



**Independent Acoustic  
Consultancy Practice**

# **Noise Impact Assessment – Air Source Heat Pump Noise**

**Tudor Inn  
Neath**

7646/NIA



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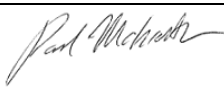
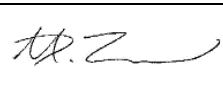
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### Noise Impact Assessment – Air Source Heat Pump Noise

|                      |                                                                            |
|----------------------|----------------------------------------------------------------------------|
| <b>Project:</b>      | <b>Tudor Inn</b>                                                           |
| <b>Site Address:</b> | Cimla<br>Neath<br>SA11 1JA                                                 |
| <b>HA Reference:</b> | 7646/NIA                                                                   |
| <b>Date:</b>         | 13/05/2025                                                                 |
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## 1. INTRODUCTION

New residential dwellings are proposed at the former Tudor Inn site in Cimla, Neath, SA11 1JA.

The local authority has requested a noise impact assessment of the proposed Air Source Heat Pumps (ASHPs) which are to provide central heating and hot water to the dwellings.

This report therefore assesses likely noise levels outside bedroom windows from ASHPs.

## 2. CRITERIA

### 2.1 Planning Conditions

The following planning condition has been issued by the Local Authority:

*“24. No mechanical heating or ventilation plant, including air source heat pumps, shall be installed in any external areas of the site until a Noise Impact Assessment has been first submitted to and approved in writing by the Local Planning Authority. The assessment shall be carried out in accordance with BS 4142:2014 Method for rating and assessing industrial and commercial sound, the plant shall be installed and commissioned in accordance with the approved scheme.*

*Prior to first operation of the approved heating and ventilation plant, a Noise Impact Assessment demonstrating compliance with the target noise rating level shall be submitted to, and approved in writing by, the Local Planning Authority.*

### 2.2 British Standard 4142:2014+A1:2019

British Standard 4142:2014+A1:2019 “Methods for rating and assessing industrial and commercial sound”, provides current guidance for the assessment of industrial noise affecting residential receivers.

This standard describes a rating method comparing  $L_{Aeq}$  noise levels from the industrial source with pre-existing background  $L_{A90}$  levels at the residential receiver. It advises at a difference (industrial noise - background) of:

- +10dB or higher, likely to be an indication of a significant adverse impact, depending on the context.
- A difference of + 5dB, 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.

A sliding scale of penalties can be applied to industrial/commercial sound levels which have acoustically distinguishing characteristics, including tonality, impulsivity and intermittency.

**Tonality** – A penalty of 2dB for a tone which is just perceptible at the noise receptor, 4dB where it is clearly perceptible, and 6dB where it is highly perceptible.

**Impulsivity** – A penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6dB where it clearly perceptible, and 9dB where it is highly perceptible.

**Other sound characteristics** – 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 3dB can be applied

**Intermittency** – If intermittency is readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied.

**BS 4142:2014 states under section 11;**

*“Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following.*

- 1) *The absolute level of sound. For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.*

*Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.*

*Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.*

- 2) *The character and level of the residual sound compared to the character and level of the specific sound. Consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.*

*NOTE 3 Consideration should be given to evidence on human response to sound and, in particular, industrial and/or commercial sound where it is available. A number of studies are listed in the “Effects on humans of industrial and commercial sound” portion of the “Further reading” list in the Bibliography.”*

- 3) *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:*
- i. façade insulation treatment;*
  - ii. ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
  - iii. acoustic screening.”*

In addition to the above, the Association of Noise Consultants (ANC) have produced a Technical Note to BS 4142:2014+A1:2019, dated March 2020 (v1.0).

It states under ‘Other Contextual Matters’ – *“The assessor may also wish to consider matters such as the:*

- character of a particular neighbourhood;*
- former uses at or close to a site;*
- legitimacy of the industrial use, e.g. planning permissions or environmental permits;*
- implementation of best practicable means for a given process or activity; or*
- local convention or perceptions.*

*When relying on such matters, it is incumbent for the assessor to make clear all elements of context.”*

It goes on to say, *“There is no theoretical limit to how the context can or should influence the impact assessment, but any alteration of the conclusions of an assessment due to context should be sufficiently explained and justified for the specific circumstances in question.”*

### 2.3 British Standard 8233:2014

British Standard 8233:2014 'Guidance on sound insulation and noise reduction for buildings' includes internal noise criteria of habitable rooms in residential dwellings, as shown below:

**Table 2.1 – BS 8233:2014 Internal Ambient Noise Criteria for Habitable Rooms**

| Location         | Desired              |                     | Reasonable *         |                     |
|------------------|----------------------|---------------------|----------------------|---------------------|
|                  | 07:00 to 23:00       | 23:00 to 07:00      | 07:00 to 23:00       | 23:00 to 07:00      |
| Living room      | 35 dB $L_{Aeq,16hr}$ | -                   | 40 dB $L_{Aeq,16hr}$ | -                   |
| Dining room/area | 40 dB $L_{Aeq,16hr}$ | -                   | 45 dB $L_{Aeq,16hr}$ | -                   |
| Bedroom          | 35 dB $L_{Aeq,16hr}$ | 30 dB $L_{Aeq,8hr}$ | 40 dB $L_{Aeq,16hr}$ | 35 dB $L_{Aeq,8hr}$ |

\* NOTE 7 states "Where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved."

