



Dowlais Hydrogen Plant, Merthyr Tydfil

Noise Impact Assessment for Planning Application

11th July 2024

inacoustic | cymru

C5 Business Centre, North Road, Bridgend Industrial Estate, Bridgend, Cymru, CF31 3TP

029 2009 8830 cymru@inacoustic.co.uk

inacoustic is a trading name of Inacoustic Ltd, registered in the UK 10873933

Version	Comments	Date	Authored By	Checked By	Project Number
1	Noise Assessment	25/06/2024	Victor Valeron BEng MSc MIOA	Neil Morgan MSc MIOA	24-161
2	Client's Comments	11/07/2024	Victor Valeron BEng MSc MIOA	Neil Morgan MSc MIOA	24-161

This report has been prepared for the titled project or named part thereof and should not be used in whole or part and relied upon for any other project without the written authorisation of the author. No responsibility or liability is accepted by the author for the consequences of this document if it is used for a purpose other than that for which it was commissioned. Persons wishing to use or rely upon this report for other purposes must seek written authority to do so from the owner of this report and/or the author and agree to indemnify the author for any loss or damage resulting there from. The author accepts no responsibility or liability for this document to any other party than the person by whom it was commissioned.

The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. If additional information becomes available which may affect our comments, conclusions or recommendations, the author reserves the right to review the information, reassess any new potential concerns and modify our opinions accordingly.

CONTENTS

1.	INTRODUCTION	5
1.1.	OVERVIEW	5
1.2.	SCOPE AND OBJECTIVES	5
2.	POLICY FRAMEWORK	6
2.1.	NATIONAL POLICY	6
2.2.	ASSESSMENT CRITERIA	7
3.	SITE DESCRIPTION	8
3.1.	SITE AND SURROUNDING AREA	8
3.2.	PROPOSED DEVELOPMENT OVERVIEW	10
4.	BASELINE SOUND SURVEY	11
4.1.	OVERVIEW	11
4.2.	MEASUREMENT DETAILS	11
4.3.	SOUND INDICES	13
4.4.	SUMMARY RESULTS	13
5.	OPERATIONAL NOISE ASSESSMENT	14
5.1.	NOISE MODELLING	14
5.2.	ASSESSMENT	17
6.	CONCLUSION	22
7.	APPENDICES	23
7.1.	APPENDIX A – DEFINITION OF TERMS	24
7.2.	APPENDIX B – SOUND MEASUREMENT RESULTS	27
7.3.	APPENDIX C – STATISTICAL ANALYSIS	28

FIGURES

FIGURE 1: PROPOSED DEVELOPMENT SITE, SURROUNDING AREA AND NSRS	9
FIGURE 2: PROPOSED DEVELOPMENT INDICATIVE LAYOUT	10
FIGURE 3: MONITORING POSITION	12
FIGURE 4: SPECIFIC SOUND LEVEL MAP	16
FIGURE 5: MEASURED TIME HISTORY – MP1	27
FIGURE 6: STATISTICAL ANALYSIS OF L_{A90} BACKGROUND – DAYTIME – MP1	28
FIGURE 7: STATISTICAL ANALYSIS OF L_{A90} BACKGROUND – NIGHT-TIME – MP1	28

TABLES

TABLE 1: INVENTORY OF SOUND MEASUREMENT EQUIPMENT	11
TABLE 2: MEASUREMENT POSITION DESCRIPTION	12
TABLE 3: SOUND MEASUREMENT RESULTS	13
TABLE 4: SOUND SOURCE DATA	14
TABLE 5: PREDICTED SPECIFIC SOUND LEVEL SUMMARY	17
TABLE 6: RATING PENALTY ASSESSMENT	18
TABLE 7: MEASUREMENT UNCERTAINTY FACTORS	19
TABLE 8: CALCULATION UNCERTAINTY FACTORS	20
TABLE 9: BS4142 ASSESSMENT - DAYTIME (07:00-23:00)	21
TABLE 10: BS4142 ASSESSMENT - NIGHT-TIME (23:00-07:00)	21
TABLE 11: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT	25

1. INTRODUCTION

1.1. Overview

inacoustic has been commissioned to assess the impact of potential noise arising from a proposed hydrogen production plant on land at Penygarnddu Industrial Estate, Merthyr Tydfil, CF48 2TA.

This report details the existing background sound climate at the nearest noise-sensitive receptors, as well as the potential sound emissions associated with the Proposed Development.

The assessment considers the potential noise generation from the plant associated with the Proposed Development, with respect to existing sound levels in the area. The assessment methodology contained in British Standard 4142:2014+A1:2019 *Method for rating and assessing industrial and commercial sound* has been used.

Accordingly, the following technical noise assessment has been produced to accompany the Planning Application to Merthyr Tydfil County Borough Council and is based upon environmental noise measurements undertaken at the site and a subsequent 3-dimensional noise modelling exercise.

This noise assessment is necessarily technical in nature; therefore a glossary of terms is included in Appendix A to assist the reader.

1.2. Scope and Objectives

The scope of the noise assessment can be summarised as follows:

- A sound monitoring survey was undertaken at discrete locations representative of the closest noise-sensitive receptors to the Site;
- A 3-dimensional noise modelling exercise, in order to quantify the potential noise generation of the proposed site uses;
- An assessment of potential noise impacts with respect to the prevailing acoustic conditions at existing off-site receptors; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the Technical Advice Note (Wales) 11

2. POLICY FRAMEWORK

The development proposals for the Site are guided by the following policy directives and guidance:

2.1. National Policy

2.1.1. Planning Policy Wales

The Government's planning policies for Wales are contained in Planning Policy Wales (Edition 12, February 2024). The policy provides overarching requirements for developments to adequately control noise pollution, to provide appropriate soundscapes and to incorporate good acoustic design.

