



REPORT REFERENCE:

SA – 7710-5

**ENVIRONMENTAL NOISE IMPACT ASSESSMENT**  
**UPGRADED GLAZING & ACOUSTIC TRICKLE VENTS**

British Standard 8233: 2014

World Health Organisation (WHO)

CLIENT:

Alumno Developments

SITE:

Moss Lane East

Manchester

SURVEY DATES:

20<sup>th</sup> – 21<sup>st</sup> February 2024

Report By

A handwritten signature in black ink, appearing to be 'B. J. Scrivener', written over a light blue grid background.

Mr. B. J. Scrivener MIOA.

**Sound Advice Acoustics Ltd**  
2 West Links, Tollgate, Chandlers Ford, Hampshire, SO53 3TG  
Tel: 02380 641357  
[soundadviceacoustics.co.uk](http://soundadviceacoustics.co.uk)

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## 1 EXECUTIVE SUMMARY

### 1.1 Instruction

Sound Advice Acoustics Ltd have been instructed by Alumno Developments to undertake a background noise survey to British Standard 8233: 2014 to determine the impact of existing noise sources on the proposed accommodation scheme at Moss Lane East, Manchester.

### 1.2 Scope of Report

The measurements will be undertaken in accordance with ISO 1996 – Part 2: 2017 to determine the existing background noise levels and British Standard 8233: 2014 will be used to determine the impact of existing traffic on the internal noise environment within the proposed residential dwellings. This report aims to establish the following:

- Existing background noise levels within the area;
- Assess the potential internal noise levels on the proposed rooms;
- Provide specifications for the ventilation and window glazing with the proposed rooms.

### 1.3 Summary of Results

#### 1.3.1 Background Noise Levels

A 24 hour background noise survey was undertaken from 20th to 21st February 2024 at two positions on the site in order to establish the underlying background noise levels. The recorded levels are as follow: -

| Assessment Position | Date Start | Date Finish | Daytime LAeq | Night time LAeq |
|---------------------|------------|-------------|--------------|-----------------|
| Position 1          | 20/02/2024 | 21/02/2024  | 68.4         | 64.0            |
| Position 2          | 20/02/2024 | 21/02/2024  | 56.8         | 53.0            |

| Assessment Position | Date Start | Date Finish | Daytime LA90 | Night time LA90 |
|---------------------|------------|-------------|--------------|-----------------|
| Position 1          | 20/02/2024 | 21/02/2024  | 66.0         | 61.0            |
| Position 2          | 20/02/2024 | 21/02/2024  | 53.0         | 45.0            |

### 1.4 Glazing & Ventilation Specification

The development should be designed with various glazing specification across the site together with an MEV System 3 ventilation strategy to all rooms to ensure the internal noise levels are acceptable in terms of the assessment to British Standard 8233: 2014.

### 1.5 Patron Noise

There have been concerns from the local council regarding patron noise from inside the building with windows being permanently open as a form of ventilation. With the proposed made within this report alongside the ventilation strategy, these windows will not be required to be permanently open due to the acoustic trickle vent proposed within this report. This will be addressed within our M&E Report to issued once details of all plant have been received.

## **1.6 Conclusion**

Levels have been recorded and assessments made in accordance with the relevant standards. Internal criteria's have been set and calculations made in order to determine the minimum construction details required in order to meet the desired level within the proposed residential dwellings and satisfy the local council's requirements.

National Planning Policy Framework 2023 suggests that planning permission should be granted unless any adverse impacts of doing so would significantly and demonstrably outweigh the benefits, when assessed against the policies in the framework taken as a whole, or specific policies in the framework indicate the application should be restricted.

Based on the calculations and assessments made within this report it is the professional opinion of Sound Advice Acoustics Ltd that the proposed development can demonstrate compliance with the National Planning Policy Framework 2023, NPPF & NPSE and that, with regards to sound, planning permission can be granted.

## 2 INTRODUCTION

Sound Advice Acoustics Ltd have been instructed by Alumno Developments to undertake a background noise survey to British Standard 8233: 2014 to determine the impact of existing noise sources on the proposed accommodation scheme at Moss Lane East, Manchester.

Ambient noise levels were measured between 20<sup>th</sup> – 21<sup>st</sup> February 2024. This report by Sound Advice Acoustics Ltd gives the results of these measurements and an assessment in accordance with government planning guidelines and relevant standards together with mitigation measures as required.

With regards to external ambient noise, environmental noise levels are to be monitored at the site in accordance with British Standard 7445: 2003 'Description and measurement of environmental noise assessments and assessments made in-line with PROPG: Planning and Noise.

### 2.1 Planning Practice Guidance and Noise

March 2014 saw the publication of the Planning Practice Guidance for Noise (PPG-Noise) and this was subsequently updated in 2023. The Planning Practice Guidance and Noise sets out details of how potential noise impacts should be evaluated.

*'Local planning authorities' plan-making and decision taking 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.*

*In line with the Explanatory Note of the Noise Policy Statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.'*

In accordance with Stage 2: Full Assessment, Other Noise Sources, detailed calculations and assessments should be carried out pertaining to these as PPG Noise does not provide advice and guidance when taking these elements into consideration.

## 2.2 British Standard 8233: 2014

Calculations are to be made in accordance with BS 8233: 2014 Sound Insulation and Noise Reduction for Buildings Code of Practice.

BS 8233: 2014 set the following parameters as target levels that should be designed to within rooms such as Living Rooms and Bedrooms.

| Indoor ambient noise levels in spaces when they are unoccupied and privacy is also important |                    |                                |
|----------------------------------------------------------------------------------------------|--------------------|--------------------------------|
| Objective                                                                                    | Typical situations | Design Range<br>$L_{Aeq,t}$ dB |
| Typical noise levels for acoustic privacy in shared spaces                                   | Living room        | 35 – 40                        |
| NOTE: See Noise control in building services [28] and BS EN ISO 3382.                        |                    |                                |

| Indoor ambient noise levels for dwellings |                    |                         |                        |
|-------------------------------------------|--------------------|-------------------------|------------------------|
| Activity                                  | Location           | 07:00 – 23:00           | 23:00 – 07:00          |
| Resting                                   | Living Room        | 35 dB $L_{Aeq}$ 16 HOUR | --                     |
| Dining                                    | Dining Room / Area | 40 dB $L_{Aeq}$ 16 HOUR | --                     |
| Sleeping (daytime resting)                | Bedroom            | 35 dB $L_{Aeq}$ 16 HOUR | 30 dB $L_{Aeq}$ 8 HOUR |

Calculations and assessments are therefore to be carried out in order to satisfy the above requirements of BS 8233: 2014.

## **2.3 National Planning Policy Framework 2023 (NPPF) and Noise Policy Statement for England 2010 (NPSE).**

References and evaluations are to be made to the National Planning Policy Framework 2023(NPPF) and the Noise Policy Statement for England 2010 (NPSE). The purpose of this document is to include all aspects of environmental noise within assessments i.e. environmental noise, neighbour noise and neighbourhood noise. Noise is to be considered alongside other relevant issues relating to the site and should not be considered in isolation, according to the NPSE.

There are several key phrases within the NPSE aims and these are discussed below.

### **2.3.1 “Significant adverse” and “adverse”**

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

### **2.3.2 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.*

### **2.3.3 LOAEL – Lowest Observed Adverse Effect Level**

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

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

### **2.3.4 SOAEL – Significant Observed Adverse Effect Level**

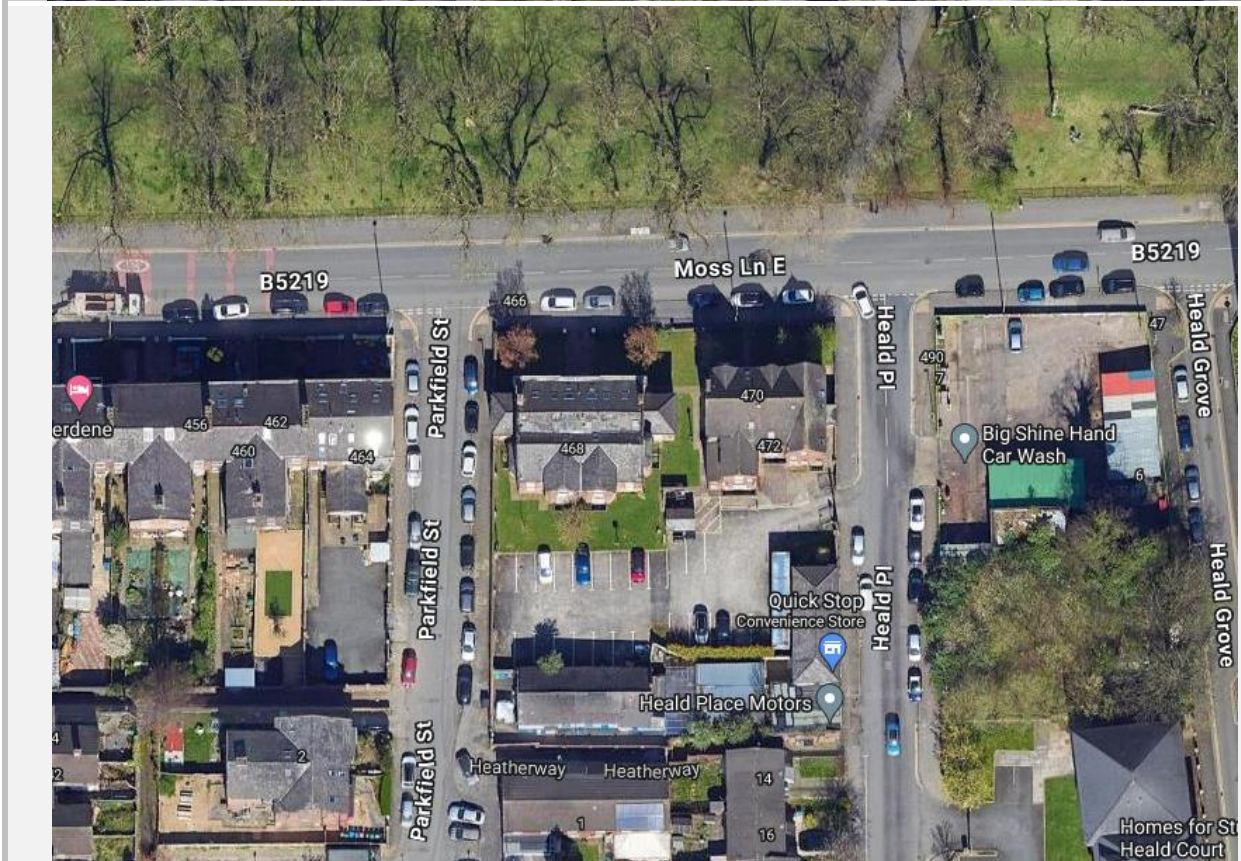
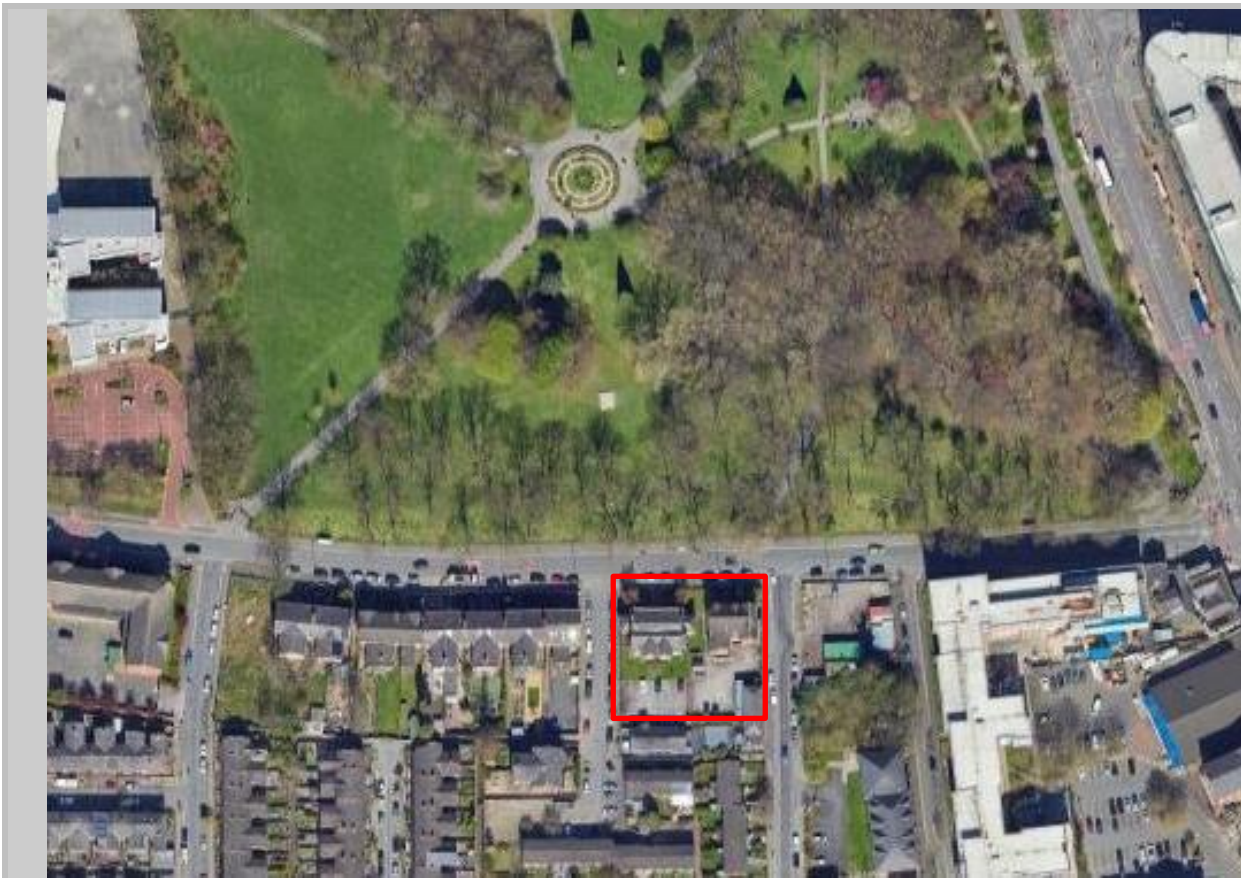
*This is the level above which significant adverse effects on health and quality of life occur.*