### 3. SOUND SENSITIVE RECEIVERS

In order to carry out a noise impact assessment, it is first necessary to define the existing ambient and background sound climate at the agreed nearest Sound Sensitive Receivers (SSRs) located on Beacons View and Cae Rhos Ddu.

Table 3.1 below shows the development site and the closest existing SSRs listed below:

**Table 3.1 – Nearest Sound Sensitive Receivers**

| Sound Sensitive Receiver (SSR) | Approx. Distance (m) to nearest ASHPs |
|--------------------------------|---------------------------------------|
| 13 – 21 Beacons View           | 30                                    |
| 35 – 41 Beacons View           | 25                                    |
| 55 – 57 Beacons View           | 15                                    |
| 22 – 24 Cae Rhos Ddu           | 45                                    |

**Figure 3.1 – Site Plan Showing Nearest SSRs & Measurement Location**

## 4. ENVIRONMENTAL NOISE SURVEY

### 4.1 Procedures

Continuous noise monitoring was carried out from 1700hrs on Wednesday, 30 April 2025 to 0900hrs on Friday, 02 May 2025 at position A.

Data including  $L_{Amax}$ ,  $L_{Aeq}$  and background  $L_{A90}$  was logged at 1 minute intervals over the monitoring period, along with continuous audio and 100ms data to allow source identification and further detailed analysis of results if required.

Site plan in Figure 3.1 above shows the development site and continuous monitoring positions used, namely:

**Table 4.1 – Continuous Monitoring Location Details**

| Position | Description                                                                                    |
|----------|------------------------------------------------------------------------------------------------|
| A        | Located in centre of the proposed development site. Representative of background sound levels. |

*Note: All microphone positions approximately 1.5m above local ground level.*

## 4.2 Meteorological Conditions

Approximate weather conditions are shown in Figure B.1, Figure B.2 and Figure B.3 in Appendix B.

To summarise, the weather conditions during the monitoring period were dry with a light breeze. There was heavy rain on Thursday 1<sup>st</sup> May 1730-1925hrs.

## 4.3 Measurement Equipment

The following measurement equipment was used during the surveys:

**Table 4.2 – Noise Monitoring Equipment List**

| Make         | Description                            | Model  | Serial Number | Last Calibrated | Certificate No. |
|--------------|----------------------------------------|--------|---------------|-----------------|-----------------|
| NTi          | Type 1 - Sound Level Meter             | XL2-TA | A2A-08723-E0  | 27 October 2023 | UK-23-127       |
|              | Preamplifier                           | MA220  | 1820          | 27 October 2023 | UK-23-127       |
|              | Filters                                | XL2-TA | A2A-08723-E0  | 27 October 2023 | UK-23-127       |
|              | Microphone Capsule                     | MC230  | 9381          | 27 October 2023 | UK-23-127       |
| Larson Davis | Calibrator (94.00dB / 114.03dB @ 1kHz) | CAL200 | 19047         | 14 August 2024  | 48532           |

Measurement systems were calibrated before and after the surveys and no variation occurred.

*Note: Copies of traceable calibration certificates for all equipment are available upon request.*

## 4.4 Results

Time History chart in Figure B.4 of Appendix B show  $L_{Amax}$  and  $L_{Aeq}$  sound pressure levels measured at position A. *Period 1730-1925 on 1<sup>st</sup> may has been excluded due to heavy rain.*

Daytime and night-time background sound levels are controlled by distant road traffic noise. A statistical analysis of background sound levels is given in Figure B.5. The following minimum consistent daytime and night-time background  $L_{A90}$  sound levels have been determined.

**Table 4.3 – Minimum Consistent Daytime and Night-time Background  $L_{A90}$  Results**

| Period                                         | Position |
|------------------------------------------------|----------|
|                                                | A        |
| Daytime (0700-2300hrs) $L_{A90,1hr}$ (dB)      | 33       |
| Night-time (2300-0700hrs) $L_{A90,15min}$ (dB) | 29       |

## 5. ASSESSMENT OF NOISE IMPACT

### 5.1 Proposed Air Source Heat Pump Units

The proposed air source heat pump (AHSP) units are as follows:

- Apartments 212                      Vaillant *arOTHERM* Plus 3.5kW
- House Type 421,422 & 531      Vaillant *arOTHERM* Plus 5kW
- House Type 641                      Vaillant *arOTHERM* Plus 7kW

The following sound power levels has been provided by Vaillant for ASHPs running at design duty:

**Table 5.1 – ASHP  $L_{WA}$  Spectra**

|              | $L_{WA}$ | Octave Band Centre Frequencies (dBA) |       |       |       |      |      |      |      |
|--------------|----------|--------------------------------------|-------|-------|-------|------|------|------|------|
|              |          | 63Hz                                 | 125Hz | 250Hz | 500Hz | 1kHz | 2kHz | 4kHz | 8kHz |
| 3.5kW<br>5kW | 54       | -                                    | 48.4  | 48.9  | 46.0  | 43.4 | 41.0 | 36.3 | -    |
| 7kW          | 55       | -                                    | 42.7  | 54.1  | 42.6  | 41.6 | 39.5 | 31.2 | -    |

### 5.2 Noise Map Model

The above ASHP source noise levels have been used to set up a noise map using *iNoise* (2024 V3) which in turn uses methodology from ISO9613 (2024).

This model allows noise levels from noise sources to be predicted over large distances and varying terrain. Attenuation is included accounting for distance, air absorption, ground absorption and screening losses from site topography/local structures where applicable.

