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Environmental Noise Assessment

Prepared: 8th January 2024

Report No	22711-1
Client	Karen Gardener Architects
Site	9 Primrose Lane Rhos Swansea SA8 3ES

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1. Quality Management

Report Number	22711 - 1
Issue	Issue 1
Prepared	8 th January 2024
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3. Executive Summary

3.1.1. An environmental noise assessment has been carried out for a proposed residential development at 9 Primrose Lane, Rhos, Swansea, SA8 3ES (“Proposed Development”).

3.2. Measurement, Assessment and Evaluation

3.2.1. The survey was carried out to BS7445-1:2003,¹ BS7445-2:1991² and BS4142:2014³

3.3. Scope

- 3.3.1. This report covers all aspects of the noise survey, including:
- the identification of acoustic design criteria;
 - the identification of specific sound sources;
 - an objective sound pressure level survey of the existing site;
 - calculation of the specific sound level;
 - calculation of appropriate acoustic feature corrections and determination of the rating level;
 - assessment of the specific sound sources based on guidance contained in BS4142:2014; and

3.4. Results Summary

3.4.1. The numerical BS4142 assessment outcome of +1dB during the night-time is a minor exceedance which is unlikely to be perceptible by the general population and is based on a worst case condition. The outcome indicates that the proposed specific sound source will have a low impact on the existing residential receivers.

¹ BS7445-1:2003 “Description and measurement of environmental noise – Part 1: Description of quantities and procedures”

² BS7445-2:1991 “Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use”

³ BS4142:2014 “Methods for rating and assessing industrial and commercial sound”

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5. Background

5.1. Noise Policy Statement for England

- 5.1.1. The Noise Policy Statement for England (NPSE), published in March 2010, states the long-term vision of Government noise policy is to *“promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development”*.
- 5.1.2. This long-term vision is supported by the following aims; through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:
 - Avoid significant adverse impacts on health and quality of life;
 - Mitigate and minimise adverse impacts on health and quality of life;
 - Where possible, contribute to the improvement of health and quality of life.
- 5.1.3. The intention is that the NPSE should apply to all types of noise apart from noise in the workplace (occupational noise).

5.2. National Planning Policy Framework

- 5.2.1. The National Planning Policy Framework (NPPF) was published on the 27th of March 2012 and was most recently updated on the 5th September 2023; it sets out the Government’s planning policies for England and how these are expected to be applied. The framework states that the planning system should contribute to and enhance the natural and local environment by:

“preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability”.
- 5.2.2. The NPPF requires that new developments be appropriate to their locations such that the effects of pollution on health have been taken into account. Planning policies and decisions should aim to:
 - 1. avoid noise giving rise to significant adverse impacts on health and the quality of life;
 - 2. mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development; and,
 - 3. identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value.
- 5.2.3. Existing businesses near to proposed development should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or ‘agent of change’) should be required to provide suitable mitigation before the development has been completed.

5.3. National Planning Practice Guidance

- 5.3.1. The National Planning Practice Guidance (PPG) is a web-based resource, launched by the Department for Communities and Local Government (DCLG) which was published on the 29th November 2016 and is regularly updated to reflect the changes made to the NPPF and make it more accessible.⁴

⁴ <http://planningguidance.communities.gov.uk/>

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5.3.2. There are a number of factors that determine whether a noise could be a concern to a receptor. These include: the absolute level of the noise and when it occurs, whether it is existing or new to the area, temporal characteristics, spectral content and the acoustic absorption in the area.

Perception	Examples of outcomes	Effect level	Action
Not noticeable	No effect	No observed effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. 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 (NOAEL)	No specific measures required
Lowest Observed Adverse Effect Level (LOAEL)			
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, 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 perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level (SOAEL)			
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, 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
Noticeable and very intrusive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 1 – Noise exposure hierarchy

5.3.3. It is emphasised in the PPG that the planning process should be used to mitigate and minimise the impact of noise. This could include: engineering the noise sources to be quiet, minimising the impact of noise through layout, using conditions/obligations to restrict activities, mitigating the impact in places where noise is likely to be experienced (e.g. using facade sound insulation).

