# ACOUSTIC DESIGN STATEMENT

Proposed three-storey extension to northeast corner of existing hotel and single upward extension. New main entrance façade, exterior cladding and dressing and new fenestration to all windows. Associated works to include internal reconfiguration and repurposing to deliver rooftop restaurant and bar, new large restaurant and bar, new reception and overflow reception, seventeen additional bedrooms together with plant rooms, luggage storage and a new sub-station.

First Inn Venue Wimbledon Ltd Holiday Inn Express

200 High Street – Colliers Wood – SW19 2BH

| Control Sheet | |
|---|---|
| Site Address: | Holiday Inn Express – 200 High Street Colliers Wood SW19 2BH |
| Report Ref: | **41999-R1** |
| Prepared by: | **Brett D Attwell BEng. (Hons) MIOA Senior Acoustic Consultant. Acoustic Experience 8 years**<br><br>**Checked by L Denson BSc (Hons) MSc MIOA Principal Acoustic Consultant. Acoustic Experience 11 years.** |
| Issue No: | **1** |

## Summary

A study of noise from and affecting a proposed development has been carried out at Holiday Inn Express, Colliers Wood, SW19 2BH. Incident sound was observed predominantly from transport sources.

The environmental noise survey data has been used to assess noise break-in to the proposed development building, using provided architectural drawings, in accordance with BS 8233:2014 and the IHG Technical Handbook (2023). The results of this assessment have been used to provide acoustic performance specifications for the building envelope.

A noise impact assessment has been carried out in line with BS 4142 methodology. Cumulative rating sound levels have been predicted at the nearest residential receptor using noise propagation software, based on manufacturer sound data within the supplied equipment schedule.

The numerical assessment in Section 4 has predicted rating levels significantly (> 10 dB) below the representative background sound level in the day and night. The assessment has indicated the likelihood of a low adverse impact, which has been supported by a contextual review of the site.

On the basis that design specifications within this report have been adopted, it follows that any significant adverse noise impacts will be avoided in the finished development as to accord with overarching planning requirements for additional hospitality at the development site and comply with IHG internal sound level criteria.

# Table of Contents

# 1 INTRODUCTION

1.1 A development has been proposed at Holiday Inn Express, Colliers Wood, SW19 2BH (hereinafter, "The Site"). A site plan indicating the development site has been provided in Appendix B.

1.2 The area surrounding The Site has been noted to be mixed commercial and residential, sited off High Street Colliers Wood (A24).

1.3 The proposal comprises *"Three storey extension to northeast corner of existing hotel and single storey upward extension. New main entrance facade, exterior cladding and dressing with new fenestration to all windows. Associated works to include internal reconfiguration and repurposing to deliver rooftop restaurant and bar, new large restaurant and bar, new reception and overflow reception, seventeen additional guest bedrooms together with plant rooms, luggage storage and a new sub station".*

1.4 This document has been prepared to inform on noise impact from the proposed development on adjacent residential receptors (and on future guests of the hotel), and offer suitable acoustic design advice, accounting for current industry guidance.

1.4.1 This document does not cover internal design recommendations, which are generally considered at the design stage.

1.5 A site-based study of environmental sound has been used to evaluate the existing acoustic environment at The Site, in the context to the proposal for new residential development (with reference to BS 8233:2014 and WHO criteria), and additional commercial noise sources (with reference to BS 4142:2014+A1:2019).

1.6 Consideration has also been given to the InterContinental Hotels Group (IHG) Technical Handbook with additional Brand Safety, Engineering & Acoustic requirements.

1.7 A Glossary of Acoustic Terms has been provided in Appendix A that may assist with the terminology used within this report.

# 2 NOISE CRITERIA

## NATIONAL PLANNING POLICY FRAMEWORK (NPPF)

2.1 The Department for Communities and Local Government introduced the National Planning Policy Framework (NPPF) in March 2012, latest revision of the NPPF dated December 2024.

2.2 The Framework replaced most planning policy, circulars and guidance including Planning Policy Guidance 24: Planning and Noise (1994). The NPPF defines the Government's planning policies for England and sets out the framework, within which local authorities must prepare their local and neighbourhood plans, reflecting the needs and priorities of their communities. The Government's stated purpose in producing the NPPF was to streamline policy, so the planning process is less restrictive, to give a more easily understood framework for delivering sustainable development.

2.3 Under the heading of "Conserving and Enhancing the Natural Environment", specific noise pollution aims are detailed in Section 15 of the NPPF. It is stated that 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 ... noise pollution..."*

2.4 Considering "Ground Conditions and Pollution" it is also stated in paragraph 198 of the NPPF that planning policies and decisions should also ensure that any new development is appropriate for its location considering the likely effects of pollution on health, living conditions, the natural environmental, sensitivity of the site and wider area and impacts that could arise from the development. The aims in doing so should:

- *"mitigate and reduce to a minimum potential adverse impacts 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."*

2.5 Planning policies and decisions should also ensure that any new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). The applicant (or 'agent of change') is required to provide suitable mitigation to avoid significant adverse effects, to avoid established businesses/facilities having unreasonable restrictions placed upon them as a result of the new permitted development.

2.6 It is stressed that the above references to noise should not be considered in isolation and that the theme, referred to as the "golden thread" of sustainability that runs through the NPPF is integral to noise. The NPPF acknowledges that there is a host of existing sources of national and international guidance which can be used, in conjunction with the Framework, to inform the production of Local Plans and decision making.

## NOISE POLICY STATEMENT FOR ENGLAND (NPSE)

2.7 The Noise Policy Statement for England (NPSE) was published in March 2010. It sets out the long-term vision of government noise policy, which is fundamentally to: "Promote good health and good quality of life through the effective management and control of noise within the context of Government policy on sustainable development". The vision is supported by three key aims:

- Avoid significant adverse impacts on health and quality of life;
- Mitigate and reduce to a minimum, other adverse impacts on health; and
- Where possible, contribute to the improvement of health and quality of life.

2.8 The NPSE should apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise but does not apply to noise in the workplace. The NPSE adopts the following concepts, to help consider whether noise is likely to have "significant adverse" or "adverse" effects on health and quality of life:

**SOAEL** – Significant Observed Adverse Effect Level.

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

**LOAEL** – Lowest Observed Adverse Effect Level.

This is the level above which adverse effects on health and quality of life can be detected.

**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.

2.9 The NPSE emphasises that:

*"It is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. It is acknowledged that further research is required to increase our understanding of what may constitute a significant adverse impact on health and quality of life from noise. However, not having specific SOAEL values in the NPSE provides the necessary policy flexibility until further evidence and suitable guidance is available (Defra, 2010)."*

## NATIONAL PLANNING PRACTICE GUIDANCE (PPG)

2.10 Revised Planning Practice Guidance was released in March 2014 to support the NPPF and last updated in July 2019. The Guidance stipulates that Local Planning Authorities' plan making and decision making should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or likely to occur; and
- Whether or not a good standard of amenity can be achieved.

2.11 The table below is in the Guidance to assist recognising "when noise could be a concern".

| Perception | Examples of Outcomes | Increasing Effect Level | Action |
|---|---|---|---|
| Unnoticeable | No Effect | NOEL | 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 | |
| | | 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 sleep disturbance. Affects acoustic character of the area and creates a perceived change in quality of life. | Observed Adverse Effect | Mitigate and reduce to a minimum |
| | | 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 disruptive | 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 – Planning Practice Guidance to Support National Planning Policy Framework.**

## BS 8233:2014 GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

2.12 BS 8233:2014 provides guidance on suitable internal noise levels for residential dwellings. The assessment should assume that the ventilation strategy is providing the required background ventilation rate (i.e. trickle vents open or mechanical ventilation operating). The requirements of BS 8233:214 are outlined in Table 2 below.

| Activity | Location | Daytime 07:00 – 23:00 | Night-time 23:00 – 07:00 |
|---|---|---|---|
| Resting | Living room | 35 dB $L_{Aeq,\ 16\ h}$ | - |
| Sleeping (daytime resting) | Bedroom | 35 dB $L_{Aeq,\ 16\ h}$ | 30 dB $L_{Aeq,\ 8\ h}$<br>45 dB $L_{Amax(F)}$ * |

*BS8233:2014 does not provide guidance on maximum noise events. This criterion is taken from WHO Guidelines for Community Noise 1999. Maximum noise events in bedrooms should not exceed 45dB $L_{AFmax}$ more than 15 times per night-time from sources other than emergency sirens.

**Table 2 – BS 8233 Internal Noise Level Guidelines**

2.13 BS 8233:2014 also provides design criteria for noise in external areas used for amenity spaces such as gardens and patios stating a desirable external level not exceeding 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments.

2.14 BS8233 recognises that *"these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations, or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited."*

## APPROVED DOCUMENT E 2003 (ADE 2003) PERFORMANCE STANDARDS

2.15 Approved Document E (2003 Edition incorporating 2004, 2010, 2013 & 2015 amendments) deals with the following requirements of Part E of Schedule 1 to the Building Regulations 2010:

- E1 Protection against sound from other parts of the building and adjoining buildings.
- E2 Protection against sound within a dwelling-house etc.
- E3 Reverberation in the common internal parts of buildings containing flats or rooms for residential purposes.

2.16 The performance standards for walls, floors and stairs that have a separating function relevant to this project are summarised from ADE Table 0.1a.

| Build Description | Element | Airborne Sound Insulation $D_{nT,w} + C_{tr}$ dB (Minimum values) | Impact sound insulation $L'_{nT,w}$ dB (Maximum values) |
|---|---|---|---|
| | | Material Change of Use | Purpose Built |
| Dwelling-houses and flats | Walls | 43 | - |
| | Floors and stairs | 43 | 64 |

**Table 3 – Performance standards: purpose-built dwelling-houses and flats.**

## BS 4142:2014+A1:2019 METHODS FOR RATING AND ASSESSING INDUSTRIAL AND COMMERCIAL SOUND

2.17 The British Standard BS 4142:2014 +A1:2019 "Methods for Rating and Assessing Industrial and Commercial Sound" describes methods for rating and assessing sound of an industrial or commercial nature. The scope of the standard includes relevant topics for commercial development, such as sound from fixed installations (mechanical and electrical plant and equipment). The standard is applicable to the determination of rating levels for sources of sound as well as ambient, background and residual levels. The Standard was amended in June 2019.

2.18 Certain acoustic features can increase the significance of impact that might be expected from a comparison of the specific sound level to the background sound level where these features are likely to affect perception and response. Where such features are present at the assessment location, a character correction (or penalty) to the specific sound level is made to obtain the rating level. This can be approached from subjective, objective and reference methods.

+ Tonality: A correction of 0 dB to + 6 dB for sound ranging from not tonal to prominently tonal.

+ Impulsivity: A correction of up to + 9 dB can be applied for sound that is impulsive.

+ Intermittency: A penalty of + 3 dB can be applied if on/off conditions are readily distinctive within the reference time interval over the period of the greatest amount of on-time.

+ Other characteristics: A penalty of + 3 dB can be applied in the absence of all other defined characteristics, where the specific sound contains a distinctive feature in the residual acoustic environment.

2.19 Character corrections are normally added arithmetically where more than one feature is present, however, if any single feature is dominant to the exclusion of others, then it may be appropriate to reduce the correction or apply a zero correction for the minor characteristics. The rating sound level is equal to the specific sound level if there are no acoustic features present or expected to be present.

2.20 The significance of sound depends upon both the margin by which the rating level exceeds the background sound level and the context in which the sound occurs. An initial estimate of the

impact of the specific sound is made by subtracting the measured background sound level from the rating level. The context of the development is important in assessing the impact.

- Typically, the greater this difference, the greater the magnitude of the impact.
- 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.
- 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 significant adverse impact. Where the rating level does exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context.

2.21 The scope of the Standard recognises that human response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact can depend on various factors such as the exceedance to the background level, its absolute level, time of day and change in environment, as well as local attitudes to the source of sound and character of the neighbourhood.

## BS 6472-1:2018 'GUIDE TO EVALUATION OF HUMAN EXPOSURE TO VIBRATION IN BUILDINGS

2.22 The British Standard BS 6472-1:2018 provides vibration dose values (VDV) above which adverse comment is likely to occur in residential properties from intermittent vibration.

2.23 The table below shows VDV ranges which are likely to result in different probabilities of adverse comment within residential buildings.

| Period | Low probability of adverse comment $m/s^{1.75}$ | Adverse comment possible $m/s^{1.75}$ | Adverse comment probable $m/s^{1.75}$ |
|---|---|---|---|
| Residential buildings 16 h day | 0.2 – 0.4 | 0.4 – 0.8 | 0.8 – 1.6 |
| Residential buildings 8 h night | 0.1 – 0.2 | 0.2 – 0.4 | 0.4 – 0.8 |

**Table 4 - Vibration dose value ranges which might result in various probabilities of adverse comment within residential buildings.**

## IHG DESIGN GUIDE CRITERIA (2023)

2.24 InterContinental Hotels Group provide a Technical Handbook, detailing Brand Safety and Engineering requirements for all their sites. The latest revision of the handbook is the November 2023 addition.

2.25 The IHG Handbook (2023) includes acoustic specifications and design criteria to be achieved at all new development sites, primarily concerning

- Internal noise levels from external sources;
- Internal noise levels from building services equipment;
- Sound insulation between rooms;
- Reverberation in public areas.

The assessment in this document does not include sound insulation and reverberation times in rooms – these details are to be considered at the design stage.

| Application | External noise intrusion levels to be achieved | Comments / Notes |
|---|---|---|
| Reception / Lobby | 50 dB $L_{Aeq}$ | - |
| Atrium | 50 dB $L_{Aeq}$ | - |
| Lobby bar | 45 dB $L_{Aeq}$ | - |
| All day dining | 45 dB $L_{Aeq}$ | - |
| Fine dining | 40 dB $L_{Aeq}$ | - |
| Meeting rooms | 35 dB $L_{Aeq}$<br>40 dB $L_{Aeq}$ | 20 – 100 person meeting room<br>100 + meeting room |
| Guestrooms | 35 dB $L_{Aeq, 1\ hour}$ | Daytime (07:00-23:00hrs) |
| | 30 dB $L_{Aeq, 1\ hour}$ | Night-time (23:00-07:00hrs) |
| | 45 dB $L_{AF, MAX}$ | Excluding infrequent & irregular sources such as sirens or car alarms |
| Retail space | 50 dB $L_{Aeq}$ | - |
| Gym / fitness | 45 dB $L_{Aeq}$ | - |
| Spa / relaxation | 35 dB $L_{Aeq}$ | - |
| Heart of House | 45 dB $L_{Aeq}$ | Includes offices |

**Table 5 – IHG acoustic performance criteria as set out in version 2023 Technical Handbook.**

2.26 *"Noise levels resulting from air conditioning or comfort cooling systems serving guestrooms shall not exceed NR 30 Leq when operating at normally occupied design duty. These systems shall also have the opportunity to be turned to a quieter setting for operation at night."*

2.27 *"Noise levels from extract ventilation serving bathrooms shall not exceed NR 40 Leq in the bathroom."*

2.28 *"Noise from hydraulic systems serving other parts of the hotel, shall be controlled such that they do not give rise to unacceptable levels of noise in the guestrooms."*

2.29 *"The noise from lift movements and operation shall not give rise to unacceptable levels of noise in the guestrooms."*

# 3 ENVIRONMENTAL NOISE SURVEY

3.1 An environmental noise survey has been undertaken between 17th – 20th January 2025 to determine sound levels at the proposed development site.

