

MILLER GOODALL

ACOUSTICS - AIR QUALITY - LIGHTING

NOISE IMPACT ASSESSMENT

on behalf of

RP Tyson Construction Ltd

for development at

Devonshire Street, Manchester

Report Number NA103403-RPT01-V2

Date of Report 13 March 2026

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Summary

A noise assessment has been undertaken to predict the potential impact of noise from the fixed plant associated with a supported living development at Devonshire Street, Manchester.

An environmental sound survey has been undertaken to establish the existing sound climate at nearby residential noise sensitive receptors (NSRs) during periods when the plant will operate.

A 3D computer model of the proposed development and surrounding site has been assembled based on the proposed site layout and client-provided plant specifications. The likely noise levels at the nearest NSRs due to emissions from the site have been predicted and are presented within this report.

The predicted noise levels have been used to assess the potential impact at the most affected NSR during the night-time period when background levels and corresponding plant noise limits are lowest, and impact would be greatest.

Based on the results of the computer modelling and the proposed site layout, no mitigation is required to achieve the noise limits previously set for the site as levels are predicted 9 dB below the limits without mitigation.

Verification measurements have been carried out indicating that the predicted noise levels are achieved.

The assessment concludes that the impact of noise associated with the proposed development is likely to be low. We would therefore consider that Condition 14 A and B (of Planning Permission ref: *138482/FO/2023*) can be discharged.

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Date:	18 February 2026	**Date:**	18 February 2026

Revision Number	Date	Updated by	Checked by	Changes made
V2	13/03/2026	JT	LWT	Included verification measurements

Advisory Note

The suitability of any recommended noise mitigation measures within this report should be approved by the relevant architects, structural engineers, building contractors, fire consultants and material manufacturers constituting the wider design team, prior to procurement and field application. This should ensure that when the recommended noise control measures are implemented on site, they will satisfy the requirements of all disciplines, therefore should not cause any health and safety issues.

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1 Introduction

1.1 Miller Goodall Ltd has undertaken a noise assessment to accompany an application to discharge a planning condition (Planning Condition 14) for a proposed assisted living development at Devonshire Street, Manchester. The scope of this report is to assess the potential impact of operational noise from the fixed plant associated with the development on nearby noise sensitive receptors (NSRs).

1.2 Planning Condition 14 of the planning permission associated with the development (planning ref: *138482/FO/2023*) is reproduced below:

> *"14) a) Any externally mounted ancillary plant, equipment and servicing shall be selected and/or acoustically treated in accordance with a scheme designed so as to achieve a rating level of 5dB (LAeq) below the typical background (LA90) level at the nearest noise sensitive location. The scheme shall be submitted to and approved in writing by the City Council as Local Planning authority in order to secure a reduction in the level of noise emanating from the site. The approved scheme shall be completed before the apartments are occupied.*
>
> *b) Upon completion of the development a verification report will be required to validate that the work undertaken throughout the development conforms to the recommendations and requirements in the approved acoustic report. The report shall also undertake post completion testing to confirm that the noise criteria has been met. Any instances of nonconformity with the recommendations in the report shall be detailed along with any measures required to ensure compliance with the agreed noise criteria.*
>
> *Reason – To minimise the impact of the development and the prevent a general increase in pre-existing background noise levels around the site, and safeguard the amenity of existing and future occupiers of nearby residential accommodation, pursuant to saved policy DC26 of the Unitary Development Plan for the City of Manchester and policies SP1 and DM1 of the Manchester Core Strategy (2012)."*

2 Policy, Standards and Guidance

2.1 The following planning policy and acoustics standards and guidance have been considered in this assessment.

- BS 4142:2014+A1:2019 '*Methods for rating and assessing industrial and commercial sound*'.

2.2 Further detail is provided in **Appendix 1: Policy, Standards and Guidance**.

3 Assessment Methodology

3.1 BS 4142 has been considered with regard to the potential noise from the development. Environmental sound monitoring was undertaken to establish background noise levels at noise sensitive receptors (NSRs) close to the development. These measurements have been considered in the context of the achievability of appropriate noise limits on fixed external plant and equipment associated with the development.

4 Site Description

4.1 The site is located at Devonshire Street, Manchester. The site location is indicated in the figure presented in **Appendix 2: Site Location and NSR Locations**. The site is located in Ardwick, to the south-east of Manchester City Centre, with Devonshire Street demarcating the western site boundary. To the east are dwellings, with a brain-injury care home to the south. Across Devonshire Street to the west is a fast food restaurant and office buildings while to the north, across Coverdale Crescent, is a small wooded and grassland area with Hyde Road beyond.

5 Proposed Development

5.1 The proposed development is a two-storey assisted living building, with some office space at the rear (south) of the ground floor along with 3no. condensers mounted on the wall at ground level. The proposed layout is presented in **Appendix 3: Site Layout**.

5.2 This plant may operate 24 hours a day, 7 days a week. The plant will likely have the greatest impact on NSRs during night-time periods when background noise is at its lowest and thus this assessment focuses on this time period.

6 Plant Noise Limits

6.1 Plant noise limits have previously been set as part of the planning application process by *E3P*. These noise limits are reproduced in **Table 1** and used to inform this assessment. The full report can be seen in **Appendix 5: E3P Report**.

Table 1: Plant Noise Limits

Description	Sound Pressure Level, dB at Octave Band Centre Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
NR30 (dB)	59	48	40	34	30	27	25	23
Reduction through partially open window	13	13	13	13	13	13	13	13
Resultant external plant noise limits	72	61	53	47	43	40	38	36

7 Noise Modelling Methodology

7.1 A baseline noise model of noise from the proposed development has been assembled using CadnaA noise modelling software.

7.2 The general horizontal plan information of the area surrounding and including the proposed development site was imported from Google Earth. This was used to determine road positions, building footprint areas and relative locations and is considered accurate to within 5%.

7.3 Topography was not included in the design of the model as the proposed site is flat with little variation in terrain height. Existing building heights were modelled based on a combination of Google Earth imagery and publicly available building height data.

7.4 The following parameters were assigned to the model:

- Propagation of noise using algorithms within ISO 9613:2024 *Acoustics - Attenuation of sound during propagation outdoors*.
- Default ground absorption G = 0.2. Representing soft ground surrounding the site.
- No adverse meteorological effects.
- Three orders of reflection.

- Buildings are reflecting with smooth non-structured facades.
- Receiver heights of 4 m for first floor receivers.
- Grid height for noise contour plots of 4 m, to be representative of the worst-case night-time scenario at the NSRs.

7.5 Octave band L_{eq} source data used within modelling is shown in shown in **Table 2**. This data was imported directly into the model. This data was provided by the client and taken from the manufacturer's data book for the condenser unit proposed.

Table 2: Sound Pressure Level source data used within CadnaA

Description	Distance (m)	Sphere Part (%)	Sound Pressure Level, dB at Octave Band Centre Frequency, Hz								Sound Power Level dB(A)
			63	125	250	500	1k	2k	4k	8k	
Mitsubishi MUZ-AY35VG2-E	1	50	43	50	51	49	44	40	39	31	58

8 Baseline BS 4142:2014+A1:2019 Assessment

8.1 Assessment

8.1.1 **Table 3** sets out the noise sensitive receptors (NSRs) considered within the assessment and included within the noise model. The modelled noise levels at the NSRs due to emissions from the proposed development with baseline mitigation included are also presented.

Table 3: Modelled noise levels and noise sensitive receptors - Baseline

Noise Sensitive Receptor (NSR)		Modelled Height, m	Modelled Specific Noise Leve,l dB $L_{Aeq,Tr}$
Reference	Description		
NSR1	First floor façade at Voyager Care Home, south of site.	4	34
NSR2	First floor façade of 20 Polebrook Avenue, east of site	4	26

8.1.2 The output from the baseline noise model at a height of 4 m is presented in **Appendix 4: Noise Model Output**. The figure shows the predicted noise levels at receiver locations and corresponding noise contours for the baseline modelling.

8.1.3 The BS 4142 assessment of noise impact at the most affected NSR (NSR1) during the night-time period is presented in **Table 4**.

Table 4: BS 4142:2014 numerical night-time assessment at NSR1 – Baseline

Parameter	Results	Commentary
Noise Limit	$L_{Aeq,15min}$ = 43 dB	Single figure external noise criteria
Modelled Specific Noise Level	$L_{Aeq,15min}$ = 34 dB	Modelled noise level at NSR1.
Acoustic Feature Correction	0 dB	No tonality evident in modelled noise levels, new equipment suggests no impulsivity expected under normal operating conditions, equipment assumed to operate with 100% on-time (i.e. no intermittency) and no other character corrections are expected to be applicable.
Rating Level	$L_{Ar,15min}$ = 34 dB	Sum of Modelled Specific Noise Level and Acoustic Feature Correction
Excess of Rating Level over noise limit	- 9 dB	The rating level is 9 dB below the noise limit at the nearest / worst-affected noise sensitive receptor.
Outcome	Indication of no adverse impact	Context detailed in section **8.2** for indicative assessment.
Uncertainty of the assessment		There is uncertainty in determining the Residual Sound and Background Sound Level as no survey works have been undertaken at this stage.

8.2 Context

8.2.1 It can be seen from **Table 4** that the outcome of the initial numerical BS 4142 assessment indicates no adverse impact at the most affected NSR during night-time period. It is important to note that no sound monitoring has been undertaken to date, but DEFRA noise maps indicate night-time noise levels in excess of 45 dB at the receptor positions. Consequently, plant noise is not expected to be audible at the receptor positions.

8.2.2 It is important to also take note of the context in which the development is proposed. There is already a care home located adjacent to the proposed site, which will have its own mechanical services plant in operation. Additionally, to the west of the site are office buildings and a fast-food restaurant with associated mechanical services plant. The new mechanical services plant will have the same acoustic character as the pre-existing plant.

8.2.3 Additionally, the predicted noise levels are significantly below the ambient noise levels shown in DEFRA noise maps for the site, where the environmental sound climate is dominated by road traffic noise.

8.2.4 No specific mitigation is therefore considered to be required to achieve appropriate noise levels at the site.

8.3 All plant is assumed, for the purposes of assessment, to operate in a steady state with a one hundred per cent on-time, which will result in the highest noise emissions from them. This is unlikely to occur at night, so this approach provides a conservative assessment.

8.4 On site measurements

8.5 In order to correlate modelled data with on-site activity, attended sound level measurements of the operational fan units were carried out on Wednesday 11 March 2025.

8.6 Sound level measurements were made using a Rion NL-52 sound level meter in accordance with BS 7445-2:1991 'Description and measurement of environmental noise Part 2: Guide to the acquisition of data pertinent to land use'. The sound level meter (SLM) was set up to log the Z-weighted 1/3 octave sound pressure level (SPL).

8.7 The consultant on site noted low noise levels from the plant, with the main sources of noise affecting the background acoustic environment being distant road traffic noise and occasional bird song. It should also be noted that when these tertiary sources increased in volume i.e. a motorbike went by, or a stronger gust of wind, then the plant was barely audible.

8.8 A total of nine 1-minute measurements were undertaken at 1 m away from the fan units, three from the front, three from the left and three from the right. A summary of the A-weighted results can be found below in **Table 5** below, with full results found in **Appendix 6: Measured Data**.

Table 5: A-weighted Measured Levels

Location	Measurement	Sound Pressure Level, dB at Octave Band Centre Frequency, Hz								dB(A)
		63	125	250	500	1k	2k	4k	8k	
Front	01	31	37	37	42	42	38	31	25	47
	02	28	35	37	41	41	37	31	25	46
	03	29	36	38	41	41	37	33	25	46
Left	04	31	38	37	40	39	34	28	21	45
	05	29	33	34	39	42	35	30	24	45
	06	30	33	38	39	38	35	29	23	45
Right	07	33	34	35	35	40	34	26	19	44
	08	32	34	35	35	40	36	25	18	44
	09	32	36	39	35	40	35	25	18	45
Energetical Average		31	35	37	39	41	36	30	23	45

8.9 **Table 6** below shows a comparison of the manufacturers data which was used to influence the model and the average of on-site measurements from the plant.