*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.*

### 3 SITE LOCATION

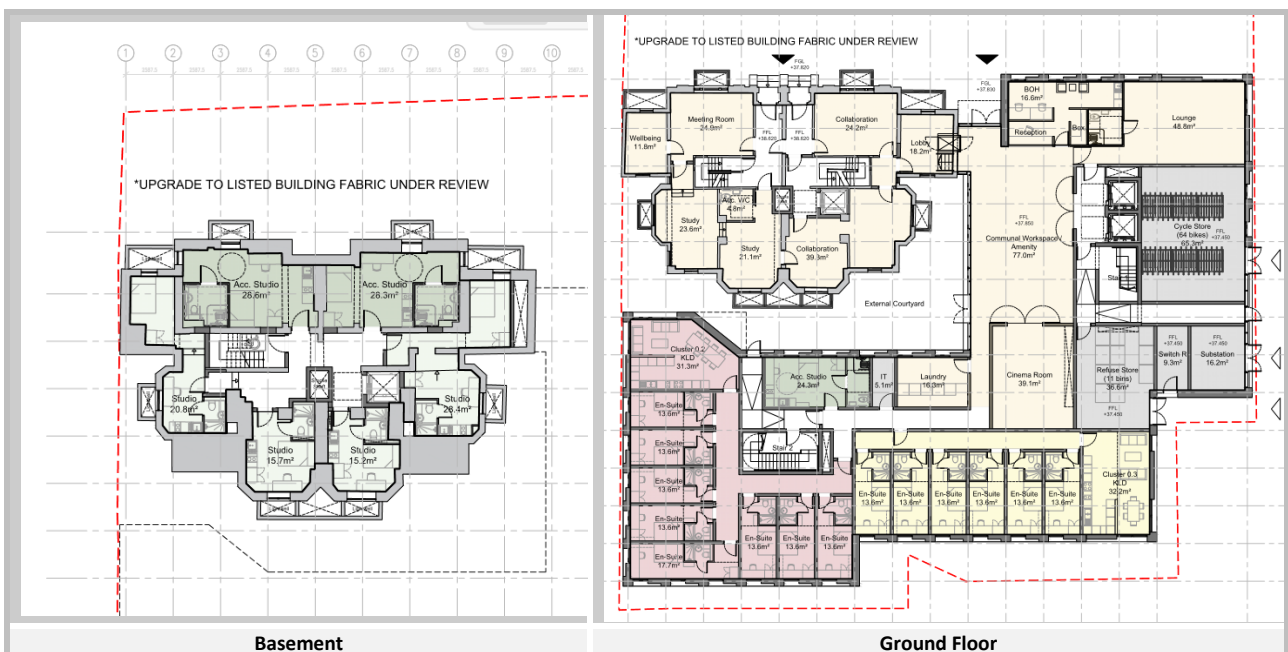
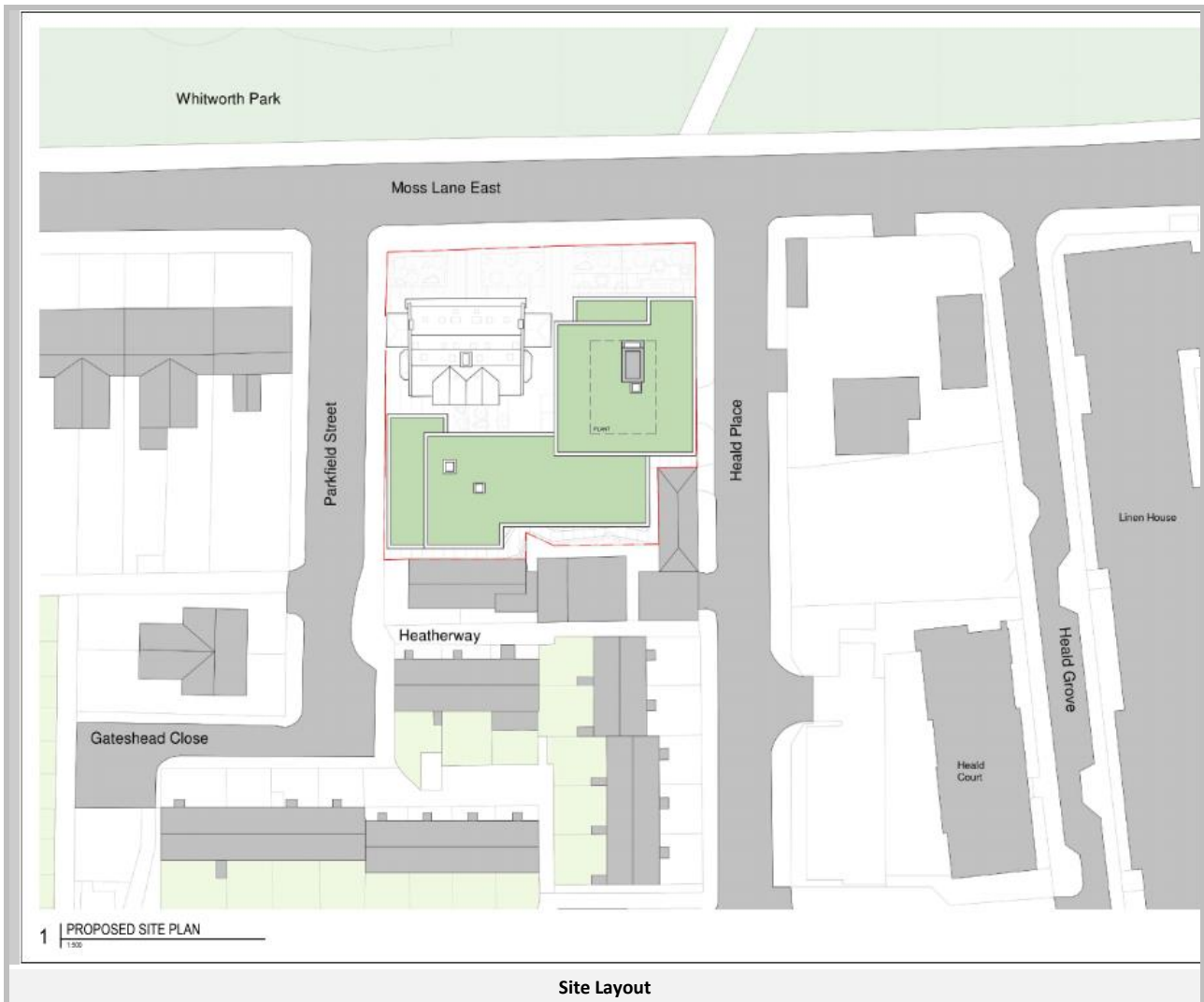
Position of Site in Wider Area

The site is located in Manchester. The dominant noise source is road traffic noise.



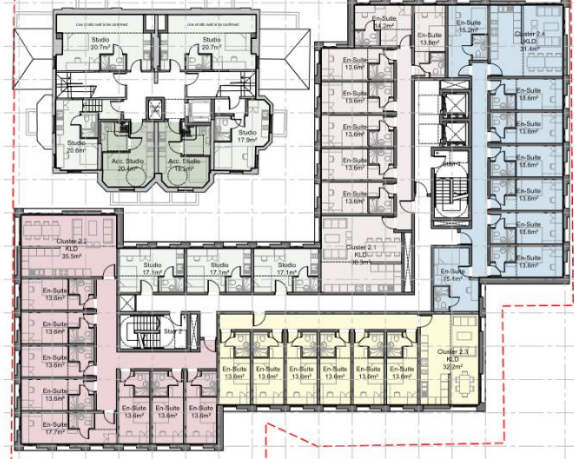
### 3.1 Proposed Development

The proposed development is shown below.





First Floor



Second Floor



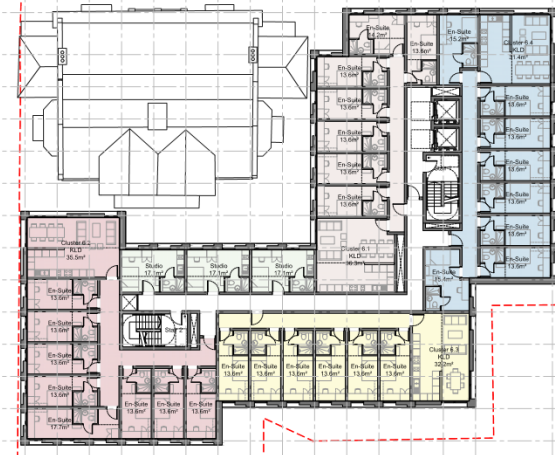
Third Floor



Fourth Floor



Fifth Floor



Sixth Floor



#### 4 PROCEDURE

External noise levels were recorded over a typical period and analysis date extrapolated between 07:00 hrs 20<sup>th</sup> February 2024 and 07:00 hrs on 21<sup>st</sup> February 2024 at 2 positions as detailed within this report.

Position 1 was located at the front of the site in order to capture the noise levels associated with the Main Road. Position 2 was located at the rear of the site in order to capture the noise levels associated with the background. Sample measurements were recorded over continuous 15 minute samples and from this data the hourly LAeq daytime values have been evaluated. Sound Pressure Levels were recorded on the following setting along with a full octave band frequency analysis measured simultaneously and between 31.5 Hz and 16.0 kHz.

| <u>Daytime 07:00 – 23:00</u> |                | <u>Night Time 23:00 – 07:00</u> |                    |
|------------------------------|----------------|---------------------------------|--------------------|
| LAeq 1 HOUR dB               | LA10 1 HOUR dB | LAeq 15 MINUTES dB              | LA10 15 MINUTES dB |
| LAMAX 1 HOUR dB              | LA50 1 HOUR dB | LAMAX 15 MINUTES dB             | LA50 15 MINUTES dB |
| LAMIN 1 HOUR dB              | LA90 1 HOUR dB | LAMIN 15 MINUTES dB             | LA90 15 MINUTES dB |

Calculations have been made in accordance with BS 8233: 2014 ‘Sound Insulation and Reduction of Buildings - Code of Practice’. Recommendations were made for any additional acoustics measures to conform to these standards.

From the downloaded recorded results, the daytime and night time periods were assessed and used within the above calculations as LAeq 16 HOUR dB levels for daytime and LAeq 8 HOUR dB levels for night time. These are detailed within this report. All data averaged throughout the day has been done so on a logarithmic basis to give accurate LAeq 16 Hour dB daytime and LAeq 8 Hour dB night time noise levels.

Finally, it should be noted that calculations are carried out with façade levels corrected from the recorded noise levels to the calculated façade levels.

## 5 APPARATUS

The equipment was calibrated using a sound pressure level of 114.0 dB at an octave band centre frequency of 1000Hz with reference to  $2 \times 10^{-5} \text{ Nm}^{-2}$  before and after the tests and the equipment set to have no inaccuracy greater than 0.2dB.

All the following equipment was calibrated in accordance with the laboratory accreditation requirements of the United Kingdom Accreditation Service (UKAS) on the following dates. Calibration schedules are implemented within Sound Advice Acoustics Ltd in accordance with UKAS directive LAB 23.

### 5.1 Rion NL – 52 s/n 00242696

| Description                  | Make | Type  | Serial No. | Calibration Intervals | Last Calibrated | Next Due Calibration |
|------------------------------|------|-------|------------|-----------------------|-----------------|----------------------|
| Integrated Sound Level Meter | Rion | Nl-52 | 00242696   | 2 Years               | 23.06.2023      | 23.06.2025           |
| Microphone (With Windshield) | Rion | Uc-59 | 06178      | 2 Years               | 23.06.2023      | 23.06.2025           |
| Microphone Pre – Amplifier   | Rion | Nh-25 | 32724      | 2 Years               | 23.06.2023      | 23.06.2025           |

Full calibration certificates are available upon request.

## 6 RESULTS

### 6.1 Downloaded results, and averages.

#### 6.1.1 07:00 – 07:00 20<sup>th</sup> – 21<sup>st</sup> February 2024 – Position 1

| NOISE LEVEL SUMMARY ASSESSMENT                                                         |      |       |      | Octave Band Centre Frequency (Hz) |      |      |      |      |      |      |      |       |
|----------------------------------------------------------------------------------------|------|-------|------|-----------------------------------|------|------|------|------|------|------|------|-------|
| Date / Time                                                                            | LAeq | LAmaz | LA90 | 63                                | 125  | 250  | 500  | 1.0k | 2.0k | 4.0k | 8.0k | 16.0k |
| DAYTIME 07:00 - 23:00<br><small>LA90 1 HOUR &amp; Corresponding LAeq 1 HOUR</small>    | 68.4 | 83.5  | 66.0 | 69.1                              | 64.6 | 60.6 | 59.7 | 64.2 | 63.2 | 57.7 | 51.4 | 39.7  |
| NIGHT TIME 23:00 - 07:00<br><small>LA90 15 MIN &amp; Corresponding LAeq 15 MIN</small> | 64.0 | 75.7  | 61.0 | 63.5                              | 60.0 | 55.7 | 55.6 | 59.9 | 58.6 | 54.3 | 47.9 | 35.8  |

#### 6.1.2 07:00 – 07:00 20<sup>th</sup> – 21<sup>st</sup> February 2024 – Position 2

| NOISE LEVEL SUMMARY ASSESSMENT                                                         |      |       |      | Octave Band Centre Frequency (Hz) |      |      |      |      |      |      |      |       |
|----------------------------------------------------------------------------------------|------|-------|------|-----------------------------------|------|------|------|------|------|------|------|-------|
| Date / Time                                                                            | LAeq | LAmaz | LA90 | 63                                | 125  | 250  | 500  | 1.0k | 2.0k | 4.0k | 8.0k | 16.0k |
| DAYTIME 07:00 - 23:00<br><small>LA90 1 HOUR &amp; Corresponding LAeq 1 HOUR</small>    | 56.8 | 70.6  | 53.0 | 64.4                              | 58.1 | 54.4 | 52.7 | 52.0 | 50.1 | 46.4 | 41.7 | 37.0  |
| NIGHT TIME 23:00 - 07:00<br><small>LA90 15 MIN &amp; Corresponding LAeq 15 MIN</small> | 53.0 | 69.6  | 45.0 | 60.1                              | 55.2 | 52.0 | 49.7 | 48.6 | 46.0 | 39.3 | 33.8 | 25.9  |

The following noise levels at position 1 have been used within the BS 8233: 2014 calculations