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6. Introduction

6.1.1. An environmental noise assessment has been carried out for a proposed residential development at 9 Primrose Lane, Rhos, Swansea.

6.2. Proposed Development

6.2.1. An image showing the proposed location and layout of the Proposed Development is given in Figure 1.

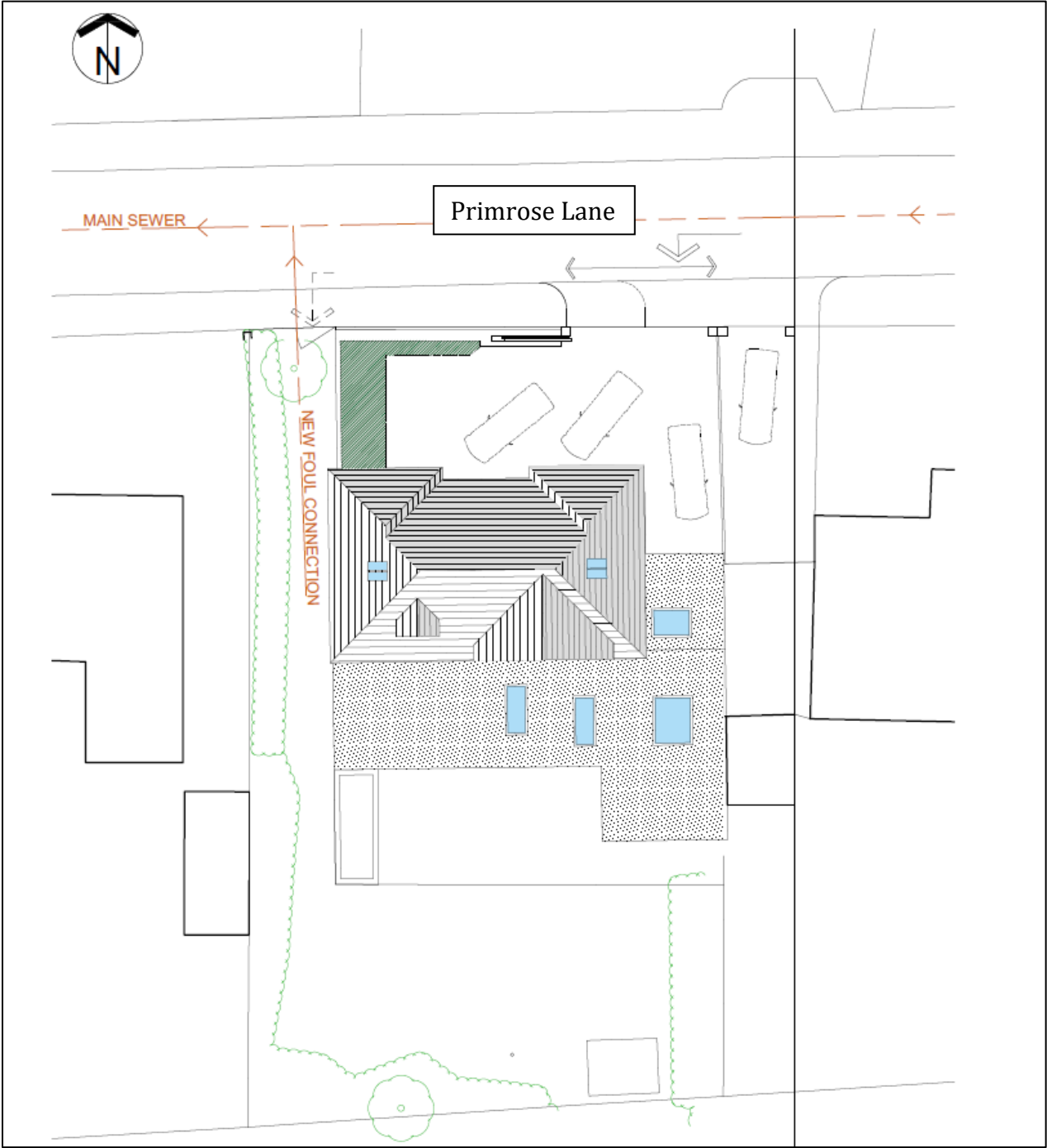


Figure 1 - Plan showing the location and layout of the Proposed Development

6.3. Noise Climate

6.3.1. The technician noted that the noise climate was not dominated by any continuous noise sources at the time of the survey. The noise climate was generally dominated by birdsong, with transient noise from local traffic occasionally.