Drawings used in our assessment are referenced in Appendix D.

The noise map model considers a **worst-case scenario** of every single ASHP on the site operating simultaneously. The units have been modelled at 0.75m (3.5 & 5kW) and 0.95m (7kW) heights.

The noise map model in Figure C.1 of Appendix C shows the predicted noise contour plot across the surrounding area to critical SSRs at 4.5m above local ground height.

### 5.3 ASHP Noise Impact Assessment to Existing Sound Sensitive Receptors

Predicted ASHPs noise levels of  $\leq 20\text{dB } L_{Aeq}$  are indicated at the closest SSRs on Beacons View. Noise from ASHPs would therefore fall well below the night-time background sound level of  $29\text{dB } L_{A90}$  outside windows of habitable rooms at these receptors during a worst-case scenario of all ASHPs running simultaneously.

BS 4142:2014+A1:2019 advises a low impact, depending on context. With absolute noise levels very low, and any sound characteristics unlikely to be perceptible, no modification for context is proposed. A low impact is therefore assessed.

## 5.4 ASHP Noise to Plots on the Development

Table C.1 of Appendix C shows that the predicted total ASHP noise levels at each of the plots, and also shows both individual noise contributions from that plot's own ASHP and from neighbouring ASHPs.

### 5.4.1 ASHP Noise levels from neighbouring plots

The highest noise level indicated at neighbouring plots on the development itself (without the plot's own ASHP running) is indicated to be up to 33dB(A) for House Type 212.

With a pre-development night-time background sound level of 29dB  $L_{A90}$ , an excess over background of 4dB is indicated worst-case. Assuming no tonal or intermittent characteristics are clearly present at such low absolute noise levels, BS 4142:2014+A1:2019 would assess an adverse impact is indicated less likely depending on context (at <5dB above background). Given the relatively low absolute noise levels however, we would suggest a low impact is more likely when context is considered.

MVHR units are proposed on all plots for ventilation (which we understand are in all plots on this scheme), then a level of up to 33dB(A) outside windows, where they may be ordinarily closed, should be considered insignificant. This is also indicated to easily meet BS 8233:2014 desirable internal noise levels during the night-time inside properties with windows open and should therefore be considered acceptable.

### 5.4.2 Plots' Own ASHPs

The highest noise level indicated at plots from their own ASHP is indicated to be <34dB(A) for the majority of plots, except for House Type 212 where levels from the plots' own ASHP is indicated at up to 38dB(A).

For noise of the plot's own unit at the plot's own windows, we would suggest that a level not exceeding 40dB  $L_{Aeq}$  outside windows is not an unreasonable design aim. MVHR units are proposed on all plots for ventilation (which we understand is in all plots on this scheme), then a level of up to 38dB(A) outside a plot's own windows, where they may be ordinarily closed, should be considered insignificant.

This is also indicated to easily meet BS8233:2014 desirable internal noise levels during the night-time inside properties with windows partially open and should therefore be considered acceptable.

## 6. CONCLUSION

A noise impact assessment has been carried out for the proposed air source heat pumps (ASHPs) at the Tudor Inn residential development in Cimla, Neath, SA11 1JA.

Background sound levels have been measured pre-development.

A noise map model has been generated to predict worst-case noise levels with all ASHPs on the site operating simultaneously. Overall noise levels at existing off-site residential receivers are indicated to fall <20dB(A), well below the night-time background sound level. A low impact is indicated.

For on-site receivers, overall noise levels from ASHPs at neighbouring plots are also indicated to have a low impact when considering context and assessed in accordance with British Standard 4142:2014+A1:2019.

Overall noise levels from plot's own ASHPs are indicated to meet desirable levels within habitable rooms of the plots with windows partially open.

MVHR units are proposed on all plots for ventilation (which we understand are in all plots on this scheme), then a level of up to 38dB(A) outside a plot's own windows, where they may be ordinarily closed, should be considered insignificant.

## APPENDIX A - ACOUSTIC TERMINOLOGY

Human response to noise depends on a number of factors including loudness, frequency content and variations in level with time. Various frequency weightings and statistical indices have been developed in order to objectively quantify 'annoyance'.

The following units have been used in this report:

|             |                                                                                                                                                                                                               |
|-------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| dB(A)       | The sound pressure level A-weighted to correspond with the frequency response of the human ear and therefore a persons' subjective response to frequency content.                                             |
| $L_{eq}$    | The equivalent continuous sound level is a notional steady state level which over a quoted time period would have the same acoustic energy content as the actual fluctuating noise measured over that period. |
| $L_{max}$   | The highest instantaneous sound level recorded during the measurement period.                                                                                                                                 |
| $L_{10}$    | The sound level which is exceeded for 10% of the measurement period. i.e. The level exceeded for 6 minutes of a 1 hour measurement - used as a measure of background noise.                                   |
| $L_{90}$    | The sound level which is exceeded for 90% of the measurement period. i.e. The level exceeded for 54 minutes of a 1 hour measurement - used as a measure of background noise.                                  |
| $L_{Ar,Tr}$ | The 'rating' level, as described in BS 4142:2014 – the specific noise plus any adjustment for the characteristic features of the noise.                                                                       |
| SSR         | Sound sensitive receiver                                                                                                                                                                                      |