The policy is supplemented by the Noise and Soundscape Action Plan 2018-2023, which provides more detailed guidance on planning for a new development, but does not set out specific assessment methods or criteria. The guidance in this document has been used to inform a qualitative assessment of the effect the proposed development could have on the local soundscape.

2.1.2. Technical Advice Note (Wales) 11

This note provides advice on how the planning system in Wales can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business.

It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources.

2.2. Assessment Criteria

2.2.1. BS4142:2014+A1:2019

BS4142:2014+A1:2019 *Methods for Rating and Assessing Industrial and Commercial Sound* sets out a method to assess the likely effect of sound from factories, industrial premises or fixed installations and sources of an industrial nature in commercial premises, on people who might be inside or outside a dwelling or premises used for residential purposes in the vicinity.

The procedure contained in BS4142:2014+A1:2019 for assessing the effect of sound on residential receptors is to compare the measured or predicted sound level from the source in question, the $L_{Aeq,T}$ *specific sound level*, immediately outside the dwelling with the $L_{A90,T}$ background sound level.

Where the sound contains a tonality, impulsivity, intermittency and other sound characteristics, then a correction depending on the grade of the aforementioned characteristics of the sound is added to the specific sound level to obtain the $L_{Ar,Tr}$ *rating sound level*. A correction to include the consideration of a level of uncertainty in sound measurements, data and calculations can also be applied when necessary.

BS4142:2014+A1:2019 states: *"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"*. An estimation of the impact of the specific sound can be obtained by the difference of the rating sound level and the background sound level and considering the following:

- *"Typically, the greater this difference, the greater the magnitude of the impact."*
- *"A difference of around +10dB or more is likely to be an indication of a significant adverse impact, depending on the context."*
- *"A difference of around +5dB is likely to be an indication of an adverse impact, depending on the context."*
- *"The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."*

During the daytime, the assessment is typically carried out over a reference time period of 1-hour, with a reference period of 15-minutes used for the night-time assessment. The periods associated with day or night, for the purposes of the Standard, are considered to be 07.00 to 23.00 and 23.00 to 07.00, respectively.

3. SITE DESCRIPTION

3.1. Site and Surrounding Area

The Proposed Development occupies a parcel of land within the Penygarnddu Industrial Estate, Merthyr Tydfil.

The Site is surrounded by other industrial premises. To the south there is a large industrial unit manufacturing motor vehicle parts, to the east is the Merthyr Reclamation Centre, which includes a large wind turbine at the site, beyond which is the St Merryn meat processing facility and to the north and north west there are energy generation sites.

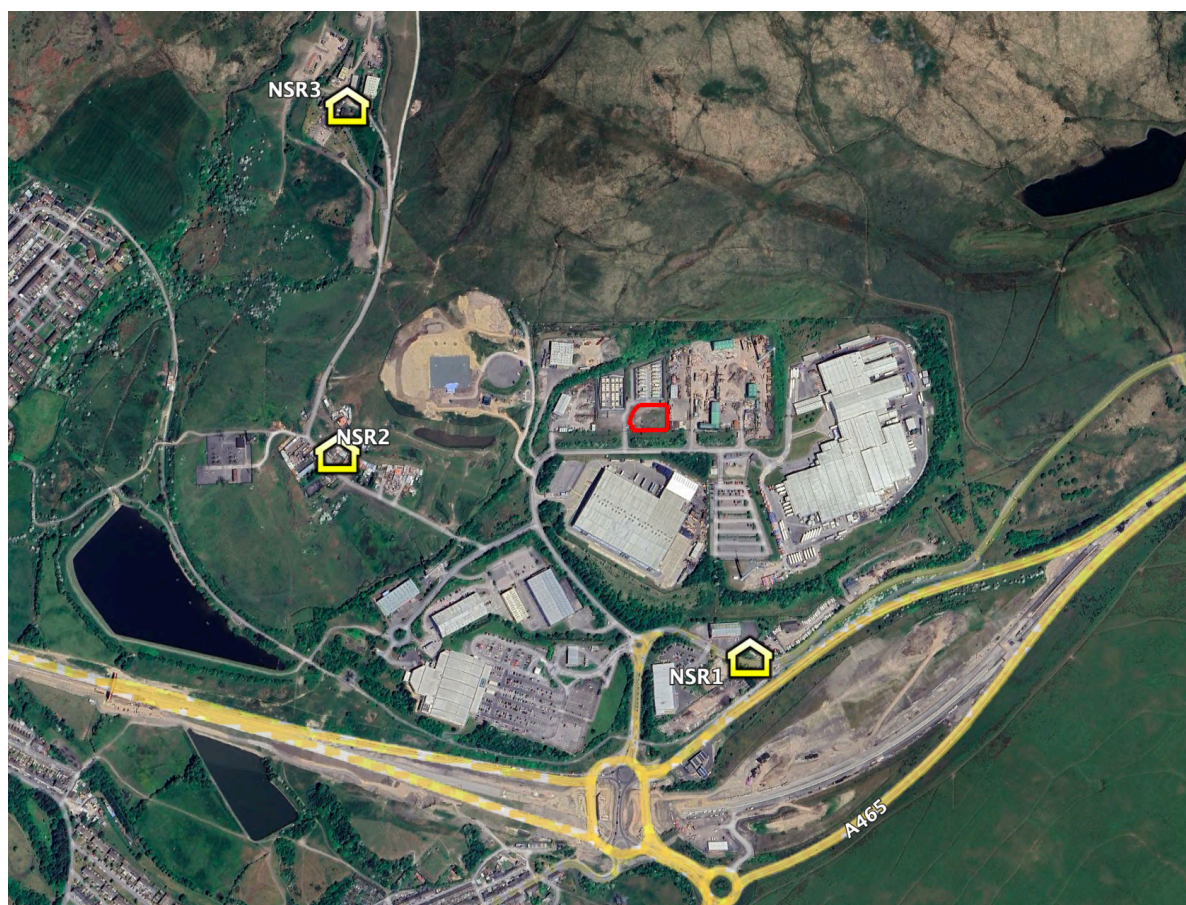
The nearest Noise-Sensitive Receptors (NSRs) to the site are deemed to be:

- NSR1: Abandoned residential building to the south of the site, next to the A465 Heads of the Valleys Road, at approximately 390m from the site boundary. Although the premises are not currently used for residential use, it is still considered in the assessment due to its potential for future noise-sensitive use.
- NSR2: Residential dwellings on an unnamed road to the west of the site, at approximately 450m from the site boundary;
- NSR3: Residential dwellings within the farm premises to the north west of the site, at approximately 640m from the site boundary; and

The ambient sound environment at the area is influenced by road traffic noise from the A465 and the A4060 to the south of the site, along with commercial sound from the industrial estate.

The Proposed Development site and the surrounding area, including the nearest NSRs can be seen in Figure 1 overleaf.

FIGURE 1: PROPOSED DEVELOPMENT SITE, SURROUNDING AREA AND NSRs

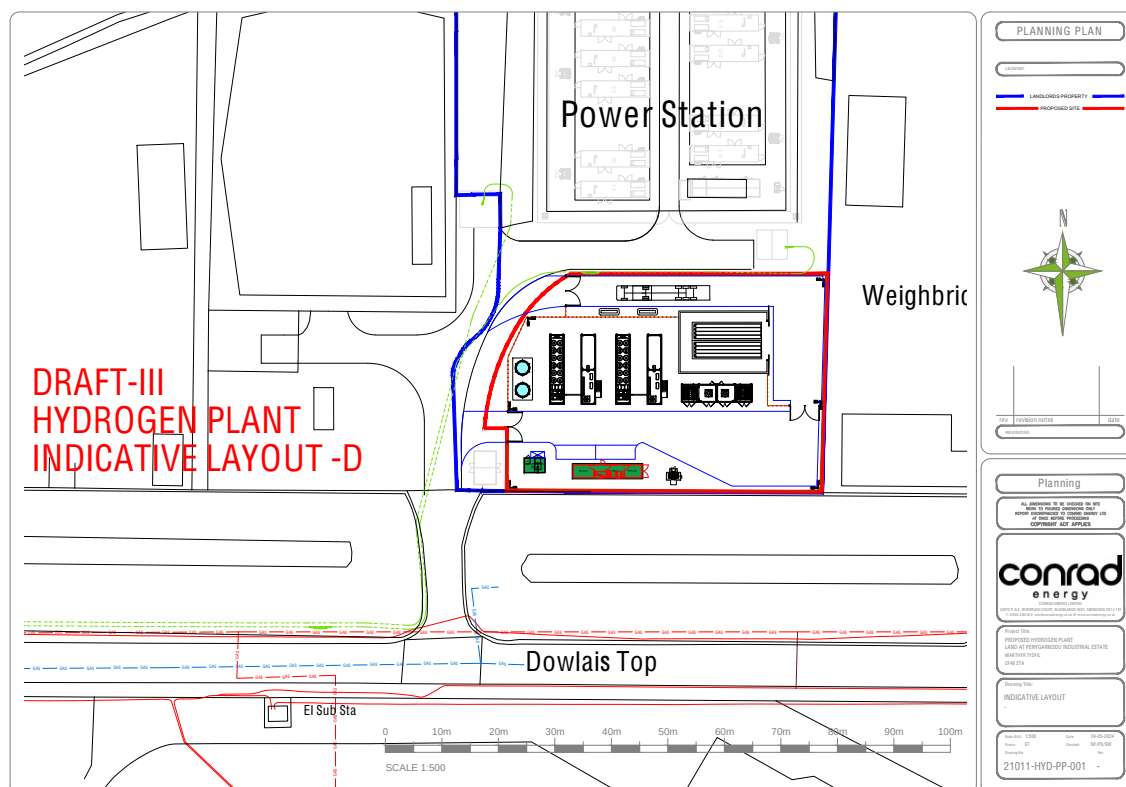


3.2. Proposed Development Overview

The development proposals comprise up to two hydrogen electrolyzers, along with two dry chillers and two compressors. The hydrogen electrolyzers are proposed to be housed within purpose-built containers, as supplied by the manufacturer.

An overview of the proposed site layout can be seen below in Figure 2.

FIGURE 2: PROPOSED DEVELOPMENT INDICATIVE LAYOUT



4. BASELINE SOUND SURVEY

4.1. Overview

The prevailing noise conditions in the area have been determined by an environmental noise survey conducted during both daytime and night-time periods between Monday 17th and Thursday 20th June 2024.

4.2. Measurement Details

All noise measurements were undertaken by a consultant certified as competent in environmental noise monitoring, and, in accordance with the principles of BS 7445¹.

All acoustic measurement equipment used during the noise survey conformed to Type 1 specification of British Standard 61672². A full inventory of this equipment is shown in Table 1 below.

TABLE 1: INVENTORY OF SOUND MEASUREMENT EQUIPMENT

Position	Make, Model & Description	Serial Number	Calibration Certificate Number	Calibration Due Date
MP1	Svantek 955 Sound Level Meter	23676	1140235	19/02/2025
	Svantek SV 12L Preamplifier	25615		
	ACO 7052E Microphone	49543		
	Cirrus CR:515 Acoustic Calibrator	80029	1161557	29/04/2025

The sound measurement equipment used during the survey was field calibrated at the start and end of the measurement period. A calibration laboratory has calibrated the field calibrator used within the twelve months preceding the measurements. A drift of less than 0.2 dB in the field calibration was found to have occurred.