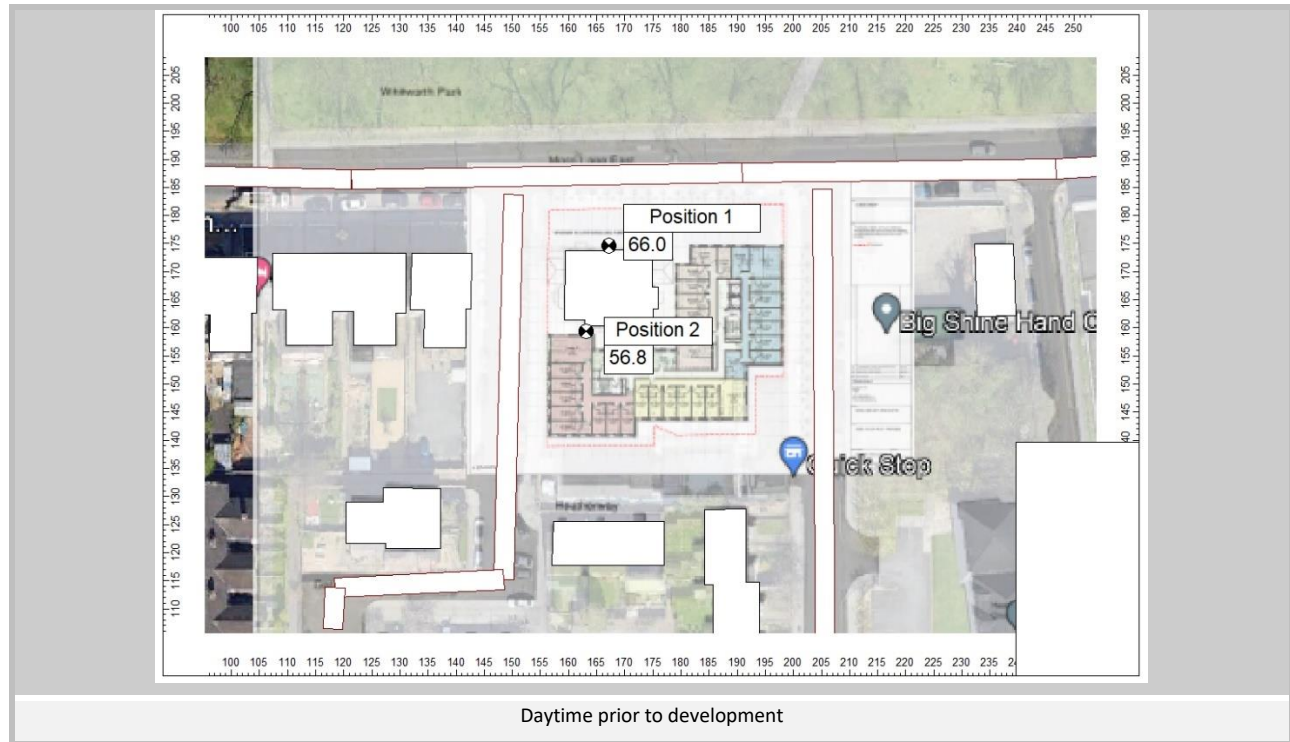
| NOISE LEVEL SUMMARY ASSESSMENT                                                        |      |       |      | Octave Band Centre Frequency (Hz) |      |      |      |      |      |      |      |       |
|---------------------------------------------------------------------------------------|------|-------|------|-----------------------------------|------|------|------|------|------|------|------|-------|
| Date / Time                                                                           | LAeq | LAmaz | LA90 | 63                                | 125  | 250  | 500  | 1.0k | 2.0k | 4.0k | 8.0k | 16.0k |
| DAYTIME 07:00 - 23:00<br><small>LA90 1 HOUR &amp; Corresponding LAeq 1 HOUR</small>   | 68.4 | 83.5  | 66.0 | 69.1                              | 64.6 | 60.6 | 59.7 | 64.2 | 63.2 | 57.7 | 51.4 | 39.7  |
| NIGHT TIME 23:00 - 07:00<br><small>A90 15 MIN &amp; Corresponding LAeq 15 MIN</small> | 64.0 | 75.7  | 61.0 | 63.5                              | 60.0 | 55.7 | 55.6 | 59.9 | 58.6 | 54.3 | 47.9 | 35.8  |

## 7 ELEMENT 2 – INTERNAL NOISE LEVEL GUIDELINES

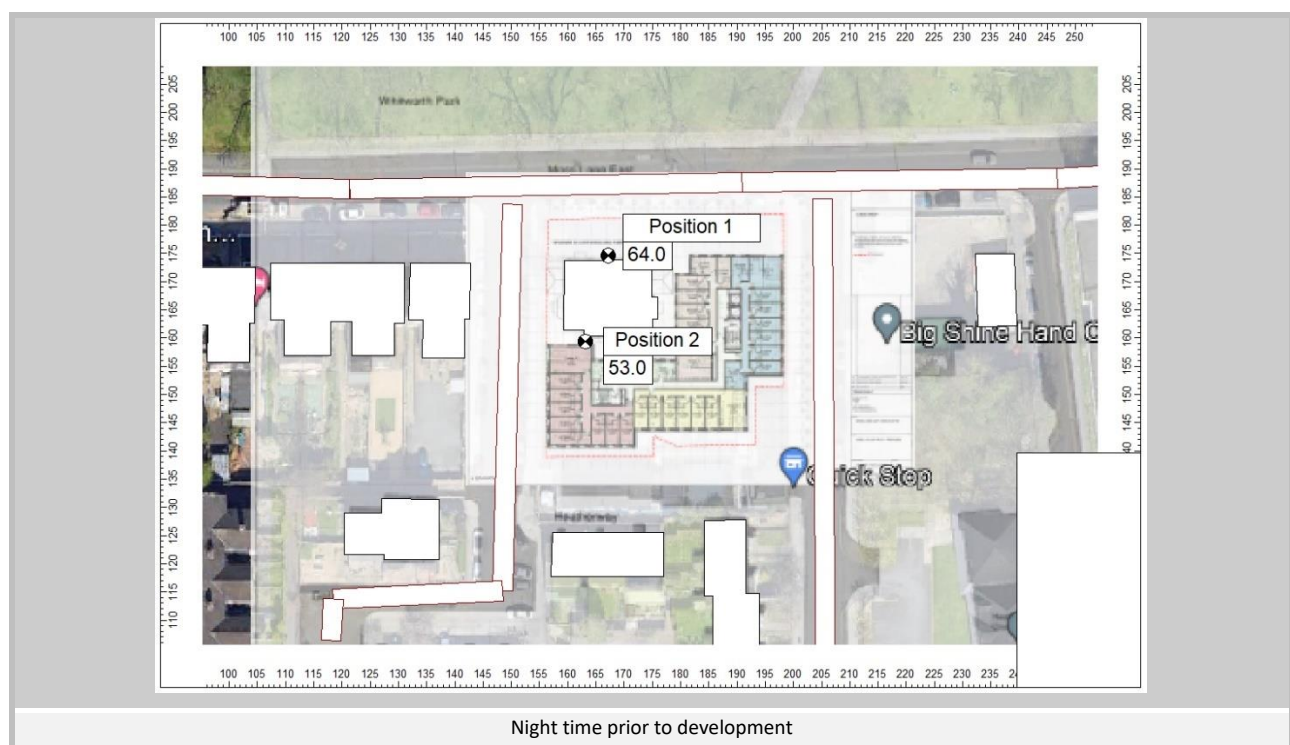
### 7.1 Discussion of Results

It can be seen from the attached graph and downloaded results that the external noise levels have followed the expected path and remained fairly constant throughout the day. The levels then gradually dropped off as the evening progressed and began to rise when morning traffic levels increased.

### 7.2 Existing Noise Levels – Daytime (07:00 – 23:00)



### 7.3 Existing Noise Levels – Night Time (23:00 – 07:00)



#### **7.4 Recommendations**

For the purpose of this assessment, the corresponding façade levels will be used within the BS 8233: 2014 calculations in order to evaluate the worst case scenario and select the correct window specification.

Therefore, in order to achieve the required noise levels of  $L_{Aeq\ 16\ HOUR}$  35 dB for habitable rooms daytime and  $L_{Aeq\ 8\ HOUR}$  30 dB for Bedroom at night within the proposed, the following additional acoustic measures have been calculated.

It should be noted that the calculations have been made with the proposed windows closed. Additional calculations were made for the top floor due to the influence of sound transmission into the various rooms via the roof / ceiling i.e. an increased impeding façade. Inputted levels into the calculation sheets have been corrected for distance attenuation and free field in accordance with the aforementioned British Standard.

#### **7.5 Calculation Procedure to BS 8233: 2014**

The following calculations have been carried out in order to determine the required window and ventilation specification in order to meet the requirements of BS 8233: 2014.

#### **7.6 Glazing & Ventilation Assessment**

The development should be designed with various glazing specification across the site together with an MEV System 3 ventilation strategy to all rooms to ensure the internal noise levels are acceptable in terms of the assessment to British Standard 8233: 2014.

## 7.7 Typical Studio – Façade Corrected to Daytime 66 dB & Night Time 64 dB

| Recorded Site Data<br>(Corrected for Free Field) | Octave Band Centre Frequency (Hz)                                                                            |      |                          |                      |      |              |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------|------|--------------------------|----------------------|------|--------------|
|                                                  | 125                                                                                                          | 250  | 500                      | 1000                 | 2000 | 4000         |
| Daytime Leqff                                    | 72.5                                                                                                         | 67.4 | 62.6                     | 64.0                 | 63.8 | 59.0         |
| Night time Leqff                                 | 68.8                                                                                                         | 65.1 | 61.3                     | 63.2                 | 62.0 | 55.9         |
|                                                  |                                                                                                              |      |                          |                      |      |              |
| Room Data                                        | Sf                                                                                                           | Sr   | Swi                      | Sew                  | Srr  | Volume       |
| Area m²                                          | 9.4                                                                                                          | 0    | 2                        | 7.4                  | 0    | 35           |
|                                                  |                                                                                                              |      |                          |                      |      |              |
| Specification Summary                            | Site Specific Specification                                                                                  |      |                          | Attenuation Required |      |              |
| Glazing Specification                            | 10mm / 16mm Argon / 8.8mm Pilkington Optiphon                                                                |      |                          | Rw(C; Ctr)           |      | 44(-2,-6) dB |
| Ventilation Strategy                             | Titon V75 / C75                                                                                              |      |                          | Dne'w                |      | 44 dB        |
| Wall Specification                               | Brick & Block Cavity Wall                                                                                    |      |                          | Rw                   |      | 54 dB        |
| Roof Specification                               | 150mm Concrete Flat Roof                                                                                     |      |                          | Rw                   |      | 55 dB        |
|                                                  |                                                                                                              |      |                          |                      |      |              |
| Calculation Results                              |                                                                                                              |      |                          |                      |      |              |
| Daytime Hours (07:00-23:00)                      |                                                                                                              |      | L <sub>Aeq</sub> 16 HOUR | 31.3                 |      | dB(A)        |
| Night Time Hours (23:00-07:00)                   |                                                                                                              |      | L <sub>Aeq</sub> 8 HOUR  | 29.0                 |      | dB(A)        |
|                                                  |                                                                                                              |      |                          |                      |      |              |
| Formula                                          | Leq2=Leqff+10log[A0/S*10^(-Dne/10)+Swi/S*10^(-Rwi/10)+Sew/10*10^(-Rew/10)+Srr/S*10^(-Rrr/10)] +10log(S/A) +3 |      |                          |                      |      |              |
| Note                                             | The expected precision of this calculation is ±2 dB.                                                         |      |                          |                      |      |              |

## 7.8 Typical Studio – Façade Corrected to Daytime 60 dB & Night Time 58 dB

| Recorded Site Data<br>(Corrected for Free Field) | Octave Band Centre Frequency (Hz)                                                                                      |      |                          |                      |              |        |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------|--------------------------|----------------------|--------------|--------|
|                                                  | 125                                                                                                                    | 250  | 500                      | 1000                 | 2000         | 4000   |
| Daytime Leqff                                    | 66.5                                                                                                                   | 61.4 | 56.6                     | 58.0                 | 57.8         | 53.0   |
| Night time Leqff                                 | 62.8                                                                                                                   | 59.1 | 55.3                     | 57.2                 | 56.0         | 49.9   |
|                                                  |                                                                                                                        |      |                          |                      |              |        |
| Room Data                                        | Sf                                                                                                                     | Sr   | Swi                      | Sew                  | Srr          | Volume |
| Area m²                                          | 9.4                                                                                                                    | 0    | 2                        | 7.4                  | 0            | 35     |
|                                                  |                                                                                                                        |      |                          |                      |              |        |
| Specification Summary                            | Site Specific Specification                                                                                            |      |                          | Attenuation Required |              |        |
| Glazing Specification                            | 6mm / (6-16mm) / 10mm Laminated                                                                                        |      |                          | Rw(C; Ctr)           | 33(-2,-5) dB |        |
| Ventilation Strategy                             | Titon V50 / C25                                                                                                        |      |                          | Dne'w                | 39 dB        |        |
| Wall Specification                               | Brick & Block Cavity Wall                                                                                              |      |                          | Rw                   | 54 dB        |        |
| Roof Specification                               | 150mm Concrete Flat Roof                                                                                               |      |                          | Rw                   | 55 dB        |        |
|                                                  |                                                                                                                        |      |                          |                      |              |        |
| Calculation Results                              |                                                                                                                        |      |                          |                      |              |        |
| Daytime Hours (07:00-23:00)                      |                                                                                                                        |      | L <sub>Aeq</sub> 16 HOUR | 32.0                 | dB(A)        |        |
| Night Time Hours (23:00-07:00)                   |                                                                                                                        |      | L <sub>Aeq</sub> 8 HOUR  | 29.8                 | dB(A)        |        |
|                                                  |                                                                                                                        |      |                          |                      |              |        |
| Formula                                          | $Leq2=Leqff+10\log[A0/S*10^{(-Dne/10)}+Swi/S*10^{(-Rwi/10)}+Sew/10*10^{(-Rew/10)}+Srr/S*10^{(-Rrr/10)}]+10\log(S/A)+3$ |      |                          |                      |              |        |
| Note                                             | The expected precision of this calculation is ±2 dB.                                                                   |      |                          |                      |              |        |

## 7.9 Typical Studio – Façade Corrected to Daytime 57 dB & Night Time 55 dB

| Recorded Site Data<br>(Corrected for Free Field) | Octave Band Centre Frequency (Hz)                                                                                      |      |                          |                      |       |              |
|--------------------------------------------------|------------------------------------------------------------------------------------------------------------------------|------|--------------------------|----------------------|-------|--------------|
|                                                  | 125                                                                                                                    | 250  | 500                      | 1000                 | 2000  | 4000         |
| Daytime Leqff                                    | 63.5                                                                                                                   | 58.4 | 53.6                     | 55.0                 | 54.8  | 50.0         |
| Night time Leqff                                 | 59.8                                                                                                                   | 56.1 | 52.3                     | 54.2                 | 53.0  | 46.9         |
|                                                  |                                                                                                                        |      |                          |                      |       |              |
| Room Data                                        | Sf                                                                                                                     | Sr   | Swi                      | Sew                  | Srr   | Volume       |
| Area m²                                          | 9.4                                                                                                                    | 0    | 2                        | 7.4                  | 0     | 35           |
|                                                  |                                                                                                                        |      |                          |                      |       |              |
| Specification Summary                            | Site Specific Specification                                                                                            |      |                          | Attenuation Required |       |              |
| Glazing Specification                            | 4mm / (6-16mm) / 4mm                                                                                                   |      |                          | Rw(C; Ctr)           |       | 29(-1,-4) dB |
| Ventilation Strategy                             | Titon Std. Vent / C25                                                                                                  |      |                          | Dne'w                |       | 35 dB        |
| Wall Specification                               | Brick & Block Cavity Wall                                                                                              |      |                          | Rw                   |       | 54 dB        |
| Roof Specification                               | 150mm Concrete Flat Roof                                                                                               |      |                          | Rw                   |       | 55 dB        |
|                                                  |                                                                                                                        |      |                          |                      |       |              |
| Calculation Results                              |                                                                                                                        |      |                          |                      |       |              |
| Daytime Hours (07:00-23:00)                      |                                                                                                                        |      | L <sub>Aeq</sub> 16 HOUR | 30.4                 | dB(A) |              |
| Night Time Hours (23:00-07:00)                   |                                                                                                                        |      | L <sub>Aeq</sub> 8 HOUR  | 28.0                 | dB(A) |              |
|                                                  |                                                                                                                        |      |                          |                      |       |              |
| Formula                                          | $Leq2=Leqff+10\log[A0/S*10^{(-Dne/10)}+Swi/S*10^{(-Rwi/10)}+Sew/10*10^{(-Rew/10)}+Srr/S*10^{(-Rrr/10)}]+10\log(S/A)+3$ |      |                          |                      |       |              |
| Note                                             | The expected precision of this calculation is ±2 dB.                                                                   |      |                          |                      |       |              |

The following are minimum construction attenuation values and should alternative methods be selected; these should be equal to or greater than the above corresponding values. Calculations carried out have indicated the following specifications should be installed for this site.

