instrumentation has been calibrated to national standards and was field calibrated at the time of the measurements.

We would therefore consider that the effect of uncertainty on the measurement of background sound would be minimal.

8.2 Uncertainty in Sound Power Levels

We have been provided with sound power levels for the proposed plant items. It will need to be ensured that the noise emissions match the levels quoted within Section 6.2.

8.3 Uncertainty in Calculation Method

It is noted that the calculations have been undertaken utilising the standard ISO 9613 and have been undertaken utilising commercial prediction software. In addition where there is uncertainty in the assessment, we have undertaken these on a conservative basis. We would therefore consider that this would minimise uncertainty in the assessment.

9.0 CONCLUSION

At the request of Forsa Energy Gas Holdings Ltd a noise impact assessment has been undertaken for the proposed new Gas Generator Plant at Protos Site, Ash Road, Elton.

An assessment of the noise emissions from the proposed units has been undertaken and compared with the guidelines contained within BS4142:2014 *"Methods for rating and assessing industrial and commercial sound"*.

The assessment indicates that the development will not result in an adverse impact at the nearest noise sensitive receivers in accordance with the recommendation described within BS4142:2014. This is therefore an indication that the proposed scheme is compliant with the requirements within the National Planning Policy Framework.

APPENDIX A – DEFINITION OF ACOUSTIC TERMS

The decibel

This is the basic unit of noise, denoted dB.

A Weighting

This is a weighting process which simulates the human ear's different sensitivity at different frequencies. A weighting can be shown two typical ways, 50 dB(A) L_{eq} or 50 dB $L_{Aeq.}$ Both mean the same thing. (See below for a definition of L_{eq}). The dB(A) level can be regarded as the overall level perceived by human beings.

L_{eq} and $L_{eq(s)}$

This is the equivalent continuous noise level which contains the same acoustic energy as the actual time-varying sound. In other words it is a kind of average noise level. It is denoted dB L_{eq} or, for A-weighted figures dB(A) L_{eq} or dB L_{Aeq}. It can also be expressed in terms of frequency analysis (see later). $L_{eq(s)}$ is the sample L_{eq} level.

L_n

This is the level exceeded for n% of the time. It is denoted dB L_n or, for A-weighted figures dB(A) L_n or dB $L_{An.}$ It can be expressed in terms of frequency analysis (see later). L_{90} is the level exceeded for 90% of the time and is a measure of the lowest level typically reached. L_{10} is the level exceeded for 10% of the time and is the highest level typically reached. L_{50} is the level exceeded for 50% of the time and, mathematically, it is the median.

L_{max}

This is the maximum level reached during a measurement period. The "time constant", or the ability of the equipment to respond to impulses is usually expressed along with it, e.g. "Fast", "Slow", etc. It is denoted dB L_{max} or, for A-weighted figures dB(A) $L_{max,}$ dB $L_{Amax,}$ etc. It can also be expressed in terms of frequency analysis.