3.2 The measured sound levels have been summarised in Table 6 below, with full noise survey details provided in Appendix D.

| Position | Time | Period | Metric | Sound Pressure Levels, dB re. 20µPa | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| | | | | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | dBA |
| **1** Southeast Facing Elevation | Day | 07:00-23:00 | dB $L_{eq, 16hr}$ | 65 | 62 | 60 | 64 | 63 | 56 | **68** |
| | Night | 23:00 - 07:00 | dB $L_{eq, 8hr}$ | 60 | 59 | 57 | 60 | 58 | 51 | **64** |
| | | | dB $L_{max(F)}$* | 61 | 61 | 61 | 76 | 80 | 71 | **82** |
| **2** Northeast Facing Elevations | Day | 07:00 - 23:00 | dB $L_{eq, 16hr}$ | 62 | 61 | 59 | 60 | 60 | 51 | **65** |
| | Night | 23:00 - 07:00 | dB $L_{eq, 8hr}$ | 58 | 58 | 58 | 58 | 57 | 48 | **62** |
| | | | dB $L_{max(F)}$* | 81 | 82 | 79 | 75 | 70 | 59 | **81** |

** Value exceeded 10 times during entire night-time period, following latest industry guidance[1].*

**Table 6 – Average free-field sound pressure levels (Positions 1 and 2).**

3.3 In addition to assessing the 16-hour (daytime) and 8-hour (night-time) averages, it has also been necessary to consider the worst-case 1-hour scenario, in compliance with IHG Technical Handbook (v2021). The highest 1-hour measurement result has been presented below.

| Highest measured 1-hour sound levels at either measurement position | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| Time | Period | Metric | Sound Pressure Levels, dB re. 20µPa | | | | | | |
| | | | 125 Hz | 250 Hz | 500 Hz | 1 kHz | 2 kHz | 4 kHz | dBA |
| Day | 07:00-23:00 | dB $L_{eq, 1hr}$ | 65 | 63 | 60 | 68 | 69 | 60 | **74** |
| Night | 23:00 - 07:00 | dB $L_{eq, 1hr}$ | 66 | 64 | 63 | 62 | 63 | 58 | **68** |

**Table 7 – Highest measured 1-hour free-field sound pressure levels (for IHG Criteria).**

3.4 The resultant 1-hour values are notable 6 dB above the daytime average sound levels and 4 dB above the night-time average.

[1] Paxton, B. Conlan, N et al. Assessing $L_{max}$ for residential developments: the AVO guide approach. Proceedings of the Institute of Acoustics. Volume 41, Part 1, 2019.

## BACKGROUND AND RESIDUAL SOUND LEVELS

3.5 The dominant sound source at the front of The Site was road traffic noise along Highstreet Colliers Wood (A24). However, at the northeast corner of the building roof, among constant transport noise, mechanical plant noise was occasionally audible.

3.5.1 Commercial sound was observed in the form of intermittent mechanical plant noise associated with the existing hotel. The source of this noise was identified as 3no. *Mitsubishi City Multi* A/C units located on the existing hotel roof, approximately 17 m west of Position 1.

3.5.2 It is understood that these units would be replaced by newer plant items as part of the development proposals.

3.6 In accordance with BS 4142:2014 +A1:2019, it is also necessary to estimate the typical residual and background sound levels; where in this case, contributions from the units make up the existing residual sound environment.

3.7 In line with Section 8.1.4 of BS 4142, the monitoring duration should reflect the range of sound levels for the period assessed. In practice, there is no single level for background or residual sound as these are fluctuating parameters, although a representative value of the period should be used. Note that this is not either the lowest or mean average values of dB $L_{A90,\ 15min}$ / $L_{Aeq,\ 15min}$.

| Background Sound Level | | | | |
|---|---|---|---|---|
| Measurement Data | | | Free Field Sound Pressure Level, dB $L_{A90,\ T}$ re. 20µPa | |
| Position | Period | Time HH:MM | Range | Representative |
| 1 | Day | 07:00 – 23:00 | 54 – 65 | **60** |
| | Night | 23:00 – 07:00 | 50 – 61 | **53** |
| 2 | Day | 07:00 – 23:00 | 56 – 63 | **60** |
| | Night | 23:00 – 07:00 | 51 – 61 | **59** |

**Table 8 – Background sound level summary, dB $L_{A90,\ T}$.**

| Residual Sound Level | | | | |
|---|---|---|---|---|
| Measurement Data | | | Free Field Sound Pressure Level, dB $L_{Aeq\ T}$ re. 20µPa | |
| Position | Period | Time HH:MM | Range | Representative* |
| 1 | Day | 07:00 – 23:00 | 63 – 77 | **66** |
| | Night | 23:00 – 07:00 | 58 – 72 | **61** |
| 2 | Day | 07:00 – 23:00 | 61 – 73 | **63** |
| | Night | 23:00 – 07:00 | 57 – 67 | **62** |

** Representative values of residual have been noted at times of representative background sound.*

**Table 9 – Residual sound level summary, dB $L_{Aeq,\ T}$.**

# 4 NEW BUILDING SERVICES PLANT – NOISE IMPACT ASSESSMENT

4.1 Concern has also been noted to the potential noise impact from new plant associated with the development.

4.2 The recognised methodology for assessment has been taken from BS 4142:2014+A1:2019 *Methods for rating and assessing industrial and commercial sound* which includes consideration of sound from fixed plant installations. The numerical assessment has been provided below for relevant periods of proposed operation, following the definition of specific sound levels.

4.3 The proposed development would comprise a substation at ground floor level, a first-floor plant room and various changes and additions to plant at roof level, as shown in Appendix C, Figures C4 and C8.

4.4 Details of the proposed plant have been specified in the tables below:

| Ref: | Description: | Location: | Type: | Sound pressure level at 1m, dBA | |
|---|---|---|---|---|---|
| HP 001 | Bedrooms VRF - System 1 (RF) ROOF Plant Compound - Air Source Heat Pump Unit (Replacements) | Roof plant compound | MITSUBISHI Electric Air Conditioning VRF HR HIGH COP / Model: PURY-P250YNW-A1 | 61 | |
| HP 002 | | | | | |
| HP 003 | | | | | |
| HP 004 | Bedrooms VRF - System 4 (RF) ROOF Plant Compound - Air Source Heat Pump Unit | | | | |
| HP 005 | | | | | |
| HP 006 | ASHP for Hot Water Pre-Heat | | MITSUBISHI Heavy Industries Model: Q-Ton-ESA30E-25 | 58 | |
| HP 007 | ASHP for Hot Water Pre-Heat | 1F Roof plant compound | | | |
| HP 008 | Bedrooms VRF - System 5 (RF) ROOF Plant Compound - Air Source Heat Pump Unit | 1F Roof plant compound | MITSUBISHI Electric Air Conditioning VRF HR HIGH COP / Model: PURY-P250YNW-A1 | 61 | |
| HP AHU | Roof mounted AHU for meeting room top floor | Roof Plant compound | VES Air Handling Unit | Inlet | Outlet |
| | | | | 58 | 68 |

**Table 10 – Summary of proposed plant and relevant sound data.**

4.5 Manufacturer sound pressure level data has been taken from the ventilation equipment schedule (shown in Table C1 and C2 in Appendix C), sourced from manufacturer specification sheets.

Substation

4.6 The development would also include the erection of a substation within a first-floor compound as shown in Appendix C.

4.6.1 The proposed substation enclosure would likely comprise a solid composite construction with louvered vents where required. A conservative 10 dB insertion loss provided by the enclosure has been assumed in this assessment, in lieu of a more rigorous calculation of enclosure break-out. It has been assumed that the enclosure would likely mitigate any acoustically distinguishing characteristics of the substation sound emissions, including as any low frequency components which may be generated (such as low, electrical "hum").

4.6.2 In the absence of specific source data for the substation, **a sound power level of 61 dB(A)** has been used in this assessment, based upon Wilson Power Solutions data sheet for a substation of a 1,500 kVA transformer rating. The data sheet has been provided in Appendix C, Figure C11.

4.6.3 The substation has been modelled as a building with noise radiating walls and roof.

## CALCULATION OF SPECIFIC SOUND LEVELS / NOISE MODEL DETAILS

4.7 To understand a specific sound level for the purposes of assessment, it has been necessary to make some level of assumption to the proposed usage times of equipment.

4.7.1 To inform a robust assessment, it has been assumed that all items could operate continuously and coherently throughout the daytime and night-time assessment period.

4.8 Specific sound level calculations have been undertaken using IMMI™ v2023 prediction software. Calculations for mechanical plant emissions have been made in accordance with ISO 9613, describing an industry standard method for environmental noise prediction as applicable to commercial operations.

4.9 It has been noted that the accuracy of a noise model is dependent on the software user to generate both valid and representative results, accounting for proposed topography and form.

4.10 The following, general modelling assumptions have been made when reviewing the sound level emission from existing and proposed noise generating units at the NNSRs:

- Sound power levels have been derived from manufacturer source data, (as outlined in the equipment schedule) with no corrections for on-time.
- Site geometry and proposed development plans has been taken from architectural scheme drawings presented in Appendix C, calibrated to online satellite mapping.
- Surface attenuation factors have been considered, where all hard surfaces/concrete surfaces would be reflective G = 0.0.

- Receptor façade received positions have been modelled for each floor of the adjacent residential building, starting at 1.5 m AGL and increasing 3.0 m for each story.

4.11 Predicted development sound pressure levels (day and night) have been presented using graphical noise model snapshots in Appendix F.

4.12 A summary of the highest predicted sound pressure levels at the nearest noise sensitive receptors has been provided in the below table. All calculations have represented a 'realistic worst-case', based on a review of operational hours over the day and night-time assessment periods.

| Highest predicted sound pressure level ($L_P$) at NNSR, dB | |
|---|---|
| **Daytime (07:00 – 23:00)** | **Night-time (23:00 – 07:00)** |
| **37** | **37** |

**Table 11 – Summary of specific sound level predictions at worst-case NNSR**

## BS 4142 ASSESSMENT

4.13 Based on the above, the following numerical assessment has been provided in accordance with BS 4142:2014+A1:2019 to provide a comparison between the predicted development sound levels against the background sound level existing prior to development.

4.13.1 A precautionary 3 dB correction has been included within the below calculations to account for any distinctive character which could be perceived at the receptor (assuming commercial plant could be audible).

| BS 4142 assessment of proposed plant items | | | |
|---|---|---|---|
| **Result** | **Day 07:00 – 23:00** | **Night 23:00 – 07:00** | **Commentary** |
| Background sound level, dB $L_{A90,\,T}$ | 60 | 53 | Estimated as representative from histogram of background sound levels (Figure D5, Appendix D), as summarised Table 8. |
| Residual sound level, dB $L_{Aeq,\,T}$ | 66 | 61 | Estimated as representative from histogram of residual sound levels (Figure D6, Appendix D), as summarised Table 9. |
| Reference time interval | 1-hour | 15-minute | Relevant time interval for assessment period from BS 4142. |
| Specific sound level, dB $L_{Aeq,\,T}$ | 37 | 37 | |
| Acoustic feature correction, dB | +3 | +3 | Precautionary character correction for any distinctive features audible at the receptor. |

| BS 4142 assessment of proposed plant items | | | |
|---|---|---|---|
| **Result** | **Day 07:00 – 23:00** | **Night 23:00 – 07:00** | **Commentary** |
| Rating level, dB $L_{Ar,\,Tr}$ | 40 | 40 | The rating level is equal to the specific sound level plus acoustic feature corrections. |
| Excess of rating level over background sound level | **-20** | **-13** | |
| Assessment indicates likely indication of:<br><br>*depending on the context | **Low** | **Low** | 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. |
| Uncertainty of the assessment | *Low* | | See Statement of Uncertainty. |

**Table 12 – Numerical assessment in accordance with BS 4142 at nearest noise sensitive location.**

4.14 The numerical assessments in Table 12 have highlighted a low impact at the nearest noise sensitive location during periods of proposed operation, where the rating sound level is predicted to lie 10 dB or more below the representative background sound level during the day and the night.

4.15 It has been acknowledged that the assessment in Table 12 must be considered in context, following the requirements of BS 4142. The concept of "context" has been notably emphasised in Section 11 of BS 4142 when considering numerical impacts established from applying the standard.

4.16 Contextually the development would not be introducing any new types of noise source, and the proposed plant would not be out of character with the commercial operations currently occurring. The precautionary character correction should therefore be seen as an over-estimation in the context of this development.

4.17 During the worst-case daytime hour and worst-case 15-minutes in the night, predicted rating sound levels from proposed plant would be significantly below both the representative background and the residual sound level (in the region of 21 – 26 dB).

4.17.1 Where there are large differences between the residual sound level over the specific sound level, of > 10 dB(A), then it has been realised in context that the ambient sound level should not change by any perceptible degree due to the instatement of the development. Due to significant masking noise already incident on the receptors, it has been reviewed that the proposal would have a low-negligible noise impact on surrounding premises.

4.18 The consideration of context relevant to the assessed sound sources has been viewed to support the notion of a "low impact" assessment in accordance with BS 4142.

## STATEMENT OF UNCERTAINTY

4.19 Uncertainty inevitably limits the accuracy associated with all steps of any noise assessment, including measurement, calculation, or prediction. Factors include, but are not limited to:

- The inherent accuracy limitation of methodology in Standards and guidance.
- Variability in meteorological conditions.
- The accuracy of sound source input data of a calculation.

4.20 It is imperative to minimise the uncertainty to a level commensurate with the intention of the assessment objective. Measures taken in this assessment to minimise uncertainty are:

- Baseline sound levels have been measured over a reasonably long period and therefore provide a good indication of representative background and residual sound levels.
- Baseline sound level measurements were undertaken in accordance with recognised Standards, using a tall environmental windshield and were undertaken during reasonable weather conditions e.g., acceptably low wind speeds and precipitation.
- A direct measurement location was used and is considered to provide a representative basis for background noise levels at the nearest receiver locations to the development.
- Field calibration checks were undertaken before and after measurements to record very low levels of equipment drift.
- The sound source data has been provided from manufacturer's data.
- The calculations have been conservative as not to under-predict the resulting impacts.

4.21 The aforementioned measures have been considered to reduce uncertainty to a level considered not to have any significance to the outcome of this assessment.

## BUILDING SERVICES NOISE

4.22 In addition to assessing noise emissions from The Site on adjacent occupiers, the noise from the proposed building services ventilation on internal occupiers of the proposed development has been considered.