### 7.10 Walls (Non-Glazed Elements) (R<sub>ew</sub>)

| Octave Band Frequency             | 125  | 250  | 500  | 1000 | 2000 | 4000 | R <sub>w</sub> |
|-----------------------------------|------|------|------|------|------|------|----------------|
| Minimum External Wall Attenuation | 40.0 | 44.0 | 45.0 | 51.0 | 56.0 | 61.0 | 50.0           |

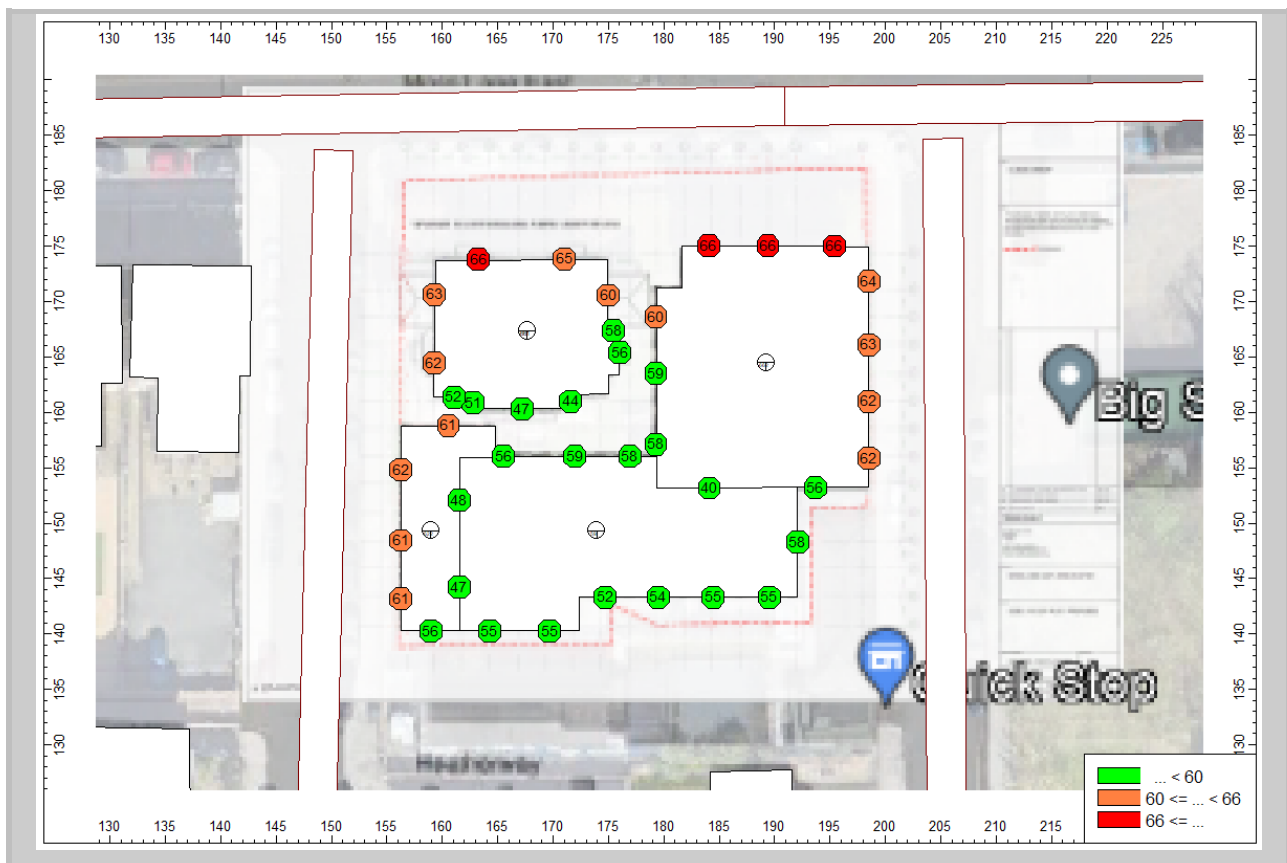
### 7.11 Roof (R<sub>rr</sub>)

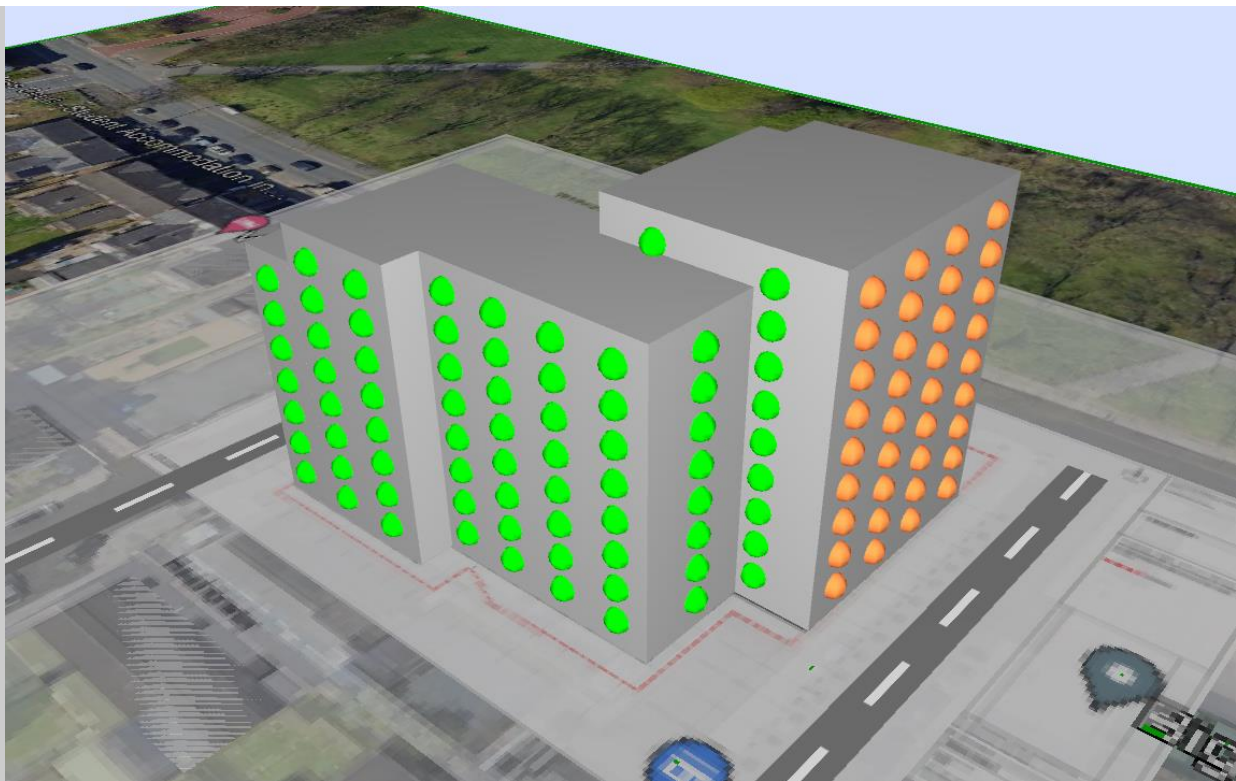
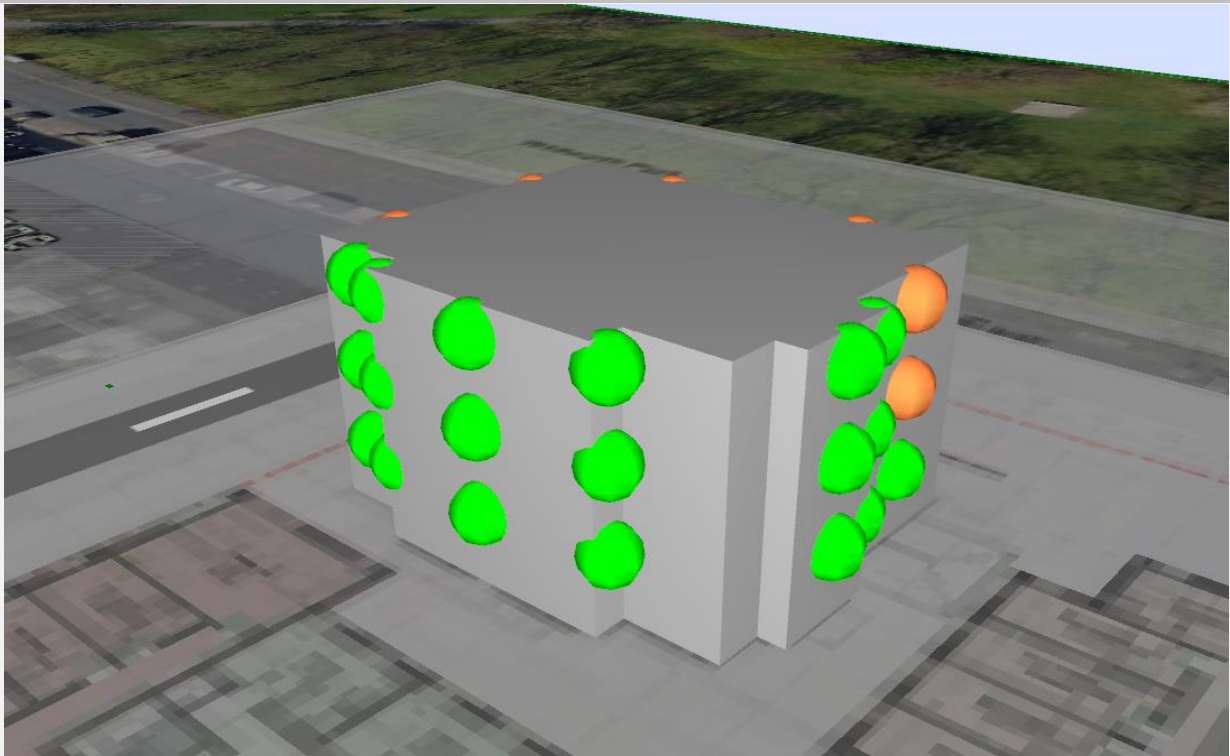
| Octave Band Frequency | 125  | 250  | 500  | 1000 | 2000 | 4000 | R <sub>w</sub> |
|-----------------------|------|------|------|------|------|------|----------------|
| Minimum Value         | 39.0 | 48.0 | 55.0 | 60.0 | 59.0 | 61.0 | 57 dB          |

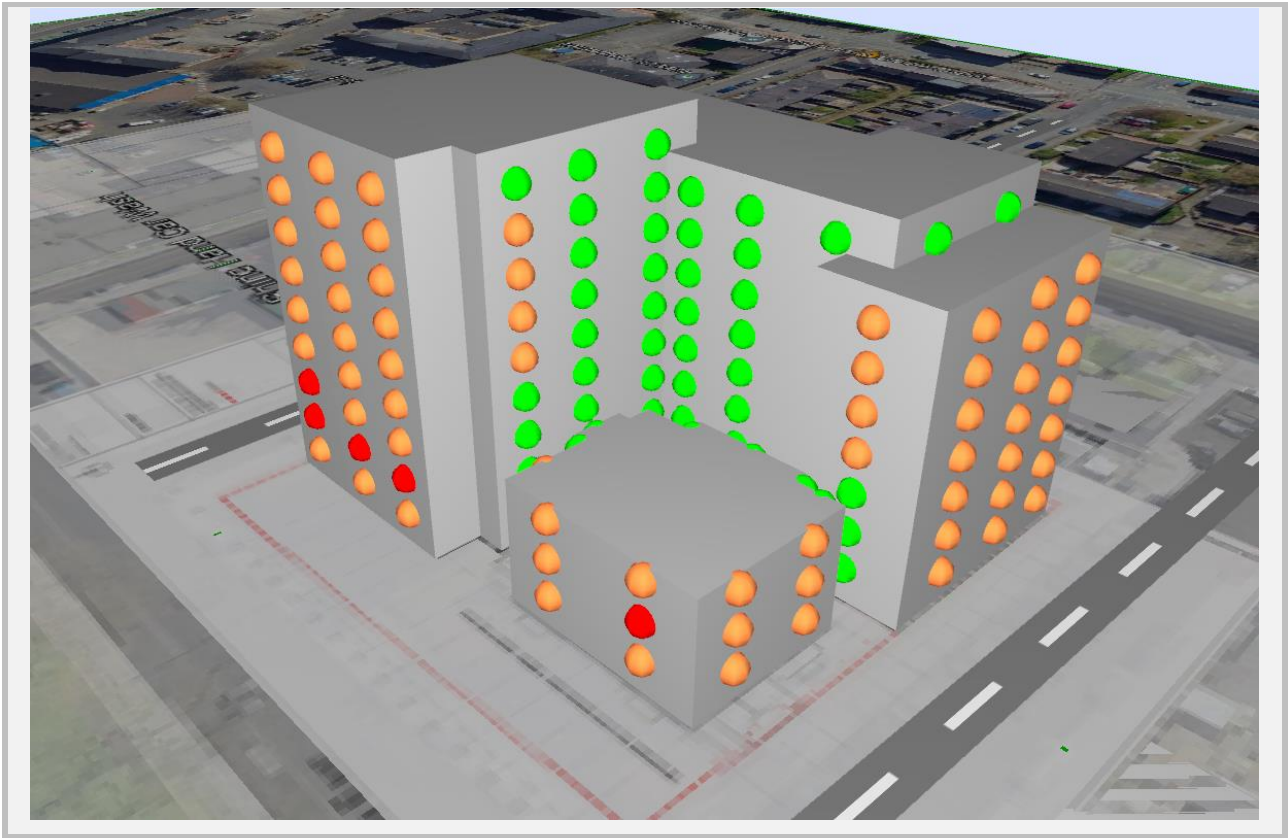
### 7.12 Glazing & Ventilation ( $R_{wi}$ )

