



Environmental Noise Survey, Noise Break-In Assessment & Sound Insulation Scheme

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Date: 11/01/2022



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Executive summary

An environmental noise survey and noise impact assessment have been undertaken to assess the suitability of the site at 29-31 Drake Street, Rochdale, OL16 1RX for residential development. The measured ambient sound levels have allowed a BS8233:2014 noise assessment to be carried out.

A sound insulation scheme has been provided in section 6.0, including glazing and an alternative ventilation strategy. These recommendations should be sufficient to achieve the internal and external noise levels for the proposed development according to the BS8233:2014 internal noise criteria. An overview of all recommendations can be found in the table below:

Recommendations and Mitigation Overview

- All glazing along the front façade requires the octave band sound reduction specific in Tables 3.0. Appropriate glazing specifications can be found in Table 8.0
- All glazing along the rear facade requires the octave band sound reduction specific in Tables 4.0. Appropriate glazing specifications can be found in Table 9.0
- Appropriate acoustically treated alternative ventilation can be found in Table 10.0.
- The floor between the commercial unit on the ground floor and the proposed development is evaluated in Section 5.0

The findings of this report will require written approval from the Local Authority prior to work commencing.

1. Introduction

Overview

NOVA Acoustics Ltd has been commissioned to prepare a noise assessment for a residential development ('the Proposed Development') at 29-31 Drake Street, Rochdale, OL16 1RX ('the Site').

The applicant has submitted a planning application, 21/01064/FUL- 'Proposed Change of Use of First and Second Floors from Training Centre to Three Self Contained Flats, Insertion of Dormers to Rear, Rooflights and Door to front' ('the Application') to Rochdale Borough Council. The Rochdale Borough Council have requested additional supporting documentation in order to approve the application.

The following technical noise assessment has been prepared to support the planning application to Rochdale Borough Council. This report details the ambient sound climate at the proposed development site and provides a sound insulation scheme to protect the amenity of the occupants of the proposed residential dwellings.

This noise assessment is necessarily technical in nature; therefore, a glossary of terms is included in Appendix A to assist the reader.

Scope & Objectives

The scope of the noise assessment can be summarized as follows:

- Ambient sound monitoring survey to evaluate the prevailing ambient and maximum sound levels incident on the proposed development;
- A detailed assessment of the suitability of the Site, in accordance with relevant standards in respect of sound from the surrounding noise sources; and
- Recommendation of mitigation measures, where necessary, to comply with the requirements of the National Planning Policy Framework (2021), Noise Policy Statement for England (2010) and British Standard BS8233:2014 Guidance on Sound Insulation and Noise Reduction for Buildings. Further information on the legislation can be found in Appendix B.

Local Authorities guidance & Discussions

The following image shows the conditions given by the local officer at Rochdale Borough Council.

Comments Details

This section cannot support the application in its current form. Given the close proximity to the road/tram network and the town centre, in particular the night time economy, an acoustic assessment will need to be carried to inform the design of the flats in order to achieve the following internal and external noise levels:

Comments:

- 35 dB(A) Leq (1 hour) in the bedrooms with windows shut and other means of ventilation provided between 7 am and 11pm;
- 30dB(A) Leq 5mins in the bedrooms with windows shut and other means of ventilation provided between 11pm and 7am;
- 35 dB(A) Leq (1 hour) in the living room/s with windows shut and other means of ventilation provided between 7 am and 11pm;
- 40dB(A) Leq (1 hour) in other habitable rooms with windows shut and other means of ventilation provided at all times.

Kind regards

Figure 1.0 – Local Authorities Criteria & Guidance



Figure 3.0 – Rear Façade and extraction unit from the commercial development.

*The window at MP2 was the only possible location at the rear of the development, the closest windows to the extraction unit were not suitable to install the SLM.

The ground floor level is actually operating as a retail unit “The carty party room” which is currently used as a function room. The operational times of the commercial are Monday to Sunday from 10:00 to midnight. Conversations with the client showed that the commercial may have amplified music, therefore, the partition floor between the commercial and the proposed residential will be evaluated in the Noise Breakthrough Assessment.

Background

The proposed development is based on a conversion of a three-storey building from an empty space to residential dwellings.

Environmental Noise Survey Results

The following table outlines the highest octave band $L_{eq,1hour}$ sound levels measured during the day and $L_{eq,5min}$ sound levels measured during the night period as stated in the criteria given by the local authorities. These values will be used in the noise break in assessment. A full summary of all results can be found in Appendix D.