The weather conditions during the survey were conducive to environmental noise measurement; it being dry, with wind speeds typically below 5 ms⁻¹. Periods between 04:00-07:00 have been removed from the dataset used to derive the typical background sound levels, in order to avoid the effects of the dawn chorus (intense birdsong), typical during this time of the year.

The microphone was fitted with a protective windshield for the measurements, which are described in Table 2, with an aerial photograph indicating the location shown in Figure 3.

¹ British Standard 7445: 2003: Description and measurement of environmental noise. BSI

² British Standard 61672: 2013: Electroacoustics. Sound level meters. Part 1 Specifications. BSI.

TABLE 2: MEASUREMENT POSITION DESCRIPTION

Measurement Position	Description
MP1	Largely unattended daytime and night-time measurement of sound under free-field conditions, at a height of 1.5 metres above local ground level, located at the south boundary of the Site. The sound environment was influenced by road traffic noise arising from the A465 and the A4060 to the south. Other prominent noise sources were wind turbines located within the industrial estate to the east, along with general industrial activity.

FIGURE 3: MONITORING POSITION



4.3. Sound Indices

The parameters reported are the statistical index (typical) Background Sound Level, $L_{A90,T}$, as well as the average Equivalent Continuous Sound Level, $L_{Aeq,T}$ and the typical Maximum Sound Pressure Level, L_{AFmax} . An explanation of the sound units presented is given in Appendix A.

For clarity, it is noted that the background sound level ($L_{A90,T}$) is an underlying level of sound over a period, T, and might in part be an indication of relative quietness at a given location. It does not reflect the occurrence of transient and/or higher sound level events and is generally governed by continuous or semi-continuous sounds.

The measured L_{Aeq} , L_{AFmax} , and L_{AF90} sound levels are presented as time histories in a graph in Appendix B. Furthermore, the statistical distribution of the measured background sound levels to derive the typical representative $L_{A90,T}$ values are presented in a graphical format in Appendix C.

4.4. Summary Results

The summarised results of the environmental sound measurements, during the day and night-time periods, can be seen below in Table 3. Values have been rounded to the nearest whole number.

TABLE 3: SOUND MEASUREMENT RESULTS

Measurement Position	Period	$L_{Aeq,T}$ (dB)	$L_{AF90,T}$ (dB)	L_{AFmax} (dB)
MP1	Day	50	36	76
	Night	41	37	63

5. OPERATIONAL NOISE ASSESSMENT

5.1. Noise Modelling

5.1.1. Source Data

The sound power levels associated with the Proposed Development can be seen below in Table 4. At this stage, these are considered candidate source noise levels to be achieved by scheme design.

TABLE 4: SOUND SOURCE DATA

Plant	Quantity	Sound Power Level per unit, L_{WA} (dB)*	Indicative Sound Pressure Level at 10m, L_{pA} (dB)*
Hydrogen Plant			
Electrolyser Container	2	100	72
Electrolyser Chiller	2	97	69
Electrolyser Compressor	2	97	69
<i>* Some suppliers provide their data in terms of Sound Pressure Level (SPL) at a given distance rather than Sound Power Level (SWL/Lw). However, SPL depends on i) the environment the measurements are taken in, ii) the dimensions and shape of the plant and iii) the distance from the source to the measurement position, etc. SWL is a more objective metric for noise assessments, as it represents the total sound energy radiated by a sound source and can therefore be used in the noise modelling to predict the SPL at any distance, under various environmental conditions. Thus, our noise specifications are also provided as derived SWL to enable a transparent and robust comparison between different suppliers. Indicative SPL at 10m distance from the plant are also provided for reference.</i>			

These input parameters are intended to determine the likely sources of noise impact and whether attenuation is likely to be required, such that acoustic feasibility is demonstrated for the purposes of planning consideration.

Confirmation from the selected plant manufacturers that the above noise levels can be achieved should always be sought prior to plant procurement.

5.1.2. Calculation Process

Calculations were carried out using Cadna/A, which undertakes its calculations in accordance with guidance given in ISO9613³, which considers a worst-case downwind propagation to all receptors.

5.1.3. Model Assumptions

Given that the land between the proposed development and the nearest receptors is mixed, the ground factor has been set to 0.5 within the calculation software, with 2 orders of reflection. Full octave frequency spectra have been used in the calculations. It has been assumed that all plant will operate simultaneously, representing a worst-case scenario.

³ ISO 9613-1:1993 and ISO 9613-2:1996: Acoustics - Attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere and Part 2: General method of calculation

In order to accurately model the land surrounding the development, an AutoCAD DXF drawing was produced, which was based on data provided by the Ordnance Survey, along with associated DTM topographic contours.

It is noted that the noise model does not include intervening buildings and structures to reduce uncertainty related to heights, demonstrating an absolute worst-case scenario, since these structures will provide some acoustic screening effect.