6.4. Specific Sound Sources

It is proposed that an air source heat pump will be installed as part of the development. The manufacturer’s sound level data has been provided and is given in Table 2. The equipment will be operated at the discretion of the occupants, it is therefore assumed the equipment could be operational at any time of day/night. It is noted that sound data is provided for various operating modes, and the worst case has been taken for the purpose of this assessment.

Vaillant aroTHERM plus (12kW)			
Sound Power (dB)	Sound Pressure Level (dB(A))		
60	1m	3m	5m
	52	42	38

Table 2 – Specific sound sources associated with the proposed development

7. Assessment Criteria

7.1. BS4142:2014

- 7.1.1. BS4142 provides methods for rating and assessing **specific sound sources** of an industrial and/or commercial nature, which includes: industrial and manufacturing processes, fixed services plant, sound generated by the loading/unloading of goods and sound from mobile plant/vehicles associated with industrial/commercial premises (e.g. fork-lift trucks). The **assessment location** is outside a residential receptor.
- 7.1.2. The standard is specifically precluded from being used to assess the likely impact inside a building or from the assessment of various sound sources for which other (more relevant) guidance exists, including: music/entertainment noise, noise from people and construction noise.
- 7.1.3. The foundation of the assessment is to establish the following quantities, either by measurement or prediction:
- **Ambient sound:** The overall sound at the assessment location
 - **Residual sound:** The ambient sound without the specific sound source operating
 - **Specific sound:** The ambient sound with the specific sound source operating, corrected for residual sound
 - **Background sound:** Residual sound present for 90% of the time
- 7.1.4. How these quantities relate to the sound that would be measured during a survey has been illustrated in Figure 2.

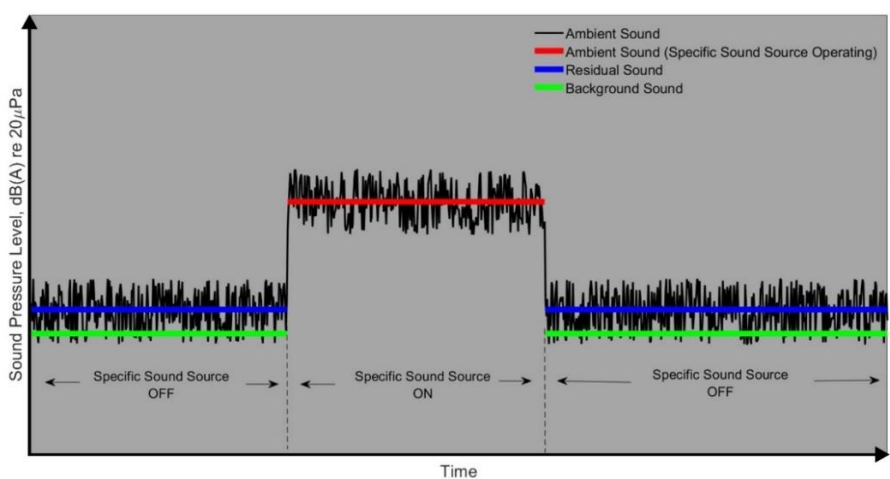


Figure 2 –
Diagrammatic
illustration of the
definitions of ambient,
residual, specific and
background sound

- 7.1.5. Once the specific sound level has been determined, this must be corrected for the presence of acoustic features that are audible at the assessment location to determine the **rating level**:
- Rating Level = Specific Sound Level + Character Corrections**
- 7.1.6. Normally it is possible to carry out a subjective assessment of characteristics, based on the following correction guidelines:
- **Tonality:** +2dB for a ‘just perceptible’ tone, +4dB for ‘clearly perceptible’, and rising to +6dB for ‘highly perceptible’ tones.
 - **Impulsivity** (rapidity of change and overall change in level): +3 dB for ‘just perceptible’ impulsivity, +6dB for ‘clearly perceptible’, rising to +9 dB for ‘highly perceptible’ impulsivity.
 - **Intermittency:** if the on/off-time of the specific sound is readily distinctive at the noise- sensitive receivers, +3dB.