Measurement Position MP1							
Measurement Period (‘t’)	Octave Band $L_{eq,t}$ (Hz, dB)						$L_{Aeq,t}$ (dB)
	125	250	500	1k	2k	4k	
Highest $L_{eq,1hour}$ (Day)	65.0	60.0	57.0	58.0	57.0	52.0	63.0
Highest $L_{eq,5min}$ (Night)	68.0	63.0	61.0	60.0	62.0	58.0	66.0
Measurement Position MP2							
Measurement Period (‘t’)	Octave Band $L_{eq,t}$ (Hz, dB)						$L_{Aeq,t}$ (dB)
	125	250	500	1k	2k	4k	

Highest $L_{eq,1hour}$ (Day)	61.0	57.0	55.0	53.0	50.0	46.0	58.0
Highest $L_{eq,5min}$ (Night)	65.0	61.0	65.0	65.0	62.0	59.0	69.0
Highest Averaged $L_{eq,5min}$ (Night)	60.0	57.0	55.0	53.0	51.0	48.0	59.0

Table 1.0 – Octave Band Sound Levels during day & night

In the following section, the maximum noise level events are assessed. ProPG states:

"...in noise sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45dB $L_{Amax,F}$ more than 10 times a night."

The following table shows a summary of the maximum sound level results.

Measurement Position MP1			
Measurement Period ('t')	$L_{AFMax,15min}$	*SMR $L_{AFMax,15min}$	10 th Highest $L_{AFMax,15min}$
Night 1	83.0	82.0	79.0
Measurement Position MP2			
Measurement Period ('t')	$L_{AFMax,15min}$	*SMR $L_{AFMax,15min}$	10 th Highest $L_{AFMax,15min}$
Night 1	70.0	66.0	66.0
Night 2	98.0	82.0	80.0
Night 3	73.0	60.0	60.0

Table 2.0 – Maximum Sound Level Summary Results

*Statistically Most Repeated

Discussion

The SLM at MP1 suffered some anomaly from Day 2 onwards. This anomaly has been deleted from the calculations and the full measurement period is shown in Appendix D.

3. BS8233:2014 & BS4142:2014

This section highlights the use of the British standards BS8233:2014 and BS4142:2014 in tandem.

BS8233 and Industrial Noise

The BS8233 is typically used to assess anonymous noise sources. However, the standard does stipulate specifically in Section 6.5.2 that when assessing noise from industrial the rating noise levels of said industrial noise in accordance with BS4142 should be used in the noise break in assessment. *'Where industrial noise affects residential or mixed residential areas, the methods for rating, the noise in BS 4142 should be applied.'*

Commercial Noise Penalties and BS4142:2014

BS4142:2014 provides commentary on situations where new noise sensitive premises are introduced to a site and where the new development incorporates specific noise control measures. Section 8.5 of the Standard states

'Where a new noise-sensitive receptor is introduced and there is extant industrial and/or commercial sound, it ought to be recognised that the industrial and/or commercial sound forms a component of the acoustic environment. In such circumstances, other guidance and criteria in addition to, or alternative to this standard can also inform the appropriateness of both introducing a new noise-sensitive receptor and the extent of required noise mitigation.'

In addition, the standard states that it uses outdoor levels to assess the likely effects of sound on people who might be inside or outside a dwelling upon which the sound is incident. Where this is applied to new dwellings, the context is important. Subsequent to the publication of the standard, guidance notes have been issued in this respect.

Section 11 of the Standard advises that *'When making assessments and arriving at decisions... it is essential to place the sound in context'* and further clarifies this by stating *'Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following...*

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as;

i) façade insulation treatment

ii) ventilation and/or cooling that will reduce the need to have windows open so as to avoid rapid or purge ventilation; and

iii) acoustic screening'

This commentary implies, therefore, that all control measures should be taken into consideration and that sound levels within a dwelling after allowance for these measures may be assessed on the basis of other design criteria appropriate to residential property.

In order to account for this noise from the mechanical plant to the rear of the site, a rating penalty will be added to the measured day time 1hour noise levels at the rear of the site. In accordance with BS4142:2014, a +3 dB and +2dB penalty will be applied Tonality and Intermittency.

4. Noise Break In & External Noise Level Assessment

Distance correction at MP2

The following section apply a distance correction the noise levels during the daytime and nighttime at MP2, in order to ascertain the plant emissions of the commercial development at the closest window. The following picture shows the location of the plant and the distances which will be applied the measured noise levels.



Figure 4.0 – Rear Façade and distance correction

The formula used for the distance correction is $20\log(R1/R2)$ and the reason of the shielding correction is because the microphone was shielded by the building. Given of the above, the following tables shows the corrections applied to measured noise levels at MP2 in order to establish the noise levels at the closest window.