Table 6: Plant Comparison

Description	Distance (m)	Sphere Part (%)	Sound Power Level dB(A)
Mitsubishi MUZ-AY35VG2-E	1	50	58
Measured Average	1	50	59[1]

1. calculated based on estimated dimensions of (m) 0.8 x 0.5 x 0.5

8.10 With respect to the above Table, measured sound levels correlate well with the manufacturers data, with a slight deviation in SPL which may be due to external factors such as tertiary noise/difference in estimated plant size.

8.11 With regard to the above it is considered that the modelling approach taken in this assessment is robust, accurate and indicative of real-world operational levels. The plant was confirmed to be operational and running whilst on site and observations made further indicate that the site is of a low risk from a noise perspective.

8.12 In summary, it is deemed that noise levels from the fans are of an acceptable level, and the noise criterion set out in *E3P* has been met.

9 Summary and Conclusion

9.1 A noise assessment has been undertaken, on behalf of RP Tyson Construction Ltd, to predict the potential impact of noise from the installed mechanical services plant items at the site. Predicted noise levels have been determined using manufacturers' datasheets for the plant and compared against mechanical services noise limits previously proposed at the site as part of the planning application.

9.2 Noise levels due to the installed plant are predicted to be approximately 9 dB below the plant noise limits at the worst-affected off-site receptors, with all plant running simultaneously at maximum capacity. Mitigation is therefore not considered to be required or appropriate for the development.

9.3 Verification measurements have been carried out. The results of the measurements demonstrates that the sound power levels of the plant are as per the manufacturer's data with the resulting sound pressure levels well within the criteria.

9.4 Based on the above it is therefore considered that condition 14 a and b can be discharged.

APPENDICES

Appendix 1: Policy, Standards and Guidance

1 BS 4142:2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

1.1 BS 4142:2014+A1:2019[1] provides guidance on the assessment of the likelihood of complaints relating to noise from industrial sources. The standard presents a method of assessing potential noise impact by comparing the noise level due to industrial sources (the Rating Level) with that of the existing background noise level at the nearest noise sensitive receiver in the absence of the source (the Background Sound Level).

1.2 The Specific Noise Level - the noise level produced by the source in question at the assessment location - is determined and a correction applied for certain undesirable acoustic features such as tonality, impulsivity or intermittency. The corrected Specific Noise Level is referred to as the Rating Level.

1.3 In order to assess the noise impact, the Background Sound Level is arithmetically subtracted from the Rating Level. The standard states the following:

- *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 a significant adverse impact. Where the Rating Level does not exceed the Background Sound Level, this is an indication of the specific sound source having a low impact, depending on the context.*

[1] BS 4142:2014+A1:2019 Methods for rating and assessing industrial and commercial sound

1.4 In addition to the margin by which the Rating Level of the specific sound source exceeds the Background Sound Level, the 2014+A1:2019 edition places emphasis upon an appreciation of the context, as follows:

> *An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.*

Appendix 2: Site Location and NSR Locations


N
Devonshire Street
A665
Hellidon Close
Coverdale Crescent
Polebrook Avenue
Globe Motors Ltd
NSR1
NSR2
Devonshire House
Winifred Massey Court
Ardwick Terrace
Kershaw Walk
Devonshire Street
0
75
150 m
Base Map: OS Map
1:1,500
Legend
Approx. Site Boundary
Noise Sensitive Receptor
Project: Devonshire Street
Report Number: NA103403-2
Drawn by: JL
Disclaimer: the scale is for indicative purposes only as the map may be skewed once it is an image, for instance during printing.
MILLER GOODALL
ACOUSTICS - AIR QUALITY - LIGHTING
Date: 09/02/2026

Appendix 3: Site Layout



Appendix 4: Noise Model Output

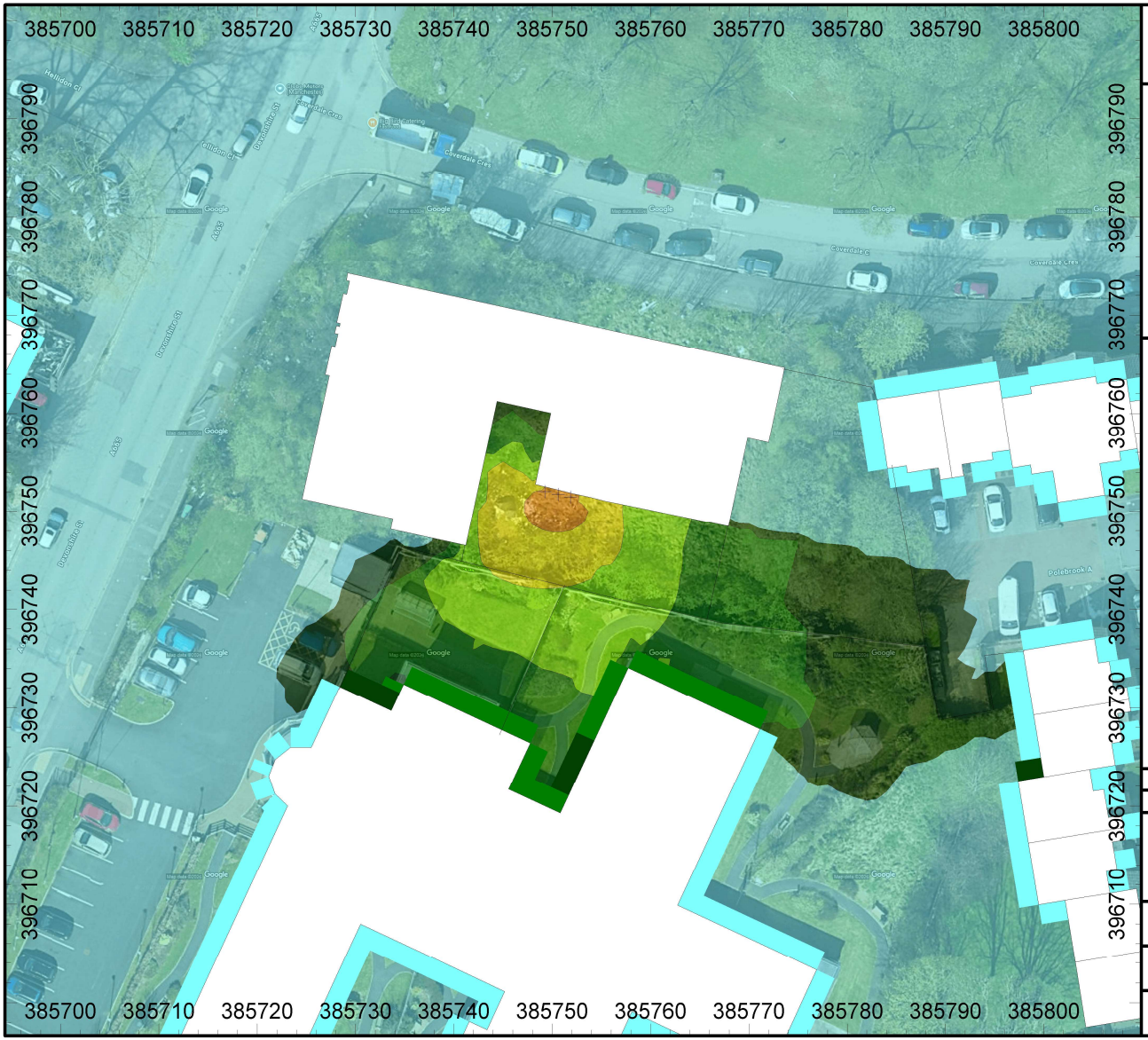


Fig 4a: Predicted LAeq,T
Cumulative Night-Time @ 4.0 m

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Object & Grid Legend

- Point Source
- Building
- Barrier
- Building Evaluation

- ... < 25 dB LAeq,T
- 25 <= ... < 30 dB LAeq,T
- 30 <= ... < 35 dB LAeq,T
- 35 <= ... < 40 dB LAeq,T
- 40 <= ... < 45 dB LAeq,T
- 45 <= ... < 50 dB LAeq,T
- 50 <= ... < 55 dB LAeq,T
- 55 <= ... < 60 dB LAeq,T
- 60 <= ... < 65 dB LAeq,T
- 65 <= ... < 70 dB LAeq,T
- 70 <= ... < 75 dB LAeq,T
- 75 <= ... dB LAeq,T

Rev.	Date	Purpose	Drawn By	Approved By
1	09/02/2026	Initial Issue	JL	CI

MILLER GOODALL
ACOUSTICS - AIR QUALITY - LIGHTING

Project: Devonshire Street

Client: RP Tyson Construction Ltd

Not To Scale | Report Number: NA103403-2

Appendix 5: E3P Report

Noise Impact Assessment

Coverdale Crescent, Manchester

Reference: 50-940-R1-4

Date: October 2023

NOISE IMPACT ASSESSMENT

Coverdale Crescent,
Manchester

Prepared for:

Eden Planning

Report Ref: 50-940-R1-4
Date Issued: 23rd October 2023

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QUALITY ASSURANCE

PROJECT NUMBER	50-940		
VERSION	Version 1	Version 3	Version 4
REMARKS	Draft for Comment	Final Version	Final Version
DATE	2nd October 2023	17th October 2023	23rd October 2023
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POSITION	Associate Director	Associate Director	Associate Director

EXECUTIVE SUMMARY

BACKGROUND

Site Address	Coverdale Crescent, Manchester, M12 4AH
National Grid Reference	E 385750 N 396759
Proposed Development	Proposed development of up to 24 residential dwellings with associated access, parking and landscaping.
Report Objectives	The objectives of this report are to: • Identify, measure and assess the potential impact of any existing noise sources in the immediate vicinity of the Site upon proposed residential receptors. • Identify and assess the potential impact of any proposed noise sources associated with the proposed development upon existing and proposed residential receptors. The report follows current and relevant British Standards in order to provide a robust assessment.

ASSESSMENT

Surveys Completed	An attended road traffic sound measurement has been undertaken for Devonshire Street and Hyde Road during a typical weekday period in accordance with Calculation of Road Traffic Noise. Supplementary rush hour traffic surveys have also been carried out for both roads. No other notable sources of sound impact upon the site.
Assessments	A 3D noise model has been constructed to assess road traffic sound across the site and incident upon facades. Road traffic sound impact is assessed in accordance with the criterion, for day and night, given in BS 8233:2014+A1:2019.
Mitigation Requirements	The assessment has shown higher specification glazing will be required at certain facades. It is assumed that a whole dwelling ventilation system will be installed as standard in accordance with the guidance within Approved Document F. The opening of windows has been found not to be an acceptable method of mitigating overheating for certain facades. Limits have been set on any proposed fixed plant items to protect the proposed and existing noise sensitive receptors.

CONCLUSIONS

With mitigation measures in place, this assessment has shown that no adverse impact is predicted day or night at the receptors due to road traffic sound.

As such, noise need not be a material consideration in the granting of planning permission if the recommendations of this report are followed and included within the design stage.

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1. INTRODUCTION

1.1. BACKGROUND

E3P were commissioned by Eden Planning to undertake a Noise Impact Assessment for a proposed residential development at Coverdale Cresent, Manchester, to be referred to hereafter as '*the Site*'.

This assessment looks to determine the key noise sources in the immediate vicinity of the Site and to assess their impact, if any, upon proposed residential receptors and to specify mitigation measures, where required.

1.2. PROPOSED DEVELOPMENT

The client intends to construct 24 self-contained apartments with communal and ancillary space within Use Class C2 with associated parking, access, landscaping, and associated works on vacant land adjacent to Devonshire Street and Coverdale Crescent.

The key source of sound impacting upon the Site is road traffic associated with Devonshire Street and Hyde Road. An office building is located to the south of the site and a garage located across the opposite side of Devonshire Street to the west however whilst in attendance at site, no significant noise was noted.