| Octave Band Frequency                   | 125  | 250  | 500  | 1000 | 2000 | 4000 | $R_{w}$ (C:Ctr)                |
|-----------------------------------------|------|------|------|------|------|------|--------------------------------|
| 10mm glass / 16mm air gap / 8.8mm glass | 28.0 | 31.0 | 42.0 | 45.0 | 50.0 | 58.0 | $R_w$ 44 <sub>(-2,-6)</sub> dB |
| Titon V75 / C75                         | 37.0 | 37.0 | 36.1 | 46.9 | 49.2 | 55.2 | $D_{ne'w}$ 44 dB               |
| 6mm glass / 16mm air gap / 10mm glass   | 20.0 | 19.0 | 30.0 | 39.0 | 37.0 | 46.0 | $R_w$ 33 <sub>(-2,-5)</sub> dB |
| Titon V50 / C25                         | 37.9 | 37.7 | 33.4 | 36.3 | 47.1 | 49.2 | $D_{ne'w}$ 39 dB               |
| 4mm glass / 16mm air gap / 4mm glass    | 21.0 | 17.0 | 25.0 | 35.0 | 37.0 | 31.0 | $R_w$ 29 <sub>(-1,-4)</sub> dB |
| Titon Std. Vent / C25                   | 35.7 | 37.7 | 36.1 | 32.1 | 37.1 | 38.9 | $D_{ne'w}$ 35 dB               |

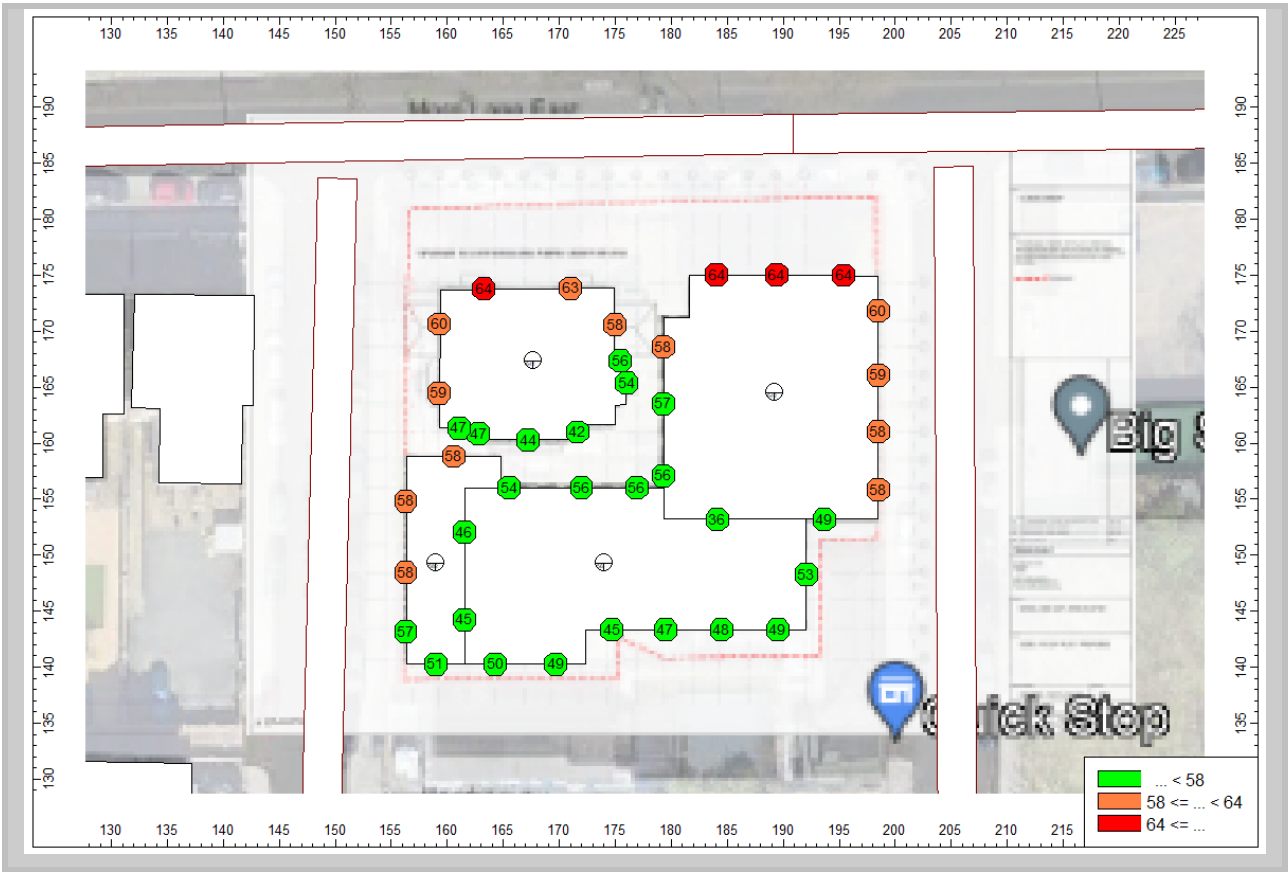
### 7.13 Proposed Noise levels – Daytime (07:00 – 23:00)

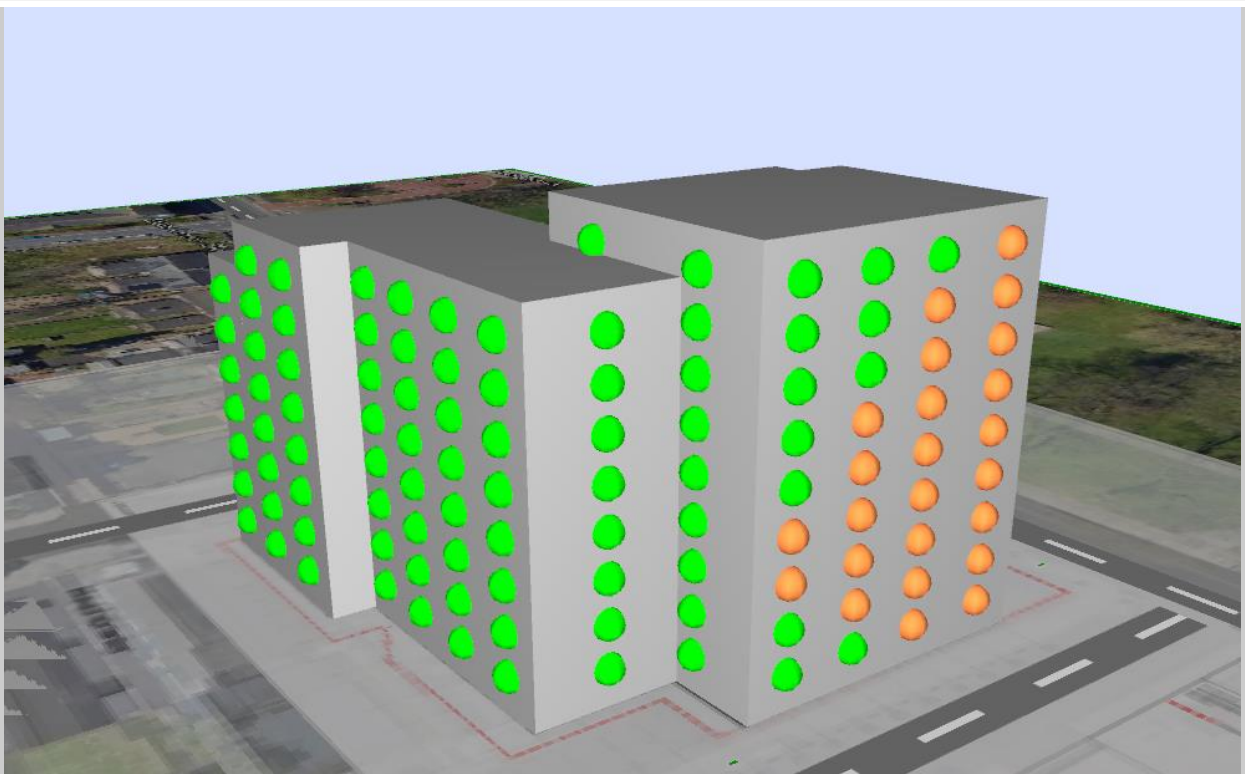
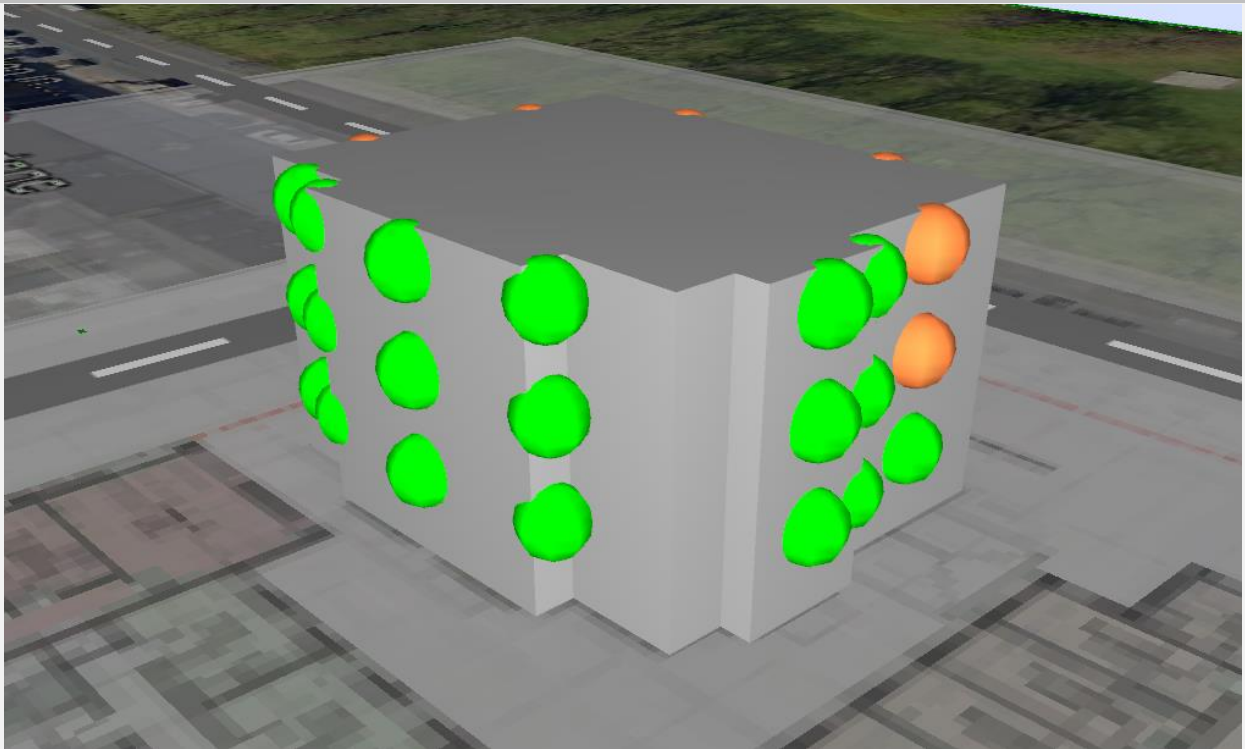


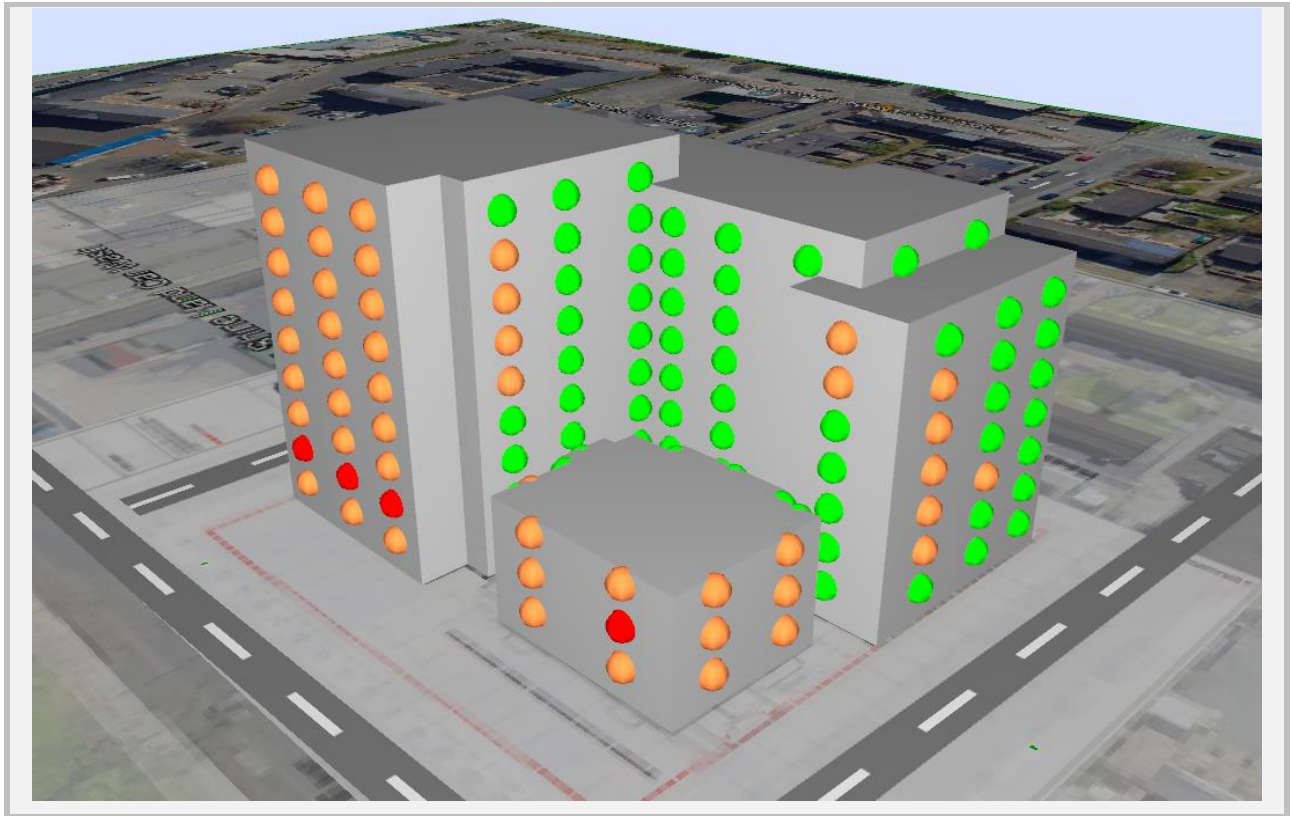




7.14 Proposed Noise levels – Night Time (23:00 – 07:00)







**NOTE:**

The above are minimum construction attenuation values and should alternative methods be selected; these should be equal to or greater than the above corresponding values. Calculations carried out have indicated the following specifications should be installed for this site.