## APPENDIX B – DIAGRAMS, GRAPHS AND TABLES

Figure B.1 – Approximate Weather History for Wednesday, 30 April 2025

**April 30, 2025**

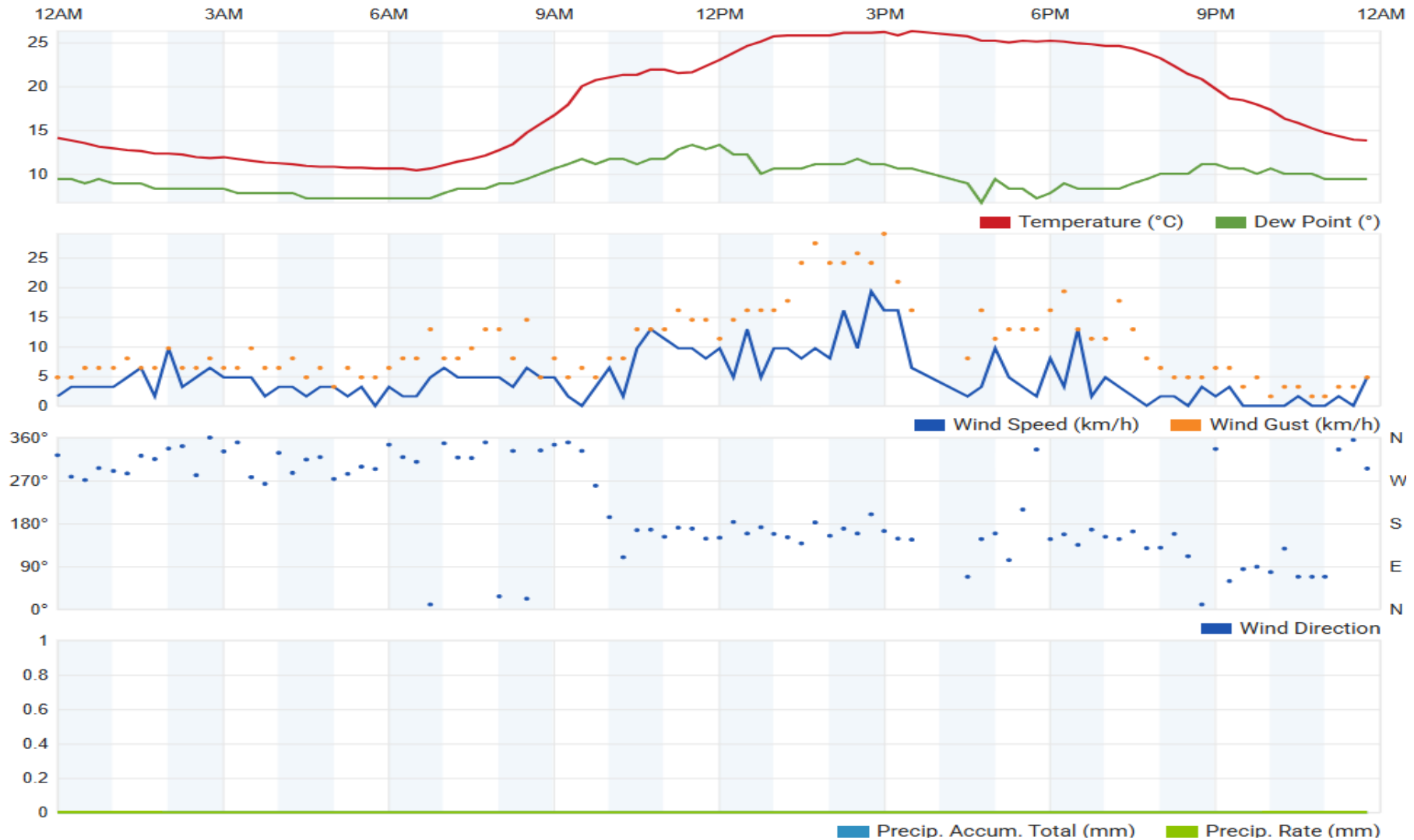