This assessment has been undertaken in accordance with the following supplied drawings:

- Proposed Site Plan – Drawing number 1326-100 Rev D dated 17th October 2023.
- Proposed First Floor Plan – Drawing number 1326-102 Rev E dated 17th October 2023.

1.3. LIMITATIONS

Where a noise or vibration survey is required to inform an assessment, E3P will endeavour to ensure that all noise and vibration measurements taken are robust, representative and reliable in order to inform an accurate assessment.

Where mitigation measures are specified in this report, it should be noted that these measures are relative to a specific sound or vibration source, both in terms of the measured sound pressure and vibration level and the character of the sound source. Where either the sound pressure level or the character of the sound varies following completion of the sound survey, E3P cannot be held responsible for any subsequent variations in the proposed mitigation performance.

2. ASSESSMENT METHODOLOGY

2.1. NATIONAL PLANNING POLICY FRAMEWORK

To prevent unacceptable risks from pollution, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be considered.

The national planning policy framework states that planning policies and decisions should aim to:

- Avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development.
- Mitigate and reduce to a minimum, other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions.
- Recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.
- Identify and protect areas of tranquillity which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason.

2.2. NATIONAL PLANNING PRACTICE GUIDANCE

Noise needs to be considered when new developments may create additional noise and when new developments would be sensitive to the prevailing acoustic environment. When preparing local or neighbourhood plans, or taking decisions about new development, there may also be opportunities to consider improvements to the acoustic environment.

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

In line with the explanatory note of the NPSE, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase, where 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.

The "observed effect levels" are as follows:

- **Significant observed adverse effect level:** This is the level of noise exposure above which significant adverse effects on health and quality of life occur.
- **Lowest observed adverse effect level:** This is the level of noise exposure above which adverse effects on health and quality of life can be detected.
- **No observed effect level:** This is the level of noise exposure below which no effect at all on health or quality of life can be detected.

Table 2.1 summarises the noise exposure hierarchy, based on the likely average response.

TABLE 2.1 NOISE EXPOSURE HIERARCHY

PERCEPTION	EXAMPLES OF OUTCOMES	INCREASING EFFECT LEVEL	ACTION
Not Noticeable	No effect.	No observed effect	No specific measures required
Noticeable and Not Intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No observed adverse effect	No specific measures required
Lowest Observed Adverse Effect Level			
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, or having to close windows for some of the time because of the noise where there is no alternative ventilation. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed adverse effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Noticeable and Disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion, having to keep windows closed most of the time because of the noise where there is no alternative ventilation. 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 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 (auditory and non-auditory).	Unacceptable adverse effect	Prevent

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any situation. These factors include the following:

- The source and absolute level of the noise together with the time of day it occurs. Some types and level of noise will cause a greater adverse effect at night than if they occurred during the day. The adverse effect can also be greater simply because there is less background noise at night.
- For non-continuous sources of noise, the number of noise events, and the frequency and pattern of occurrence of the noise can be important.
- The spectral content of the noise and the general character of the noise. The local topology and topography should also be considered along with the existing and, where appropriate, the planned character of the area.

More specific factors to consider when relevant:

- Where applicable, the cumulative impacts of more than one source should be considered along with the extent to which the source of noise is intermittent and of limited duration.
- Consideration should also be given to whether adverse internal effects can be completely removed by closing windows and, in the case of new residential development, if the proposed mitigation relies on windows being kept closed most of the time. In both cases, a suitable alternative means of ventilation is likely to be necessary.
- If external amenity spaces are an intrinsic part of the overall design, then the acoustic environment of those spaces should be considered so that they can be enjoyed as intended.

2.3. MANCHESTER CITY COUNCIL – PLANNING & NOISE (MAY 2022)

Manchester City Council have produced a guidance note in relation to the assessment of planning and noise.

3.7.7.1 Residential Developments

The Council has adopted the following noise limits for residential properties:

• Bedrooms (night-time - 23.00 - 07.00) 30 dB L_{Aeq} (individual noise events should not normally exceed 45 dB $L_{Amax,F}$ by more than 10 times)
• Living Rooms (daytime - 07.00 - 23.00) 35 dB L_{Aeq}
• Gardens and terraces (daytime) 55 dB L_{Aeq}

These criteria have been adopted for the following reasons:

• BS 8233: 2014 recognises these levels as a good standard for resting/sleeping conditions.
• The WHO document 'Guidelines for Community Noise' recommends an internal LAeq of 30dB for optimal sleep conditions (and no more than 35dB for internal rooms during daytime).
• The performance of acoustic insulation schemes can often be below that specified, according to the quality of installation, materials, noise spectrum and deterioration / wear and tear of building elements. A high design specification introduces a 'safety

margin' should building elements not perform as well as expected ('on-site' performance).
• Performance specification for glazing does not usually take into account the detrimental effect of vents on the sound insulation. Even 'acoustic' vents will reduce the performance of the facade insulation, as they will inherently contain a free open area for air exchange.
• There is a general increase in urban noise levels, which can in the future be reasonably accommodated by these standards.
• The standards support the Local Authority corporate objective to prevent ill-health and improve local peoples' health and well being.

2.4. BUILDING REGULATIONS: APPROVED DOCUMENT F - VOLUME 1: DWELLINGS (JUNE 2022)

Approved document F Volume 1: Dwellings (ADF) provides guidance set by the Department for Levelling Up, Housing and Communities, that relates to means of ventilation within dwellings. The ventilation strategy specified within the ADF are as follows.

1.9 The ventilation strategy in this approved document relies on a combination of all of the following.

a. Extract ventilation from rooms where water vapour or pollutants are likely to be released (e.g. bathrooms and kitchens), to minimise their spread to the rest of the building. Ventilation fans may be either intermittent operation or continuous operation.

b. Whole dwelling ventilation to provide fresh air to the building and to dilute, disperse and remove water vapour and pollutants not removed by extract ventilation.

c. Purge ventilation to remove high concentrations of pollutants and water vapour. Purge ventilation is used intermittently and required only for pollutants produced by occasional activities (e.g. fumes from painting).

1.10 Ventilation may be delivered through natural ventilation, mechanical ventilation or a combination of both.

1.11 The ventilation systems in this approved document are examples of systems that comply with Part F of the Building Regulations. Other ventilation systems may be acceptable if they can be shown to meet an equal level of performance.

Within the ADF there are three system specific ventilation systems that can be utilised to provide sufficient ventilation. These methods are as follow.

1. ***Natural ventilation with background ventilators and intermittent extract fans*** *(guidance suitable only for less airtight dwellings) - Ventilation provided by thermal, wind or diffusion effects through doors, windows or other intentional openings without the use of mechanically driven equipment. For the purposes of this approved document, natural ventilation refers to a ventilation strategy using background ventilators and intermittent extract ventilation.*

2. ***Continuous mechanical extract ventilation*** *- Mechanically driven ventilation that continuously extracts indoor air and discharges it to the outside.*

3. ***Mechanical ventilation with heat recovery*** *- A mechanically driven ventilation system that both continuously supplies outdoor air to the inside of the dwelling and continuously extracts indoor air and discharges it to the outside. For the purposes of this approved document, the guidance for mechanical ventilation with heat recovery applies to centralised or decentralised supply and extract systems, with or without heat recovery.*

2.5. BUILDING REGULATIONS: APPROVED DOCUMENT O – OVERHEATING (JUNE 2022)

Approved document O - Overheating (ADO) provides guidance set by the Department for Levelling Up, Housing and Communities, that relates to the mitigation of overheating. In relation to noise the ADO provides the following guidance.

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 $L_{Aeq,T,}$ averaged over 8 hours (between 11pm and 7am).
b. 55dB $L_{AFmax,}$ 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)

2.6. BRITISH STANDARD BS 8233:2014+A1:2019 – GUIDANCE ON SOUND INSULATION AND NOISE REDUCTION FOR BUILDINGS

2.6.1. NOISE CRITERIA LIMITS

The scope of this standard is the provision of recommendations for the control of noise in and around buildings including residential dwellings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including residential dwellings, as shown in Table 2.2.

TABLE 2.2 BS 8233:2014 RECOMMENDED INTERNAL NOISE LEVELS

CRITERION	TYPICAL SITUATION	DESIGN CRITERION, $L_{Aeq,T}$ (dB)
Suitable Resting and Sleeping Conditions	Living Room	35
	Bedroom	30

BS 8233 goes on to recommend noise levels for gardens:

> *It is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised 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 might be warranted.*

BS 8233 goes on to say:

> *In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces but should not be prohibited.*

2.7. WORLD HEALTH ORGANISATION (WHO) – GUIDELINES FOR COMMUNITY NOISE

The WHO gives guidance on desirable levels of environmental noise. The levels presented in the WHO Community Guidelines are those at which adverse effects become measurable. The 1980 WHO document suggested that *"general daytime outdoor noise levels of less than 55 dB(A) $L_{eq,16hr}$ are desirable to prevent any significant community annoyance."* This level is an external free-field noise level. The 1980 document also stated in relation to internal levels, *"that night-time noise levels of 35 dB(A) $L_{eq,8hr}$ or less will not interfere with the restorative process of sleep"*.

A report was submitted to the WHO in 1995 for consideration as a revision to the 1980 document and revised community guidelines were issued in 2000. In the 2000 guidelines, it is considered that the sleep disturbance criteria should be taken as an internal noise level of 30 dB $L_{Aeq,8\ hr}$ or an external level of 45 dB $L_{Aeq,8\ hr}$. It also recommends that internal L_{Amax} levels of 45 dB and external L_{Amax} levels of 60 dB should be limited where possible.

3. SURVEY RESULTS

3.1. ROAD TRAFFIC SOUND MEASUREMENT – DEVONSHIRE STREET

E3P have undertaken a road traffic sound survey in accordance with the shortened measurement procedure given in Calculation of Road Traffic Noise (CRTN) during a typical weekday period. The survey was undertaken during the following period:

- 13:17-13:18 Wednesday 9th August 2023.

The following noise measurement position was chosen for the Road Traffic Noise Survey:

- Noise Measurement Position 1 (NMP1): Located on the western boundary of the site approximately 4 m from the roadside edge. The microphone was located at a height of 1.5 m above ground level and in free-field conditions. Sound sources consisted of road traffic along Horsedge Street.

Table 3.1 details the measured sound pressure levels.

TABLE 3.1 MEASURED ROAD TRAFFIC SOUND LEVELS – DEVONSHIRE STREET

MEASUREMENT START TIME	MEASURED SOUND PRESSURE LEVELS (dB)			
	$L_{Aeq,T}$	10th Highest $L_{Amax,fast}$	$L_{A90,T}$	$L_{A10,T}$
13:17	67.7	82.1	56.8	70.9
14:17	69.6		57.4	71.4
15:17	69.6		57.8	71.3
Derived Daytime Noise Level, $L_{Aeq,16hr}$				**68.2**
Derived Night-time Noise Level, $L_{Aeq,8hr}$				**59.4**

In conjunction with the above CRTN measurement, traffic sound has also been measured between 06:00 and 07:00 to capture night-time rush hour road traffic sound in the same location as the above measurement.

Table 3.2 details these measured sound pressure levels.

TABLE 3.2 MEASURED RUSH HOUR ROAD TRAFFIC SOUND LEVELS – DEVONSHIRE STREET

MEASUREMENT START TIME	MEASURED SOUND PRESSURE LEVELS (dB)			
	$L_{Aeq,T}$	10th Highest $L_{Amax,fast}$	$L_{A90,T}$	$L_{A10,T}$
06:00	67.2	77.1	51.8	71.8

As can be seen above the rush hour L_{A10} levels are comparable to the 3-hour measurement with the 10th highest maximum noise level being lower by 5 dB. This is to be expected as road traffic during the rush hour period is typically not free flowing. Given this the 3-hour measurement will be used for the assessment in line with the procedure outlined in CRTN.