Measurement Position MP2 – Corrected at the closest window							
Measurement Period ('t')	Octave Band $L_{eq,t}$ (Hz, dB)						$L_{Aeq,t}$ (dB)
	125	250	500	1k	2k	4k	
Highest $L_{eq,1hour}$ (Day)	61.0	57.0	55.0	53.0	50.0	46.0	58.0
Distance correction $20\log(R2/R1)$	+10.0	+10.0	+10.0	+10.0	+10.0	+10.0	+10.0
Shielding correction	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0
Highest $L_{eq,1hour}$ at the closest window (Day)	76.0	72.0	70.0	68.0	65.0	61.0	73.0
Highest Averaged $L_{eq,5min}$ (Night)	60.0	57.0	55.0	53.0	51.0	48.0	59.0
Distance correction - $20\log(R2/R1)$	+10.0	+10.0	+10.0	+10.0	+10.0	+10.0	+10.0
Shielding correction	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0	+5.0
Highest Averaged $L_{eq,5min}$ at the closest window (Night)	75.0	72.0	70.0	68.0	66.0	63.0	74.0

Table 3.0 – Octave Band Sound Levels during day & night - MP2 corrected at the closest window.

Noise Break In Assessment

The following section analyses the ambient sound levels incident on the development compared with the internal noise level criteria presented within BS8233:2014. Where octave band sound levels have been assessed these have been compared to the appropriate Noise Rating Curve (NR Curve).

To ensure a robust analysis the following considerations have been taken:

- The $L_{AFmax,15min}$ during the night exceeded less than ten times.
- The highest $L_{eq,1hour}$ during the day and the highest $L_{eq,5min}$ nighttime periods at the façades A & B.
- The highest $L_{eq,1hour}$ during the day and the highest averaged $L_{eq,5min}$ nighttime periods corrected at the closest window.
- A rating penalty BS4142 during daytime at the rear of the development.

The following table outlines the minimum octave band sound reduction required of the building envelope in order to achieve appropriate internal noise levels.

Measurement Position MP1 – Façade A								
Measurement Period ('t')	Octave Band $L_{eq,t}$ (Hz, dB)						$L_{Aeq,t}$	$L_{AMax,t}$
	125	250	500	1k	2k	4k		
Highest $L_{eq,1hour}$ (Day)	65.0	60.0	57.0	58.0	57.0	52.0	63.0	-
NR30 Curve (dB)	48.1	39.9	34.0	30.0	26.9	24.7	35.0	
Min. Sound Reduction (R_w)	17.0	21.0	23.0	28.0	31.0	28.0	28.0	
Highest $L_{eq,5min}$ (Night)	68.0	63.0	61.0	60.0	62.0	58.0	66.0	79.0
NR25 Curve (dB)	43.7	35.2	29.2	25.0	21.9	19.5	30.0	45.0
Min. Sound Reduction (R_w)	25.0	28.0	32.0	35.0	41.0	39.0	36.0	34.0

Table 4.0 – Octave Band Internal Noise Level Analysis – MP1

Measurement Position MP2 – Façade B								
Measurement Period ('t')	Octave Band $L_{eq,t}$ (Hz, dB)						$L_{Aeq,t}$	$L_{AMax,t}$
	125	250	500	1k	2k	4k		
Highest $L_{eq,1hour}$ (Day)	61.0	57.0	55.0	53.0	50.0	46.0	63.0*	-
NR30 Curve (dB)	48.1	39.9	34.0	30.0	26.9	24.7	35.0	
Min. Sound Reduction (R_w)	13.0	18.0	21.0	23.0	24.0	22.0	28.0	
Highest $L_{eq,5min}$ (Night)	65.0	61.0	65.0	65.0	62.0	59.0	69.0	80.0

NR25 Curve (dB)	43.7	35.2	29.2	25.0	21.9	19.5	30.0	45.0
Min. Sound Reduction (R_w)	22.0	26.0	36.0	40.0	41.0	40.0	39.0	35.0

Table 5.0 – Octave Band Internal Noise Level Analysis – MP2

*BS4142 Rating Noise Levels $L_{Aeq,1hour}$ +3 dB and +2dB for Tonality and Intermittency.

The following table shows the corrected noise levels calculated on Tables 3.0 and 4.0 at the closest window.

Measurement Position MP2 – Noise levels calculated at the closest window - Façade C								
Measurement Period ('t')	Octave Band $L_{eq,t}$ (Hz, dB)						$L_{Aeq,t}$	$L_{AMax,t}$
	125	250	500	1k	2k	4k		
Highest $L_{eq,1hour}$ at the closest window (Day)	76.0	72.0	70.0	68.0	65.0	61.0	78.0*	-
NR30 Curve (dB)	48.1	39.9	34.0	30.0	26.9	24.7	35.0	
Min. Sound Reduction (R_w)	28.0	33.0	36.0	38.0	39.0	37.0	43.0	
Highest Averaged $L_{eq,5min}$ at the closest window (Night)	75.0	72.0	70.0	68.0	66.0	63.0	74.0	80.0
NR25 Curve (dB)	43.7	35.2	29.2	25.0	21.9	19.5	30.0	45.0
Min. Sound Reduction (R_w)	32.0	37.0	41.0	43.0	45.0	44.0	44.0	35.0

Table 6.0 – Octave Band Internal Noise Level Analysis – MP2

*BS4142 Rating Noise Levels $L_{Aeq,1hour}$ +3 dB and +2dB for Tonality and Intermittency.