4.22.1 These details are not necessary to assess at the planning stage, but it is good practice to consider this information to inform the final scheme at the design stage.

4.23 The IHG handbook requires noise levels resulting from air conditioning or comfort cooling systems to not exceed NR 30 Leq in guestrooms (with a *"quieter setting for operation at night").*

4.24 All proposed guestrooms are scheduled to be served by *Vectaire PREM 3* heat recovery units (HR-XX), with a declared sound output of NR 20 *"Trickle"* and an NR 30 *"Boost"* function.

**4.24.1 Based on stated sound data, this equipment should readily comply with IHG requirements.**

4.25 Guestrooms are also to be supplied air conditioning via ducted *MITSUBISHI Electric* A/C units *(ACU-XX)* through a ceiling cassette system. These items have a specified output of 22 -29 dB(A), as shown in Table C2. These broadband figures suggest that the units would likely comply with the frequency-dependent IHG criteria, however a more detailed study is recommended following planning.

4.25.1 Separated inlet, discharge and breakout sound power levels for this unit have been requested, and a response is pending from the manufacturer. Once this information is available, a full CIBSE calculation procedure can be carried out by a suitably qualified acoustic consultant, who can advise on suitable mitigation (where necessary).

# 5 ACOUSTIC DESIGN PROCESS (BS 8233:2014)

## NOISE MODELLING TRANSPORTATION NOISE

5.1 Transport sound pressure level predictions have been undertaken using the IMMI™ (v2023) model, described in the previous section. Indicative noise contour map(s) for typical day and night-time periods have been shown in Appendix D, based on site-based measurement data.

- Road traffic noise sources have been modelled as line sources, with equivalent sound power levels derived from long-term survey measurements in 1/1 octave bands.
- Results have been generated as single figure components for ease of understanding.

5.2 Sound pressure levels have been calculated at each façade of the proposed development building. A summary of the wort-case sound levels at each façade has been provided below in Table 13.

| Development Building Elevation | Highest predicted sound pressure level, dB | | |
|---|---|---|---|
| | Daytime, $L_{Aeq,\ 16\ h}$ | Night-time, $L_{Aeq,\ 8\ h}$ | Night-time, $L_{Amax(F)}$ |
| Southeast Façade (GF) | 70 | 65 | 84 |
| East Façade (1F) | 66 | 61 | 79 |
| Northeast Façade (1F) | 69 | 65 | 83 |
| Northeast Meeting Room (4F) | 64 | - | - |

**Table 13 – Highest predicted sound pressure levels outside each key development building façade.**

## INTERNAL AMBEINT NOISE LEVEL CRITERIA

5.3 The review to achieve suitable internal noise level guidelines has been based upon information contained within the ANC publication, The AVO Guide[2]. This has provided an approach as to how the competing aspects of thermal and acoustic comfort can be managed and has been written to reflect the requirements of BS 8233 and IHG Handbook specifications.

5.4 The environmental noise survey has determined that the external sound level outside proposed guest rooms would be predominately transport noise, whereby the criteria with BS 8233:2014 (Table 2 above) would apply. These values are averaged over 16-daytime period and an 8-hour night-time period.

5.5 However, the IHG design criteria requires that guest rooms achieve a more rigorous standard, where the worst-case 1-hour period should achieve the criteria set out in Table 5 in Section 2.

5.6 It has been demonstrated in Table 7 and paragraph 3.4 that the worst-case measured 1-hour values are notable 6 dB above the 16-hour daytime average levels and 4 dB above the 8-hour night-time average.

5.6.1 To account for this, all daytime acoustic specifications have been provided with an additional + 6 dB buffer, and average night-time recommendations with + 4 dB (to achieve both 8233 and IHG conditions).

---

[2] Acoustics Ventilation and Overheating Residential Design Guide Version 1.1, January 2020.

5.7 Detailed noise break-in calculations have been performed in octave frequency bands in accordance with Section G2.2.1 of BS 8233:2014 (based on the method given in EN 12354-3:2000), and noise mitigation measures have been generated in accordance with the proposed plans. The octave band results have been shown in Appendix E alongside recommended façade specifications.

5.8 The following window and ventilation specifications have been recommended to achieve the required internal requirements of BS 8233 and IHG Handbook (2023), given that predicted values in Table E1 do not exceed those in Table 2 by a margin of 6 dB in the day and 4 dB during the night.

5.9 An adaptation term has been provided for all specifications following the method ISO 717-1:2013. This includes a comparison between the normalised, A-weighted sound spectrum for day and night against the adaptation curves for C and $C_{tr}$. In this instance the relevant spectrum adaptation term $C_{tr}$ has been confirmed by visual comparison. As the dominant sound sources have been identified as urban road traffic, this has also been directly relevant from Table A1 of ISO 717-1.

| Recommended window specifications based on break-in calculations (results summarised in Appendix E) | | | |
|---|---|---|---|
| **Façade component** | **Specification** | **Metric with AdaptationTerm** | **Example Configuration or Proprietary Product** |
| Guest bedrooms along Southeast façade (GF) | ≥ 40 | dB $R_w + C_{tr}$ | Double glazing, standard glass types, 4-16-4 (glass-gap-glass) + 6 mm secondary pane |
| Guest bedrooms along North/Northeast façade | ≥ 33 | dB $R_w + C_{tr}$ | Double glazing, standard glass types, 4-12-8.8 laminate (glass-gap-glass) |

**Table 14 – Minimum specifications for windows and ventilators.**

| Recommended ventilation specifications based on break-in calculations (results summarised in Appendix E) and details in Section 4 | | | |
|---|---|---|---|
| **Façade component** | **Specification** | **Metric with AdaptationTerm** | **Example Configuration or Proprietary Product** |
| All guest rooms | ≥ 49 | dB $D_{ne,w} + C_{tr}$ | Through-wall mechanical ventilator (MEV) or whole-house MVHR system |

**Table 15 – Minimum specifications for ventilators and recommendations.**

5.10 Where the total number of ventilators need to achieve a suitable Equivalent Area for the entire dwelling, each habitable room may need to contain more than one trickle ventilator or mechanical wall vent. In this instance, the performance of the ventilator will need to increase (by a factor 10 x $log_{10}$ [n], where n is the number of vents per room), as demonstrated below:

| Façade component | Quantity in Room Façade | Specification Front Façade | Metric with Adaptation Term |
|---|---|---|---|
| Ventilators (per habitable room) | 1 | ≥ 49 | dB $D_{ne,w} + C_{tr}$ |
| | 2 | ≥ 52 | |
| | 3 | ≥ 54 | |
| | 4 | ≥ 56 | |

**Table 16 – Minimum specifications for ventilators, where one or more are used per habitable room.**

5.11 To reduce inaccuracy by design, all window data referenced in this assessment have been based on ISO140 laboratory test records provided by leading manufacturers. It would be acceptable to use alternative specifications, however the minimum performance standards as specified must be met or exceeded by any alternative design approach.

5.12 The advice in this section has considered the internal ambient noise level with closed windows.

5.13 The potential for adverse effects with open windows depends upon both the internal ambient noise level and the frequency and duration of the overheating condition. There has been no known appraisal[3] to determine the latter. The AVO guide has provided that such assessment should be optional, based on the external sound levels.

5.14 With an advocated and simplistic insertion loss of 13 dB from external to internal areas with an open window, the following summary has been provided for the worst-case rear façade with both closed and open windows.

| Level 1 Risk Assessment following the AVO Guide | | | Internal ambient noise level dB re. 20 µPa | | |
|---|---|---|---|---|---|
| Location | Windows | Ventilation State | Day dB $L_{Aeq,T}$ | Night dB $L_{Aeq,T}$ | Max dB $L_{Amax(F)}$ |
| Southeast Façade | Window closed/vents open | Building ventilation | 29 | 25 | 41 |
| | Windows partially open | Overheating ventilation | 55 | 51 | 69 |
| Northeast Façade | Window closed/vents open | Building ventilation | 27 | 23 | 35 |
| | Windows partially open | Overheating ventilation | 52 | 50 | 68 |

**Table 17 – Estimated IANL in different ventilation conditions (AVO Advice).**

5.15 It has been noted from the AVO guide, that a material change in behaviour may occur with internal ambient noise levels of > 50 dB $L_{Aeq,T}$ (07:00 – 23:00) during the day, > 42 dB $L_{Aeq,T}$ or > 65 dB $L_{Amax(F)}$ (23:00 – 07:00) during the night.

5.16 Based on the simple calculations provided in Table 17, The AVO Guide's internal noise criteria would likely be exceeded; therefore, providing the initial estimation that opening windows is unlikely to be a suitable strategy for ventilation for any of the new guest rooms.

[3] CIBSE Technical Memorandum 59. Design methodology for the assessment of overheating risk in homes.

5.17 Continuous mechanical extract (MEV)) or a whole house mechanical supply and extract with heat recovery system (MVHR) should be employed (as proposed). These ventilation systems would preclude the need for opening windows in an overheating condition, minimising the risk of adverse impact from incident transport noise.

5.17.1 Manufacturer test data should be reviewed prior to installation, to ensure that all units would accord with ADF ventilation criteria and IHG requirements.

## OTHER CONSIDERATIONS

5.18 Meeting rooms and office spaces have been proposed on the fourth floor of the building, as shown in Appendix C, Figure C5.

5.19 Although these spaces do not require particular consideration under planning, the IHG Handbook (2023) specifies a target internal ambient noise level of 35 dB $L_{Aeq,\,T}$ for meeting rooms of 20 – 100-person occupancy.

5.20 Similarly, the handbook requires that meeting rooms of < 20-person occupancy shall not exceed 35 dB $L_{Aeq,\,T}$ from building services noise levels.

5.21 IMMI™ noise modelling has determined that the worst-case meeting room window would have an incident sound level of approximately 64 dB $L_{Aeq,\,T}$ (including existing plant noise), as shown in Table E1 in Appendix E. It has been inferred through calculation that internal noise level criteria can be achieved by a window system rated 30 dB $R_w + C_{tr}$, which could be accomplished via conventional double glazing with standard glass types, 4-14-6 (glass-gap-glass).

# 6 CONCLUSIONS

6.1 A study of noise from and affecting a proposed development has been carried out at Holiday Inn Express, Colliers Wood, SW19 2BH. Incident sound was observed predominantly from transport sources.

6.2 The environmental noise survey data has been used to assess noise break-in to the proposed development building, using provided architectural drawings, in accordance with BS 8233:2014 and the IHG Technical Handbook (2023). The results of this assessment have been used to provide acoustic performance specifications for the building envelope.

6.3 A noise impact assessment has been carried out in line with BS 4142 methodology. Cumulative rating sound levels have been predicted at the nearest residential receptor using noise propagation software, based on manufacturer sound data within the supplied equipment schedule.

6.4 The numerical assessment in Section 4 has predicted rating levels significantly (> 10 dB) below the representative background sound level in the day and night. The assessment has indicated the likelihood of a low adverse impact, which has been supported by a contextual review of the site.

6.5 On the basis that design specifications within this report have been adopted, it follows that any significant adverse noise impacts will be avoided in the finished development as to accord with overarching planning requirements for additional hospitality at the development site and comply with IHG internal sound level criteria.

# Appendix A: Glossary of Acoustic Terms

**'A' weighting dB(A):** Correction applied to the frequency range of a noise in order to approximate the response of the human ear. Noise measurements are often A-weighted using an electronic filter in the sound level meter.

**Attenuation:** Sound reduction, measured in decibels (dB).

**Ambient Sound:** The totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far. Note: The ambient sound comprises the residual sound and the specific sound when present.

**Background sound level:** A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

**Calibration:** A check of the function of a sound level meter by comparing the meter reading with a known sound pressure level.

**Decibel (dB):** The unit of sound level and noise exposure measurement. The range of audible sound pressures is approximately 0 dB to 140 dB.

**Frequency (Hz):** The pitch of the sound, measured in Hertz.

**LAeq,T:** The A-weighted equivalent continuous sound pressure level during a period. It is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period, T.

**Octave-bands:** A division of the frequency range into recognised bands.

**Rating level, LAr,Tr:** The specific sound level plus any adjustment for the character of the sound.

**Residual sound:** Ambient sound remaining in the absence of the specific sound or that it is supressed as not to contribute to the ambient sound level.

**Residual sound level, Lr or Leq,T:** The equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given reference time interval, T.

**Sound pressure level (SPL):** The basic measure of sound, expressed in decibels, usually measured with an appropriate frequency weighting (e.g. the A-weighted SPL in dB(A)).

**Sound power level (Lw):** The sound energy radiated per unit time by a sound source measured in watts (W). Sound power can be weighted (e.g. A-weighted) and is not influenced by environmental or physical factors such as weather or distance.

**Specific sound:** Sound source being assessed.

**Specific sound level, Ls or Leq,T:** The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval, T.

## Appendix B: Annotated Site Location Plan

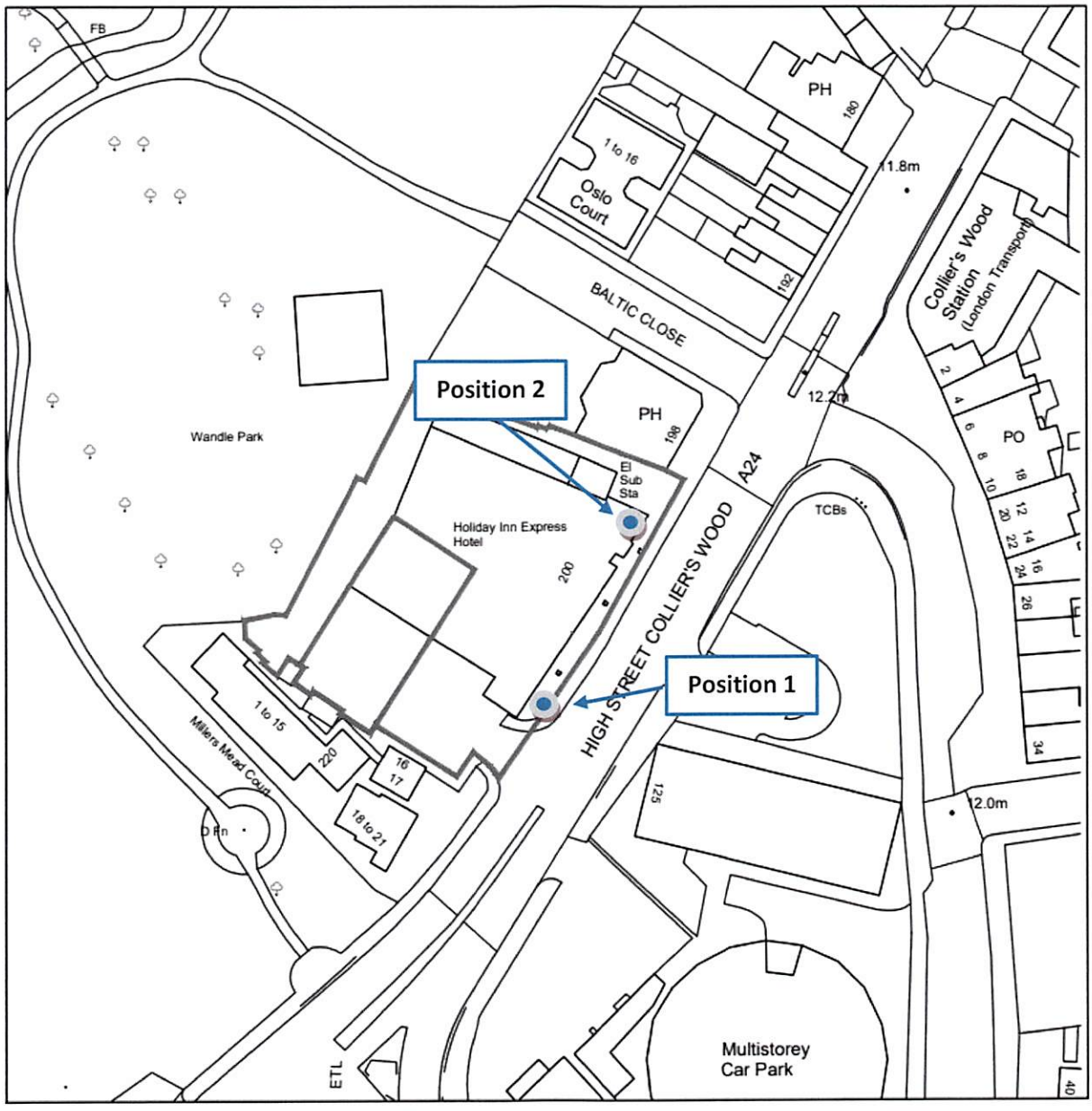



**Figure B1 – Location plan annotated for measurement positions.**

**Figure B2 – Existing ground floor plan.**

**Figure B3 – Existing first floor plan.**

Figure B4 – Existing second floor plan.