3.2. ROAD TRAFFIC SOUND MEASUREMENT – HYDE ROAD

Hyde Road is approximately 140 m from the proposed site however due to Hyde Road being a major road, E3P have undertaken a road traffic sound survey in accordance with the shortened measurement procedure given in Calculation of Road Traffic Noise (CRTN) during a typical weekday period. The survey was undertaken during the following period:

- 10:10-13:10 Thursday 10th August 2023.

The following noise measurement position was chosen for the Road Traffic Noise Survey:

- Noise Measurement Position 1 (NMP1): Located on the western boundary of the site approximately 5 m from the roadside edge. The microphone was located at a height of 1.5 m above ground level and in free-field conditions. Sound sources consisted of road traffic along Hyde Road.

Table 3.3 details the measured sound pressure levels.

TABLE 3.1 MEASURED ROAD TRAFFIC SOUND LEVELS – HYDE ROAD

MEASUREMENT START TIME	MEASURED SOUND PRESSURE LEVELS (dB)			
	$L_{Aeq,T}$	10th Highest $L_{Amax,fast}$	$L_{A90,T}$	$L_{A10,T}$
10:10	71.3	85.6	61.1	74.3
11:10	71.5		61.7	74.3
12:10	73.0		62.5	74.3
Derived Daytime Noise Level, $L_{Aeq,16hr}$				**71.3**
Derived Night-time Noise Level, $L_{Aeq,8hr}$				**62.2**

A rush hour measurement during the night-time period has not been carried out for this location given the distance this road is from the site and given that Devonshire Street would be the dominant source of sound at the proposed development.

During the survey, conditions remained dry and wind speeds rarely exceeded 5 m/s.

The equipment outlined in Table 3.4 was used for the noise survey.

TABLE 3.4 NOISE MEASUREMENT EQUIPMENT AND CALIBRATION DATES

MEASUREMENT POSITION	EQUIPMENT DESCRIPTION	MANUFACTURER & TYPE NUMBER	SERIAL NUMBER	CALIBRATION DUE DATE AT TIME OF SURVEY
NMP1 and NMP2	Sound Level Meter	Cirrus CR:171A	G303884	20/09/2023
	Pre-amplifier	Cirrus MV:200F	12731F	
	Microphone	Cirrus MK:224	215899D	
	Calibrator	Cirrus CR:515	99403	20/09/2023

The sound level meter was field calibrated on site using the above-mentioned calibrators prior to and after noise measurements were taken. No significant drift was witnessed as noted above. Calibration certificates are available upon request.

4. NOISE IMPACT ASSESSMENT

For the purposes of this assessment, E3P has used noise modelling software, CadnaA 2023 MR2, to determine the impact of noise from road traffic sound.

The following inputs have been included in the model:

- Proposed Ground floor Plan – Drawing number 1326-101 Rev E dated 6th June 2023.
- Devonshire Street and Hyde Road are calibrated using NMP1 and NMP2 respectively.
- Site elevations have been taken as existing by way of a 2 m grid Digital Terrain Model (DTM) which contains public sector information licensed under the Open Government License v3.0.
- Existing buildings are included.
- A reflection order of 2 has been used in all calculations. All ground has been assumed to be acoustically hard.
- Noise levels generated using ISO 9613-1 and ISO 9613-2 "*Acoustics – Attenuation of sound during propagation outdoors*" as incorporated into CadnaA software.

Figures 2 and 3 determine the noise levels across the Site during the daytime and night-time periods, respectively, due to road traffic.

4.1. EXTERNAL AMENITY AREA NOISE LEVEL ASSESSMENT

The noise model has been used to predict noise levels in rear amenity areas to be used for relaxation. The predicted levels range between 44 dB and up to 55 dB.

As such, it is predicted that the No Observed Adverse Effect Level (NOAEL) is achieved in most rear garden areas with the following commentary:

> *"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."*

Accordingly, no action is required for these areas.

4.2. INTERNAL NOISE LEVEL ASSESSMENT

With regards to internal noise levels, E3P has assumed a standard glazing specification of 4 mm glass/20 mm air space/4 mm glass affords sound insulation performance in the order of 29 dB however this is for a pink noise spectrum. The same unit, weighted for road traffic noise using the '+C_{tr}' correction, has a sound insulation performance value of approximately 25 dB and so this value has been used to calculate internal noise levels. The recently published AVO guide recommends that a partially open window provides approximately 13 dB attenuation.

The model has been used to predict façade noise levels at all floors. In order to determine any requirements for mitigation, E3P has added the reduction provided by the glazing (25 dB) to the relevant criterion for day (35 dB) and for night (30 dB). As such, any facades subject to noise levels higher than 60 dB during the day and/or 55 dB during the night will require higher specification glazing.

As can be seen in Figures 2 and 3, certain facades exceed the above criterion in the daytime or night-time period. As such, higher specification glazing will be required for certain facades. Section 5 details the exact requirements of glazing per façade.

Consideration must also be given to maximum noise levels generated by road traffic on Devonshire Street and Hyde Road. The 10th highest maximum noise level from Devonshire Street and Hyde Road when distance corrected to the closest façade would be 74 dB and 56 dB respectively.

Internal maximum noise levels of 45 dB L_{Amax} should also not be exceeded. The sound insulation performance achieved by standard glazing (29 dB) has been added to the 45 dB maximum internal noise level limit. As, such, facades subject to maximum noise levels above 74 dB will require higher specification glazing.

As shown above, no facades are subject to levels higher than 74 dB L_{Amax}. Therefore, standard glazing would be sufficient across the site to mitigate against maximum noise levels generated by road traffic from Devonshire Street and Hyde Road.

With regards opening windows, there is a requirement to consider the need to open windows for ventilation and the mitigation of overheating. At this stage, the assessment assumes that ventilation would be provided by way of extract fans in kitchens and bathrooms and open windows.

4.2.1. VENTILATION CONDITION

It is assumed that the developer would be installing a whole dwelling ventilation system in accordance with Part F of the Building Regulations as it is assumed Natural Ventilation is not appropriate for these dwellings.

Where background ventilators form part of the system, consideration is required to the sound reduction provided by these when in the open position and, as such, are discussed in Section 5.0.

4.2.2. OVERHEATING CONDITION

E3P has considered the potential impact of noise, internally, should windows be opened to mitigate overheating, as per the criteria stipulated in ADO. Any plots/facades that pass this test can open windows for this without resulting in unacceptable internal noise levels. Those that fail the test would be subject to a Part O Overheating Assessment by a suitably qualified consultant.

Part O only applies to bedrooms at night in relation to the average 8-hour noise level and 10th highest maximum noise level.

Given that the site is within a moderate risk location, as per guidance within Approved Document O the external noise limit threshold is 49 dB during the night-time ($L_{Aeq,8hr}$) and 64 dB more than 10 times a night ($L_{Af,max}$).

As can be seen from the figures, northern, western and certain southern facades experience an exceedance of the above criterion. As such, a full overheating assessment will be required for habitable rooms located on these facades, as the opening of windows is not an acceptable method for mitigation against overheating. A full overheating assessment should be completed by a suitably qualified consultant and is beyond the scope of the noise impact assessment. Figure 4 indicates the facades which require a full overheating assessment.

4.3. PROPOSED FIXED PLANT

It is understood that as part of the development, fixed plant items may be present. At the time of submission, details of the plant are unknown and, as such, it is appropriate to set limits on the noise levels for the plant. Given that the location of the plant is unknown nor are the background sound levels known when the building is in place, it is considered prudent to set limits based on the NR30 curve, as above.

As such, any fixed plant items installed as part of the development, should not exceed the below criterion when measured or predicted outside the closest habitable room window. A correction of 13 dB is applied to all frequencies to allow for the attenuation achieved by the open window.

TABLE 4.1 PROPOSED PLANT LIMITS

FREQUENCY (Hz)	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
NR30 (dB)	76	59	48	40	34	30	27	25	23
Open Window (dB)	13	13	13	13	13	13	13	13	13
Allowable external noise level due to proposed fixed plant	**89**	**72**	**61**	**53**	**47**	**43**	**40**	**38**	**36**

Where octave band data is not available, as a minimum, the rating level from the plant should be no more than 43 dB at the closest habitable room window so as to achieve 30 dB internally with an open window.

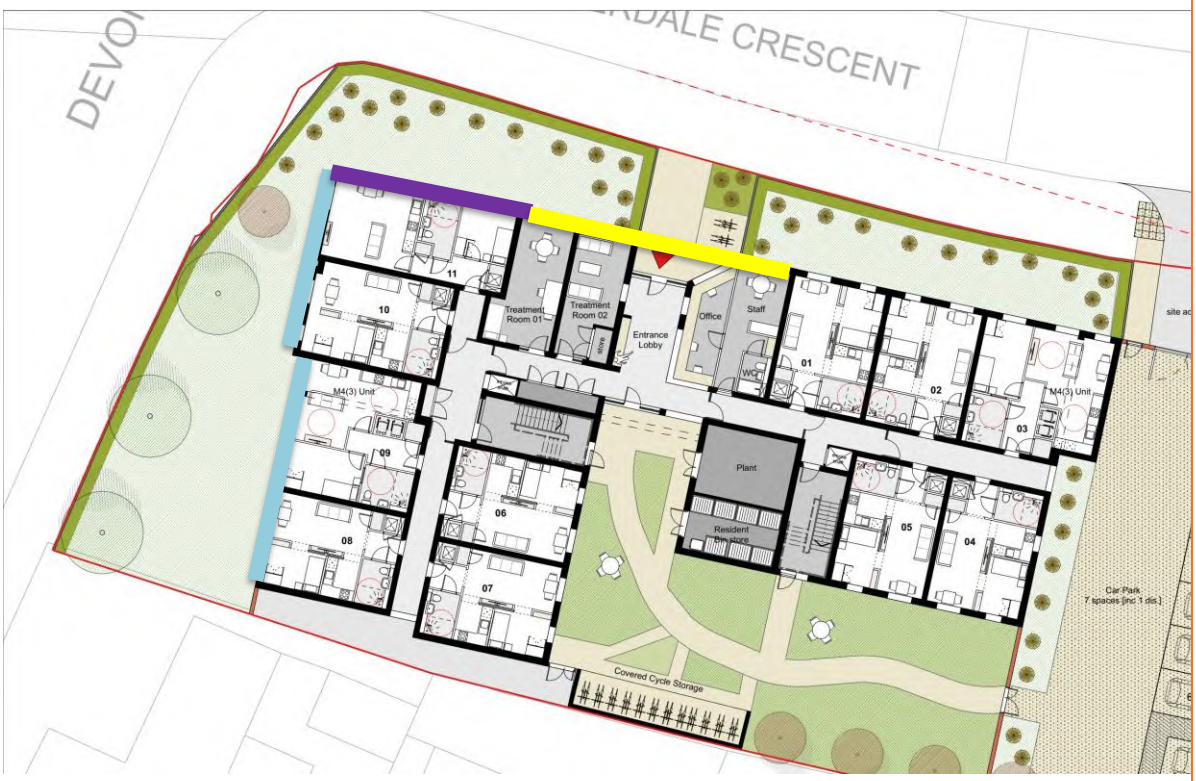
5. MITIGATION

5.1. FAÇADE INSULATION

The previous section determined that a whole dwelling ventilation system in accordance with Part F would be installed across the site as it is assumed natural ventilation is not appropriate for these dwellings.

The assessment has shown that higher specification glazing will be required for certain facades. Figures 5.1 and 5.2 below detail where higher specification glazing is required and what specific glazing is needed to control internal noise levels.

FIGURE 5.1 LOCATION OF HIGHER SPECIFICATION GLAZING (GROUND FLOOR)



Glazing to achieve 28 dB $R_w + C_{t,r}$ as a minimum.

Glazing to achieve 26 dB $R_w + C_{t,r}$ as a minimum.