5.1.4. Mitigation by Design

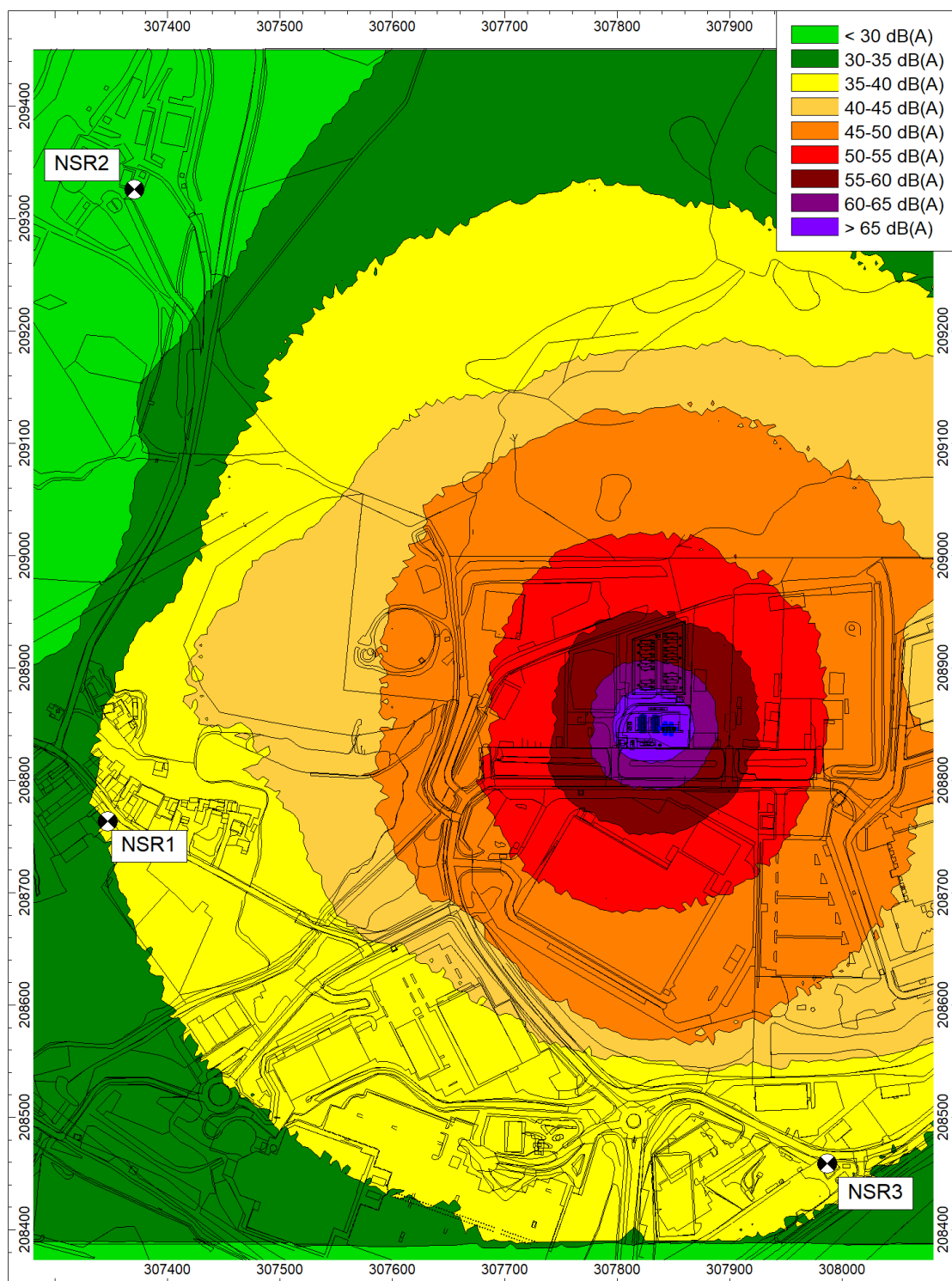
Table 4 shows candidate sound power level at source, which will ensure compliance with the noise limits at the nearest receptors.

It is the responsibility of the contractor/manufacture to provide test documentation confirming that the plant does not exceed the noise specifications set out in this report, including specific mitigation measures at source if required.

5.1.5. Specific Sound Level Map

The sound map at 4m above ground, showing the specific sound level emissions arising from the Proposed Development can be seen in Figure 4.

FIGURE 4: SPECIFIC SOUND LEVEL MAP



5.1.6. Specific Sound Level Summary

A summary of the predicted specific sound levels at the closest NSR, based on the sound map shown in Figure 4 can be seen below in Table 5.

TABLE 5: PREDICTED SPECIFIC SOUND LEVEL SUMMARY

NSR	Specific Sound Level (dB)
1	35
2	24
3	36

5.2. Assessment

5.2.1. Rating Penalty Principle

Section 9 of BS4142:2014+A1:2019 describes how the rating sound level should be derived from the specific sound level, by determining a rating penalty.

BS4142:2014+A1:2019 states:

“Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level. This can be approached in three ways:

- a) subjective method;*
- b) objective method for tonality;*
- c) reference method.”*

Given that the Proposed Development is not operational, the subjective method has been adopted to derive the rating sound level from the specific sound level. This is discussed in Section 9.2 of BS4142:2014+A1:2019, which states:

“Where appropriate, establish a rating penalty for sound based on a subjective assessment of its characteristics. This would also be appropriate where a new source cannot be measured because it is only proposed at that time, but the characteristics of similar sources can subjectively be assessed.

Correct the specific sound level if a tone, impulse or other characteristics occurs, or is expected to be present, for new or modified sound sources.”

BS4142:2014+A1:2019 defines four characteristics that should be considered when deriving a rating penalty, namely; tonality; impulsivity; intermittency; and other sound characteristics, which are defined as:

Tonality

A rating penalty of +2 dB is applicable for a tone which is *“just perceptible”*, +4 dB where a tone is *“clearly perceptible”*, and +6 dB where a tone is *“highly perceptible”*.

Impulsivity

A rating penalty of +3 dB is applicable for impulsivity which is *“just perceptible”*, +6 dB where it is *“clearly perceptible”*, and +9 dB where it is *“highly perceptible”*.