Figure B4 – Existing third floor plan.

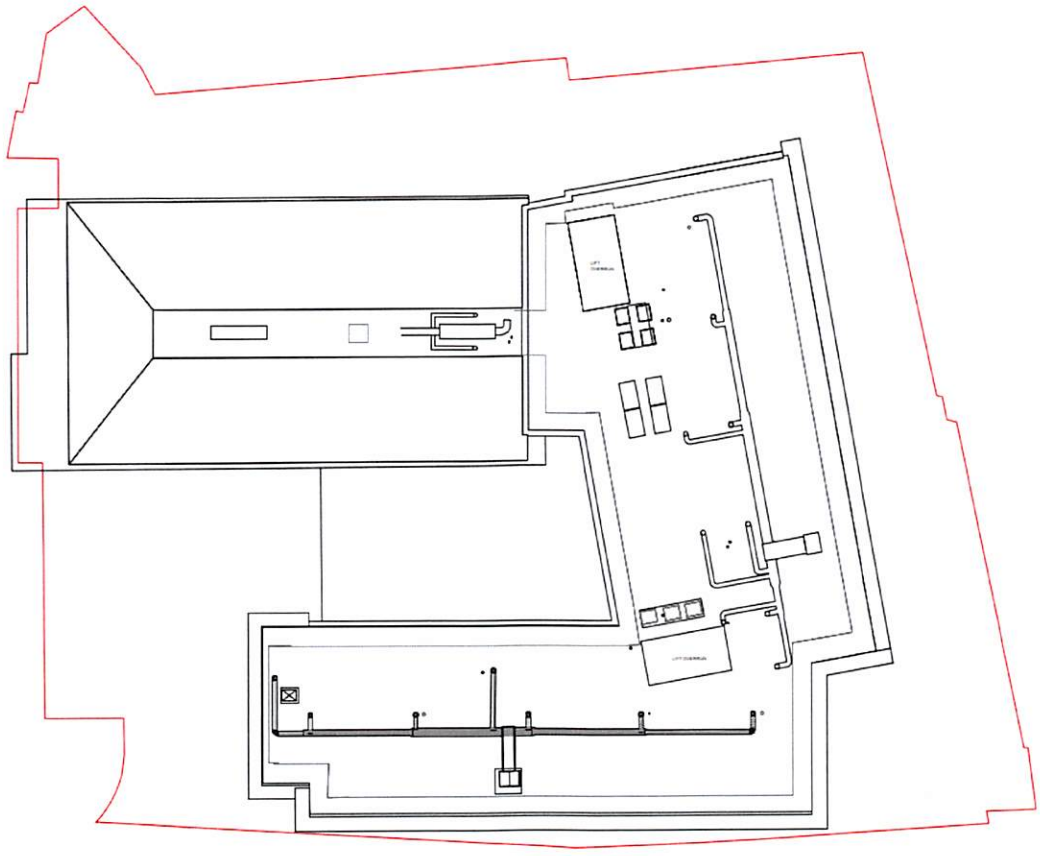


**Figure B4 – Existing roof plan.**

# Appendix C: Scheme Design

Figure C1 – Proposed ground floor plan.

Figure C2 – Proposed ground floor M&E Plan.