Frequency Analysis

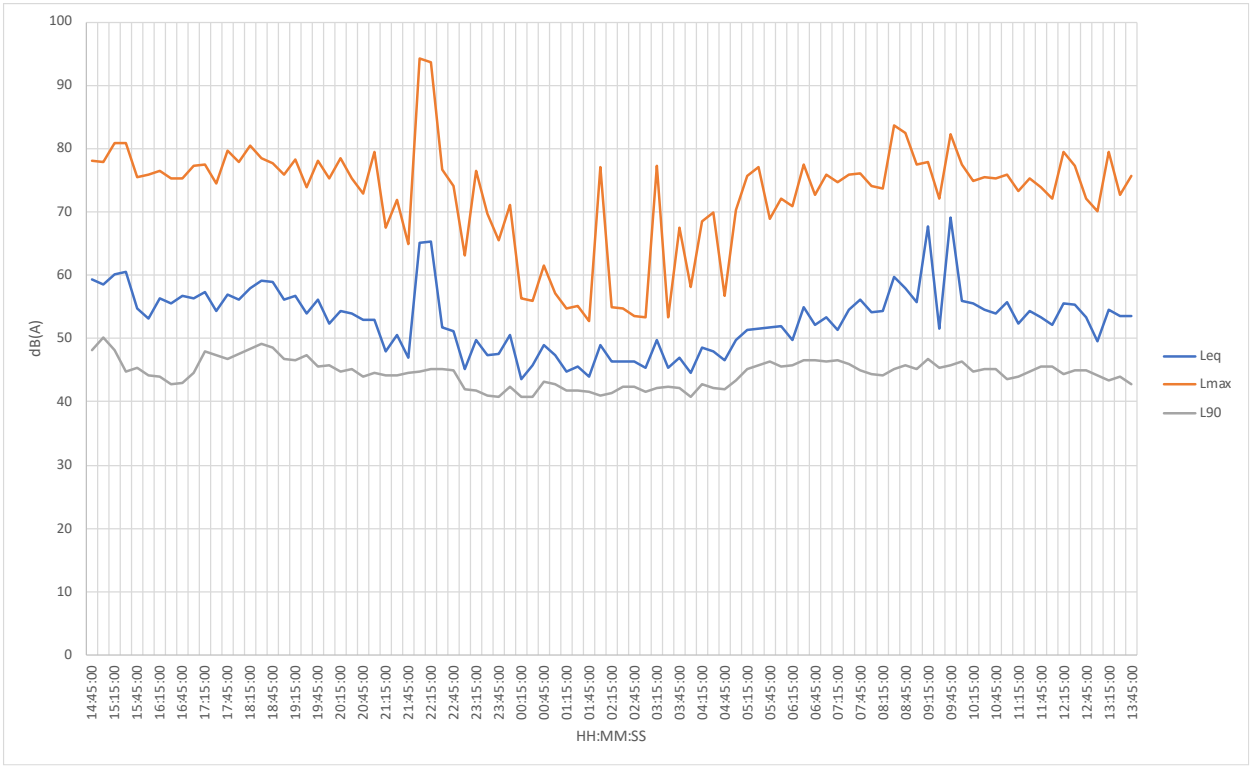
Whereas dB(A) gives a very useful overall figure, it has its limitations in that it cannot be used to model or predict the effect of noise control and mitigation as this nearly always has radically different performance at different frequencies.

Frequency analysis expresses an overall noise level at each frequency or band of frequencies in the audible range. Octave band analysis divides the audible range into 10 bands from 31.5 Hz to 16 kHz and the noise level in each band can be expressed in any form e.g. L_{eq}, L_{90}, L_{max} etc. One third octave band analysis uses 30 bands.

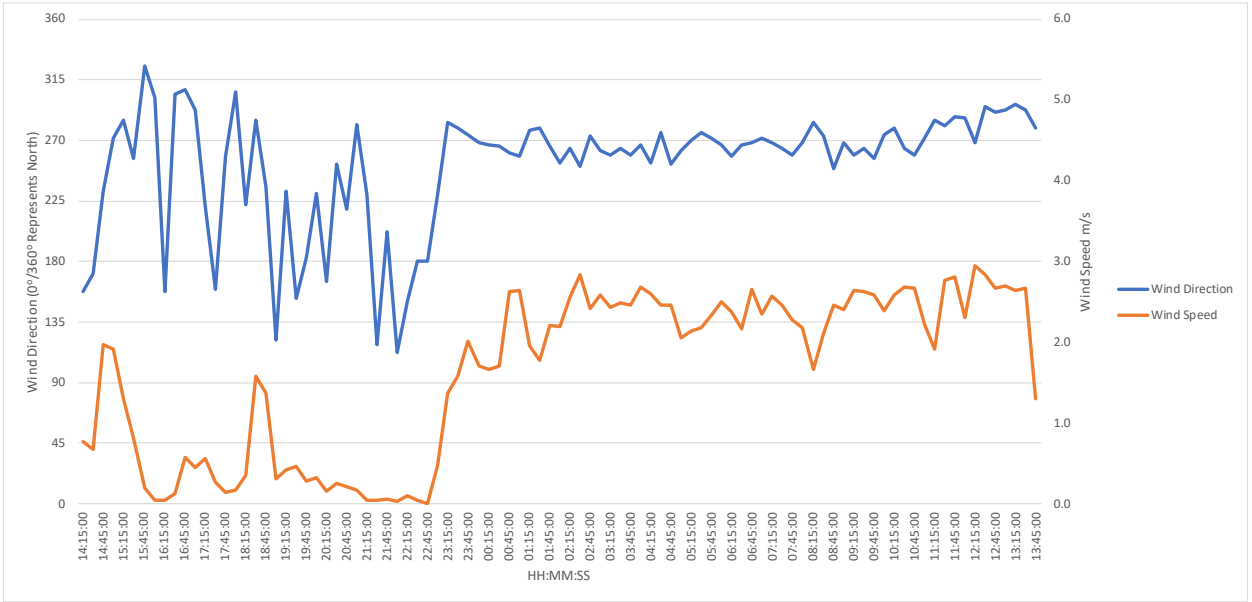
Narrow band analysis takes the process to resolutions of less than 1 Hz. This is useful for identifying the existence of tones (whines, hums, etc.) and in pin-pointing the sources.