- 7.1.7. It should be noted that, where one feature is clearly perceived as dominant, it may be appropriate to apply a single correction. Where multiple features are likely to affect perception and response, each should be added arithmetically.
- 7.1.8. An estimate of the magnitude of the impact is evaluated by subtracting the measured background sound level at the assessment location from the rating level

Assessment Level = Rating Level – Background Sound Level

- 7.1.9. Typically, the greater the difference between the background and rating level, the greater the magnitude of impact, although BS 4142 emphasises that this is highly context-specific. As an initial estimate, BS4142 states that:
 - A difference (between the background and rating level) of around +10 dB or more is likely to be indicative of significant adverse impact, depending on context
 - A difference (between the background and rating level) of around +5 dB or more is likely to be indicative of adverse impact, depending on context
 - Where the rating level does not exceed the background level, this is an indication that the specific sound will have a low impact, depending on context
- 7.1.10. Where the initial estimate of the impact needs to be modified due to the context, other factor should be considered, including: absolute sound levels, the character and level of the residual sound and the sensitivity of the receiver, which includes the effect of building façade sound insulation.

7.2. Local Planning Authority Criteria

- 7.2.1. The local planning authority has provided specific noise-related planning requirements for the Proposed Development. The noise-related requirements have been reproduced in Figure 3.

*"The applicant is to submit a noise impact assessment for the proposed development.
The noise rating level emitted from external plant serving the approved use shall not be greater than the existing background noise level. The noise levels shall be determined at the nearest noise-sensitive premises or at another location that is deemed suitable by the Local Planning Authority. Measurements and assessments shall be made in accordance with 'BS 4142:2019 Method for rating and assessing industrial and commercial sound.'"*

Should the Noise Impact Assessment identify the need for an acoustic barrier; then the specification of the sound reduction capacity of the barrier shall be included in the Noise Impact Assessment".

Figure 3 – Noise related planning requirements provided by the local planning authority

8. Survey

8.1. Measurement Locations

8.1.1. Fixed position monitoring took place at to determine the typical ambient sound levels and the typical background sound levels. The monitoring equipment was located 1.5m from the ground and at least 3m from the next nearest reflecting surface. The monitoring position is shown in Figure 4.