**7.15 Glazing & Ventilation Assessment**

The development should be designed with various glazing specification across the site together with an MEV System 3 ventilation strategy to all rooms to ensure the internal noise levels are acceptable in terms of the assessment to British Standard 8233: 2014.

## **8 APPROVED DOCUMENT O 2021 – ‘OVERHEATING’**

### **8.1 Approved Document O – Section 3: Ensuring the Overheating Mitigation Strategy is Usable.**

Building Regulations 2010 Approved Document O 2021 ‘Overheating’ states the following within Section 3: ‘Ensuring the Overheating Mitigation Strategy is Usable’:-

- 3.2 In locations where external noise may be an issue (for example, where the local planning authority considered external noise to be an issue at the planning stage), the overheating mitigation strategy should take account of the likelihood that windows will be closed during sleeping hours (11pm to 7am).
- 3.3 Windows are likely to be closed during sleeping hours if noise within bedrooms exceeds the following limits.
- a. 40dB L , averaged over 8 hours (between 11pm and 7am)
  - b. 55dB L , more than 10 times a night (between 11pm and 7am).
- 3.4 Where in-situ noise measurements are used as evidence that these limits are not exceeded, measurements should be taken in accordance with the Association of Noise Consultants *Measurement of Sound Levels in Buildings with the overheating mitigation strategy in use*.

NOTE: Guidance on reducing the passage of external noise into buildings can be found in the National Model Design Code: Part 2 – Guidance Notes (MHCLG, 2021) and the Association of Noise Consultants’ Acoustics, Ventilation and Overheating: Residential Design Guide (2020)

The above document makes no specific reference to daytime target criteria. However, the above night time criteria has a +10 dB relaxation of the internal noise criteria set out within BS 8233: 2014 and therefore this is to be adopted for the daytime period as well.

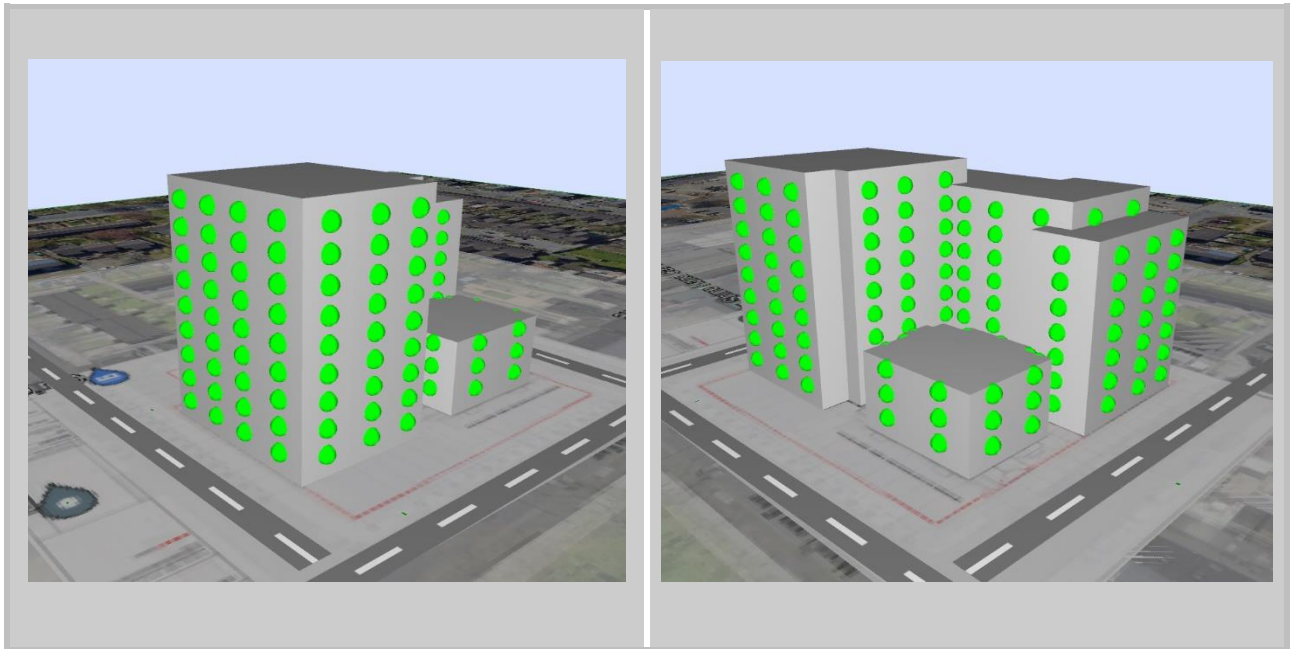
The current ventilation strategy does not propose to utilise openable windows to combat overheating during night time hours and therefore, only daytime assessments have been made.

The following calculations demonstrate the windows can be open to combat overheating for 4 hours during the day.

## 8.2 Assessment of Openable Windows

The following Table demonstrates which plots of the proposed development would be able to utilise openable windows to mitigate overheating and the proposed system 3 – MEV units will remain compliant.

### 8.2.1 Windows Open 1 – 4 Hours during Daytime Hours (07:00-23:00)



### 8.3 TM59 Overheating ‘Assessment of Requirement for Testing’

With regards to potential overheating at the proposed development and any TM59 assessment that may be required for this site, we would like to confirm that having opening windows to dissipate excessive summer heat vs the internal acoustics is always a fine balancing act.

With regards to the internal acoustic criteria of Daytime  $L_{Aeq\ 16\text{ HOUR}}$  35 dB and Night Time  $L_{Aeq\ 8\text{ HOUR}}$  30 dB, this is a planning requirement under BS 8233: 2014 to which this report and calculations have been carried out to and is based on. This assessment has detailed the glazing and ventilation requirements required in order to achieve these criteria based on the assumption that the windows are closed.

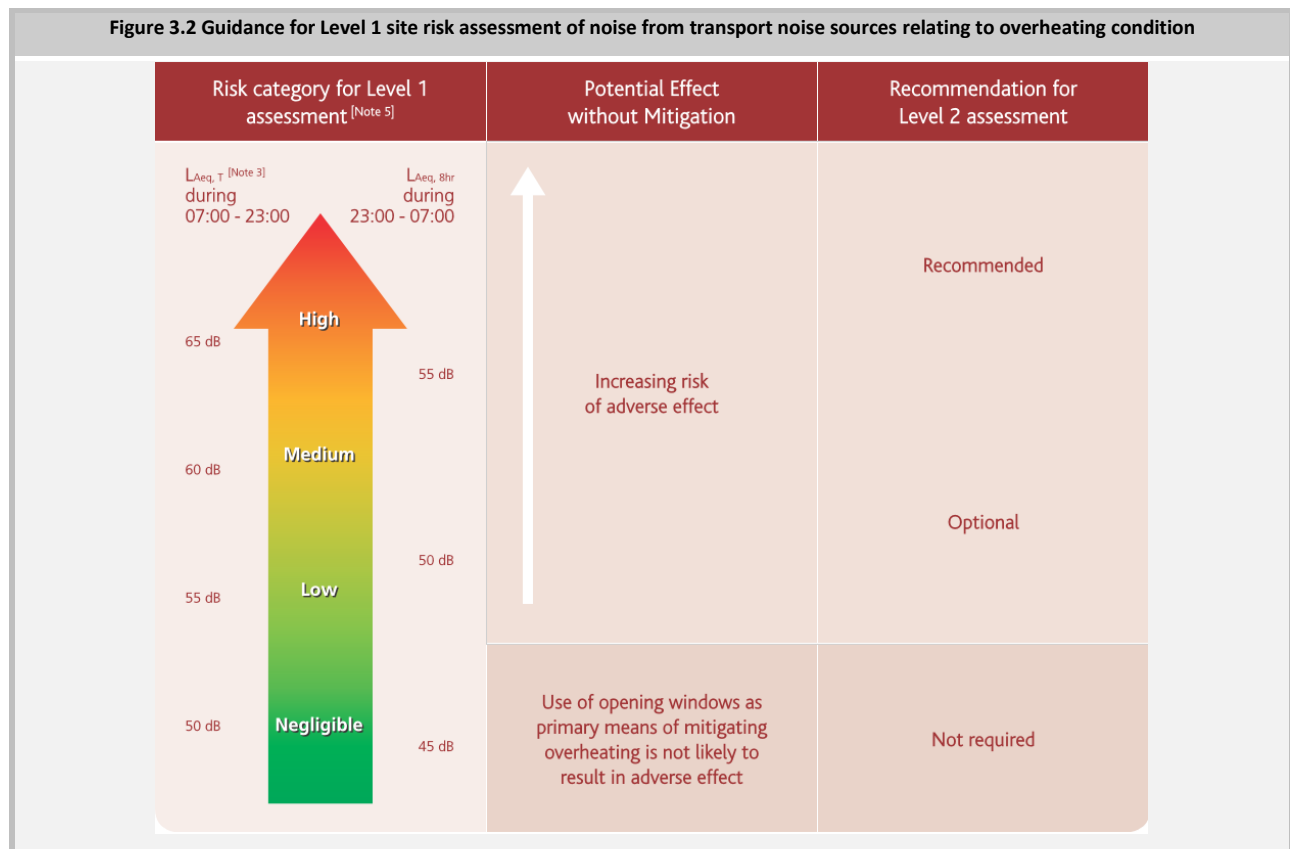
References and assessments are to be made to the Association of Noise Consultants ‘Acoustic Ventilation & Overheating – Residential Design Guide’ 2020. The calculations carried out within this report have identified an acoustic requirement for System 1 & 2 and therefore guidelines values from Table 4 of BS 8233: 2014 are to be adopted.

This document takes a Level 1 and Level 2 approach to an acoustic overheating assessment and depending on the outcome of Level 1, further determines the need or necessity for a Level 2 assessment.

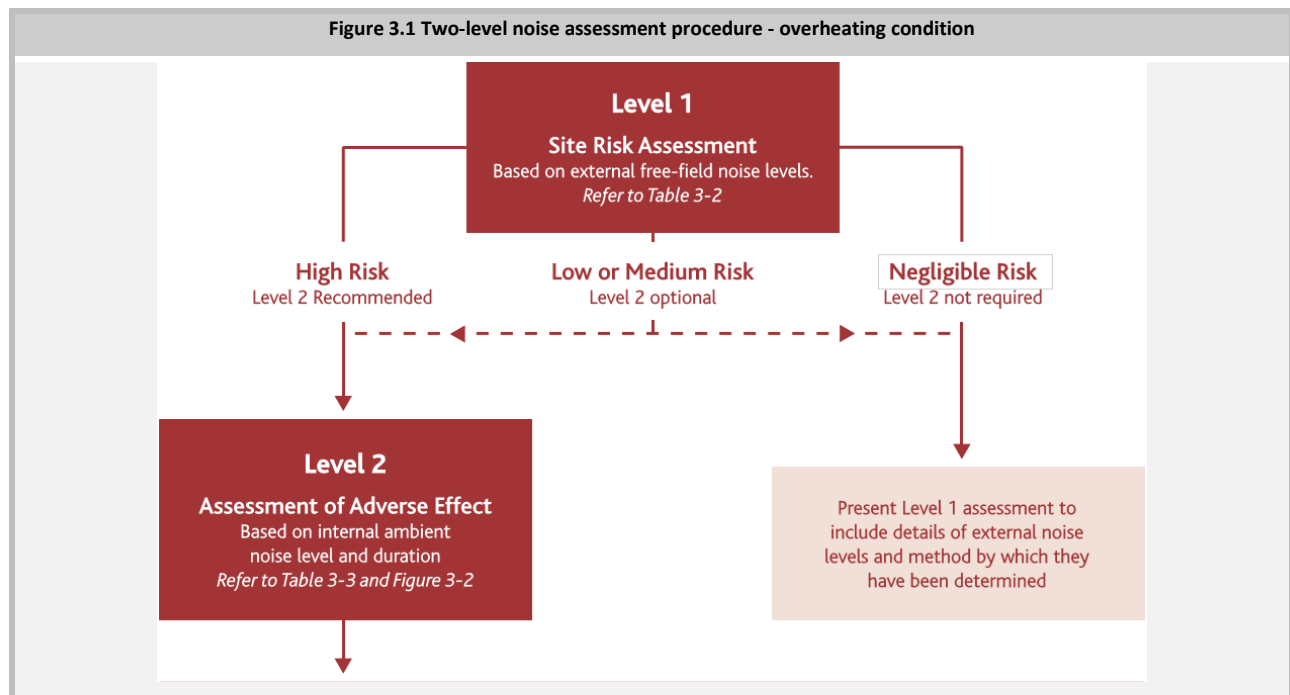
#### 8.3.1 Table 3.1 - Indoor Ambient Noise Levels Resulting from Transport Noise Sources

| Table 3.1 ‘Indoor ambient noise levels resulting from transport noise sources – ADF ventilation condition’ |                                                                                                                                                                                                                                                     |                                                                                                                                         |  |
|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------|--|
| Ventilation condition                                                                                      | Operational condition of System                                                                                                                                                                                                                     | Desirable internal ambient noise level from transport noise sources                                                                     |  |
| Part F - Whole dwelling ventilation                                                                        | Systems 1 & 2: Background (‘trickle’) ventilators open to provide whole dwelling ventilation in the winter period. Additional ventilation required at other times of the year – windows are assumed to be ajar for assessment <sup>[Note 2]</sup> . | Guideline values from Table 4 of BS 8233:2014.                                                                                          |  |
|                                                                                                            | System 3: Continuous mechanical extract with background (‘trickle’) ventilators open <sup>[Note 2]</sup> .                                                                                                                                          |                                                                                                                                         |  |
|                                                                                                            | System 4: Continuous mechanical supply and extract with heat recovery (MVHR) – no trickle vents required.                                                                                                                                           |                                                                                                                                         |  |
| Part F – Purge Ventilation <sup>[Note 1]</sup>                                                             | Option 1: Opening external window(s) meeting requirements described in Appendix B of Part F.                                                                                                                                                        | No specific acoustic criterion needs to be met in a room using purge ventilation for the purpose of rapidly diluting indoor pollutants. |  |
|                                                                                                            | Option 2: Manually controlled fan extracting 4 air changes per hour.                                                                                                                                                                                |                                                                                                                                         |  |

8.3.2 figure 3.2 - Guidance for Level 1 Site Risk Assessment of Noise from Transport Noise Sources Relating to Overheating Condition



8.3.3 Figure 3.1 Two-Level Noise Assessment Procedure



8.3.4 Requirement for Testing Conclusion

Based on the above assessments, it is the concluded that a detailed TM59 assessment is recommended for this site.