APPENDIX B – SUMMARY OF MEASUREMENT RESULTS

Sound Level Measurements:



Wind Speed and Direction Measurements:



APPENDIX C – CALIBRATION CERTIFICATION

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

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APPROVED SIGNATORIES

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UKAS CALIBRATION 0801

University of Salford MANCHESTER

Certificate Number: 05641/2 Date of Issue: 7 March 2022

PERIODIC TEST OF A SOUND LEVEL METER to IEC 61672-3:2006

FOR:	PDA Ltd 3 Bridgewater Court Barsbank Lane Lymm Cheshire, WA13 0GH
FOR THE ATTENTION OF:	Edmund Evenden
DATE RECEIVED:	26 January 2022
PERIODIC TEST DATE:	4th and 7th March 2022
LOCATION OF CALIBRATION:	Acoustic Calibration Laboratory, Newton G31, University of Salford
TEST PROCEDURE:	CTP12 (Laboratory Manual)

Sound Level Meter Details-

Manufacturer	NTI Audio
Model	XL2
Serial number	A2A-04169-D2
Class	1
Firmware version	V4.33

Associated Items:-

Type	Manufacturer	Model	Serial Number
Microphone	ACO	7052	48913
Preamplifier	NTI Audio	MA220	6946

Test Engineer (initial):	GP	Name:	Gary Phillips

Results in this certificate relate only to instruments tested.

Certificate of Calibration

Issued by University of Salford (Acoustics Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

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The manufacturer's instruction manual was marked as follows: XL2-TA Firmware V2.71 Version 2.71.01/3. April 2014.

Adjustment data used to adjust the sound levels indicated in response to the application of a electrostatic actuator, to sound levels equivalent to those that would be indicated in response to plane, progressive sound waves were obtained from the manufacturer.

The sound level meter calibration check frequency is 1000 Hz; the reference sound pressure level is 114 dB; the nominal reference level range is the 120 dB range, but due to the sensitivity of the supplied microphone, the refence level range was actually the 130 dB range on the instrument.

The environmental conditions in the laboratory at the start of the test were:
Static pressure 101.570 kPa ± 0.013 kPa; air temperature 23.6 °C ± 0.4 °C; relative humidity 42.2 % ± 2.1 %.

The initial response of the instrument to application of the suitable laboratory sound calibrator was 114.1 dB (Z). The instrument was then adjusted to indicate 114.0 dB (Z). This indication was obtained from the calibration certificate of the calibrator and information in the manufacturer's instruction manual specified in this certificate, when the pre-amplifier is connected to the instrument via the supplied 5 metre ASD cable. The instrument was calibrated without a windshield. Consult manufacturer's instructions if using a windshield.