Glazing to achieve 30 dB $R_w + C_{t,r}$ as a minimum.

FIGURE 5.2 LOCATION OF HIGHER SPECIFICATION GLAZING (FIRST FLOOR)



Glazing to achieve 28 dB $R_w + C_{t,r}$ as a minimum

Glazing to achieve 26 dB $R_w + C_{t,r}$ as a minimum

Glazing to achieve 30 dB $R_w + C_{t,r}$ as a minimum

In order to achieve the required internal ambient noise levels, any background ventilators that make up part of the whole dwelling ventilation system must achieve at least that of the specified glazing unit in the open position. This level of reduction is likely to be achieved by a standard background ventilator. The number of background ventilators per room will be dependent on the requirements given in Building Regulations Part F.

6. CONCLUSION AND RECOMMENDATIONS

E3P were commissioned by Eden Planning to undertake a Noise Impact Assessment for a proposed residential development at Coverdale Crescent, Manchester.

Attended road traffic sound measurements have been undertaken for both Devonshire Street and Hyde Road during a typical weekday period in accordance with calculation of road traffic noise.

No other notable sources of sound impact upon the site.

A 3D noise model has been constructed to assess noise levels across the site due to road traffic sound. The predicted external and internal noise levels have been compared to the criteria given in BS 8233:2014. Consideration has been given to external amenity space and internal habitable rooms.

The assessment has shown that higher specification glazing will be required for certain facades. It is assumed that a whole dwelling ventilation system will be installed as standard in accordance with the guidance within approved document F. The opening of windows has been found not to be an acceptable method of mitigating overheating for facades with line of sight to Devonshire Street and Hyde Road.

Limits have been set on any proposed fixed plant items to protect the proposed and existing noise sensitive receptors.

The assessment has shown that, with mitigation measures in place, no adverse impact is expected due to existing sound sources. As such, noise need not be a material consideration in the granting of planning permission.

END OF REPORT

APPENDIX I
GLOSSARY OF ACOUSTIC TERMINOLOGY

NOISE

Noise is defined as unwanted sound. Human ears are able to respond to sound in the frequency range 20 Hz (deep bass) to 20,000 Hz (high treble) and over the audible range of 0 dB (the threshold of perception) to 140 dB (the threshold of pain). The ear does not respond equally to different frequencies of the same magnitude but is more responsive to mid-frequencies than to lower or higher frequencies. To quantify noise in a manner that approximates the response of the human ear, a weighting mechanism is used. This reduces the importance of lower and higher frequencies, in a similar manner to the human ear.

Furthermore, the perception of noise may be determined by a number of other factors, which may not necessarily be acoustic. In general, the impact of noise depends upon its level, the margin by which it exceeds the background level, its character and its variation over a given period of time. In some cases, the time of day and other acoustic features such as tonality or impulsiveness may be important, as may the disposition of the affected individual. Any assessment of noise should give due consideration to all of these factors when assessing the significance of a noise source. The most widely used weighting mechanism that best corresponds to the response of the human ear is the "A"-weighting scale. This is widely used for environmental noise measurement, and the levels are denoted as dB(A) or L_{Aeq}, L_{A90} etc., according to the parameter being measured.

The decibel scale is logarithmic rather than linear, and hence a 3 dB increase in sound level represents a doubling of the sound energy present. Judgement of sound is subjective but, as a general guide, a 10 dB(A) increase can be taken to represent a doubling of loudness, whilst an increase in the order of 3 dB(A) is generally regarded as the minimum difference needed to perceive a change under normal listening conditions. An indication of the range of sound levels commonly found in the environment is given in the following table.

TABLE A1 TYPICAL SOUND PRESSURE LEVELS

SOUND PRESSURE LEVEL	LOCATION/EXAMPLE
0	Threshold of hearing
20–30	Quiet bedroom at night
30–40	Living room during the day
40–50	Typical office
50–60	Inside a car
60–70	Typical high street
70–90	Inside a factory
100–110	Burglar alarm at 1 m away
110–130	Jet aircraft on take off
140	Threshold of pain

ACOUSTIC TERMINOLOGY

TABLE A2 TERMINOLOGY

DESCRIPTOR	EXPLANATION
dB (decibel)	The scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and a reference pressure (2E-05 Pa).
dB(A)	A-weighted decibel. This is a measure of the overall level of sound across the audible spectrum with a frequency weighting (i.e. "A" weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
$L_{Aeq, T}$	L_{Aeq} is defined as the notional steady sound level which, over a stated period of time (T), would contain the same amount of acoustical energy as the A-weighted fluctuating sound measured over that period.
L_{Amax}	L_{Amax} is the maximum A-weighted sound pressure level recorded over the period stated. L_{Amax} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the "fast" sound level meter response.
L_{10} and L_{90}	If a non-steady noise is to be described, it is necessary to know both its level and the degree of fluctuation. The L_n indices are used for this purpose, and the term refers to the level exceeded for n% of the time. Hence L_{10} is the level exceeded for 10% of the time and as such can be regarded as the "average maximum level". Similarly, L_{90} is the "average minimum level" and is often used to describe the background noise. It is common practice to use the L_{10} index to describe traffic noise.
Free-field Level	A sound field determined at a point away from reflective surfaces other than the ground with no significant contributions due to sound from other reflective surfaces. Generally, as measured outside and away from buildings.
Fast	A time weighting used in the root-mean-square section of a sound level meter with a 125-millisecond time constant.
Slow	A time weighting used in the root-mean-square section of a sound level meter with a 1000-millisecond time constant.

APPENDIX II
FIGURES

Figure 1 - Noise Measurement Positions



Project:
Coverdale Crescent, Manchester

Project-No:
50-940

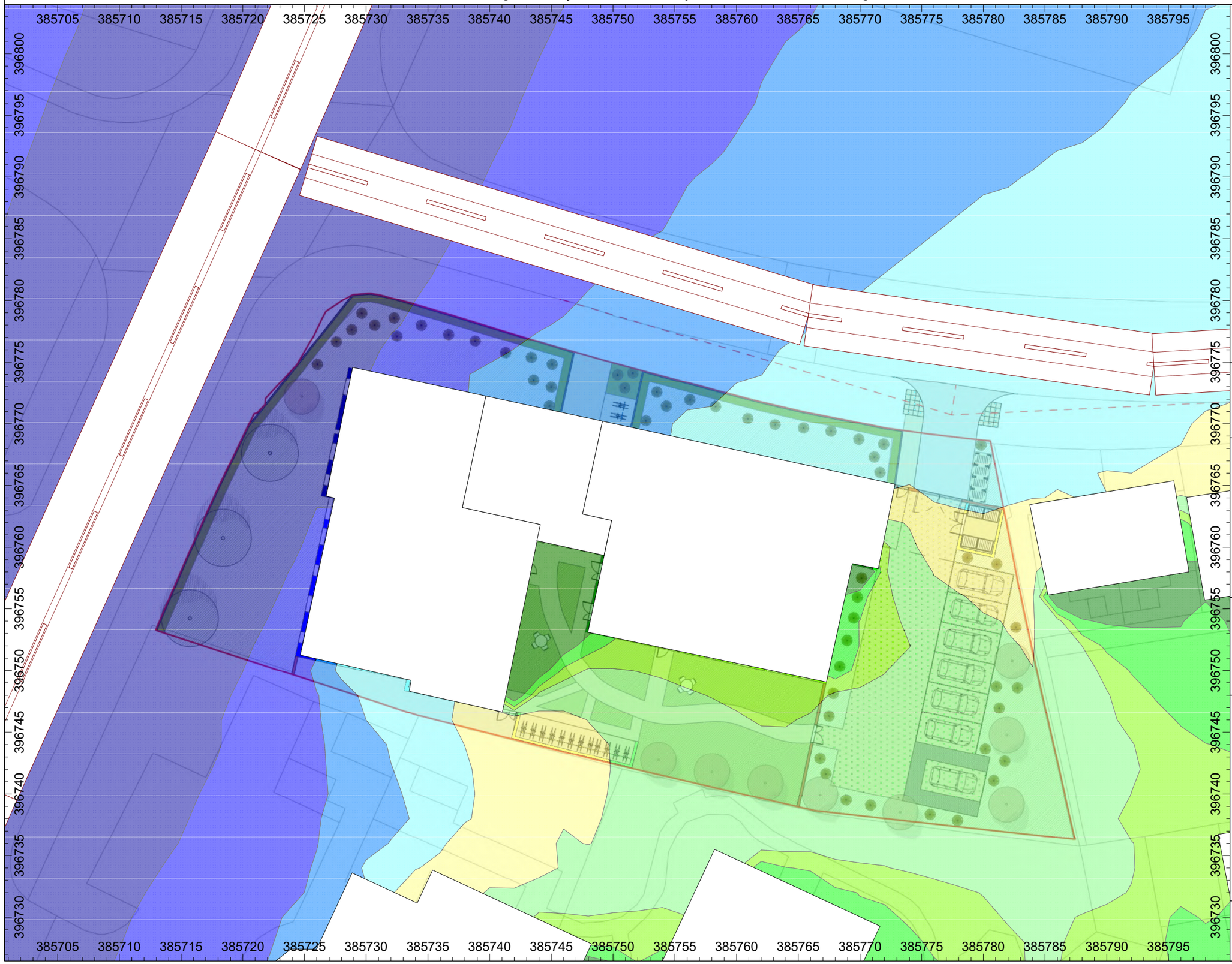
Client:
Eden Planning

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e3p

Project Engineer: Scott Boughton
Date: 23/10/2023

Figure 2 - Daytime Grid Noise Map - Calculation at 1.5 m above ground level



Project:
Coverdale Crescent, Manchester

Project-No:
50-940

Client:
Eden Planning

Daytime Noise Level, LAeq, 16hr (dB)

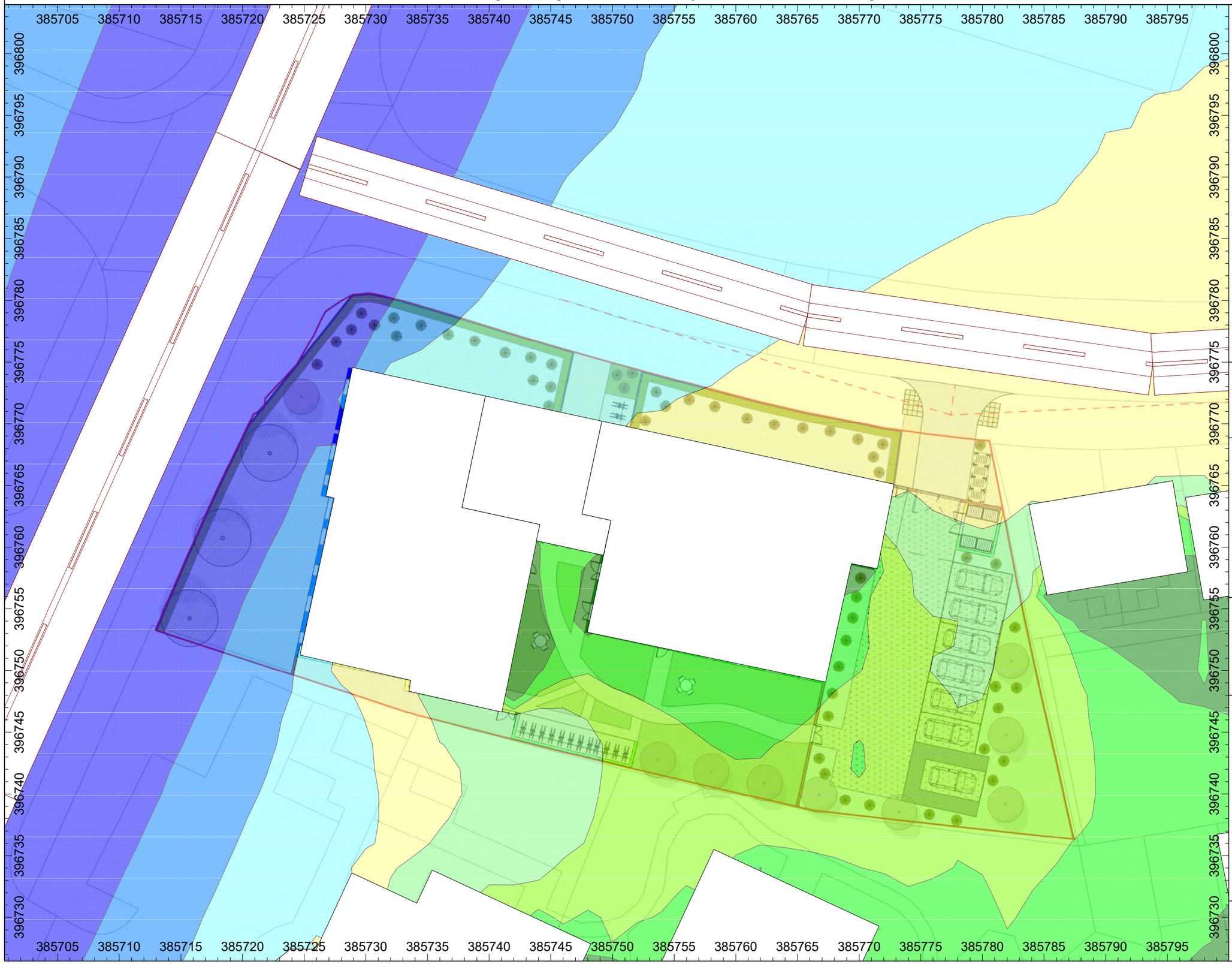
- ... <= 48
- 48 < ... <= 50
- 50 < ... <= 52
- 52 < ... <= 56
- 56 < ... <= 58
- 58 < ... <= 60
- 60 < ... <= 62
- 62 < ... <= 65
- 65 < ...