Figure B.2 – Approximate Weather History for Thursday, 01 May 2025

**May 1, 2025**

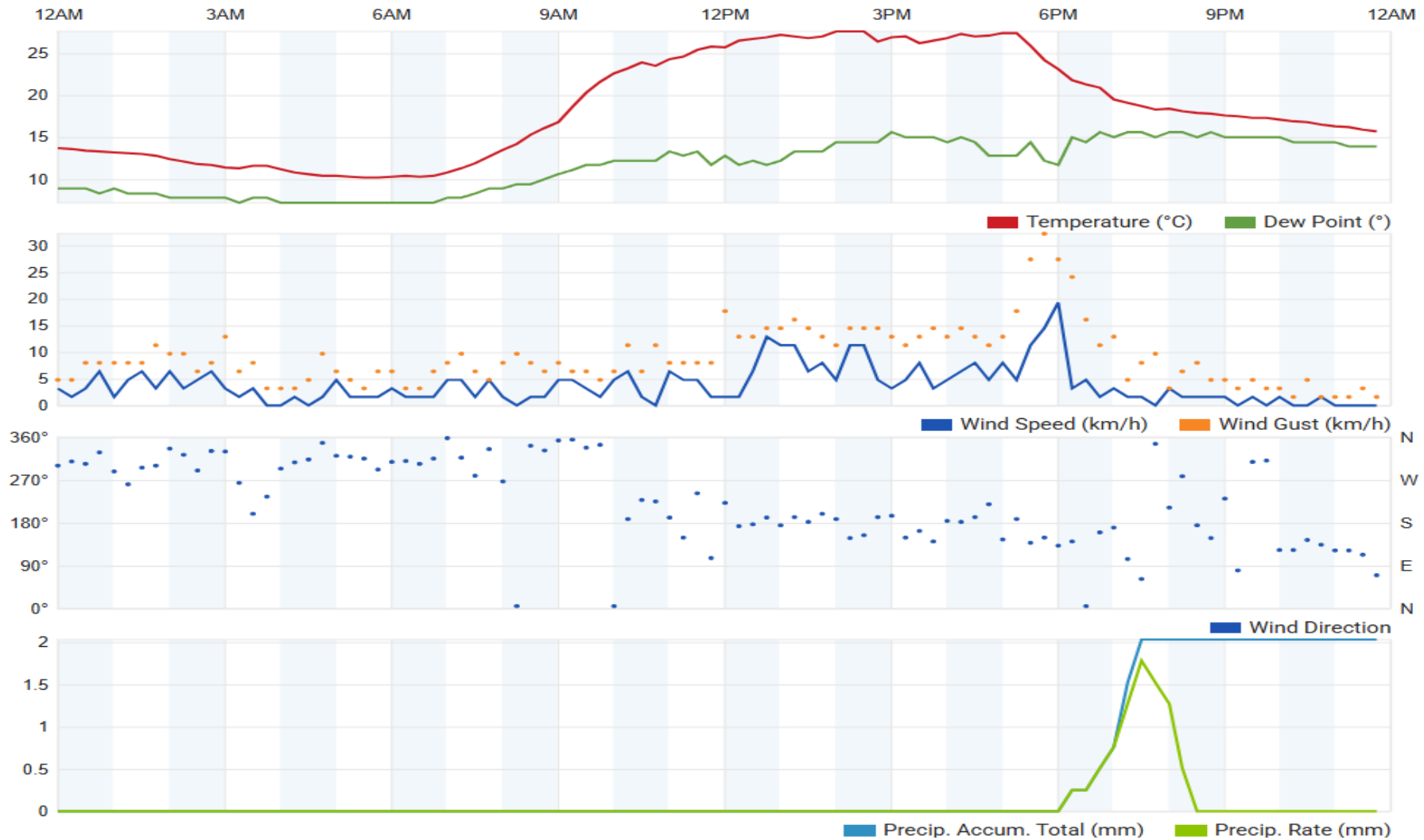
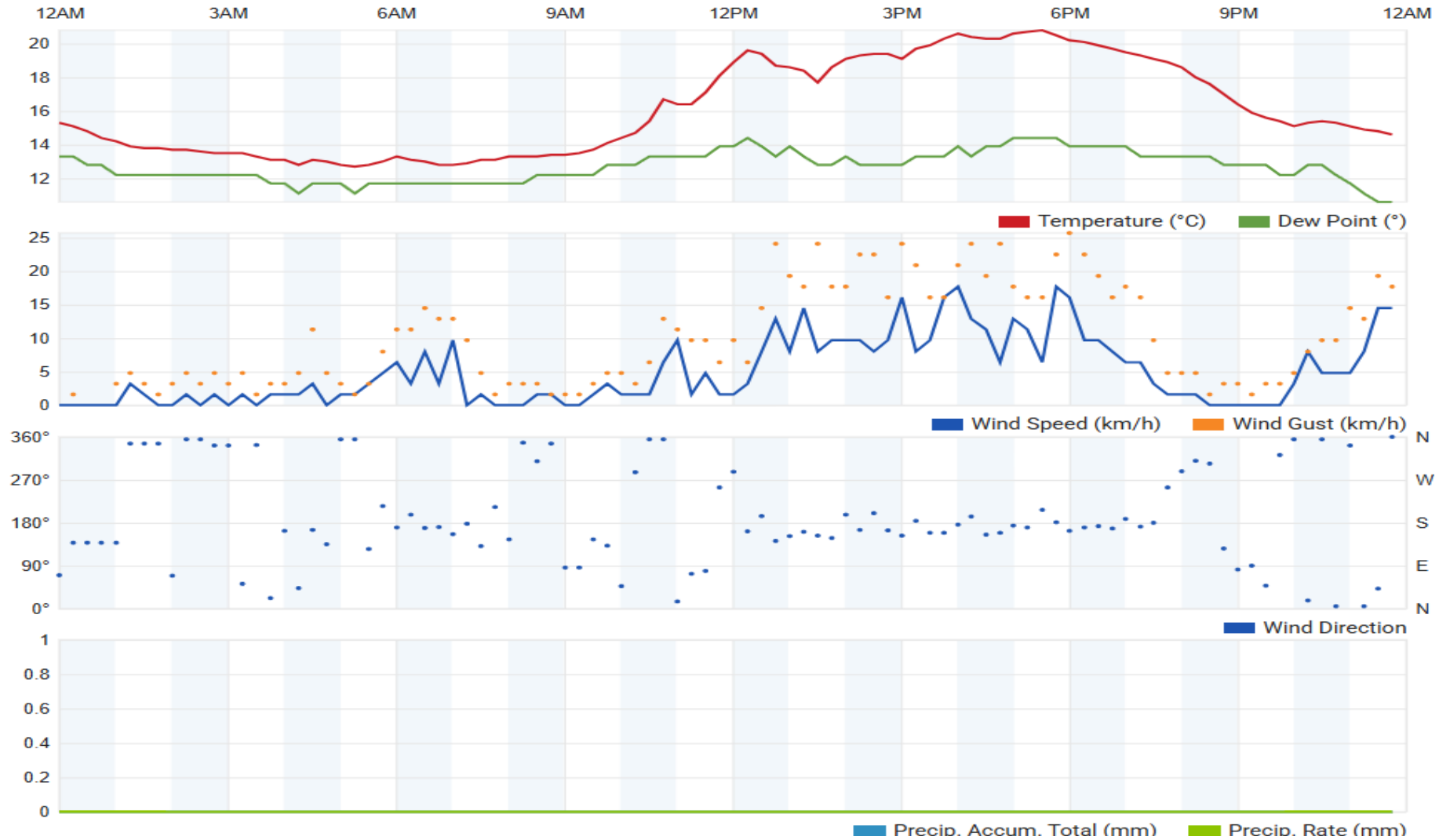