With the microphone installed, the level of self-generated noise on the most-sensitive level range was:

A: 19.7 dB*↑ (110 dB range on the instrument)

* Under-range indicated on instrument display. ↑ Indicates that the measured level exceeds the highest anticipated level of self-generated noise stated in the manufacturer's instruction manual.

With the microphone replaced by an electrical input device with a similar capacitance to that of the electrical input device specified in the manufacturer's instruction manual, the levels of self-generated noise on the most-sensitive level range were:

A: 15.4 dB* (110 dB range on the instrument)
C: 19.5 dB* (110 dB range on the instrument)
Z: 24.7 dB* (110 dB range on the instrument)

* Under-range indicated on instrument display.

The environmental conditions in the laboratory at the end of the test were:
Static pressure 102.227 kPa ± 0.013 kPa; air temperature 22.6 °C ± 0.4 °C; relative humidity 38.2 % ± 2.1 %.

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The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2006, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2003, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002, the sound level meter submitted for testing conforms to the class 1 requirements of IEC 61672-1:2002.

The microphone corrections applied as specified in 12.6 of IEC 61672-3:2006 were obtained from a frequency response measured by this Laboratory using the electrostatic actuator method. This response in isolation is not covered by our UKAS accreditation.

Instruments used in the verification procedure were traceable to *National Standards*. The electrostatic actuator method was employed in the acoustical tests of a frequency weighting.

The uncertainty evaluation has been carried out in accordance with UKAS requirements. All measurement results are retained at the acoustic calibration laboratory for at least four years.

-----END OF CERTIFICATE-----

Certificate of Calibration

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UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

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UKAS CALIBRATION 0801

University of Salford MANCHESTER

Certificate Number: 06105/2 Date of Issue: 14 February 2023

CALIBRATION OF A SOUND CALIBRATOR

FOR:	PDA Ltd 3 Bridgewater Court Barsbank Lane Lymm Cheshire WA13 0ER
FOR THE ATTENTION OF:	David Hible
DESCRIPTION:	Calibrator with housing for one-inch microphones and adaptor type NC-74-002 for half-inch microphones.
MANUFACTURER:	Rion
TYPE:	NC-74
SERIAL NUMBER:	34615257
DATE RECEIVED:	31 January 2023
DATE OF CALIBRATION:	1 February 2023
LOCATION OF CALIBRATION:	Acoustic Calibration Laboratory, Newton G31, University of Salford.
TEST PROCEDURE:	CTP06 (Laboratory Manual)

Test Engineer (initial):	GP	Name:	Gary Phillips

Results in this certificate relate only to instruments tested.

Certificate of Calibration

Issued by University of Salford (Acoustic Calibration Laboratory)
UKAS ACCREDITED CALIBRATION LABORATORY NO. 0801

Certificate Number: 06105/2 Date of Issue: 14 February 2023

MEASUREMENTS

The sound pressure level generated by the calibrator was measured using a calibrated, WS2P condenser microphone as specified in this certificate. The calibration was carried out with the calibrator in the half-inch configuration.

Five determinations of the sound pressure level, frequency and total distortion were made.

The manufacturer states that automatic compensation is applied for the effects of changes in atmospheric pressure.

RESULTS

Coupler configuration:	Half-inch
Microphone type:	B&K 4134
Output level (dB re 20μPa):	94.10 dB ± 0.10 dB
Frequency (Hz):	1001.66 Hz ± 0.12 Hz
Total Distortion (%):	1.28 % ± 0.22 %

Average environmental conditions at the time of measurement were:

Pressure:	101.585 kPa ± 0.014 kPa
Temperature:	22.9 °C ± 0.4 °C
Relative humidity:	41.4 % ± 2.7 %

The reported expanded uncertainty is based on a standard uncertainty multiplied by a coverage factor k=2, providing a coverage probability of approximately 95%. The uncertainty evaluation has been carried out in accordance with UKAS requirements.

All measurement results are retained at the acoustic calibration laboratory for at least four years.

-----END OF CERTIFICATE-----