Intermittency

BS4142:2014+A1:2019 states that when the *“specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time ... if the intermittency is readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.”*

Other Sound Characteristics

BS4142:2014+A1:2019 states that where *“the specific sound features characteristics that are neither tonal nor impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of +3 dB can be applied.”*

5.2.2. Rating Penalty Assessment

Considering the content of Section 5.2.1, an assessment of the various sound sources associated with the Proposed Development, in terms of whether any rating penalties are applicable, and has been detailed in Table 6 below.

TABLE 6: RATING PENALTY ASSESSMENT

Source	Tonality	Impulsivity	Intermittency	Other Sound Characteristics	Discussion
Hydrogen Plant	0 dB	0 dB	0 dB	0 dB	The units will operate continuously without the audibility or prominence of sudden sounds. Tonality, if present at source, will be <i>“imperceptible”</i> at the NSRs, due to the residual acoustic environment and low predicted specific sound level.

In summary, a rating penalty of 0 dB has been included in the assessment.

5.2.3. Uncertainty in Calculations

BS4142:2014+A1:2019 requires that the level of uncertainty in the measured data and associated calculations is considered in the assessment. The Standard recommends that steps should be taken to reduce the level of uncertainty.

Measurement Uncertainty

BS4142:2014+A1:2019 states that measurement uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

- “ ...
- b) the complexity and level of variability of the residual acoustic environment;*
 - “ ...
 - d) the location(s) selected for taking the measurements;*
 - “ ...
 - g) the measurement time intervals;*
 - h) the range of times when the measurements have been taken;*
 - i) the range of suitable weather conditions during which measurements have been taken;*
 - “ ...
 - k) the level of rounding of each measurement recorded; and*
 - l) the instrumentation used.”*

Each of the measurement uncertainty factors outlined above have been considered and discussed in Table 7 below.

TABLE 7: MEASUREMENT UNCERTAINTY FACTORS

Measurement Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	0 dB	Residual acoustic environment is relatively constant, hence no correction for a complex residual acoustic environment.
d)	+/- 3 dB	Measuring at positions representative of the closest receptors to the site has enabled the determination of representative background sound levels, particularly for NSR2. Closer monitoring at NSR1 or NSR3 was not possible due to access denial and security concerns. NSR1 is closer to the main roads than the monitoring position. As such the background sound levels may be much higher than measured at MP2. NSR3 is approximately at a double distance from the main roads than the monitoring position. As such background sound may be in the order of 3dB quieter than at MP2, as per the attenuation with distance described for busy roads.
g)	0 dB	Measurement time intervals were set in accordance with BS4142, hence no further correction needs to be made.
h)	0 dB	Measurements were undertaken over a continuous 3-day period, including midweek and weekend periods.
i)	0 dB	The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445
k)	0 dB	Rounding would not have had a significant impact on the overall typical background sound levels.
l)	0 dB	The acoustic measurement equipment accorded with Type 1 specification of British Standard 61672, and were deployed with appropriate wind shields.

In summary, an uncertainty budget of +/- 3dB has been considered in the assessment, to account for measurement uncertainty, which is not expected to have an influence on the outcomes of the assessment.

Calculation Uncertainty

BS4142:2014+A1:2019 states that calculation uncertainty depends on a number of factors, including the following, which are applicable to the Proposed Development:

- “ ...
- b) uncertainty in the operation or sound emission characteristics of the specific sound source and any assumed sound power levels;*
 - c) uncertainty in the calculation method;*
 - d) simplifying the real situation to “fit” the model (user influence on modelling); and*
 - e) error in the calculation process.”*

Each of the calculation uncertainty factors outlined above have been considered and discussed in Table 8 below.

TABLE 8: CALCULATION UNCERTAINTY FACTORS

Calculation Uncertainty Factor Reference	Level of Uncertainty	Discussion
b)	0 dB	Sound source levels are based on robust candidate data, to be achieved by the design.
c)	0 dB	Calculations were undertaken in accordance with ISO 9613-2, which is considered a “ <i>validated method</i> ” by BS4142:2014+A1:2019.
d)	0 dB	The real situation has not been simplified for the purposes of this assessment.
e)	±1dB	ISO 9613-2 indicates that there is a ±3 dB accuracy to the prediction method, therefore, an uncertainty factor of ±1 dB is considered appropriate and proportional, given the separation distances involved.

In summary, an uncertainty budget of ±1 dB has been considered in the assessment, to account for calculation uncertainty.

The overall uncertainty is considered to be sufficiently small enough that it would not affect the conclusions of the assessment. It is also noted that because the assessment considers a worst-case scenario, such as downwind sound propagation (which in reality cannot happen at all NSRs at the same time) the relevance of the uncertainty is further reduced.

5.2.4. BS4142:2014+A1:2019 Assessment

The rating sound level, as calculated from the predicted specific sound level, has been assessed in accordance with BS4142:2014+A1:2019, at the closest NSRs.

TABLE 9: BS4142 ASSESSMENT - DAYTIME (07:00-23:00)

NSR	Specific Sound Level (dB)	Rating Penalty (dB)	Rating Sound Level (dB)	Daytime Background Sound Level (dB)	Excess of Rating over Background Sound Level (dB)
1	35	0	35	36	-1
2	24	0	24	36	-12
3	36	0	36	36	0

TABLE 10: BS4142 ASSESSMENT - NIGHT-TIME (23:00-07:00)

NSR	Specific Sound Level (dB)	Rating Penalty (dB)	Rating Sound Level (dB)	Night-time Background Sound Level (dB)	Excess of Rating over Background Sound Level (dB)
1	35	0	35	37	-2
2	24	0	24	37	-13
3	36	0	36	37	-1

It can be seen that the Proposed Development is predicted to generate noise levels that do not exceed the prevailing background sound level in the area. This is considered to have a 'Low Impact' in BS4142 terms, considering the specific context of the site, which is discussed below.