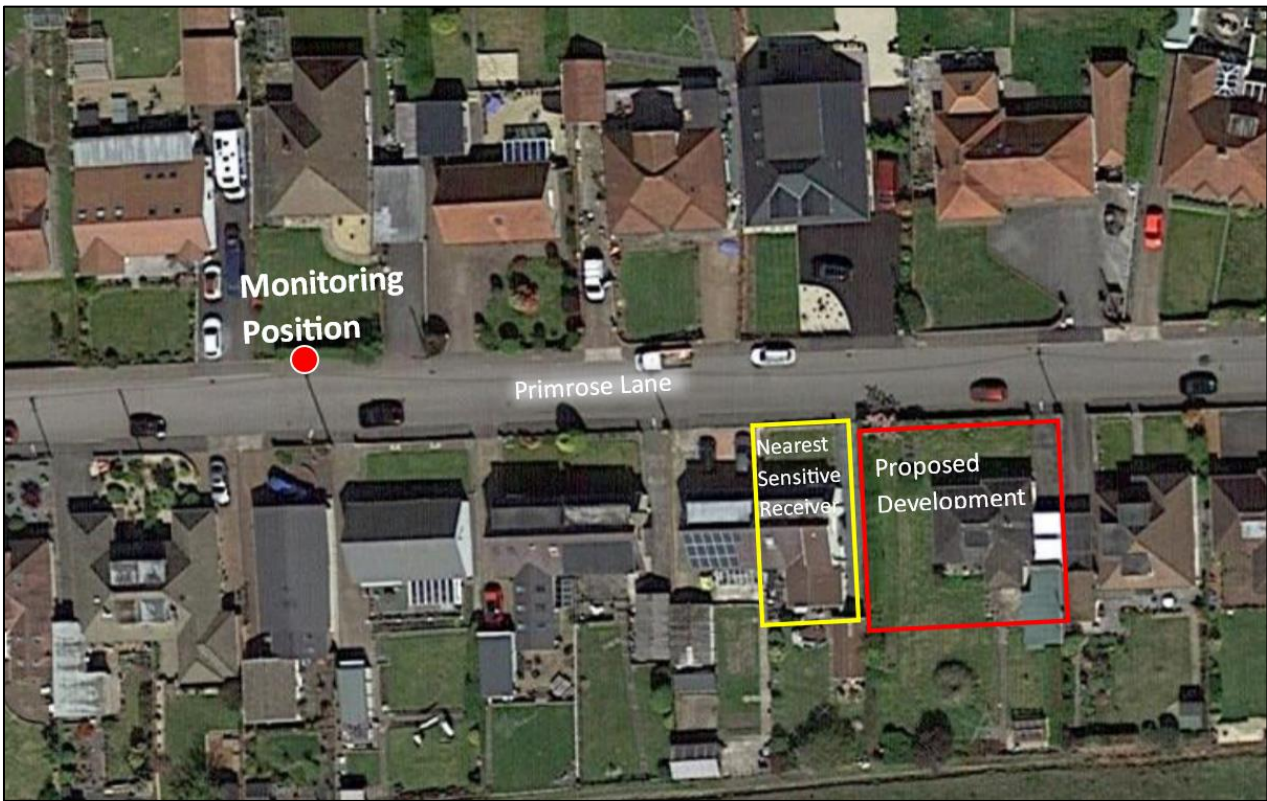


Figure 4 - Noise monitoring locations on site.

8.1.2. The measurement instrumentation used during the survey is detailed in the appendix. The acoustic equipment was calibrated to comply with Section 4.2 of BS7445-1:2003⁵ before and after the surveys. The calibration details are also detailed in the appendix.

8.2. Meteorology

8.2.1. During the survey the weather information was noted. This is summarised in Table 3.

	4 th January 2024	5 th January 2024
Roads(Wet/Dry)	Dry	Dry
Wind Speed (ms ⁻¹)/Direction	1 / S	3 / NW

Table 3 - Meteorological data noted during the survey

⁵ BS7445-1:2003 “Description and measurement of environmental noise – Part 1: Guide to quantities and procedures”

8.3. Measurement and Timescale

8.3.1. Unattended monitoring was carried out between 4th January 2024 and 5th January 2024. The measurements that have been made are summarised in Table 4.

Monitoring position	Date	Type	Quantity
1	4 th January 2024 to 5 th January 2024	Unattended	L _{Aeq} / L _{A90}

Table 4 – Measurements made at the site of the Proposed Development

8.3.2. Sound pressure measurements were subsequently averaged into hourly, daytime and night-time periods. The acoustic measurements and their interpretation have been in accordance with BS 7445: Parts 1, and 2⁶. All sound pressure levels are in dB (re 20µPa).

8.4. Results Summary

Average Sound Pressure Levels

8.4.1. The fixed position external measurement results are summarised in Table 5.

Measurement location	Daytime dB, L _{Aeq,16hr}	Night-time dB, L _{Aeq,8hr}
1	53.4	44.0

Table 5 - Summary of the external sound pressure levels measured

Background Sound Levels

8.4.2. Figure 5 shows the results of the data analysis in terms of the frequency of occurrence of each data value during the daytime and the night-time.