Noise Map Objects

- Road
- Building
- Barrier
- Calculation Area

Project Engineer: Scott Boughton
Date: 23/10/2023

Figure 3 - Night-time Grid Noise Map - Calculation at 1.5 m above ground level



Project:
Coverdale Crescent, Manchester

Project-No:
50-940

Client:
Eden Planning

Night-time Noise Level, LAeq,8hr (dB)

- ... <= 42
- 42 < ... <= 45
- 45 < ... <= 47
- 47 < ... <= 50
- 50 < ... <= 52
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- 55 < ... <= 57
- 57 < ... <= 60
- 60 < ...

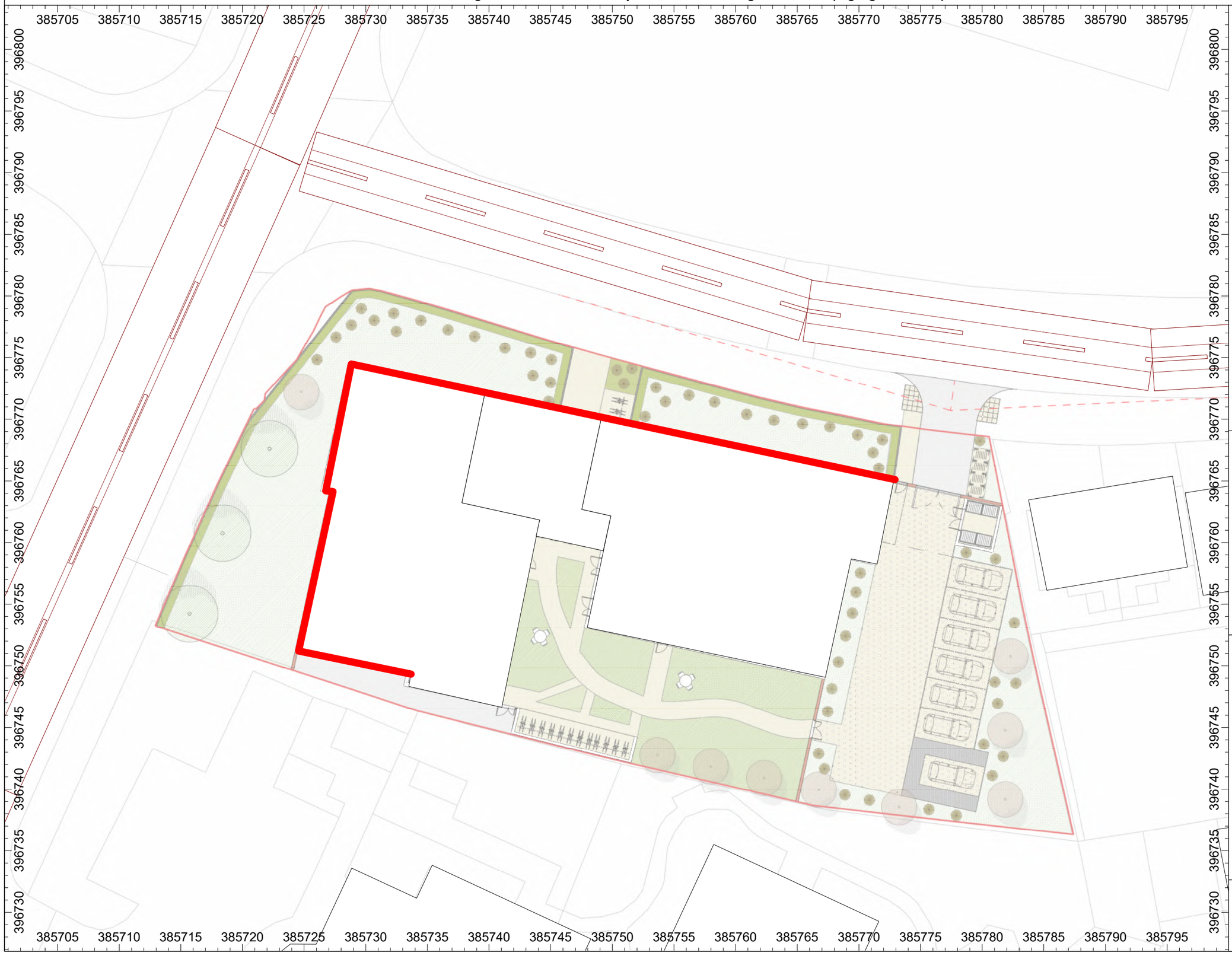
Noise Map Objects

- Road
- Building
- Barrier
- Calculation Area

e3p

Project Engineer: Scott Boughton
Date: 23/10/2023

Figure 4 - Facades which require a full overheating assessment (Highlighted in Red)