5.2.5. Discussion on Context

The results set out in Table 9 and Table 10 identify that the operation of the scheme, as proposed, can occur without affecting the amenity of the closest residential receptors to the site. BS4142:2014+A1:2019, however, recognises the importance of the context in which a sound occurs when assessing impacts.

It is noted that the noise model considers an absolute worst-case scenario, such as all plant operating simultaneously and continuously, no screening effect from intervening buildings and structures and downwind sound propagation to all receptors.

As such, the calculated noise levels from the Proposed Development are likely to be an overprediction based on a worst-case scenario which is unlikely to happen in reality.

6. CONCLUSION

inacoustic has been commissioned to assess the impact of potential noise arising from a proposed hydrogen production plant on land at Penygarnddu Industrial Estate, Merthyr Tydfil, CF48 2TA.

This technical noise assessment has been produced to accompany a Planning Application to Merthyr Tydfil County Borough Council and is based upon environmental noise measurements undertaken at the site and a subsequent 3-dimensional noise modelling exercise.

The assessment considers the potential noise generation from the plant associated with the Proposed Development, with respect to existing sound levels in the area.

The assessment methodology contained in British Standard 4142: (2014) +A1: 2019 *Method for rating and assessing industrial and commercial sound* has been used in conjunction with supplementary acoustic guidance.

The assessment identifies that the Proposed Development will give rise to rating sound levels that do not exceed the measured background sound level at all NSRs during the day and during the night, thus giving rise to a 'Low Impact' and aligned with the principles of Technical Advice Note (Wales) 11.

Since the Proposed Development conforms to British Standard and National Planning Policy requirements, it is recommended that noise should not be a considered constraint to the approval of this Planning Application, providing that the plant is constructed and operated in accordance with the acoustic assumptions, specifications and recommendations set out within this report.

7. APPENDICES

7.1. Appendix A – Definition of Terms

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 ⁻⁶ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s1 and s2 is given by 20 log ₁₀ (s1 / s2). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
$L_{max,T}$	A noise level index defined as the maximum noise level during the period T. L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response.
$L_{90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T. L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise.
$L_{10,T}$	A noise level index. The noise level exceeded for 10% of the time over the period T. L_{10} can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE 11: TYPICAL SOUND LEVELS FOUND IN THE ENVIRONMENT

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source.

A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10} , the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} .

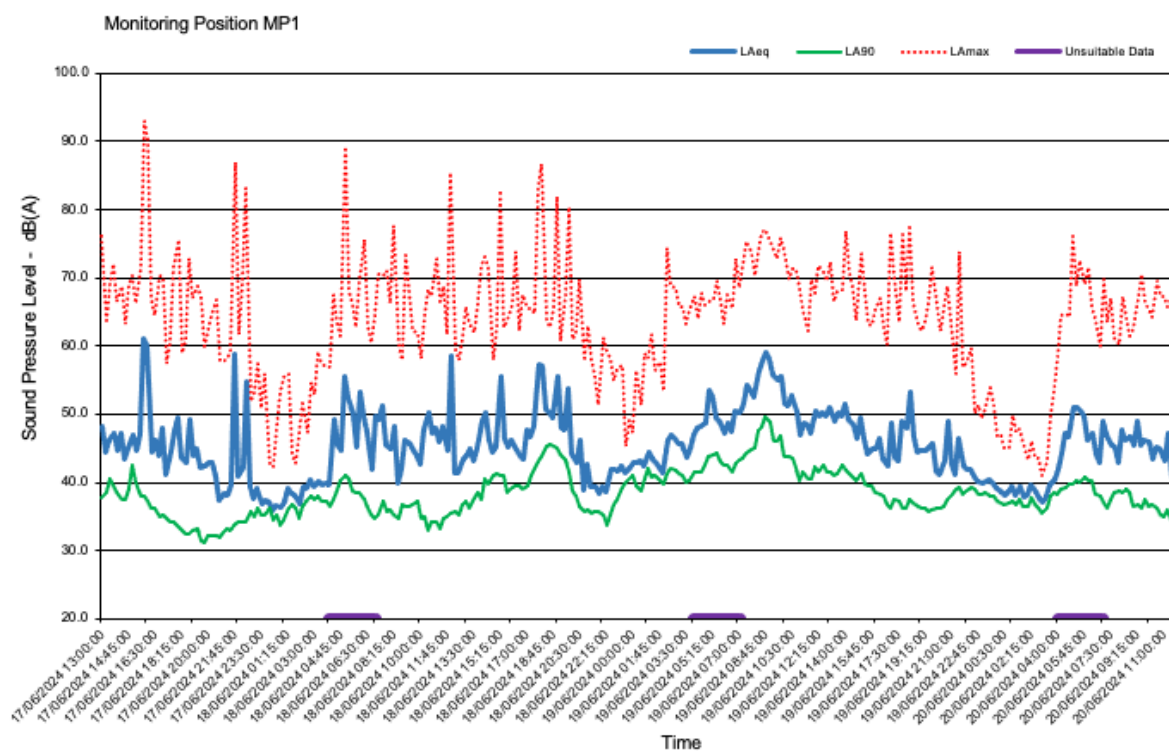
This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS 4142 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1\text{hour}}$ dB and $L_{A90,15\text{mins}}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125 ms.