**Figure C3 – Proposed first floor plan.**

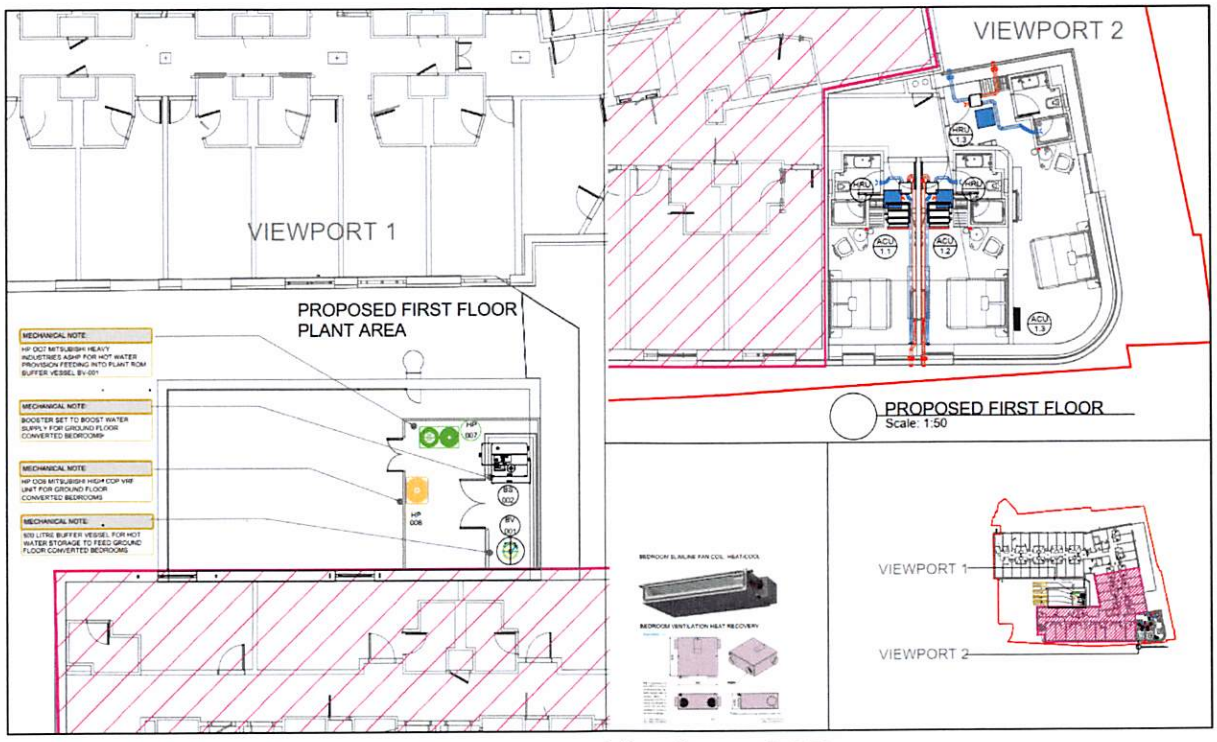



**Figure C4 – Proposed first floor M&E Plan.**

**Figure C5 – Proposed second floor plan.**

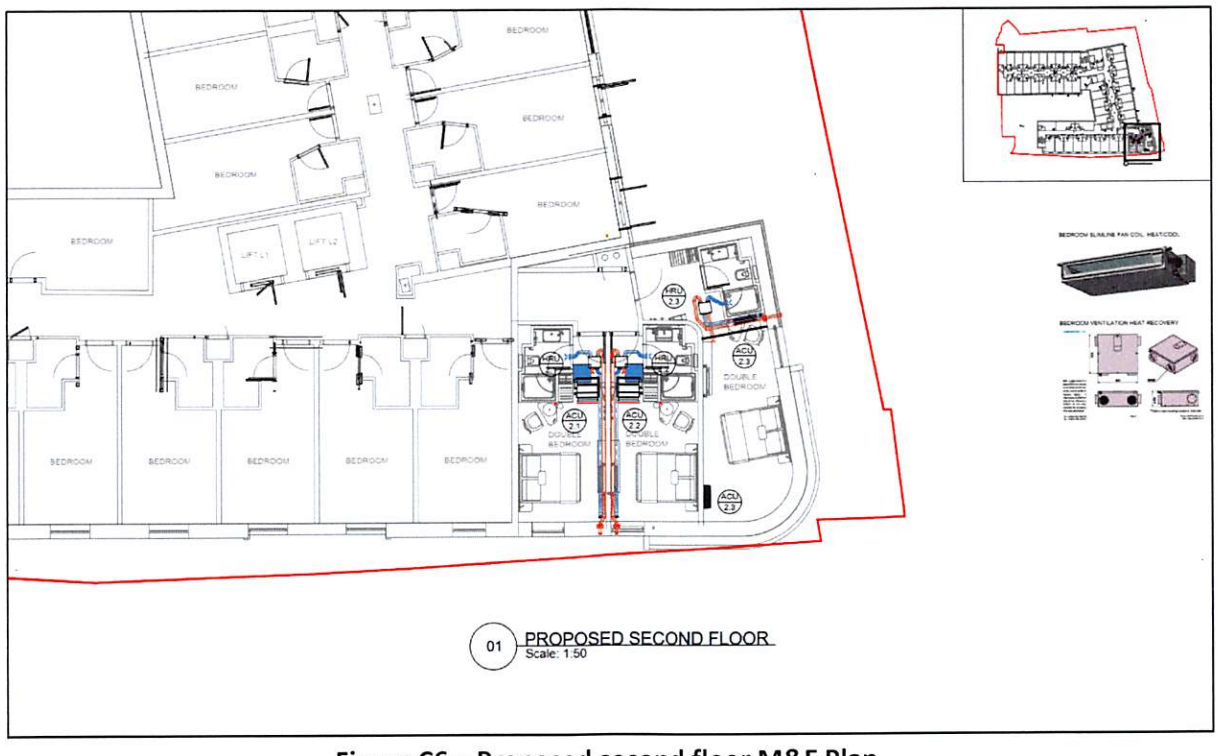



**Figure C6 – Proposed second floor M&E Plan.**

**Figure C7 – Proposed third floor plan.**

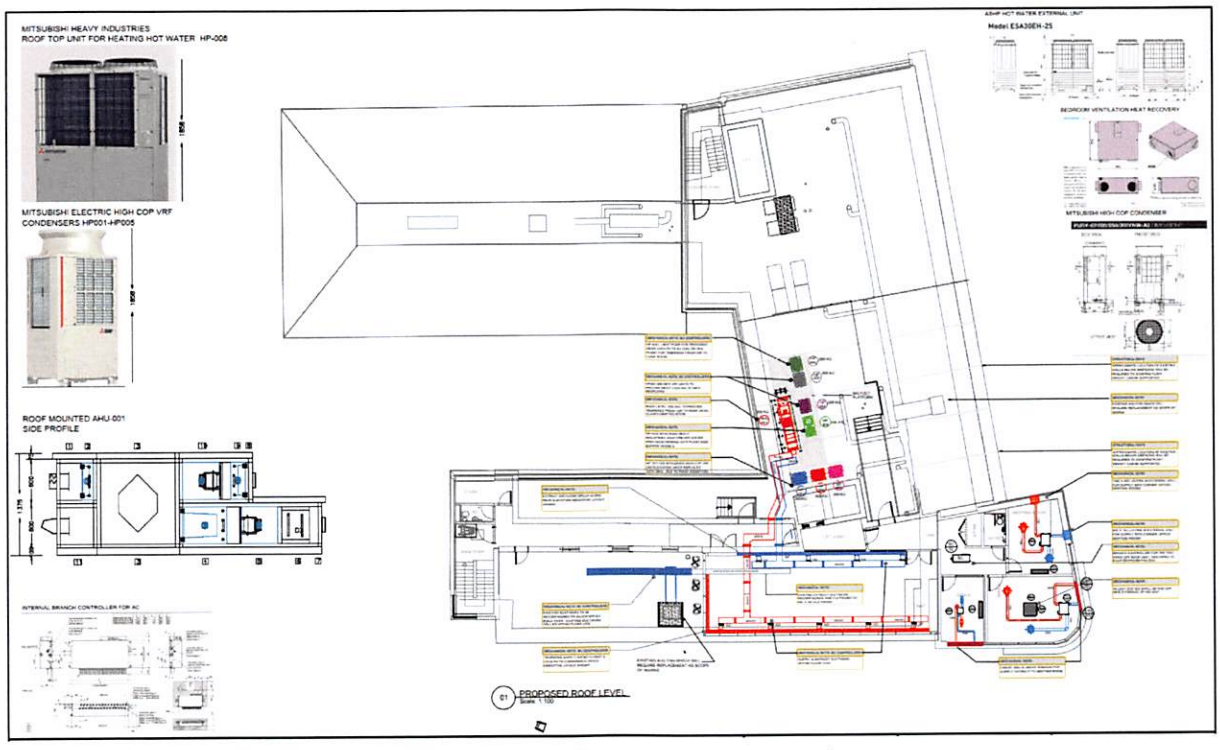



**Figure C8 – Proposed third floor M&E Plan.**

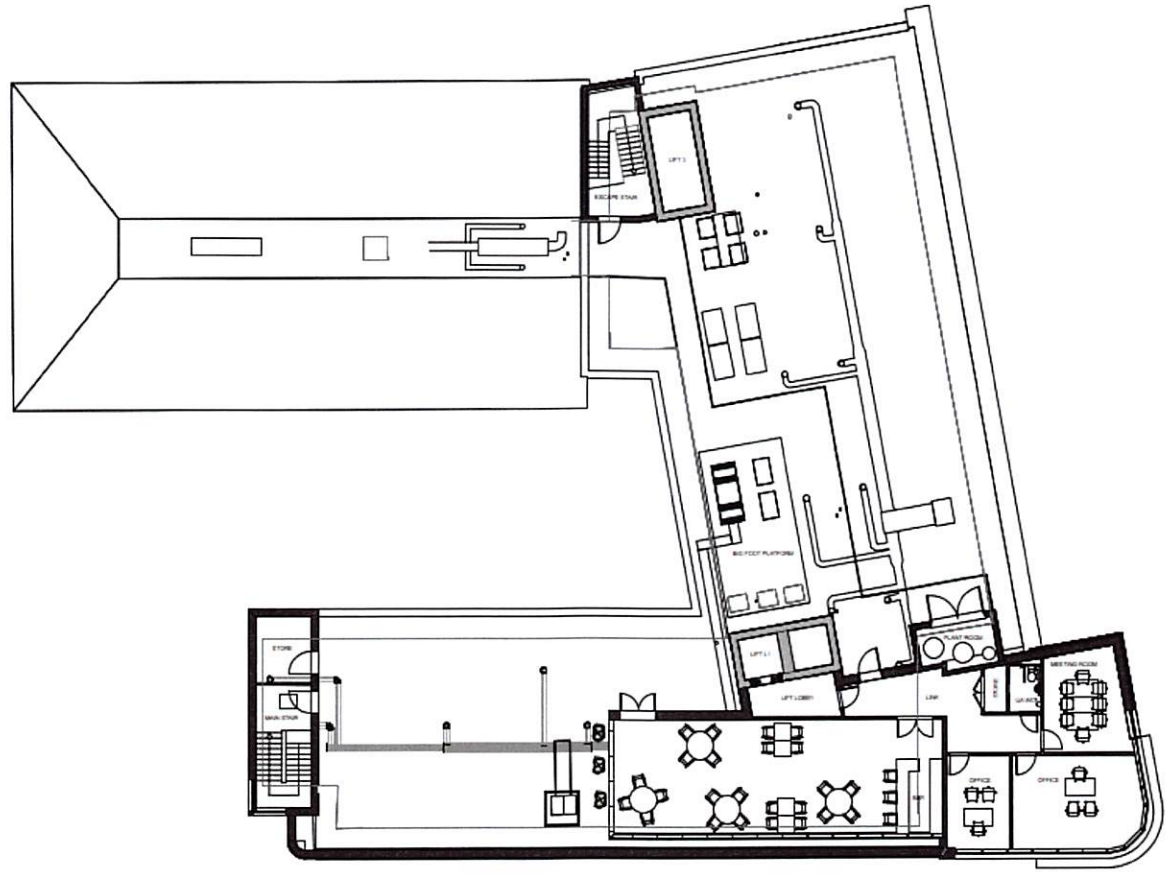



**Figure C9 – Proposed roof/fourth floor plan.**

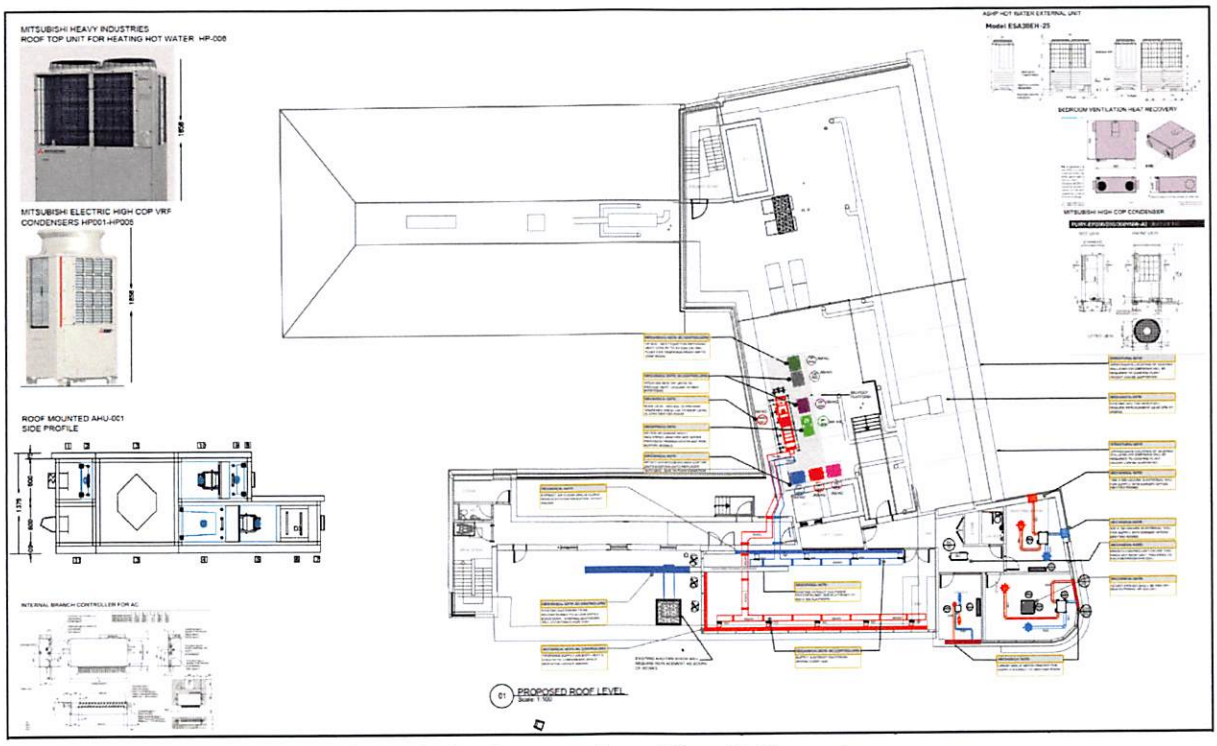



**Figure C10 – Proposed roof/fourth floor plan.**

WILSON POWER SOLUTIONS

| TRANSFORMER DATA SHEET | | |
|---|---|---|
| Project Name: | | -- |
| Quote Number: | | -- |
| Manufacturer: | | Wilson Power Solutions Ltd |
| Applicable Standard: | | IEC 60076 |
| General Arrangement Dwg #: | | WPS-1500 AL-GA |
| Transformer Rating: | kVA | 1500 |
| Rated High Voltage @ No Load: | Volts | 11000 |
| Rated Low Voltage @ No Load: | Volts | 415 |
| Minimum Insulation class HV LI: | kV | 75 |
| Minimum Insulation class HV AC: | kV | 28 |
| Minimum Insulation class LV LI: | kV | - |
| Minimum Insulation class LV AC: | kV | 3 |
| Insulating Fluid: | | Mineral Oil |
| Fans: | | No |
| Pumps: | | No |
| Type of Cooling: | | ONAN |
| Number of Phases: | | 3 |
| Frequency: | Hz | 50 |
| Vector Group: | | Dyn11 |
| Impedance Voltage (Z): | % | 5.5 |
| Core Material: | | CRGO steel |
| No Load Losses: | W | 1125 |
| Load Losses @ 75°C: | W | 13140 |
| Losses as per EU Regulation No. 548/2014 | | Meets Tier-1 Requirement |
| Resistance | % | 0.88 |
| Reactance | % | 5.43 |
| Regulation type: | | DETC |
| Tapping on HV: | % | +7.5,+5.0, +2.5, 0.0, -2.5, -5 |
| Design Ambient Temperature: | °C | 40 |
| Temp Rise of Top Oil: | °C | 60 |
| Temp Rise of Winding: | °C | 65 |
| Altitude: | m | <1000 |
| Pollution class: | | C4 |
| Sound Power Level: | dB(A) | 61 |

**Figure C11 – Comparative 1,500 kVA substation sound data (Wilson Power Solutions).**

| Heat Recovery Schedule | | | | | |
|---|---|---|---|---|---|
| **Ref:** | **Description:** | **Location:** | **Type:** | **Duty:** | **Sound Pressure Level:** |
| AHU 01 | Roof mounted AHU for meeting room top floor | Roof Plant compound | VES Air Handling Unit | 0.3m³/s - 0.3m³/s | 58dBA @1m Inlet, 68dBA @1m Outlet |
| HRU 4.1 | Heat Recovery Unit | Offices-Mtg Rooms Top Floor | MITSUBISHI Model: LOSSNAY LGH25RVX-E-1 | 48l/s (SP3) | 22dBA (SP3) |
| HRU 4.2 | Heat Recovery Unit | Offices-Mtg Rooms Top Floor | MITSUBISHI Model: LOSSNAY LGH25RVX-E-1 | 48l/s (SP3) | 22dBA (SP3) |
| HRU 4.3 | Heat Recovery Unit | Offices-Mtg Rooms Top Floor | MITSUBISHI Model: LOSSNAY LGH25RVX-E-1 | 48l/s (SP3) | 22dBA (SP3) |
| HRU-XX | Heat Recovery Unit | Bedrooms | Vectaire PREM 3 Unit | 6l/s Trickle - 16l/s Boost | N2 20 Trickle NR 30 Boost |

**Table C1 – Equipment schedule for heat recovery system.**

| Outdoor Units Schedule | | | | | |
|---|---|---|---|---|---|
| **Ref:** | **Description:** | **Location:** | **Type:** | **Duty:** | **Sound Pressure Level:** |
| HP-001 | Bedrooms VRF - System 1 (RF) ROOF Plant Compound - Air Source Heat Pump Unit | Roof Plant compound | MITSUBISHI Electric Air Conditioning VRF HR HIGH COP Model: PURY-P250YNW-A1 | Heating (UK) 31.5 Cooling (UK) 25.1 | 61dBA @1m |
| HP-002 | Bedrooms VRF - System 1 (RF) ROOF Plant Compound - Air Source Heat Pump Unit | Roof Plant compound | MITSUBISHI Electric Air Conditioning VRF HR HIGH COP Model: PURY-P250YNW-A1 | Heating (UK) 31.5 Cooling (UK) 25.1 | 61dBA @1m |
| HP-003 | Bedrooms VRF - System 3 (RF) ROOF Plant Compound - Air Source Heat Pump Unit | Roof Plant compound | MITSUBISHI Electric Air Conditioning VRF HR HIGH COP Model: PURY-P250YNW-A1 | Heating (UK) 31.5 Cooling (UK) 25.1 | 61dBA @1m |
| HP-004 | Bedrooms VRF - System 4 (RF) ROOF Plant Compound - Air Source Heat Pump Unit | Roof Plant compound | MITSUBISHI Electric Air Conditioning VRF HR HIGH COP Model: PURY-P250YNW-A1 | Heating (UK) 31.5 Cooling (UK) 25.1 | 61dBA @1m |
| HP-005 | Bedrooms VRF - System 5 (RF) ROOF Plant Compound - Air Source Heat Pump Unit | Roof Plant compound | MITSUBISHI Electric Air Conditioning VRF HR HIGH COP Model: PURY-P250YNW-A1 | Heating (UK) 31.5 Cooling (UK) 25.1 | 61dBA @1m |
| HP-AHU | Air Handling Unit condenser (RF) ROOF Plant Compound - Air Source Heat Pump Unit | Roof Plant compound | MITSUBISHI Electric Air Conditioning VRF HR HIGH COP Model: PURY-P250YNW-A1 | Heating (UK) 31.5 Cooling (UK) 25.1 | 61dBA @1m |
| HP006 | ASHP for Hot Water Pre-Heat | Roof Plant compound | MITSUBISHI Heavy Industries Model: Q-Ton-ESA30E-25 | Heating Capacity 30kW | 58dBA @1m |

| Outdoor Units Schedule | | | | | |
|---|---|---|---|---|---|
| **Ref:** | **Description:** | **Location:** | **Type:** | **Duty:** | **Sound Pressure Level:** |
| HP007 | ASHP for Hot Water Pre-Heat | 1st Floor Roof Plant compound | MITSUBISHI Heavy Industries Model: Q-Ton-ESA30E-25 | Heating Capacity 30kW | 58dBA @1m |
| HP-008 | Bedrooms VRF - System 5 (RF) ROOF Plant Compound - Air Source Heat Pump Unit | 1st Floor Roof Plant compound | MITSUBISHI Electric Air Conditioning VRF HR HIGH COP Model: PURY-P250YNW-A1 | Heating (UK) 31.5 Cooling (UK) 25.1 | 61dBA @1m |
| ACU-XX | Bedroom AC VRF Type: Ducted Units | Bedrooms as indicated | MITSUBISHI Electric Air Conditioning Model: PEFY-P20VMS1-ER3.TH | Heating (UK) 2.5 Cooling (UK) 2.0 | 22-29 dBA |

**Table C2 – Equipment schedule for outdoor units.**

# Appendix D: Environmental Survey

The equipment used conforms to BS EN 61672-1:2003 (Class 1) for sound level meters and BS EN 60942 (Class 1) for sound calibrators; with at least traceable calibration history valid; no greater than two years for sound level meters and one year for sound calibrators, relevant to the times of the site assessment.

| Position No. | Manufacturer | Model No. | Description | Serial No. |
|---|---|---|---|---|
| 1 | Larson Davis | LxT (SE) | 3rd octave band sound level meter | 5851 |
| | Larson Davis | PRMLxT1L | Microphone preamplifier (low range) | 55752 |
| | Larson Davis | 337B02 | ½" electret microphone | 313910 |
| 2 | Larson Davis | LxT (ST) | 3rd octave band sound level meter | 4170 |
| | Larson Davis | PRMLxT1L | Microphone preamplifier (low range) | 36076 |
| | Larson Davis | LxT (ST) | 3rd octave band sound level meter | 4170 |
| Both | Larson Davis | CAL200 | Sound level calibrator | 11165 |

**Table D1 – Sound monitoring equipment.**

Validation checks at the end of the survey demonstrated acceptable drift across all parts of the study, across the sound level measurement equipment used, of ≤ 0.20 dB. Interval data was recorded at the measurement location at 1-minute and 15-minute periods, time synchronised to GMT.

Weather conditions at the times of site attendance were deemed acceptable for surveying.

| Weather conditions | Start | Finish | Additional comments |
|---|---|---|---|
| Wind velocity | < 2 m/s average | < 3 m/s average | None |
| Wind direction | SSW | SW | |
| Cloud cover/rain | 75 %, no rain | 50 %, no rain | |
| Temperature | 5 °C | 5 °C | |

**Table D2 – Recorded weather conditions.**

A brief description of the measurement position has been provided below:

Position 1) Microphone set at rooftop level, protruding out of balustrade along southeast façade of the development building. Incident sound was observed predominantly from transport noise sources, primarily moving along High Street Colliers Wood (A24).

Position 2) Microphone set at rooftop level, located on northeast corner of the development building. Incident sound was observed predominantly from transport noise sources, primarily moving along High Street Colliers Wood (A24), however mechanical plant was intermittently audible, emanating from the 3no. plant units, located approximately 17 m to the west (shown in Figure D9).


**Figure D1 – Photograph of Measurement Position 1.**

**Figure D2 – Photograph of Measurement Position 2.**

Figure D3 - Sound survey graphical data.

Data at Measurement Position 1.