Project:
Coverdale Crescent, Manchester

Project-No:
50-940

Client:
Eden Planning

N

e3p

Project Engineer: Scott Boughton
Date: 29/09/2023

Appendix 6: Measured Noise Levels

Address	1																																	
Start Time	11/03/2026 16:40																																	
Measureme	00d 00:01:00.0																																	
	Main	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
Leq	72.9	61.3	58.7	61	61.3	59.8	61.1	60.9	57	55.5	51.7	53	50	47.3	46	44.4	43.9	45	43.4	41.4	42	40.1	37.8	37	33.4	30.9	30	30	28.8	26	24.6	27.8	25.1	20
LE	90.7	79.1	76.5	78.8	79.1	77.6	78.9	78.7	74.3	73.3	69.5	70.7	67.8	65.1	63.9	62.2	61.7	62.3	61.2	59.2	59.4	57.9	55.6	54.4	51.2	48.7	47.6	47.8	46.6	43.9	42.4	45.6	42.9	37.8
Lmax	92.1	61.8	68.2	68.2	67.4	66.7	64.5	59.1	51.9	53.3	51.8	51.8	48.3	50	45.1	44.8	43.5	43.8	42.5	41.4	41.3	39.6	37.7	37.1	33.5	30.2	29.3	29.1	27.9	31.5	25.9	27.9	26.7	20.4
Lmin	65.2	49.7	52.1	63.3	56	53.7	57	56.5	46.1	49.9	50	49.2	48.8	44.4	46.7	42.8	42.3	43.4	41.8	40.3	40.4	38.6	36.2	35.2	33.2	29.7	29.2	27.5	26.3	23.6	23.4	27.3	24.3	19.2
LN1	75.6	66	63.1	64.8	65.8	63.7	65.7	65.4	61.3	58.6	55.8	57.1	52.6	49.7	48.3	46	45.6	46.2	44.7	42.7	43.1	41.5	39.4	37.8	34.9	32.8	32.1	33.4	32.5	29.8	26.4	28.5	26.7	21.7
LN2	74.1	63.5	61.3	63.8	64.6	62.7	64.5	63.3	60.4	57.9	54.5	54.8	51.5	49.1	47.6	45.6	45.1	45.7	44.4	42.4	42.8	41.3	38.9	37.3	34.4	32	30.8	31.5	31.1	28.3	25.9	28.3	26.2	21.2
LN3	70.3	55.2	54.6	60.4	60.1	58.5	59.8	58.5	54.3	54.9	50.6	51.3	49.5	47.1	45.9	44.3	43.6	44.3	43.3	41.3	41.5	40.1	37.6	36.5	33.2	30.4	29.3	28.8	27.6	24.8	24.1	27.7	24.9	19.7
LN4	68.2	48.8	49.2	54.8	56	55.1	55.6	54.8	50.4	51.3	47.8	49.1	47.6	45.2	44.2	42.8	42.4	43.2	42.3	40.3	40.2	38.8	36.5	35.7	32.5	29.7	28.7	27.8	25.9	23.6	23.2	27.1	24.2	19
LN5	67.8	46.9	47.9	53.2	55.2	54.1	54.8	53.7	49.5	50.7	47.3	48.6	47.2	44.5	43.5	42.5	42.1	42.9	41.8	40.1	39.9	38.6	36.3	35.5	32.3	29.6	28.6	27.7	25.8	23.4	23	27	24	18.8
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Start Time	11/03/2026 16:41																																	
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	Main	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
Leq	71.6	63.1	58.2	57.4	61.3	59.7	63.9	58.6	54.2	54	52	51.4	48.3	47	45.5	44.2	43.6	44.1	43.2	41.5	41.4	39.8	37.5	36.4	33.6	30.6	30.1	29.8	27.4	25.7	24.1	27.6	25.2	20.2
LE	89.4	80.9	76	75.2	79.1	77.5	81.7	76.4	72	71.8	69.8	69.2	66.1	64.8	63.3	62	61.4	61.9	61	59.3	59.2	57.6	55.3	54.2	51.4	48.4	47.9	47.6	45.2	43.5	41.9	45.4	43	38
Lmax	81.3	62.9	62.3	59.3	62.7	59.7	60	59.3	57.7	50.1	50.7	54.7	49.6	46.3	47	46	43.5	44.8	43.3	41.2	42.1	40.4	37.2	36.6	34	31.2	30.9	35	27.9	24.6	23.7	27.3	24.7	19.6
Lmin	63.8	49.3	44.2	52.8	59.1	57.2	54.2	53.6	48.3	47.8	48.1	52.2	47.5	44.6	45.9	43.2	43.7	43.4	43	39.8	40.2	38.5	36.4	35.6	37	29.9	29.6	27	25.3	23.8	23.2	27.7	24.4	19.7
LN1	76.3	70	63.9	62.4	65.7	64.1	70.9	62.6	58.7	57.1	56.4	54.2	50.8	48.9	47.5	45.8	45	45.3	44.4	42.7	42.5	41.2	39	37.5	35.4	32.3	32.4	33.8	30	29.1	26.5	28.6	26.5	21.3
LN2	74.9	66.3	61.7	60.8	64.3	62.3	68	61.3	57.4	56.5	55.1	53.5	50.2	48.6	47	45.4	44.6	45	44.1	42.3	42.2	40.9	38.5	37.3	34.6	31.6	31.5	32.1	29.1	28.2	25.3	28.2	26.1	20.9
LN3	69.5	55.7	54.2	55.5	60	58.2	59.4	57.6	52.7	53.5	50.5	50.8	48	46.8	45.4	44	43.5	44	43.2	41.4	41.3	39.7	37.2	36.1	33.1	30.1	29.4	28.3	26.5	24.5	23.5	27.5	25.1	20.1
LN4	66.4	48.3	48.4	50.4	56.4	54.7	55.3	54.1	49.5	50	47.9	48.2	45.6	44.9	43.8	42.7	42.4	43	42.2	40.5	40.4	38.8	36.5	35.5	32.4	29.5	28.6	27.6	25.5	23.3	23.1	26.9	24.3	19.4
LN5	65.8	46.6	47	49	55.5	53.7	54.6	52.9	48.8	48.8	47.4	47.4	45.2	44.1	43.4	42.3	42.1	42.8	42	40.2	40.2	38.5	36.3	35.4	32.2	29.4	28.5	27.5	25.4	23.2	23	26.7	24.1	19.1
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	Main	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
Leq	71.4	60.3	57.9	57.8	60.3	59.7	58.9	60.1	55.3	55.3	51.6	52.1	51.1	48.8	47	44.6	44	44.1	43.1	41.5	41.3	39.5	37.3	36	33.4	30.9	32.2	30.1	27.4	25.9	24.4	27.9	24.3	20.4
LE	89.2	78.1	75.7	75.6	78.1	77.5	76.7	77.9	73.1	73.1	69.4	69.9	68.9	66.6	64.8	62.4	61.8	61.9	60.9	59.3	59.1	57.3	55.1	53.8	51.2	48.7	50	47.9	45.2	43.7	42.2	45.7	42.1	38.2
Lmax	85.8	64.9	62.4	60.6	63.9	64.8	59.5	60.6	56.7	52.8	51.1	53	49.3	47.7	45.9	44.8	45.2	44.4	42.5	41	39.9	39.8	36.9	36.1	33.1	30.7	34.4	28.5	26	24.1	23.2	27.9	24	19.6
Lmin	64	54.2	47.3	49.4	56.4	56.5	56	54.9	54.2	53.6	48.3	46.9	45.8	46.2	44.1	41.9	41.7	42.7	42.3	39.9	39.4	38.5	35.7	35.3	32.1	29.6	30.7	27.9	25.7	23.9	23.2	27.5	24.1	20.7
LN1	75.1	65.8	63.6	62.4	64.3	63.4	62.3	64.5	60.3	58.4	54.7	55.1	55.1	51.8	49.8	46.5	45.7	45.4	44.5	42.6	42.9	40.6	38.5	36.9	35.2	32.6	35.6	34.1	30.1	29.5	26.8	28.8	25	21.2
LN2	73.6	63.8	62	60.9	63.2	62.8	61.4	63.2	58.8	57.7	54.2	54.2	53.6	50.7	48.6	46	45.1	45.2	44.2	42.4	42.5	40.4	38.2	36.7	34.7	31.6	33.8	32.8	28.8	27.9	25.5	28.5	24.8	20.9
LN3	69.8	56.9	54.7	55.9	59.3	58.9	57.9	58.5	53.2	54.7	51	51.5	50.1	48	46.2	44.3	43.8	44	43	41.4	41.1	39.4	37.2	36	33.2	30.3	30.3	28.7	26.6	24.5	23.5	27.8	24.1	20.2
LN4	66.7	50.8	48.2	51.6	54.8	55	54.7	54.3	49.9	51.2	48.2	49.2	47.4	45.7	44.3	42.8	42.7	42.9	42	40.5	40	38.5	36.2	35.4	32.4	29.7	28.9	27.9	25.7	23.5	23	27.2	23.6	19.5
LN5	66	49	46.9	50.1	53.4	54	53.9	52.7	49.2	50.4	47.6	48.5	46.7	45.3	43.8	42.4	42.4	42.6	41.7	40.3	39.7	38.2	36	35.2	32.2	29.5	28.6	27.7	25.5	23.3	22.9	27.1	23.4	19.3
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	Main	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
Leq	71.2	60.7	56.3	57.5	59.5	62.7	60.4	58.5	59.2	60.3	57.4	50.4	47.5	43.8	43.6	43.1	40	37.7	39.8	39.7	39.5	37.1	35	33.1	30	25.3	25.1	24	22	20.2	19.3	22.3	21.6	19.6
LE	89	78.5	74.1	75.3	77.3	80.5	78.2	76.3	77	78.1	75.2	68.2	65.3	61.6	61.4	60.9	57.8	55.5	57.6	57.5	57.3	54.9	52.8	50.9	47.8	43.1	42.9	41.8	39.8	38	37.1	40.1	39.4	37.4
Lmax	86.4	64.2	69.1	63.5	68.6	64.1	65.3	60.3	58.3	54	60.3	48.8	46.7	43.6	43.8	42.8	40.5	37.6	39.6	38.4	36.4	34.5	32.4	30	28	23.1	21.1	21.2	21.1	17.9	19.2	21.9	22.3	20.7
Lmin	63.6	54.8	48.8	51.6	54.9	55.5	54.6	53.5	52.4	52.4	51.9	48.7	46.2	43.9	41	38.3	37.6	37.3	38.8	38.2	39.3	37.5	34.4	33.1	30.6	25.7	25.9	20.4	19.6	15.7	17.5	22.1	20	17.5
LN1	75	62.6	60.2	61.9	63.3	66.5	64.8	62.4	62	67.1	61.9	52.9	50.1	45.7	45.7	47.4	43.5	38.9	41.1	41.3	41.7	39.1	36.6	35	32.1	28.2	31.2	30.3	26.1	26	21.5	23.6	23.5	20.9
LN2	74.2	60	58.4	60.5	62.4	65.5	63.1	61.3	59.3	63.8	60.8	52.2	49.2	45.2	45.2	46.1	41.6	38.6	40.7	40.9	41.2	38.8	36.3	34.4	31.3	27.4	28.8	26.8	24.6	23.6	20.5	23.2	22.8	20.5
LN3	69.5	54	52.9	55.7	58.3	61.9	59.2	57.3	55.5	54.2	55.6	50.1	47.1	43.6	43.3	41.7	39.1	37.6	39.6	39.6	39.4	37.1	35	33.1	29.6	24.6	22	20.4	20	17	18.6	22.2	21.4	19.5
LN4	67.1	48.5	47.8	51.5	54.6	56.8	56	53.8	52.1	50.9	51.6	48	45.2	41.9	41.5	39.9	37.8	36.6	38.6	37.9	36.8	34.5	32.8	31	28.3	22.9	20.4	19	19.3	15.9	18.1	21.5	20.7	18.6
LN5	66.5	46.8	46.2	50.5	53.7	55.4	55.2	52.7	51.3	50	50.4	47.3	44.7	41.3	41	39.5	37.5	36.3	38.3	37.6	36.1	34.1	32.3	30.6	28.1	22.6	20.2	18.8	19.1	15.8	17.9	21.3	20.5	18.3
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	Main	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
Leq	74.4	64.5	62.8	61.8	61.9	61.6	61.4	61.5	58.3	54.6	55	50.1	47.1	43.9	43.5	41.1	38.8	38	40.9	40.4	40.2	38	36.1	34.9	30.9	26.8	24	22.7	21.7	19.1	19.7	22.8	20.6	18.3
LE	92.2	82.3	80.6	79.6	79.7	79.4	79.2	79.3	76.1	72.4	72.8	67.9	64.9	61.7	61.3	58.9	56.6	55.8	58.7	58.2	58	55.8	53.9	52.7	48.7	44.6	41.8	40.5	39.5	36.9	37.5	40.6	38.4	36.1
Lmax	88.9	69.1	67.8	63.3	68	71.6	73.3	64.8	57.5	56.7	55	49.9	48.8	46.2	45.7	42.3	40	38.6	41.9	39.4	39.3	36.1	35.7	34.5	30.9	26.3	23.3	21.3	20.7	18.1	19.1	23.5	19.9	18.3
Lmin	66.3	54.2	49.2	53.7	54.3	58.6	57.8	58.7	57.7	52.3	56.4	49.1	46.3	43.3	42.2	39.7	39.4	37.3	40.4	39.5	38.6	37.1	34.7	34.1	29.6	26.2	23.7	21.9	19.7	16.1	18	21.6	19.8	16.9
LN1	80.2	71.3	68.4	67.7	66.9	65.6	65.2	65.7	62.2	58.2	58.6	52.1	49.4	46	45.2	42.7	40.1	39.3	42.3	41.9	42.2	39.7	37.8	36.3	32.3	28.4	26.4	25.4	24.3	22	21.6	24.2	21.9	19.5
LN2	78	69	66.6	65.3	64.7	64.6	64	64.2	61	57	58	51.6	48.8	45.4	44.8	42.4	39.8	39	41.9	41.6	41.6	39.3	37.4	35.8	31.8	27.7	25.1	23.6	22.3	19.9	20	23.8	21.6	19.3
LN3	70.8	60.7	59.5	58.3	60	60.2	60.2	59.7	57.2	53.9	54.1	49.9	46.9	43.7	43.4	41	38.7	37.8	40.8	40.2	39.9	37.7	35.9	34.7	30.5	26	23	21	20.1	17.1	18.7	22.5	20.4	18.2
LN4	68.5	52.9	53	53.3	56.1	55.9	56.8	56.5	53.8	51.1	50.2	47.9	44.9	42.1	41.8	39.6	37.5	36.8	39.8	39.1	38.6	36.3	34.7	33.6	29.6	24.9	22	20	19.4	16.2	18.2	21.6	19.7	17.4
LN5	68	51.1	51.1	51.4	54.9	54.9	56	55.6	52.9	50.4	49.3	47.4	44.4	41.5	41.3	39.2	37.1	36.6	39.6	38.9	38.3	36	34.3	33.2	29.4	24.6	21.7	19.8	19.3	16	18	21.4	19.5	17.2
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	Main	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
Leq	70.8	57.7	56.9	56	59.3	61.1	61.1	61.3	57.8	54.7	58	51.7	48.3	44.7	43.7	41.6	39.2	38	40.7	39.6	39.7	37.5	35.6	33.9	30.2	27.1	24.2	22.4	21.6	19	19.8	22.5	20.1	17.5
LE	88.6	75.5	74.7	73.8	77.1	78.9	78.9	79.1	75.6	72.5	75.8	69.5	66.1	62.5	61.5	59.4	57	55.8	58.5	57.4	57.5	55.3	53.4	51.7	48	44.9	42	40.2	39.4	36.8	37.6	40.3	37.9	35.3
Lmax	79.9	64	55.3	51.2	61.6	62.1	61	63.8	62.2	54.4	59.8	51.1	48.9	45.2	48.1	43.7	40.5	39.3	41.5	41.4	41.9	38.4	37	38.1	32.9	26.2	22.2	20.5	19.2	17.2	17.6	22.5	18.8	16.1
Lmin	65.2	54	55.3	56.3	56	55.9	53.4	56.3	54.8	53.8	57.5	49.6	46.5	44.3	41.4	42.4	38.9	36.1	39.7	38.7	38.6	34.9	34.2	32.6	27.8	23.4	21.4	21.1	20.6	17.9	18.6	21.5	20	17
LN1	74.5	63.2	62.7	59.9	63.5	64.4	65.1	65.6	61.6	57.8	61.8	54.5	51	46.9	45.6	43.3	41.3	39.6	41.8	40.8	41.3	38.9	37.2	35.7	32.2	29.4	26.3	25.4	24.2	22.4	21.9	23.9	21.7	19.1
LN2	73	61.5	60.4	58.9	62.4	63.7	63.9	64.1	60.6	57	60.9	53.5	50.1	46.3	44.9	42.8	40.5	39.1	41.5	40.5	40.8	38.5	36.8	34.8	31.3	28.1	25	24.3	23.4	21.4	21.1	23.6	21.3	18.8
LN3	69.6	53.2	54.1	54.7	58.2	60.5	60.2	59.6	56.8	54.1	57	51.1	48	44.3	43.5	41.4	38.8	37.8	40.7	39.5	39.6	37.3	35.3	33.4	29.6	25.7	22.7	20.9	20.2	17.4	18.7	22.2	20	17.4
LN4	67.8	47.1	49.1	50.8	54.4	56.7	56.5	56	53.7	51.4	53.8	49	46	42.4	42	40	37.6	36.7	39.7	38.5	38.6	36.1	34.1	32.5	27.9	23.6	21	19.3	18.8	16	17.6	21.4	18.5	15.8
LN5	67.4	45.8	47.5	49.3	53.1	55.8	55.6	54.7	52.9	50.7	52.9	48.5	45.4	42	41.7	39.7	37.3	36.3	39.5	38.3	38.3	35.9	33.8	32.2	27.7	23.3	20.7	19.1	18.6	15.8	17.1	21.2	18.4	15.4
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	Main	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
Leq	73.1	61.2	58.9	61.3	60.6	58.1	63	60.7	56.6	56.1	58	54.4	50.3	46.2	45.9	43.8	44.4	42.7	39.5	39.9	39.4	36.8	35.9	33.4	30.2	28.1	27.1	27.6	24.7	22.7	22	21.8	20.1	14.6
LE	90.9	79	76.7	79.1	78.4	75.9	80.8	78.5	74.4	73.9	75.8	72.2	68.1	64	63.7	61.6	62.2	60.5	57.3	57.7	57.2	54.6	53.7	51.2	48	45.9	44.9	45.4	42.5	40.5	39.8	39.6	37.9	32.4
Lmax	85.9	70	65.7	72.9	70	69.3	65.5	61.8	59.7	56.6	59.1	52	51.1	48.1	47.2	45.3	45.2	43	40.9	41.4	40.9	37.8	37	34.2	31	29.1	27.2	27.6	25.1	23	22.4	22.2	20.6	14.7
Lmin	64.3	49.4	49	54.6	56.3	47.2	56.9	55.3	48.6	55.5	52.9	47.4	47	44.2	43.2	41.2	43.8	41.4	37.9	38.3	39.4	35.6	33.3	31.6	28.6	26.9	26.6	26.9	23.7	21.8	21.5	21.2	19.2	14.3
LN1	78.1	68.4	65	65.5	64.6	62.4	65.9	64.7	61.6	58.4	61.7	56.7	52.1	48.4	48.2	45.6	46.1	44	40.7	41.5	41	38.5	37.8	35.2	32.3	30.3	28.9	29.5	26.4	25	23.3	22.6	21	15.6
LN2	75.9	65.4	62.4	63.2	63.1	60.4	65.3	63	59.7	57.4	60.9	54.3	50.7	47.9	47.1	45.1	45.6	43.7	40.4	41.2	40.7	38.1	37.4	34.7	31.8	29.5	28.1	28.4	25.5	23.6	22.4	22.2	20.6	15
LN3	70.4	55.4	54.2	58.4	59.4	56.5	62.7	59.5	54.8	54.1	56.4	50.4	48.3	45.8	45.1	43.6	44.2	42.5	39.2	39.9	39.4	36.9	35.9	33.2	29.8	27.7	26.7	27.2	24.3	22.1	21.8	21.6	20	14.5
LN4	67.9	48.5	47.6	54	55.5	53.2	58.5	55.8	50.9	51.2	52.5	48	46.2	43.7	43.5	42.2	43.1	41.4	38.2	38.1	37.2	34.6	33.8	32.1	28.6	26.8	26.2	26.7	23.8	21.6	21.4	21.2	19.5	14.2
LN5	67	46.5	45.7	52.1	54.8	52.2	57.5	54.8	49.9	50.2	51.5	47.6	45.6	43.3	43.1	41.9	42.8	41.1	37.8	37.7	36.9	34.3	33.6	31.9	28.4	26.6	26.1	26.6	23.7	21.5	21.3	21	19.4	14.2
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	Main	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
Leq	69.8	56.4	58.5	58.2	59.4	57.6	62.2	58.3	55	53.3	59.7	49.2	47.4	45.3	43.1	43.4	43.2	41.7	44.8	43.4	42.1	40.5	37	34.6	31.9	30	29.9	29.5	26.8	24.5	23.9	24	20.7	16.5
LE	87.6	74.2	76.3	76	77.2	75.4	80	76.1	72.8	71.1	77.5	67	65.2	63.1	60.9	61.2	61	59.5	62.6	61.2	59.9	58.3	54.8	52.4	49.7	47.8	47.7	47.3	44.6	42.3	41.7	41.8	38.5	34.3
Lmax	78.6	59.1	52.7	55.6	62.3	60.3	59.7	59.6	51	53.6	53.9	47.6	48.4	46	44.6	43.8	43.4	42	39.9	40.3	38.9	35.8	35.3	34.6	34.7	34.3	30.2	29.3	27.3	25.1	23.8	24.6	20.2	14.9
Lmin	64.8	50.5	51.6	47.8	52.5	54.3	57.9	58.6	54.9	51.5	52.1	48.2	44.5	41.6	42.2	40.5	42.3	40.7	38.9	38.9	38.1	35.6	34.4	33.1	28.7	27.6	27.4	28.1	25.7	24.3	23.3	23.4	20.4	16
LN1	73.6	62.8	65.1	64	63.8	61.4	64.6	62.5	58.3	56.7	63.3	51.5	49.7	47.4	45	44.8	44.9	42.9	41	40.4	39.7	38.2	35.9	35.3	32.3	32.6	32.2	32.2	29.7	28.5	27	26.4	23.4	19.1
LN2	72.4	60.5	62.1	61.3	62.9	60.4	63.8	61	57	55.5	62.8	50.8	49.1	46.9	44.6	44	44.4	42.5	40.2	39.7	39.2	37	35.2	34.5	30.7	30.4	29.8	29.5	27.7	26.2	24.8	24.7	21.3	16.8
LN3	68.6	52.6	53.8	54.7	58	56.6	61.8	57.4	53.8	52.4	59.2	49	47.1	44.9	43	42.1	42.8	41.2	38.9	38.2	38	35.6	34.2	33.5	28.5	27.3	26.8	27.4	24.5	22.5	22	22.9	19.5	14.7
LN4	67	45.6	47.7	49.6	53.4	52.6	59.6	53.5	50.9	50.2	53.5	47.3	45.1	42.9	41.2	40.6	41.5	40	37.8	37	36.5	34.5	33	32.8	27.7	26.3	25.9	26.7	23.6	21.5	21	22	18.9	14.2
LN5	66.6	44	46.7	48.2	51.9	51.6	59.1	52.7	50.3	49.5	52	46.7	44.6	42.4	40.7	40.3	41.2	39.8	37.4	36.7	36.2	34.1	32.6	32.6	27.5	26.2	25.7	26.5	23.4	21.3	20.9	21.8	18.8	14.1
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	Main	12.5 Hz	16 Hz	20 Hz	25 Hz	31.5 Hz	40 Hz	50 Hz	63 Hz	80 Hz	100 Hz	125 Hz	160 Hz	200 Hz	250 Hz	315 Hz	400 Hz	500 Hz	630 Hz	800 Hz	1 kHz	1.25 kHz	1.6 kHz	2 kHz	2.5 kHz	3.15 kHz	4 kHz	5 kHz	6.3 kHz	8 kHz	10 kHz	12.5 kHz	16 kHz	20 kHz
Leq	69.8	57.4	55.5	53.9	57.8	57.5	62.6	57.4	55.5	54.1	54.9	49.1	47.9	45.9	47	43	44	42	39.5	38.5	38.4	36.1	34.7	33.9	29	28	27.6	28	25.8	24.3	23.3	23.9	20.2	15.5
LE	87.6	75.2	73.3	71.7	75.6	75.3	80.4	75.2	73.3	71.9	72.7	66.9	65.7	63.7	64.8	60.8	61.8	59.8	57.3	56.3	56.2	53.9	52.5	51.7	46.8	45.8	45.4	45.8	43.6	42.1	41.1	41.7	38	33.3
Lmax	83.9	70.1	57.3	57.6	60.1	56.7	63.5	60	55.4	53.3	56.4	46.7	44.6	45.6	45.7	43.3	43.6	43.5	39.9	36.4	38.2	34.8	33.3	33.3	27.8	27.4	26.1	27.1	24	22.6	22	23.4	19.5	14.7
Lmin	63.8	49.2	49.8	48.7	53.1	53.1	57.6	57	50.4	45.9	50.2	50.1	46.9	45.4	44.4	43.4	42.7	41.8	38.5	37.4	36.8	33.8	32.7	33.1	28.1	26.5	26	26.9	24.1	22.6	22.6	23.6	19.9	14.5
LN1	73.4	62.5	60.3	57.9	61.6	61.9	65.1	60.9	60.1	58.1	59.3	51.7	50.3	48.7	49.4	45.1	45.8	43.7	41.1	40.2	40.1	37.4	36.1	34.9	30.9	30.6	30.9	30.5	28.7	27.4	26	25.3	21.8	17.4
LN2	71.8	60.4	58.5	56.5	60.8	60.4	64.6	60.2	58.8	56.2	58.4	50.9	49.6	47.8	48.7	44.5	45.2	43.1	40.4	39.6	39.7	37	35.6	34.7	30.2	29.8	29.4	29.2	27.6	26.1	25	24.9	21.2	16.7
LN3	68.3	53.2	53.9	52.8	56.7	56.2	62.3	56.7	54.2	52.8	53.4	48.7	47.4	45.3	46.3	42.6	43.8	41.8	39.3	38.1	38.1	35.4	34.2	33.8	28.5	27.2	26.6	27.3	24.4	22.8	22.2	23.7	20	14.9
LN4	66.4	47.3	48.4	49	52.7	52.4	59.7	53.5	50.2	49.6	49.3	46.4	45.4	43.2	43.1	41.3	42.8	40.7	38.2	37.1	36.7	34.1	33.1	33.1	27.6	26.3	25.8	26.7	23.7	22.1	21.5	22.9	19.2	14.5
LN5	65.9	45.5	46.5	47.8	51.3	51.7	59.1	52.4	49	48.8	48.5	45.8	44.9	42.6	42.5	40.8	42.5	40.4	38	36.8	36.5	33.9	32.9	32.9	27.3	26.2	25.6	26.6	23.5	21.9	21.4	22.7	19	14.4
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Glossary of Terms