## **9 ELEMENT 4 – ASSESSMENT OF OTHER RELEVANT ISSUES**

### **9.1 NPPF & NPSE**

The National Planning Policy Framework 2023 (NPPF) and assessments to the Noise Policy Statement for England 2010 (NPSE) should be made in conjunction with each other. Paragraphs 191 - 194 of the National Planning Policy Framework 2023 (NPPF) states the following:

**Paragraph 191** Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as the potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

- a) 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.
- b) Identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

**Paragraph 192** Planning policies and decisions should sustain and contribute towards compliance with relevant limit values or national objectives for pollutants. So far as possible these opportunities should be considered at the plan-making stage, to ensure a strategic approach and limit the need for issues to be reconsidered when determining individual applications.

**Paragraph 193** Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

**Paragraph 194** The focus of planning policies and decisions should be on whether proposed development is an acceptable use of land, rather than the control of processes or emissions (where these are subject to separate pollution control regimes). Planning decisions should assume that these regimes will operate effectively. Equally, where a planning decision has been made on a particular development, the planning issues should not be revisited through the permitting regimes operated by pollution control authorities

**The Noise Policy Statement for England** gives various levels of effect as detailed within this report.

With the glazing / ventilation specifications achieved within this report, the development can be implemented within the guidelines of the aforementioned documents and ensure a conclusion of **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.

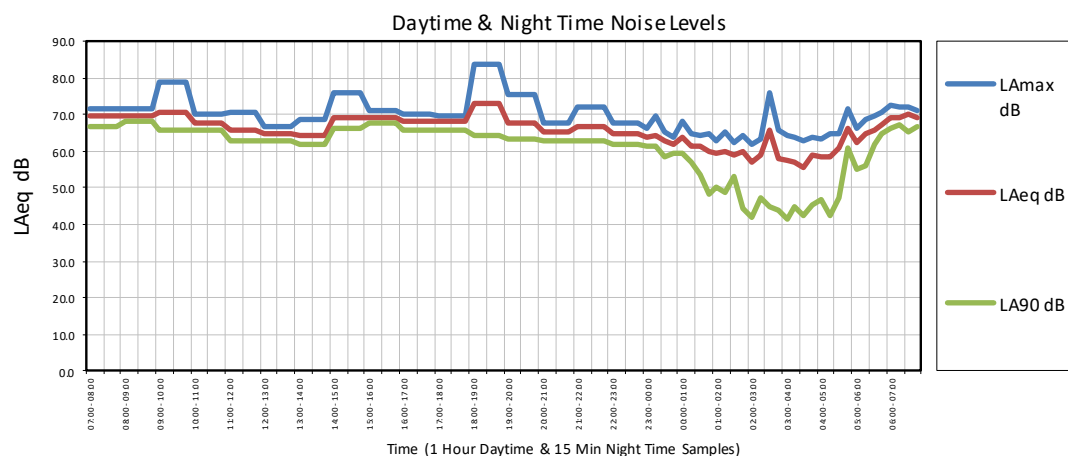
## 10 APPENDIX A - RESULTS

### 10.1 20<sup>th</sup> – 21<sup>st</sup> February 2024 Position 1

| NOISE LEVEL SUMMARY ASSESSMENT                                                      |      |       |      | Octave Band Centre Frequency (Hz) |      |      |      |      |      |      |      |       |
|-------------------------------------------------------------------------------------|------|-------|------|-----------------------------------|------|------|------|------|------|------|------|-------|
| Date / Time                                                                         | LAeq | LAmaz | LA90 | 63                                | 125  | 250  | 500  | 1.0k | 2.0k | 4.0k | 8.0k | 16.0k |
| DAYTIME 07:00 - 23:00<br><small>LAeq 16 HOUR &amp; Corrected LAmaz 16 HOUR</small>  | 68.4 | 83.5  | 66.0 | 69.1                              | 64.6 | 60.6 | 59.7 | 64.2 | 63.2 | 57.7 | 51.4 | 39.7  |
| NIGHT TIME 23:00 - 07:00<br><small>LAeq 8 HOUR &amp; Corrected LAmaz 8 HOUR</small> | 64.0 | 75.7  | 61.0 | 63.5                              | 60.0 | 55.7 | 55.6 | 59.9 | 58.6 | 54.3 | 47.9 | 35.8  |

| DAYTIME NOISE LEVELS 07:00 - 23:00 1 HOUR SAMPLES |      |       |      | Octave Band Centre Frequency (Hz) |      |      |      |       |       |       |       |        |
|---------------------------------------------------|------|-------|------|-----------------------------------|------|------|------|-------|-------|-------|-------|--------|
| Date / Time                                       | LAeq | LAmaz | LA90 | 63                                | 125  | 250  | 500  | 1.0 k | 2.0 k | 4.0 k | 8.0 k | 16.0 k |
| 07:00 - 08:00                                     | 69.6 | 71.6  | 67.0 | 68.2                              | 63.2 | 60.1 | 60.8 | 65.1  | 64.3  | 61.0  | 54.8  | 42.8   |
| 08:00 - 09:00                                     | 69.7 | 71.4  | 68.0 | 69.5                              | 65.6 | 61.4 | 61.6 | 65.1  | 64.3  | 60.9  | 54.7  | 42.6   |
| 09:00 - 10:00                                     | 70.7 | 78.9  | 66.0 | 68.8                              | 64.7 | 60.2 | 59.8 | 65.5  | 66.7  | 59.8  | 53.2  | 40.6   |
| 10:00 - 11:00                                     | 67.4 | 70.3  | 66.0 | 69.5                              | 65.5 | 61.6 | 59.7 | 63.4  | 61.6  | 57.2  | 50.8  | 37.8   |
| 11:00 - 12:00                                     | 65.6 | 70.6  | 63.0 | 68.7                              | 64.6 | 61.5 | 60.3 | 62.0  | 58.7  | 53.7  | 49.7  | 40.5   |
| 12:00 - 13:00                                     | 64.5 | 66.7  | 63.0 | 69.8                              | 66.0 | 60.1 | 58.9 | 61.6  | 57.2  | 49.2  | 42.6  | 33.0   |
| 13:00 - 14:00                                     | 64.4 | 68.6  | 62.0 | 69.1                              | 65.9 | 63.1 | 59.3 | 61.2  | 56.9  | 48.3  | 40.6  | 32.4   |
| 14:00 - 15:00                                     | 69.1 | 75.8  | 66.0 | 69.5                              | 65.6 | 60.4 | 59.5 | 64.9  | 64.0  | 58.8  | 52.5  | 40.2   |
| 15:00 - 16:00                                     | 69.2 | 70.8  | 68.0 | 69.2                              | 64.0 | 60.6 | 60.4 | 64.4  | 63.8  | 60.8  | 54.9  | 42.9   |
| 16:00 - 17:00                                     | 67.9 | 70.1  | 66.0 | 69.6                              | 63.8 | 59.9 | 59.3 | 63.2  | 62.5  | 59.3  | 53.3  | 41.4   |
| 17:00 - 18:00                                     | 68.0 | 69.7  | 66.0 | 69.8                              | 64.2 | 60.8 | 59.9 | 63.7  | 62.3  | 58.8  | 52.6  | 41.2   |
| 18:00 - 19:00                                     | 72.8 | 83.5  | 64.0 | 69.9                              | 64.5 | 61.1 | 59.9 | 69.0  | 68.5  | 57.7  | 50.0  | 39.9   |
| 19:00 - 20:00                                     | 67.7 | 75.3  | 63.0 | 69.3                              | 63.9 | 59.7 | 59.0 | 63.5  | 62.6  | 57.4  | 49.6  | 38.3   |
| 20:00 - 21:00                                     | 65.1 | 67.5  | 63.0 | 68.4                              | 64.3 | 59.7 | 58.5 | 62.1  | 58.6  | 50.7  | 44.3  | 33.5   |
| 21:00 - 22:00                                     | 66.7 | 71.8  | 63.0 | 68.3                              | 63.2 | 59.4 | 58.7 | 63.3  | 61.1  | 53.7  | 45.8  | 34.1   |
| 22:00 - 23:00                                     | 64.7 | 67.8  | 62.0 | 67.6                              | 62.8 | 58.5 | 57.8 | 61.7  | 58.4  | 49.8  | 42.9  | 31.4   |

| NIGHT TIME NOISE LEVELS 23:00 - 07:00 15 MINUTE SAMPLES |      |       |      | Octave Band Centre Frequency (Hz) |      |      |      |       |       |       |       |        |
|---------------------------------------------------------|------|-------|------|-----------------------------------|------|------|------|-------|-------|-------|-------|--------|
| Date / Time                                             | LAeq | LAmaz | LA90 | 63                                | 125  | 250  | 500  | 1.0 k | 2.0 k | 4.0 k | 8.0 k | 16.0 k |
| 23:00 - 23:15                                           | 63.9 | 66.1  | 61.0 | 66.5                              | 60.3 | 57.3 | 57.2 | 61.2  | 57.4  | 49.4  | 42.3  | 30.0   |
| 23:15 - 23:30                                           | 64.4 | 69.7  | 61.0 | 64.7                              | 65.0 | 60.3 | 58.4 | 61.3  | 57.5  | 48.1  | 40.9  | 29.3   |
| 23:30 - 23:45                                           | 62.8 | 65.4  | 58.0 | 62.9                              | 59.9 | 56.2 | 55.3 | 60.0  | 56.6  | 46.6  | 38.4  | 26.6   |
| 23:45 - 00:00                                           | 61.6 | 63.5  | 60.0 | 62.9                              | 56.0 | 53.9 | 54.9 | 59.0  | 55.3  | 45.8  | 38.0  | 25.8   |
| 00:00 - 00:15                                           | 63.7 | 67.9  | 59.0 | 62.2                              | 57.7 | 54.8 | 55.7 | 61.0  | 57.8  | 47.9  | 39.4  | 27.5   |
| 00:15 - 00:30                                           | 61.5 | 64.8  | 57.0 | 62.1                              | 58.7 | 54.1 | 54.0 | 58.7  | 55.4  | 45.3  | 37.0  | 25.8   |
| 00:30 - 00:45                                           | 61.2 | 64.4  | 54.0 | 61.9                              | 59.6 | 52.9 | 53.4 | 58.5  | 55.2  | 44.9  | 36.4  | 25.3   |
| 00:45 - 01:00                                           | 60.0 | 64.5  | 48.0 | 60.1                              | 54.7 | 51.8 | 52.8 | 57.4  | 53.8  | 43.7  | 34.9  | 22.9   |
| 01:00 - 01:15                                           | 59.3 | 62.6  | 50.0 | 61.9                              | 57.5 | 52.1 | 52.1 | 56.6  | 53.1  | 42.5  | 33.9  | 22.4   |
| 01:15 - 01:30                                           | 59.7 | 65.2  | 49.0 | 65.8                              | 63.5 | 54.7 | 53.2 | 56.3  | 53.4  | 43.6  | 35.4  | 24.3   |
| 01:30 - 01:45                                           | 58.9 | 62.5  | 53.0 | 61.4                              | 56.2 | 52.6 | 51.4 | 56.0  | 52.9  | 42.6  | 34.1  | 21.9   |
| 01:45 - 02:00                                           | 60.0 | 64.4  | 44.0 | 61.6                              | 63.9 | 56.2 | 53.0 | 57.0  | 53.2  | 43.0  | 34.1  | 22.8   |
| 02:00 - 02:15                                           | 56.9 | 61.8  | 42.0 | 57.7                              | 51.8 | 49.4 | 49.4 | 54.1  | 50.9  | 40.8  | 32.8  | 21.2   |
| 02:15 - 02:30                                           | 58.9 | 63.1  | 47.0 | 60.6                              | 55.4 | 50.9 | 51.8 | 56.1  | 52.7  | 45.2  | 38.6  | 26.3   |
| 02:30 - 02:45                                           | 65.8 | 75.7  | 45.0 | 59.7                              | 56.9 | 54.1 | 52.7 | 60.9  | 61.0  | 57.5  | 49.8  | 35.6   |
| 02:45 - 03:00                                           | 58.1 | 65.5  | 44.0 | 60.5                              | 61.1 | 51.8 | 51.0 | 55.2  | 52.0  | 41.7  | 32.0  | 20.5   |
| 03:00 - 03:15                                           | 57.3 | 64.0  | 41.0 | 56.7                              | 51.7 | 48.8 | 49.7 | 54.7  | 51.1  | 43.1  | 36.9  | 24.6   |
| 03:15 - 03:30                                           | 57.0 | 63.8  | 45.0 | 58.1                              | 51.5 | 47.8 | 48.4 | 53.1  | 51.4  | 47.4  | 41.0  | 28.3   |
| 03:30 - 03:45                                           | 55.6 | 62.7  | 42.0 | 56.8                              | 51.2 | 46.6 | 46.5 | 51.9  | 49.9  | 45.9  | 40.7  | 26.6   |
| 03:45 - 04:00                                           | 59.1 | 63.8  | 45.0 | 60.5                              | 59.5 | 52.1 | 50.5 | 54.7  | 53.5  | 49.7  | 43.0  | 30.0   |
| 04:00 - 04:15                                           | 58.2 | 63.3  | 47.0 | 58.6                              | 55.0 | 49.8 | 49.9 | 54.4  | 52.4  | 48.2  | 41.9  | 29.4   |
| 04:15 - 04:30                                           | 58.6 | 64.5  | 42.0 | 58.1                              | 54.0 | 48.2 | 49.6 | 54.7  | 53.0  | 49.4  | 43.3  | 30.4   |
| 04:30 - 04:45                                           | 60.7 | 64.6  | 47.0 | 58.5                              | 55.0 | 50.9 | 51.8 | 56.2  | 55.4  | 51.7  | 45.6  | 33.1   |
| 04:45 - 05:00                                           | 66.1 | 71.7  | 61.0 | 63.7                              | 61.2 | 57.1 | 57.0 | 61.2  | 61.3  | 56.7  | 50.7  | 38.7   |
| 05:00 - 05:15                                           | 62.5 | 66.2  | 55.0 | 61.8                              | 57.1 | 52.9 | 52.6 | 56.7  | 58.4  | 53.6  | 46.8  | 34.5   |
| 05:15 - 05:30                                           | 64.8 | 68.4  | 56.0 | 64.0                              | 58.9 | 54.8 | 55.0 | 59.3  | 60.3  | 56.2  | 49.5  | 37.1   |
| 05:30 - 05:45                                           | 65.7 | 69.6  | 62.0 | 66.8                              | 63.0 | 56.2 | 56.8 | 60.7  | 60.5  | 57.2  | 51.3  | 39.3   |
| 05:45 - 06:00                                           | 67.2 | 70.5  | 65.0 | 64.8                              | 60.3 | 58.2 | 58.2 | 62.5  | 62.1  | 58.6  | 52.4  | 40.1   |
| 06:00 - 06:15                                           | 68.9 | 72.7  | 66.0 | 67.4                              | 63.7 | 61.5 | 60.7 | 64.2  | 63.6  | 60.0  | 53.8  | 41.4   |
| 06:15 - 06:30                                           | 69.2 | 71.8  | 67.0 | 68.2                              | 62.9 | 60.4 | 61.1 | 64.5  | 63.8  | 60.7  | 54.6  | 43.8   |
| 06:30 - 06:45                                           | 69.9 | 72.2  | 65.0 | 67.8                              | 63.1 | 59.7 | 60.6 | 65.3  | 64.7  | 61.3  | 55.0  | 42.7   |
| 06:45 - 07:00                                           | 69.3 | 70.9  | 67.0 | 67.9                              | 62.3 | 59.5 | 60.3 | 65.0  | 63.9  | 60.5  | 54.5  | 41.5   |