Figure B.3 – Approximate Weather History for Friday, 02 May 2025

May 2, 2025



Note: Taken from [www.wunderground.com](http://www.wunderground.com) - **Weather Station ID: ISOUTHWA2** **Station Name: Briton Ferry**

**Latitude / Longitude:** 51.642° N, 3.818° W **Elevation:** 8 **City:** Briton Ferry

Figure B.4 – Time History at Position A (Wednesday, 30 April 2025 to Friday, 02 May 2025)

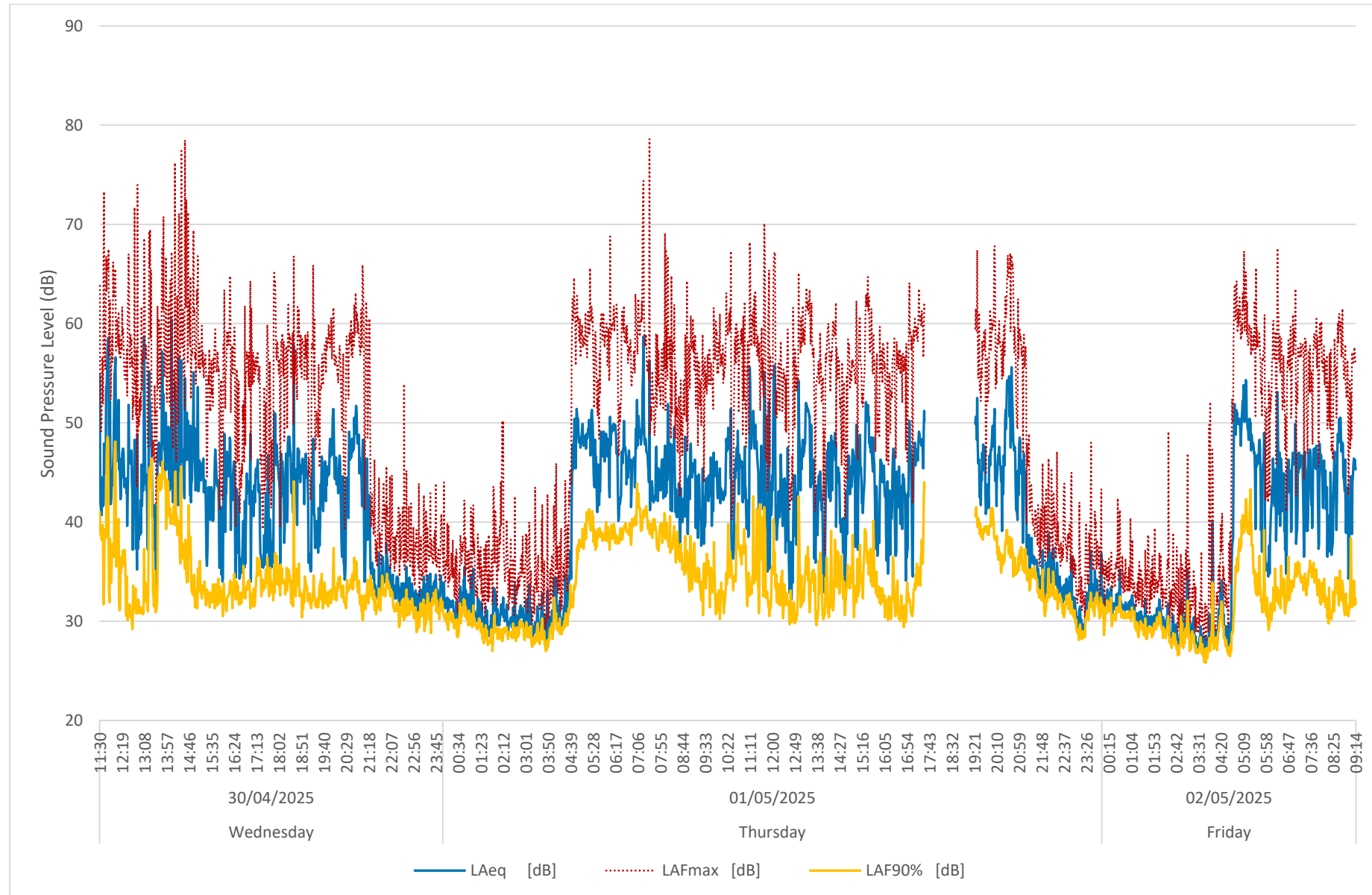
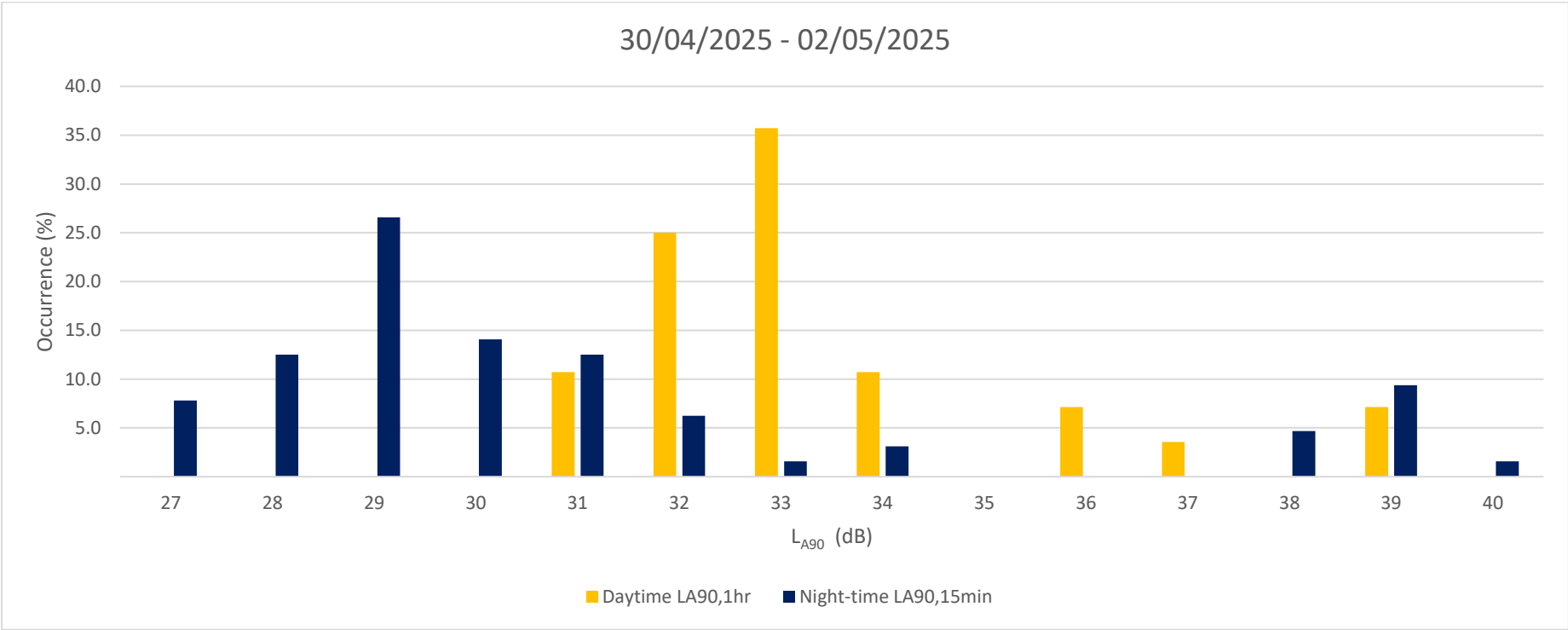