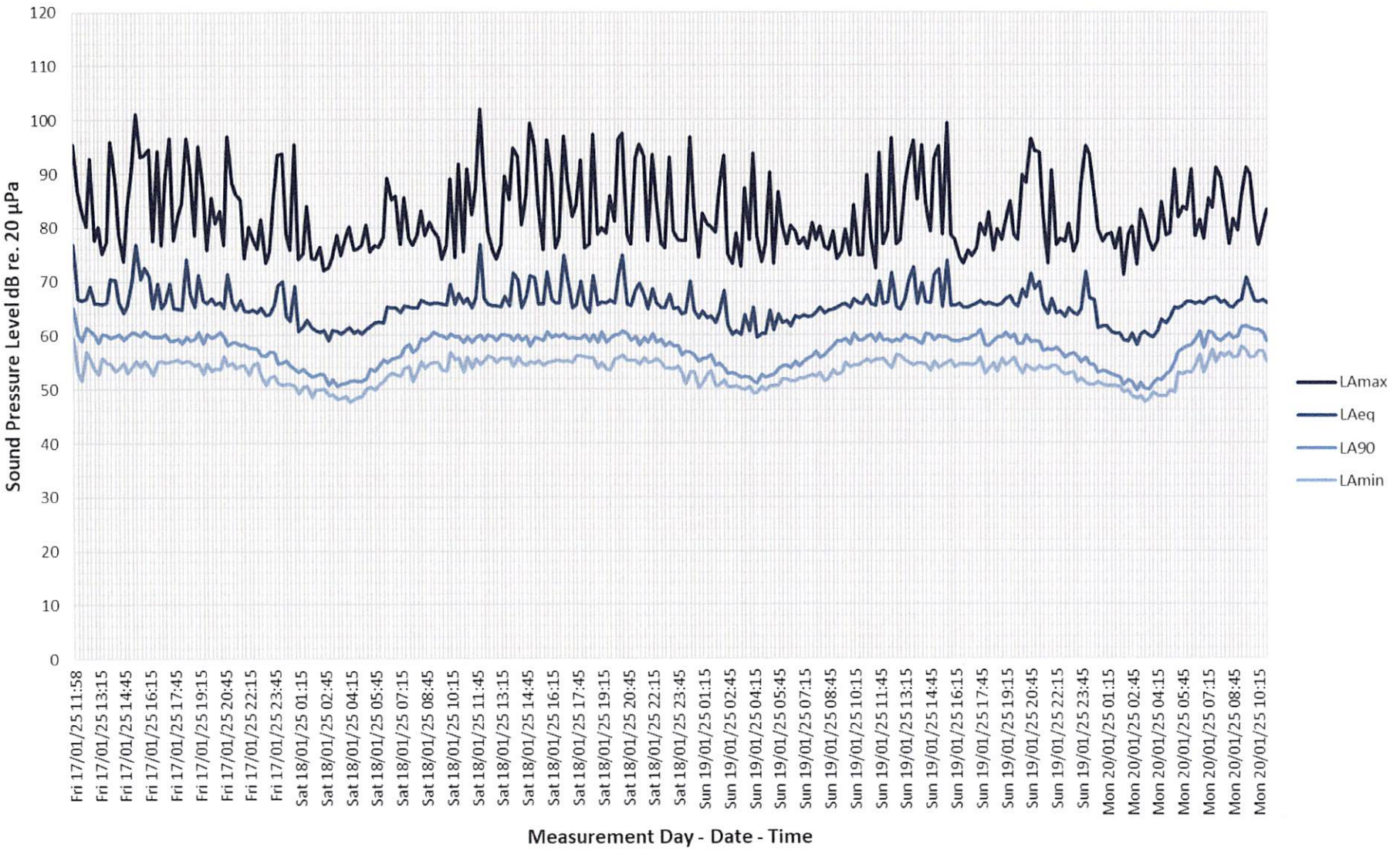


Figure D4 - Sound survey graphical data.

Data at Measurement Position 2.

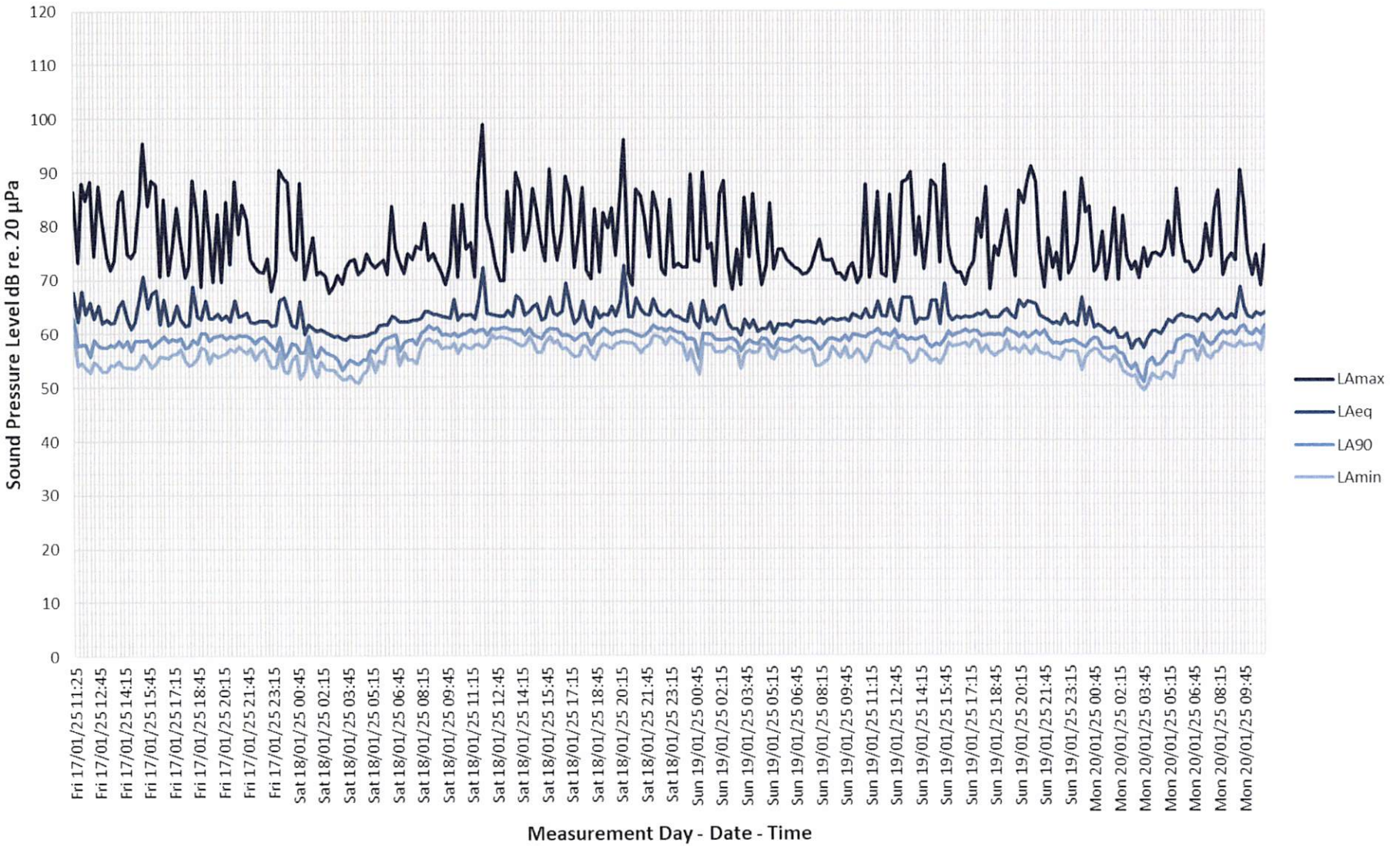


Figure D5 - Background sound level histogram. Occurrences at Measurement Position 1.

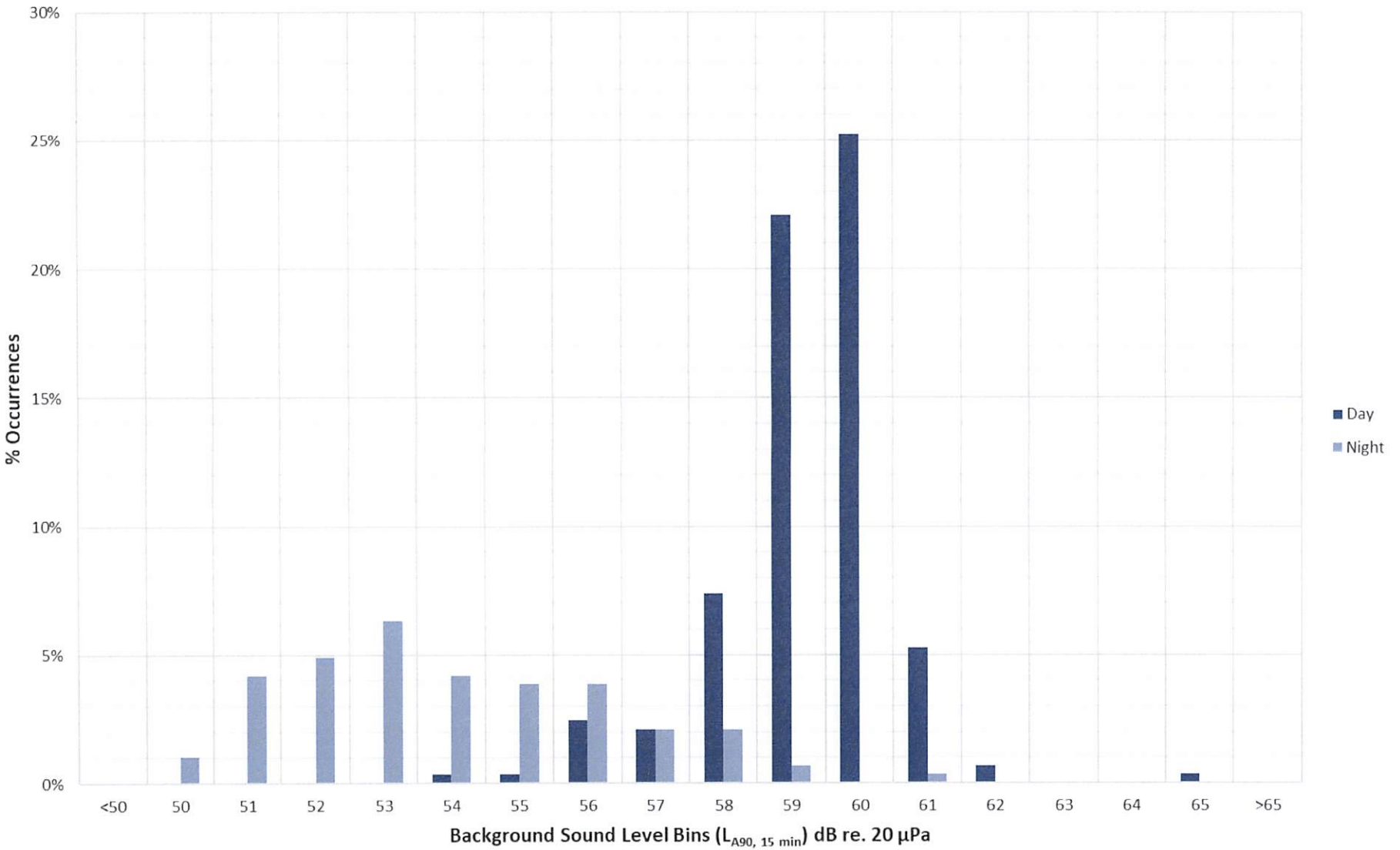


Figure D6 - Residual sound level histogram. Occurrences at Measurement Position 1.

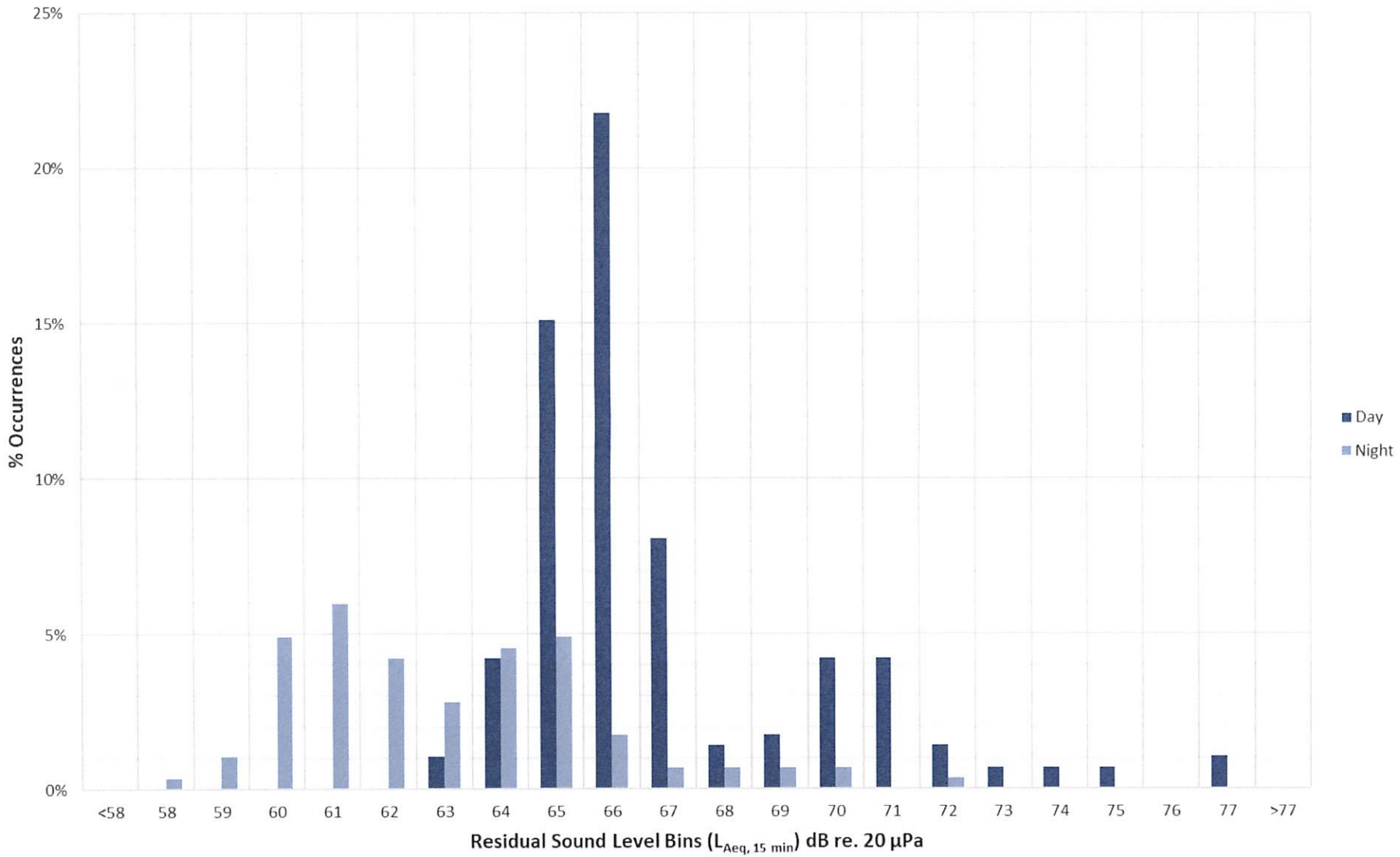


Figure D7 - Background sound level histogram. Occurrences at Measurement Position 2.