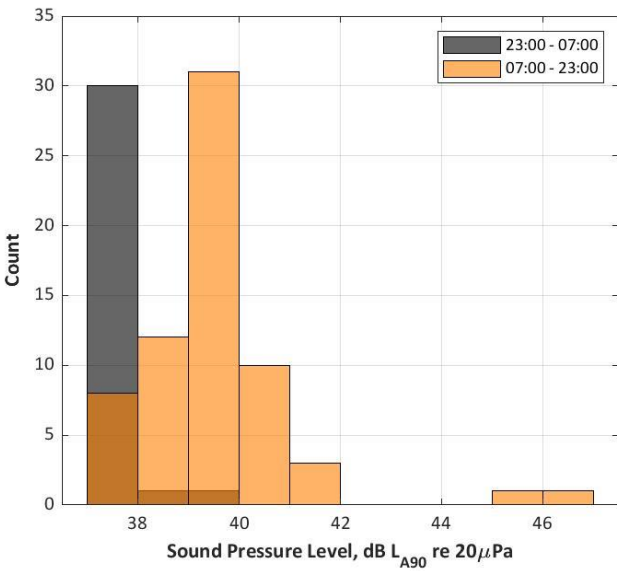


Figure 5 – Distribution of background sound levels during the daytime (07:00-23:00), and the night-time (23:00-07:00)

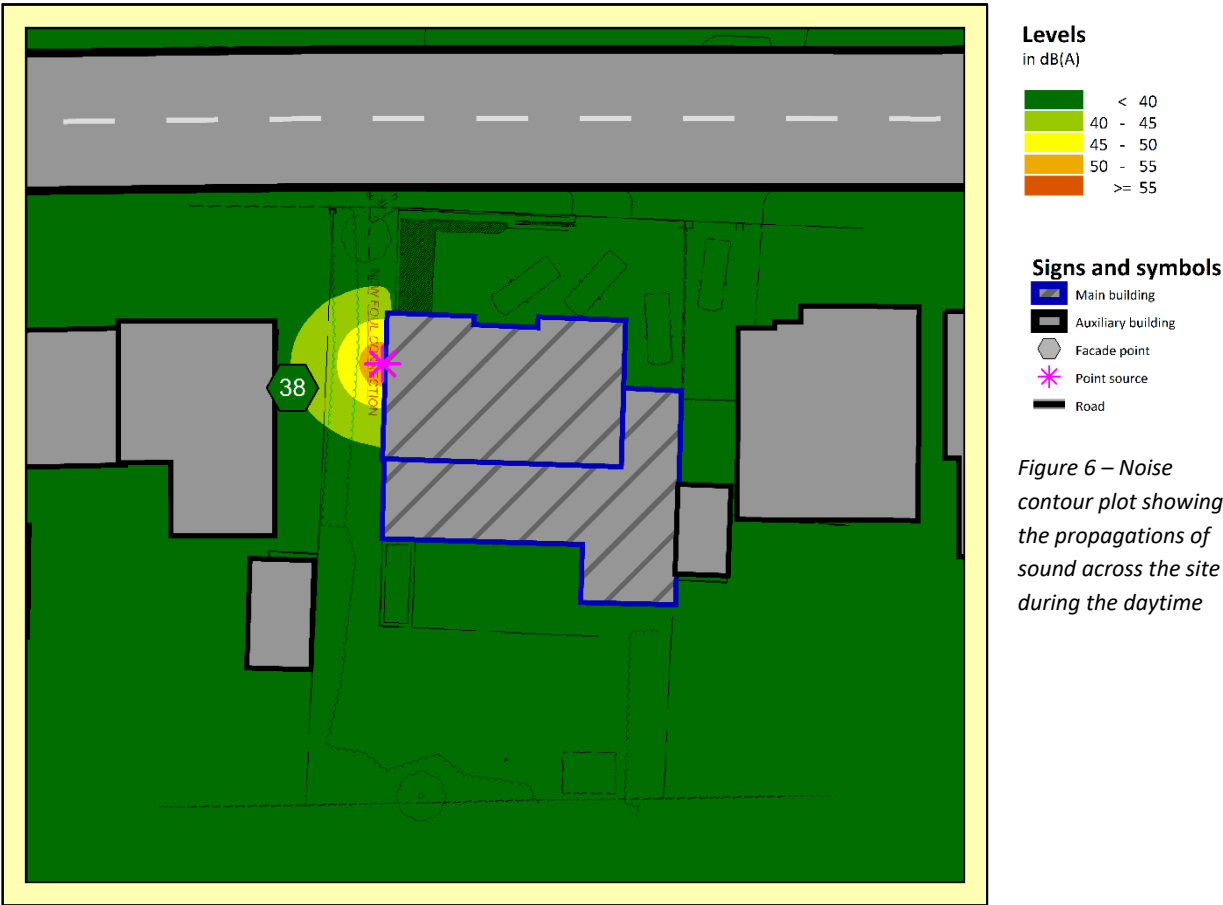
8.4.3. As can be seen in Figure 5 the background sound levels ranged between 37dB L_{A90,15min} and 47dB L_{A90,15min} during the daytime period, and that the background sound levels ranged between 37dB L_{A90,15min} and 40dB L_{A90,min} during the night-time period.