## 10.2 20<sup>th</sup> – 21<sup>st</sup> February 2024 Position 2

| NOISE LEVEL SUMMARY ASSESSMENT                                                          |      |       |      | Octave Band Centre Frequency (Hz) |      |      |      |      |      |      |      |       |
|-----------------------------------------------------------------------------------------|------|-------|------|-----------------------------------|------|------|------|------|------|------|------|-------|
| Date / Time                                                                             | LAeq | LAmaz | LA90 | 63                                | 125  | 250  | 500  | 1.0k | 2.0k | 4.0k | 8.0k | 16.0k |
| DAYTIME 07:00 - 23:00<br><small>LAeq 16 HOUR &amp; Corresponding LAmaz 16 HOUR</small>  | 56.8 | 70.6  | 53.0 | 64.4                              | 58.1 | 54.4 | 52.7 | 52.0 | 50.1 | 46.4 | 41.7 | 37.0  |
| NIGHT TIME 23:00 - 07:00<br><small>LAeq 8 HOUR &amp; Corresponding LAmaz 8 HOUR</small> | 53.0 | 69.6  | 45.0 | 60.1                              | 55.2 | 52.0 | 49.7 | 48.6 | 46.0 | 39.3 | 33.8 | 25.9  |

| DAYTIME NOISE LEVELS 07:00 - 23:00 1 HOUR SAMPLES |      |       |      |      |      |      |      |       |       |       |       |        |
|---------------------------------------------------|------|-------|------|------|------|------|------|-------|-------|-------|-------|--------|
| Date / Time                                       | LAeq | LAmaz | LA90 | 63   | 125  | 250  | 500  | 1.0 k | 2.0 k | 4.0 k | 8.0 k | 16.0 k |
| 07:00 - 08:00                                     | 56.8 | 60.5  | 55.0 | 66.0 | 59.3 | 55.2 | 53.3 | 52.7  | 49.6  | 43.9  | 39.0  | 31.2   |
| 08:00 - 09:00                                     | 58.0 | 62.5  | 56.0 | 68.7 | 61.7 | 57.1 | 54.6 | 53.7  | 50.2  | 44.3  | 40.5  | 33.1   |
| 09:00 - 10:00                                     | 58.5 | 62.0  | 56.0 | 68.2 | 61.3 | 57.0 | 54.8 | 54.2  | 51.6  | 44.7  | 38.3  | 31.9   |
| 10:00 - 11:00                                     | 57.9 | 61.6  | 55.0 | 71.2 | 63.0 | 57.7 | 54.6 | 53.3  | 49.7  | 44.0  | 37.6  | 34.2   |
| 11:00 - 12:00                                     | 63.1 | 70.6  | 53.0 | 60.9 | 57.8 | 57.2 | 57.6 | 55.5  | 57.5  | 56.5  | 52.3  | 48.4   |
| 12:00 - 13:00                                     | 56.7 | 61.7  | 53.0 | 62.7 | 58.2 | 54.0 | 53.3 | 52.5  | 49.7  | 44.8  | 38.6  | 23.2   |
| 13:00 - 14:00                                     | 55.9 | 60.7  | 53.0 | 61.5 | 57.4 | 54.8 | 52.5 | 51.3  | 48.8  | 43.7  | 36.6  | 23.1   |
| 14:00 - 15:00                                     | 55.7 | 58.5  | 54.0 | 62.1 | 57.7 | 54.2 | 52.0 | 51.3  | 48.8  | 44.0  | 38.0  | 26.8   |
| 15:00 - 16:00                                     | 55.5 | 58.8  | 54.0 | 60.8 | 57.8 | 54.6 | 51.3 | 51.4  | 48.6  | 43.1  | 37.5  | 28.1   |
| 16:00 - 17:00                                     | 55.3 | 58.8  | 53.0 | 61.6 | 56.3 | 52.5 | 51.0 | 51.5  | 48.5  | 42.7  | 36.1  | 25.1   |
| 17:00 - 18:00                                     | 54.0 | 57.9  | 52.0 | 58.9 | 54.9 | 50.9 | 49.9 | 50.5  | 47.4  | 39.7  | 33.1  | 20.2   |
| 18:00 - 19:00                                     | 55.8 | 63.5  | 52.0 | 58.9 | 53.9 | 51.2 | 52.0 | 52.3  | 49.8  | 38.9  | 33.1  | 19.6   |
| 19:00 - 20:00                                     | 52.4 | 57.1  | 50.0 | 58.7 | 54.3 | 50.2 | 48.8 | 48.7  | 45.2  | 37.8  | 32.3  | 17.4   |
| 20:00 - 21:00                                     | 51.7 | 54.6  | 50.0 | 58.2 | 53.7 | 49.8 | 47.9 | 48.5  | 43.8  | 34.6  | 28.3  | 15.5   |
| 21:00 - 22:00                                     | 51.7 | 54.5  | 50.0 | 57.8 | 52.3 | 49.0 | 47.6 | 48.9  | 44.0  | 34.5  | 27.1  | 16.1   |
| 22:00 - 23:00                                     | 51.8 | 54.8  | 49.0 | 56.1 | 51.4 | 49.9 | 48.2 | 49.0  | 43.3  | 36.7  | 29.5  | 15.1   |

| NIGHT TIME NOISE LEVELS 23:00 - 07:00 15 MINUTE SAMPLES |      |       |      |      |      |      |      |       |       |       |       |        |
|---------------------------------------------------------|------|-------|------|------|------|------|------|-------|-------|-------|-------|--------|
| Date / Time                                             | LAeq | LAmaz | LA90 | 63   | 125  | 250  | 500  | 1.0 k | 2.0 k | 4.0 k | 8.0 k | 16.0 k |
| 23:00 - 23:15                                           | 51.9 | 55.3  | 48.0 | 54.6 | 51.9 | 51.3 | 49.7 | 48.4  | 42.5  | 36.9  | 29.7  | 14.7   |
| 23:15 - 23:30                                           | 49.4 | 52.6  | 47.0 | 53.6 | 50.7 | 47.5 | 46.3 | 46.3  | 41.2  | 31.0  | 25.1  | 13.3   |
| 23:30 - 23:45                                           | 48.8 | 52.4  | 47.0 | 53.6 | 50.5 | 45.8 | 44.9 | 46.3  | 40.1  | 29.9  | 24.5  | 13.3   |
| 23:45 - 00:00                                           | 48.9 | 52.8  | 46.0 | 52.8 | 51.3 | 47.4 | 45.2 | 45.9  | 40.8  | 32.4  | 25.6  | 14.2   |
| 00:00 - 00:15                                           | 46.6 | 48.5  | 45.0 | 52.5 | 49.3 | 43.8 | 42.8 | 43.8  | 38.4  | 27.2  | 22.7  | 13.1   |
| 00:15 - 00:30                                           | 46.7 | 49.1  | 45.0 | 52.2 | 50.2 | 44.6 | 43.0 | 43.8  | 38.2  | 27.4  | 23.0  | 13.0   |
| 00:30 - 00:45                                           | 46.4 | 48.3  | 45.0 | 51.5 | 50.3 | 45.3 | 43.1 | 43.3  | 37.4  | 27.0  | 23.0  | 13.3   |
| 00:45 - 01:00                                           | 45.7 | 47.2  | 44.0 | 51.8 | 49.6 | 43.8 | 42.4 | 42.8  | 36.8  | 26.3  | 22.8  | 12.9   |
| 01:00 - 01:15                                           | 46.1 | 49.7  | 44.0 | 53.6 | 51.7 | 44.5 | 42.9 | 42.9  | 37.1  | 26.8  | 23.1  | 13.0   |
| 01:15 - 01:30                                           | 47.2 | 50.8  | 44.0 | 52.1 | 50.2 | 46.5 | 44.9 | 43.9  | 37.5  | 27.0  | 22.8  | 13.0   |
| 01:30 - 01:45                                           | 45.4 | 49.4  | 42.0 | 52.1 | 50.3 | 44.5 | 41.8 | 42.1  | 36.6  | 25.6  | 22.3  | 12.8   |
| 01:45 - 02:00                                           | 44.1 | 45.9  | 42.0 | 51.2 | 49.0 | 43.5 | 41.2 | 40.8  | 34.8  | 25.2  | 22.0  | 13.2   |
| 02:00 - 02:15                                           | 44.7 | 46.2  | 43.0 | 52.2 | 49.1 | 43.9 | 41.7 | 41.4  | 35.7  | 25.7  | 22.2  | 13.1   |
| 02:15 - 02:30                                           | 47.8 | 56.8  | 42.0 | 54.0 | 50.8 | 45.5 | 41.4 | 43.8  | 42.3  | 34.7  | 25.8  | 16.8   |
| 02:30 - 02:45                                           | 44.9 | 48.9  | 43.0 | 53.4 | 50.3 | 43.8 | 41.5 | 41.6  | 36.1  | 25.8  | 22.6  | 16.9   |
| 02:45 - 03:00                                           | 45.1 | 46.5  | 43.0 | 54.5 | 50.1 | 44.2 | 41.6 | 41.7  | 36.1  | 28.4  | 25.1  | 17.6   |
| 03:00 - 03:15                                           | 46.3 | 50.4  | 44.0 | 53.6 | 49.8 | 44.3 | 42.7 | 42.6  | 38.6  | 33.2  | 28.9  | 20.1   |
| 03:15 - 03:30                                           | 45.2 | 46.7  | 44.0 | 55.2 | 49.8 | 44.6 | 41.9 | 41.6  | 36.3  | 29.9  | 26.2  | 19.4   |
| 03:30 - 03:45                                           | 47.0 | 49.7  | 45.0 | 57.0 | 51.6 | 46.1 | 43.5 | 43.2  | 38.8  | 33.0  | 28.4  | 22.0   |
| 03:45 - 04:00                                           | 46.9 | 50.9  | 45.0 | 57.2 | 51.3 | 46.2 | 43.5 | 43.1  | 38.6  | 31.8  | 26.9  | 21.4   |
| 04:00 - 04:15                                           | 48.8 | 51.7  | 45.0 | 58.6 | 52.0 | 47.4 | 45.3 | 44.7  | 41.3  | 35.7  | 32.1  | 26.2   |
| 04:15 - 04:30                                           | 49.8 | 51.4  | 48.0 | 59.3 | 53.2 | 48.5 | 46.3 | 45.6  | 42.1  | 36.7  | 32.8  | 26.6   |
| 04:30 - 04:45                                           | 51.9 | 55.4  | 50.0 | 59.9 | 53.9 | 49.2 | 47.7 | 47.6  | 45.7  | 38.7  | 33.1  | 26.6   |
| 04:45 - 05:00                                           | 51.4 | 53.1  | 50.0 | 59.9 | 53.6 | 49.4 | 47.5 | 46.9  | 44.8  | 39.1  | 34.5  | 27.6   |
| 05:00 - 05:15                                           | 54.0 | 58.0  | 50.0 | 62.8 | 56.9 | 53.0 | 51.2 | 49.3  | 46.7  | 41.0  | 36.5  | 30.2   |
| 05:15 - 05:30                                           | 54.1 | 55.3  | 53.0 | 62.9 | 56.7 | 52.0 | 50.5 | 49.9  | 46.8  | 41.6  | 37.4  | 30.3   |
| 05:30 - 05:45                                           | 61.1 | 69.6  | 53.0 | 63.9 | 62.8 | 61.8 | 58.0 | 56.0  | 54.8  | 47.0  | 38.9  | 30.2   |
| 05:45 - 06:00                                           | 60.4 | 68.8  | 53.0 | 63.6 | 60.9 | 59.2 | 57.6 | 55.2  | 54.2  | 46.8  | 40.7  | 30.5   |
| 06:00 - 06:15                                           | 56.5 | 61.7  | 54.0 | 64.0 | 58.3 | 54.1 | 52.4 | 51.9  | 50.1  | 44.8  | 38.7  | 29.8   |
| 06:15 - 06:30                                           | 56.7 | 60.1  | 55.0 | 64.7 | 58.8 | 55.3 | 53.1 | 52.6  | 49.5  | 44.1  | 38.9  | 29.8   |
| 06:30 - 06:45                                           | 56.2 | 58.8  | 55.0 | 66.1 | 58.7 | 54.2 | 52.4 | 52.4  | 48.8  | 42.9  | 39.7  | 31.2   |
| 06:45 - 07:00                                           | 57.8 | 60.9  | 56.0 | 68.0 | 60.9 | 56.7 | 54.9 | 53.6  | 49.8  | 43.6  | 38.5  | 33.1   |