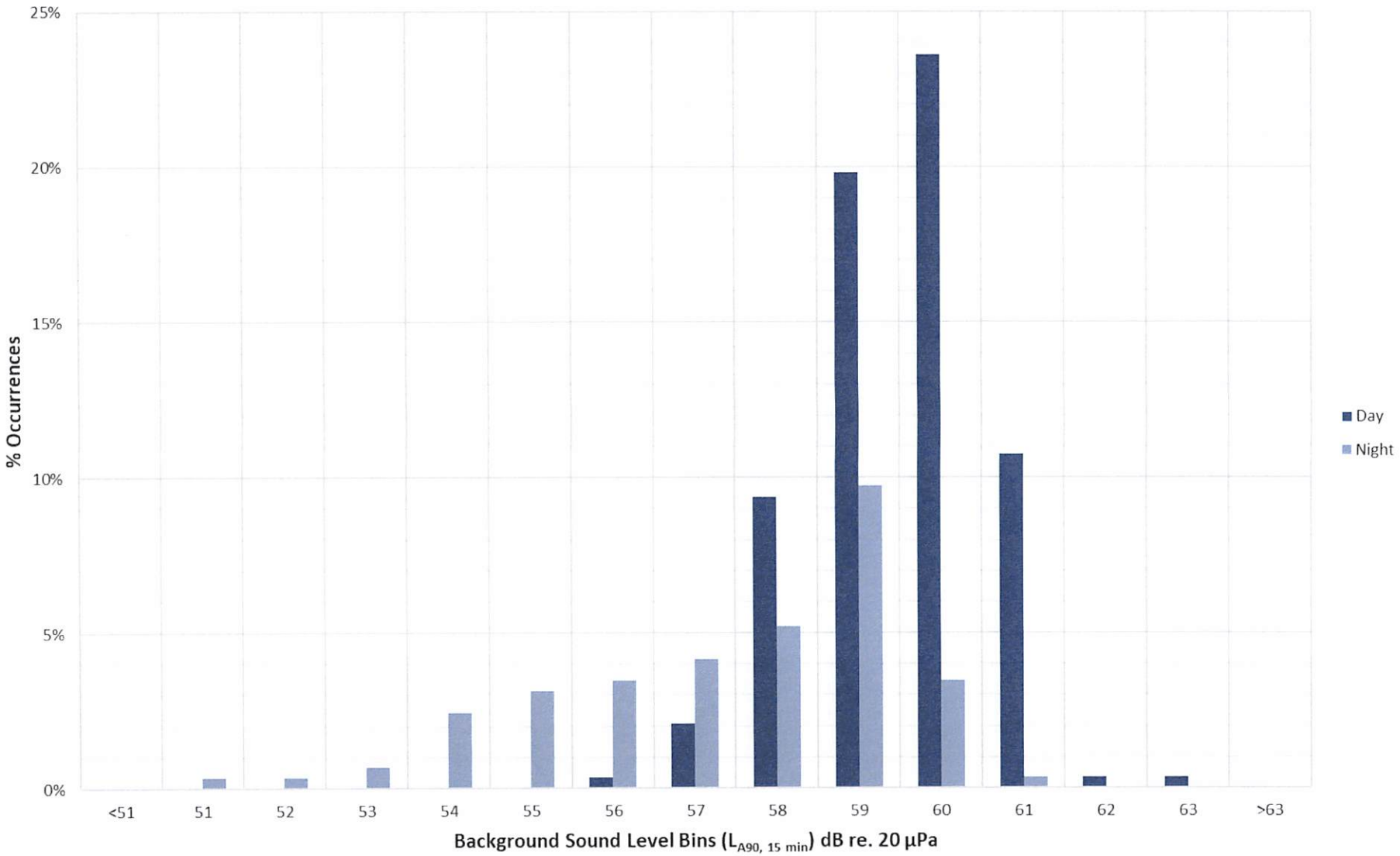


Figure D8 - Residual sound level histogram. Occurrences at Measurement Position 2.

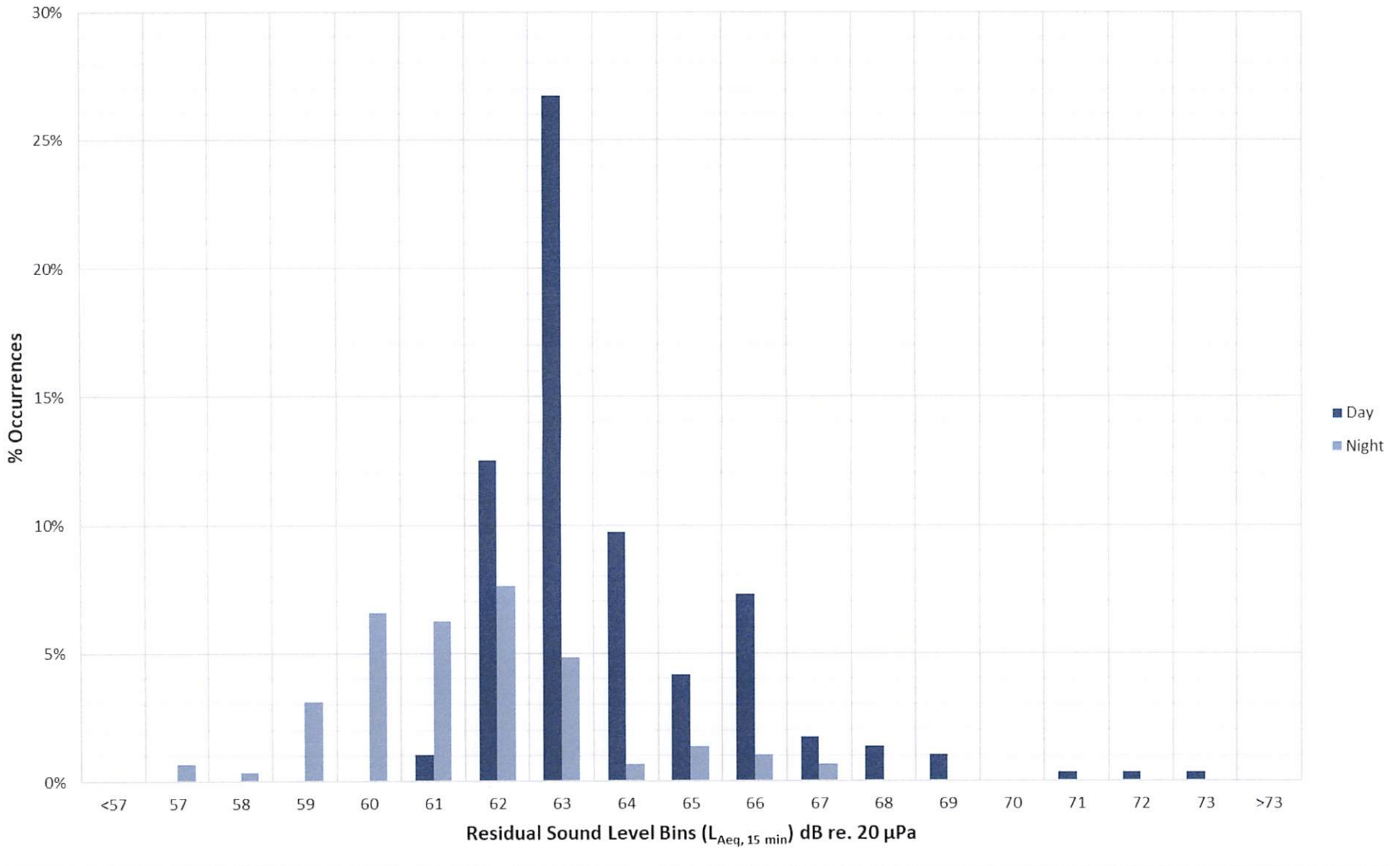


**Figure D9 – Photograph of 3no. Mitsubishi 'CITY MULTI' Air Conditioning units (PURY-P200YJM-A), located on existing hotel roof (17 m west of Position 1, visible in background of photograph).**

**Figure D10 – Photograph of 4no. Mitsubishi 'CITY MULTI' Air Conditioning units (PURY-P200YJM-A), located on existing hotel roof (33 m west of Position 1).**

## FEATURES


## OUTDOOR

| | |
|---|---|
| Heating Capacity (kW) (nominal) | 25 |
| Cooling Capacity (kW) (nominal) | 22.4 |
| High Performance Heating Capacity (kW) (UK) | 25 |
| COP Priority Heating Capacity (kW) (UK) | 22.8 |
| Cooling Capacity (kW) (UK) | 21.3 |
| Heating Power Input (kW) (nominal) | 5.69 |
| Cooling Power Input (kW) (nominal) | 5.18 |
| High Performance Heating Power Input (kW) (UK) | 7.17 |
| COP Priority Heating Power Input (kW) (UK) | 5.63 |
| Cooling Power Input (kW) (UK) | 2.98 |
| COP / EER (nominal) | 4.39 / 4.32 |
| SCOP / SEER | 4.87 / 7.27 |
| Max No. of Connectable Indoor Units | 20 |
| Airflow ($m^3$/min) | 185 |
| Sound Pressure Level (dBA) | 56 |
| Sound Power Level (dBA) | 76 |
| Weight (kg) | 240 |
| Dimensions (mm) Width x Depth x Height | 920 x 760 x 1710 |
| Electrical Supply | 380-415V, 50HZ |
| Phase | 3 |
| Starting Current (A) | 8 |
| Running Current (A) - Heating | 8.7 |
| Running Current (A) - Cooling | 8 |
| Fuse Rating (MCB sizes BS EN 60947-2) - (A) | 20 |
| Mains Cable No. Cores | 4 + EARTH |

## DIMENSIONS

PURY-P200YJM-A

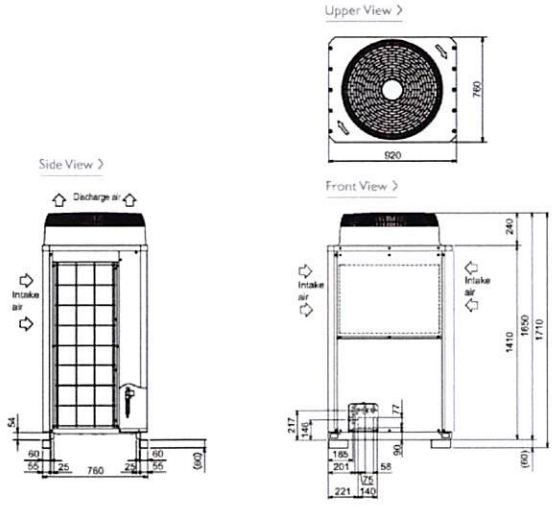



**Figure D11 – Manufacturer specification sheet for existing PURY-P200YJM-A A/C units.**

# Appendix E: Noise Break-in Calculations

Calculations have been undertaken based on achieving ProPG guidance criteria for both the internal average and maximum noise levels. The building elements specified in this section are based upon their indicated locations from the architectural scheme layout drawings in Appendix C, along with the estimated room volumes and building specifications. The noise break-in calculations are summarised based on a representative selection of (smaller) bedrooms and living areas within the development, as to not underpredict the resulting values in all similar areas. Where detailed information for the building specifications has not been made available, conservative estimates have been used in the calculations and are presented here.

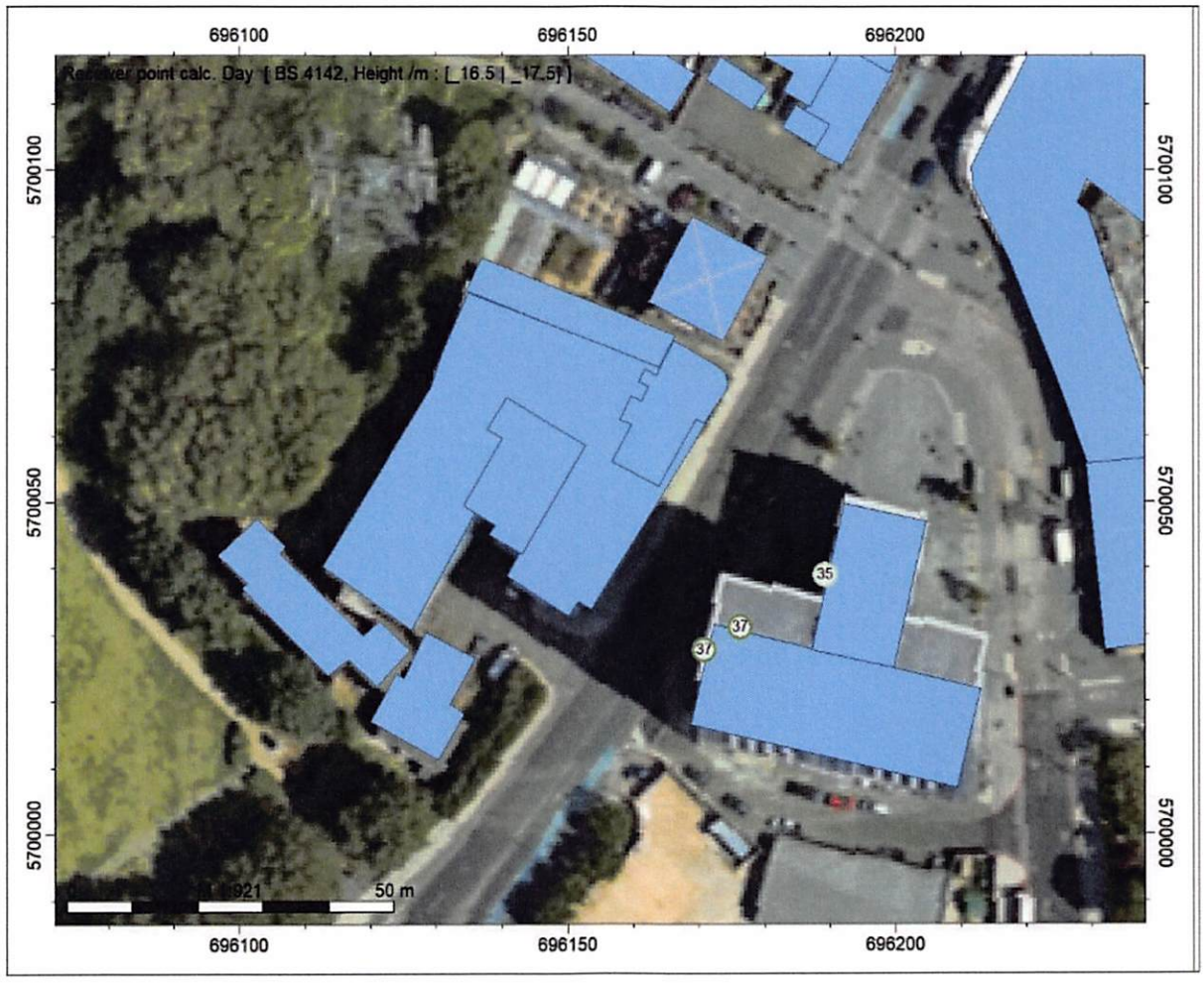
The calculation method used follows Section G.2.1 of BS 8233:2014, based on the method given in EN 12354-3:2000, and considers the sound insulation of each major building façade component summarised as wall, glazing and ventilation parts. The representative sound levels are taken as the continuous equivalent free-field sound pressure level (dB $L_{eq,\ ff}$) outside the room elements under consideration and are used in the noise break-in calculations to determine suitable building elements for the sound insulation scheme at the development.