8.4.4. The typical background sound level has been taken to be 39dB L_{A90,15min} during the daytime and 37dB L_{A90,15min} for the night-time.

⁶ BS7445-2:1991 “Description and measurement of environmental noise – Part 2: Guide to the acquisition of data pertinent to land use”

9. 3D Noise Model

- 9.1.1. A 3D noise model has been constructed using SoundPLAN™ in order to predict the propagation of sound from the specific source to the nearest sensitive receiver. The calculation procedure has been used from ISO9613-2:1996⁷ to predict the propagation of sound, taking into account distance, screening, and atmospheric and ground conditions.
- 9.1.2. Google Maps Data has been used to create the existing roads and buildings. Terrain data has also been taken from Google Maps.
- 9.1.3. The specific source has been modelled as a point source using the manufacturer’s sound data (shown in Table 2). For the purpose of this assessment, it has been assumed the plant will be operational continuously throughout the daytime and night-time periods at full duty, in the loudest operating mode.
- 9.1.4. The position of the noise sensitive receiver has been identified as an existing first floor window on the neighbouring property, overlooking the location of the proposed source.
- 9.1.5. The results of the model have been illustrated in noise contour map in Figure 6.



- 9.1.6. The results of the 3D noise model show that the specific source level is predicted to be 38dB LAeq,T at an external position, 1m from the façade of the nearest sensitive receiver.

⁷ ISO9613-2:1996 “Acoustics – Attenuation of Sound During Propagation Outdoors – Part 2: General Method of Calculation”

10. BS4142 Assessment

10.1. Rating Level

10.1.1. The proposed specific sound source has been specified but are not yet installed. The sources have been assessed based on the likely character of the sound at the boundary with nearest sensitive receiver. The adjustments to the specific sound levels for acoustic features have been added subjectively and are based on experience of similar items of heating and ventilation plant. These acoustic character corrections have been discussed in the following sections.

Tonality

10.1.2. It is expected that that source will generally generate broadband sound under normal operation, which is not likely to contain any distinguishable tones at the boundary of the neighbouring property.

10.1.3. No correction for tonality has been applied.

Impulsivity

10.1.4. It is not expected that the proposed specific sources will generate any impulsive sound under normal operation.

10.1.5. No correction for impulsivity has been applied.

Intermittency

10.1.6. It is not expected that the specific sources will be operational for 100% of the reference time period. Despite being operational at occupants discretion, it is not typical that this type of heating equipment will be turned on/off more than once during any 1-hour/15-minute (day/night) reference period.

10.1.7. No correction for intermittency has been applied.

10.2. Assessment

10.2.1. The BS4142 assessment is detailed in Table 6.

	Level, dB	
	Daytime (07:00-23:00)	Night-time (23:00-07:00)
Background sound level, dB LA90,15min	39	37
Specific sound level, dB(A)	38	38
Acoustic feature corrections		
Tonality	0	0
Impulsivity	0	0
Intermittency	0	0
Other	0	0
Rating level		
Specific sound level + corrections	38	38
Assessment Level		
Rating level – Background sound level	-1	+1
“Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact. A difference of around +5dB or more is likely to be an indication of an adverse impact, depending on the context”		