Figure B.5 – Statistical Analysis of Background Sound Levels Measured at Position B



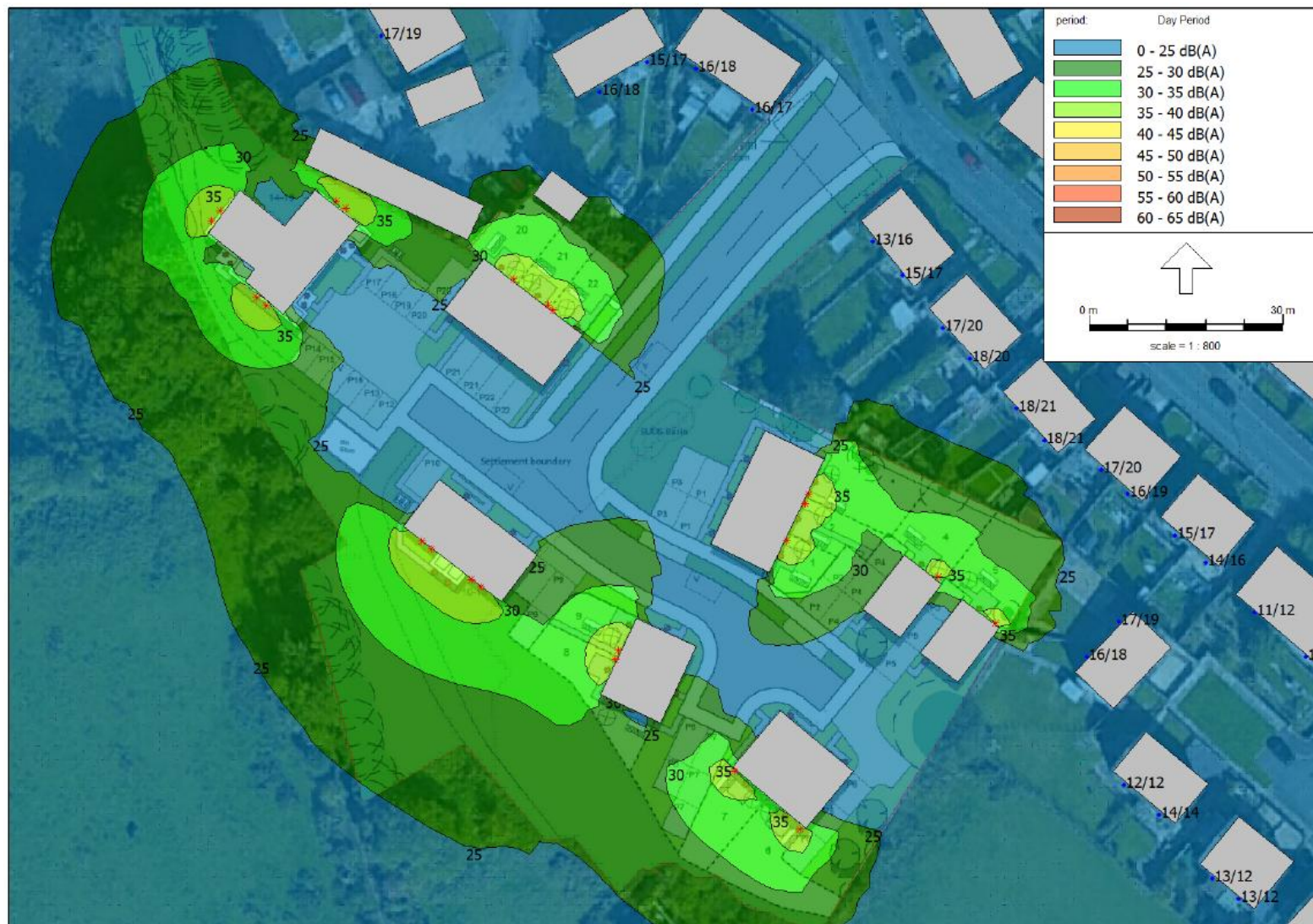


**Table C.1 – Predicted  $L_{Aeq,T}$  Levels from ASHPs at Bedroom Windows**

| Plot No. | Room      | Height (m) | Overall Level $L_{Aeq}$ (dB) | Level without own ASHP $L_{Aeq}$ (dB) | Own ASHP Only $L_{Aeq}$ (dB) |
|----------|-----------|------------|------------------------------|---------------------------------------|------------------------------|
| 01       | Bedroom 2 | 4.5        | 33                           | 30                                    | 31                           |
| 02       | Bedroom 2 | 4.5        | 34                           | 31                                    | 32                           |
| 03       | Bedroom 2 | 4.5        | 33                           | 28                                    | 32                           |
| 04       | Bedroom 1 | 4.5        | 33                           | 24                                    | 33                           |
| 05       | Bedroom 1 | 4.5        | 33                           | 21                                    | 33                           |
| 06       | Bedroom 3 | 4.5        | 35                           | 24                                    | 34                           |
| 07       | Bedroom 3 | 4.5        | 35                           | 24                                    | 34                           |
| 08       | Bedroom 2 | 4.5        | 33                           | 30                                    | 30                           |
| 09       | Bedroom 2 | 4.5        | 22                           | 19                                    | 19                           |
| 10       | Bedroom 1 | 1.5        | 19                           | 11                                    | 15                           |
| 11       | Bedroom 1 | 4.5        | 19                           | <10                                   | 17                           |
| 12       | Bedroom 1 | 1.5        | 19                           | <10                                   | 17                           |
| 13       | Bedroom 1 | 4.5        | 19                           | <10                                   | 17                           |
| 14       | Bedroom 1 | 1.5        | 39                           | 33                                    | 38                           |