Decibel (dB) The unit used to quantify sound pressure levels; it is derived from the logarithm of the ratio between the value of a quantity and a reference value. It is used to describe the level of many different quantities. For sound pressure level the reference quantity is 20 μPa, the threshold of normal hearing is in the region of 0 dB, and 140 dB is the threshold of pain. A change of 1 dB is usually only perceptible under laboratory conditions.

dB L_A Decibels measured on a sound level meter incorporating a frequency weighting (A-weighting) which differentiates between sounds of different frequency (pitch) in a similar way to the human ear. Measurements in dB L_A broadly agree with an individual's assessment of loudness. A change of 3 dB L_A is the minimum perceptible under normal conditions, and a change of 10 dB L_A corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB L_A; normal conversation about 60 dB L_A at 1 meter; heavy road traffic about 80 dB L_A at 10 meters; the level near a pneumatic drill about 100 dB L_A.

$L_{A90,T}$ The A weighted noise level exceeded for 90% of the specified measurement period (T). In BS 4142: 2014+A1:2019 it is used to define background noise level.

$L_{Aeq,T}$ The equivalent continuous sound level. The sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period (T). $L_{Aeq,T}$ is used to describe many types of noise and can be measured directly with an integrating sound level meter.

$L_{AF,max}$ The highest A-weighted noise level recorded during the time period using a Fast time-weighting. It is usually used to describe the highest noise level that occurred during the event.


MILLER
GOODALL
ACOUSTICS - AIR QUALITY - LIGHTING