Table 6 - The assessment procedure from BS4142

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10.3. Context

- 10.3.1. In this situation the specific sound source is being introduced close to existing residential receivers. The impact of the specific sound is likely to have an increased impact compared to a situation where new residents are introduced close to existing sound sources such as mechanical plant.
- 10.3.2. The 3D noise model used to predict the impact of the source is likely to be an overprediction, based on a series of worst-case assumptions. Realistically, not all of these conditions will apply and therefore any predicted impact can be slightly reduced. This assessment assumes continuous 24-hour operation which is unlikely to be the case. It also assumes the loudest mode of operation, which will ultimately be determined by the end user. In this case, the manufacturers data shows that more energy efficient modes produce less sound.
- 10.3.3. It is shown that, even with the worst-case considerations built into the assessment, the outcome during the night-time period exceeds the existing typical background level by 1dB, which is a minor exceedance and will not be perceptible to most people. Generally, a change of ± 3 dB is the minimum perceptible by most people⁸. In context of the assessment outcome, a difference of less than +5dB is a likely indication of low impact.
- 10.3.4. It should be noted that the assessment location is external and at first floor level, 1-metre from the façade. In this case it is expected that the receptor would be located indoors and will therefore be afforded some mitigation by the existing window glazing. It is not expected that the existing internal conditions would be adversely affected by the source.
- 10.3.5. The absolute levels predicted at the façade should be considered. In this case, it is expected that internal conditions for sleeping (guideline values from BS8233:2014) will be met inside the receivers property despite the assessment outcome of the proposed source.

⁸ Engineering Noise Control (Second Edition); Bies and Hanson (1996)

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11. Conclusions

- 11.1.1. An environmental noise assessment has been carried out at the site of a proposed residential development at 9 Primrose Lane, Rhos, Swansea to determine typical ambient sound levels and the typical background sound levels. The typical background sound levels have been used to form a numerical assessment from BS4142:2014.
- 11.1.2. A numerical BS4142 assessment indicates that the specific sound will have a low impact on proposed new residential receivers and, generally, the lower the rating level is relative to the background sound level, the less likely it is that the specific sound source will have an adverse impact.
- 11.1.3. In this context the specific sound source is proposed to be located near to existing residential receivers. The impact of the specific sound is likely to have an increased impact compared to a situation where new residents are introduced close to existing sources of a similar nature.
- 11.1.4. The impact of the specific source on the nearest sensitive receiver is a likely overprediction based on several worst-case assumptions, which are not all likely to apply in reality. The numerical assessment shows the source is predicted to exceed background by 1dB, which is a minor exceedance which is unlikely to be perceptible by the general population and is based on a worst case condition. The proposed source is not predicted to have an adverse impact on the internal living conditions of the nearest residential property.
- 11.1.5. We strongly recommend that this report be passed to the local planning authority for approval prior to any works being carried out.

12. Appendix

APPENDIX A: Summary Information

Required ISO Test Report Information (cross referenced where required)			
		Measurements carried out to:	Analysed to:
A	Standards	BS 7445-1: 2003 BS 7445-2: 1991	BS4142:2014
B	Organisation performed the measurements	noise.co.uk Ltd, The Haybarn, Newnham Grounds, Kings Newnham Lane, Bretford, Coventry, CV23 0JU.	
C	Name of Client	Karden Gardner Architects	
D	Full site address	9 Primrose Lane, Rhos, Swansea, SA8 3ES	
E	Date of surveys	Survey Date: 8 th January 2024 to 5 th January 2024	
F	Description & identification of Proposed Development	It is proposed to develop the site for residential use.	
G	Brief Description of details of Procedure & equipment	See Section 5 of this report.	

APPENDIX B: Technical Appendix

12.1.1. Measurements were made using the following equipment:

Monitoring Position	Sound Level Meter (Serial Number)	Calibrator (Serial Number)
1	SoftdB Piccolo 2 (PO221070105)	BSWA CA114 (590010)

12.1.2. The equipment has traceable calibration. The sound level meter was calibrated immediately prior to and immediately after the measurements were carried out.

Sound Level Meter	Before	After
SoftdB Piccolo 2 (PO221070105)	94.0 dB	94.0 dB

12.1.3. There was no adverse deviation.