The accuracy of a calculation model in accordance with EN 12354-3:2000 is heavily reliant on input data. To reduce inaccuracy by design, all window and ventilation data referenced in this assessment is based on ISO140 laboratory test records provided by leading manufacturers. It is acceptable to use alternative specifications however the minimum performance standards as specified must be met or exceeded with any alternative design approach. The specifications in this assessment have been verified by calculation as acceptable façade elements.

| Calculation Summary according to BS 8233:2014 Section G2.1, from BS EN 12354-3:2000. | | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| Room Name | Sound Insulation Scheme, dB | | | | Criteria, dB(A) | | | Pass / Fail Design Vs Criteria |
| | | | | | 35 | 30 | 45 | |
| | Wall | Glazing | Façade Vent(s) | Roof | Day | Night | Max | |
| | $R_w$ | $R_w$ | $D_{ne,\ w}$ | $R_w$ | dB(A) | dB(A) | dB(A) | |
| Southeast Guestroom (GF) | 50 | 44 | 54 | 54 | **29** | **25** | **41** | **PASS** |
| Northeast Corner Guestroom | 50 | 38 | 54 | 54 | **26** | **22** | **35** | **PASS** |
| Northeast Guestroom | 50 | 38 | 54 | 54 | **27** | **23** | **38** | **PASS** |
| Northeast 4F Meeting Room | 50 | 35 | 54 | 54 | **31** | - | - | **PASS** |

**Table E1 – BS 8233:2014 calculation summary for ventilation scheme achieving internal noise level guidelines (worst-case guest bedrooms only).**

# Appendix F: Model Outputs



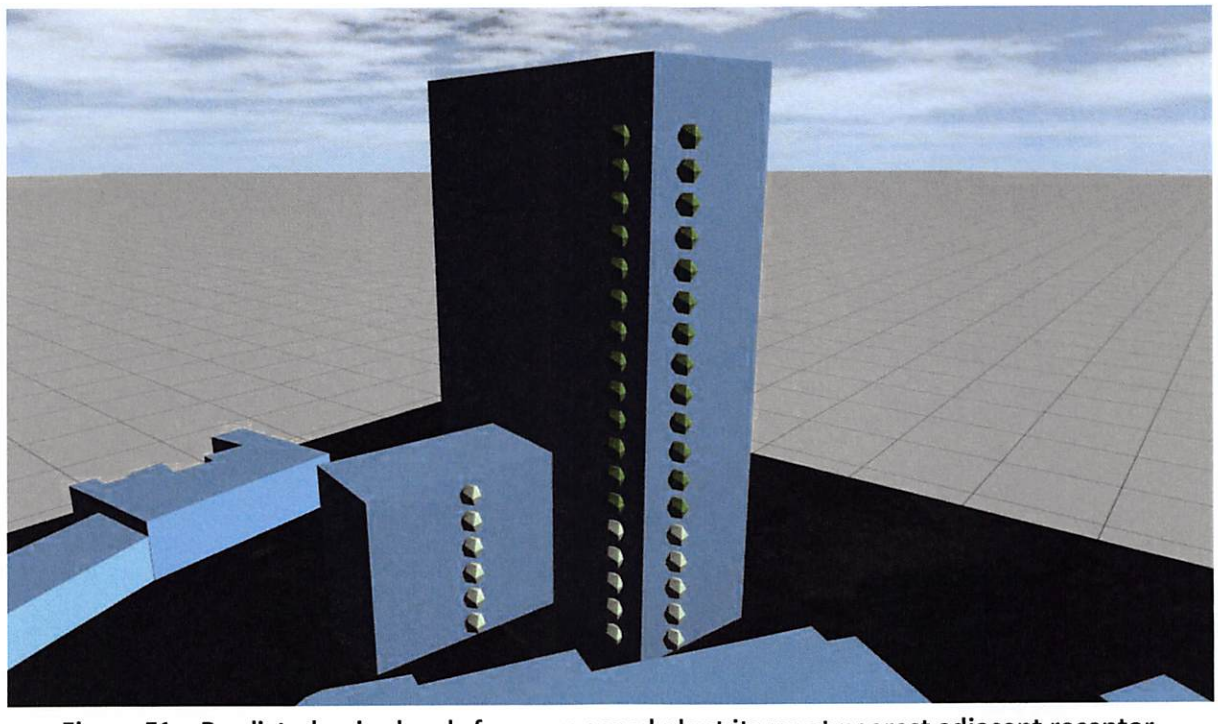



**Figure F1 – Predicted noise levels from proposed plant items at nearest adjacent receptor.**

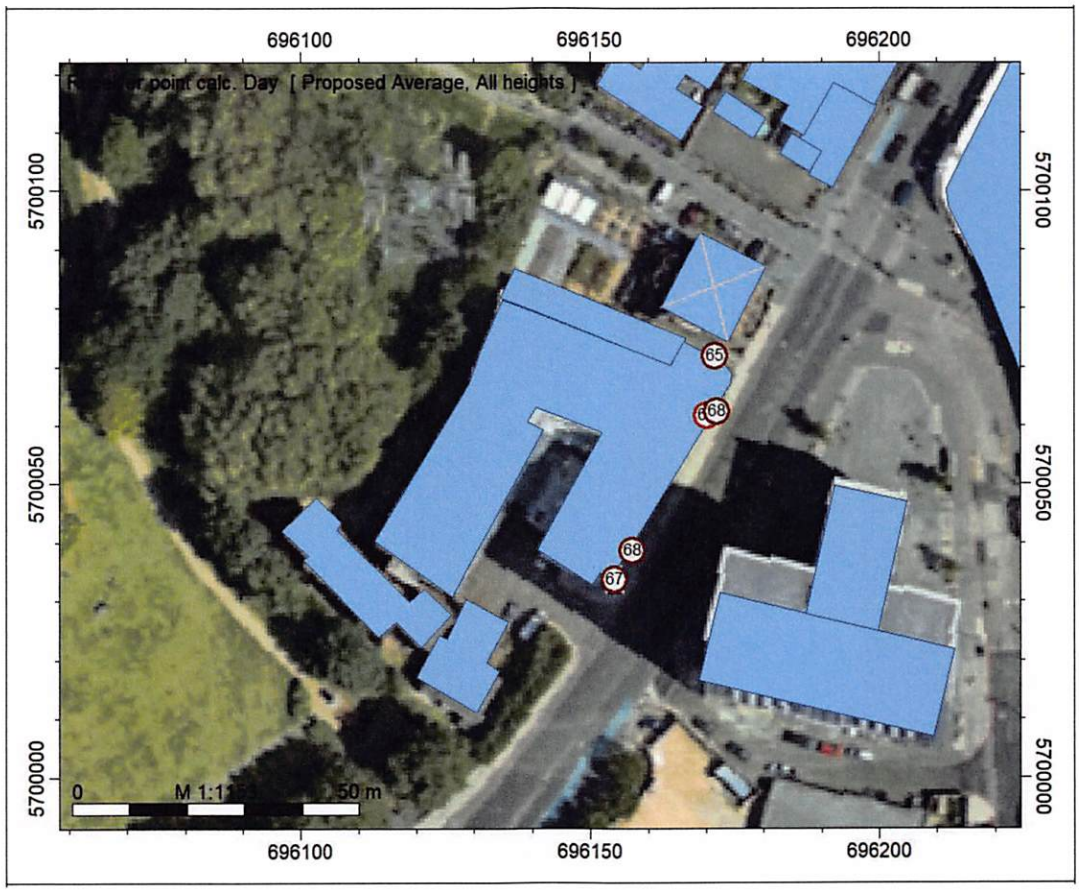



Figure F2 – Predicted noise levels from transportation sources on proposed development (day).

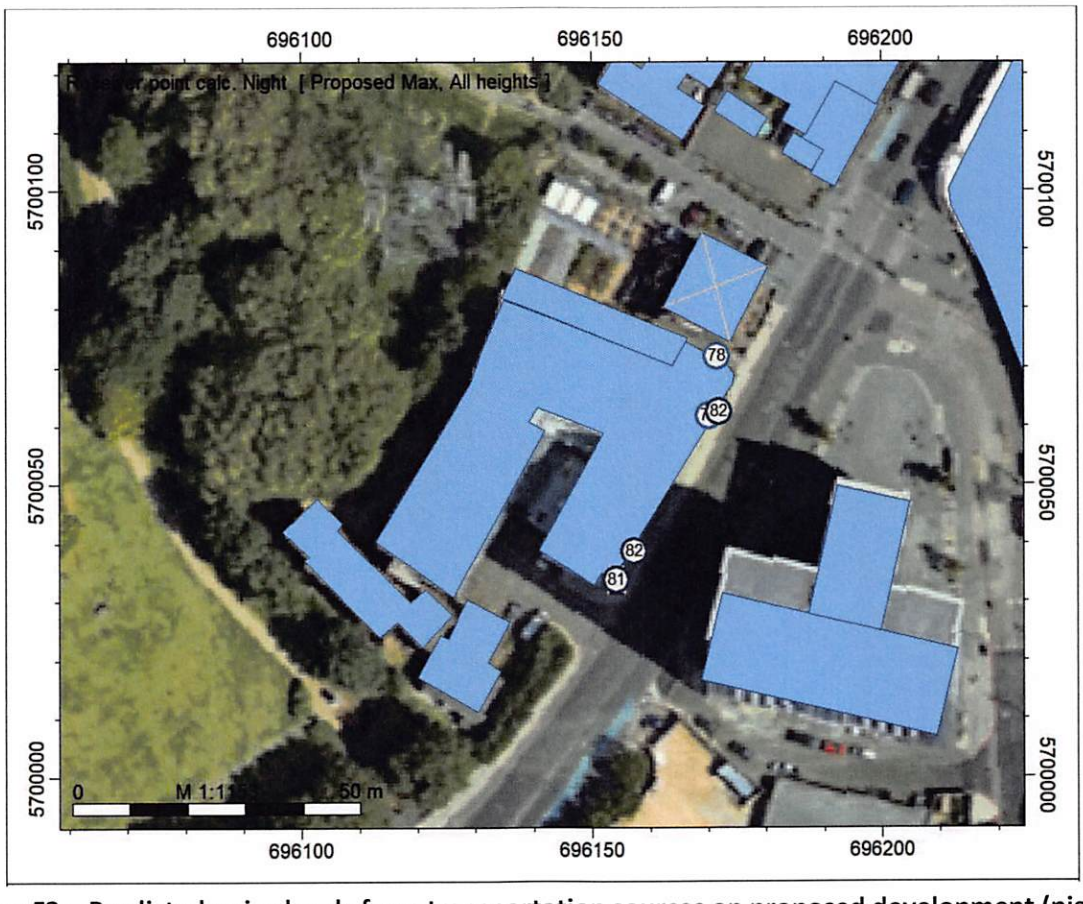



Figure F3 – Predicted noise levels from transportation sources on proposed development (night).

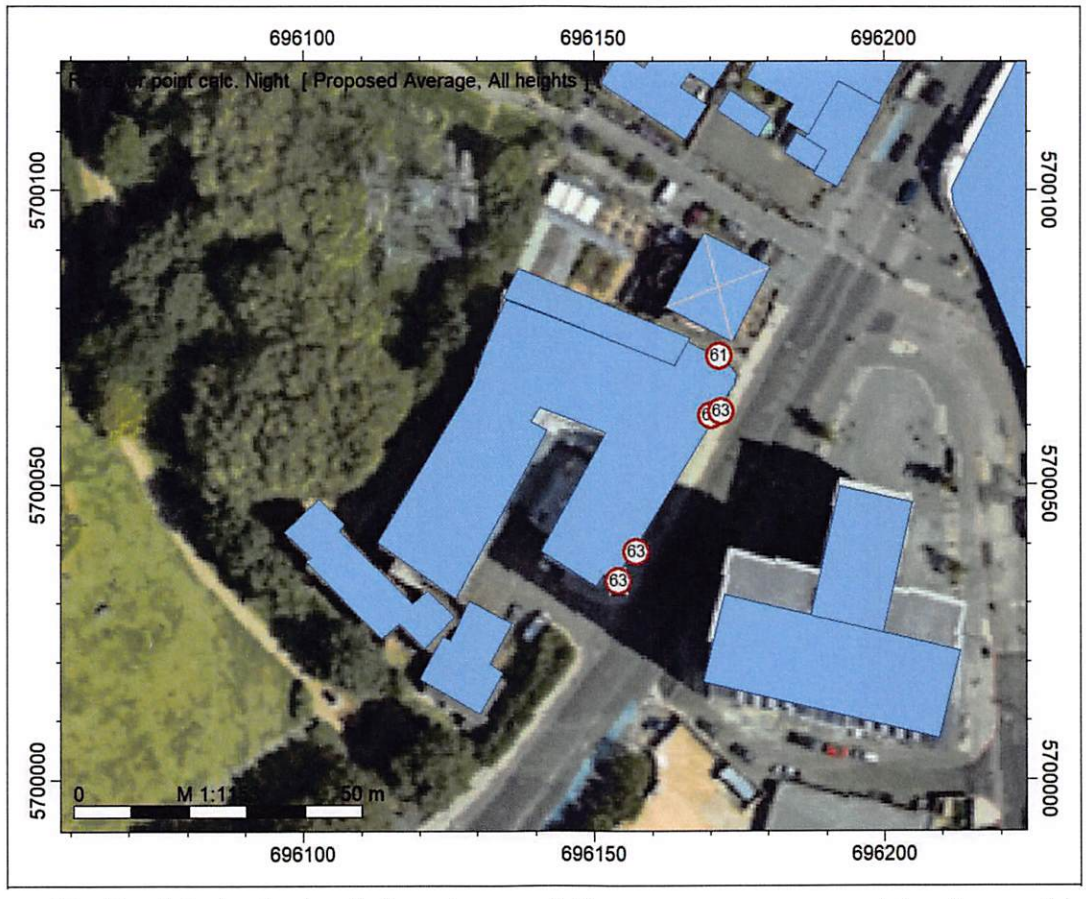



**Figure F4 – Predicted noise levels from transportation sources on proposed development (max levels).**