7.2. Appendix B – Sound Measurement Results

FIGURE 5: MEASURED TIME HISTORY – MP1



7.3. Appendix C – Statistical Analysis

FIGURE 6: STATISTICAL ANALYSIS OF L_{A90} BACKGROUND – DAYTIME – MP1

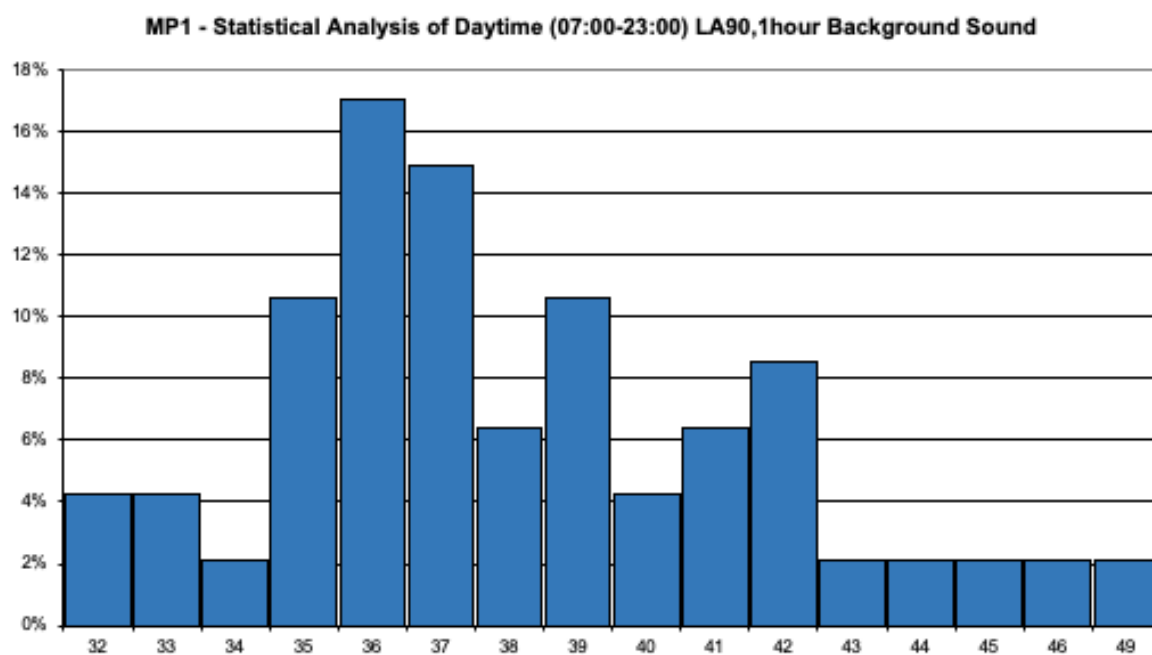
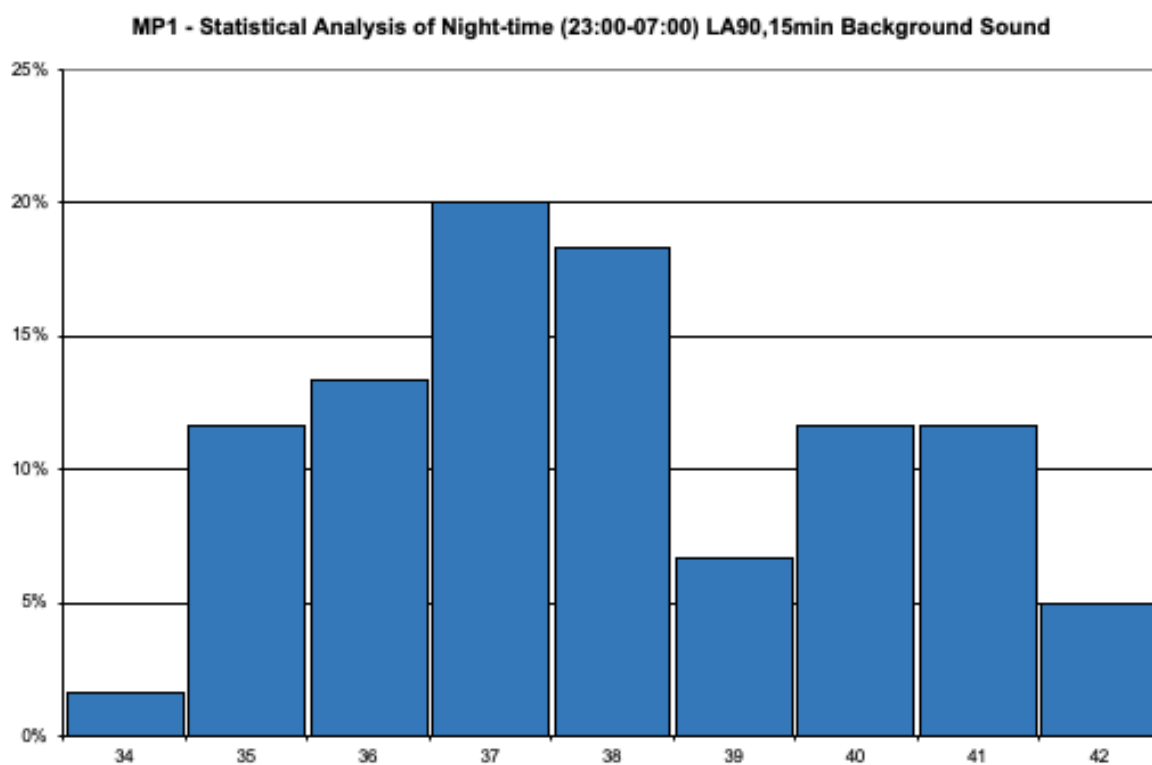


FIGURE 7: STATISTICAL ANALYSIS OF L_{A90} BACKGROUND – NIGHT-TIME – MP1



inacoustic | **cymru**

C5 Business Centre, North Road, Bridgend Industrial Estate, Bridgend, Cymru, CF31 3TP

029 2009 8830 cymru@inacoustic.co.uk

inacoustic is a trading name of Inacoustic Ltd, registered in the UK 10873933