| 15       | Lounge    | 1.5        | 38                           | 32                                    | 37                           |
| 16       | Bedroom 1 | 1.5        | 23                           | 17                                    | 21                           |
| 17       | Bedroom 1 | 4.5        | 35                           | 32                                    | 32                           |
| 18       | Lounge    | 4.5        | 34                           | 32                                    | 30                           |
| 19       | Bedroom 1 | 4.5        | 21                           | 19                                    | 16                           |
| 20       | Bedroom 2 | 4.5        | 33                           | 30                                    | 30                           |
| 21       | Bedroom 2 | 4.5        | 34                           | 29                                    | 32                           |
| 22       | Bedroom 2 | 4.5        | 21                           | 18                                    | 17                           |

## APPENDIX D – DRAWING LISTS

The following Spring Design drawings and documents have been used in our assessment:

**Table D.1 – Drawing List**

| Drawing Number    | Rev | Date       | Drawing Title           |
|-------------------|-----|------------|-------------------------|
| 2617 (03) 100     | M   | 18/12/2024 | Site Layout             |
| 2617 211 (03) 200 | B   | 24/09/2024 | HT211 Floor Plans       |
| 2617 211 (03) 300 |     | Feb 2024   | HT211 Elevations        |
| 2617 212 (03) 201 |     | Feb 2024   | HT212 Ground Floor Plan |
| 2617 212 (03) 202 |     | Feb 2024   | HT212 First Floor Plan  |
| 2617 212 (03) 301 |     | Feb 2024   | HT212 Elevations        |
| 2617 421 (03) 200 | B   | 24/09/2024 | HT421 Floor Plans       |
| 2617 421 (03) 300 | B   | Feb 2024   | HT421 Elevations        |
| 2617 422 (03) 200 | B   | 24/09/2024 | HT422 Floor Plans       |
| 2617 422 (03) 300 |     | Feb 2024   | HT422 Elevations        |
| 2617 531 (03) 200 | C   | 24/09/2024 | HT531 Floor Plans       |
| 2617 531 (03) 300 | A   | 12/08/2024 | HT531 Elevations        |
| 2617 641 (03) 200 | B   | 24/09/2024 | HT641 Floor Plans       |
| 2617 641 (03) 300 |     | Feb 2024   | HT641 Elevations        |