5. Noise Break Through Assessment

The proposed development is located above a function room "The carty party room". Consequently, there is the potential for the noise breaking through the adjoining floor to adversely impact the future residents. The following section analyses the predicted level of noise breakthrough from the function room (with amplified music) to the proposed development compared with the internal noise level criteria presented within BS8233:2014. Where octave band sound levels have been assessed these have been compared to the appropriate Noise Rating Curve (NR Curve). The neighbouring retail unit (with amplified music) operates during the night period. Thus the noise levels have been assessed against the BS8233:2014 criteria for this period. To account for the low frequency noise intrinsic to any amplified music the Moorhouse curve will be used as the lower frequency criteria in the 63 and 125Hz Octave Bands

The predicted noise levels associated with the Bar (with amplified music) have been taken from a previous survey undertaken by NOVA Acoustics Ltd of a similar facility. The noise emissions and minimum sound reduction required of the adjoining floor are shown in the table below.

Measurement Period ('t')	Octave Band $L_{eq,t}$ (Hz, dB)							Overall $L_{Aeq,t}$
	63	125	250	500	1k	2k	4k	
Amplified Music Levels	91.0	92.0	93.0	93.0	90.0	86.0	83.0	95.0
NR25/Moorhouse Curve (dB)	47.0	41.0	35.0	29.0	25.0	22.0	20.0	30.0
Min. Sound Reduction (R_w)	44.0	51.0	58.0	64.0	65.0	64.0	63.0	65.0

Table 7.0 - Noise Breakthrough Minimum Sound Reduction

As can be seen in the table above provided the floor achieves the outlined minimum sound reduction appropriate residential noise criteria can be achieved and thus the amenity of all future residents can be protected from the commercial entertainment venues on the ground floor.

The level of sound insulation provided by the adjoining has been predicted using INSUL 9.0 Sound Insulation Prediction Software. The predicted sound insulation of the adjoining floor is based upon the construction detail of the adjoining floor which has been provided by the client. The existing construction detail are as follows:

- Assumed 18mm standard Particle Board.
- Assumed 200mm Timber Joists filled with Fiberglass Insulation.
- Assumed No. 2 layers of 12.5mm Fireline underneath the timber joists.
- Independent Timber Joists filled with assumed 200mm fiberglass insulation
- Assumed No. 2 layers of 12.5m of Fireline Plasterboard underneath the suspended timber joists.

The following table compares the predicted airborne sound insulation to the required minimum sound reduction of the adjoining floor to see if the adjoining floor requires additional sound insulation.

Measurement Period ('t')	Octave Band $L_{eq,t}$							Minimum R_w
	63	125	250	500	1k	2k	4k	
Predicted Airborne Sound Reduction	29.0	57.0	72.0	83.0	94.0	102.0	105.0	82.0
Min. Sound Reduction	44.0	51.0	58.0	64.0	65.0	64.0	63.0	65.0
Additional Sound Reduction Required	+15.0	-6.0	-14.0	-19.0	-29.0	-38.0	-42.0	-17.0

Table 8.0 - Noise Breakthrough Assessment

Discussion

The assessment above indicates that there is an exceedance at the 63Hz of +15dB. In order to protect the tenants of the proposed development, further mitigation measures should be followed.

The recommendation in this scenario will be setting up a music limit level in the function room.

Measurement Period ('t')	Octave Band $L_{eq,t}$ (Hz, dB)							Minimum R_w
	63	125	250	500	1k	2k	4k	
Predicted Airborne Sound Reduction	73.0	92.0	93.0	93.0	90.0	86.0	83.0	95.0

Table 9.0 - Noise Breakthrough Assessment

Further recommendations can be found in the mitigation section.

6. Sound Insulation Scheme

The following section outlines the required sound insulation scheme that should be installed at the proposed development to protect the amenity of the future residents. The sound insulation scheme should be installed prior to occupation and be retained thereafter.

Building Envelope

The noise levels within the proposed dwellings will be dictated by the configuration, materials, and elements of the façade. The non-glazed elements of the facade will contribute significantly to the reduction of ambient noise levels. The façade construction for lightweight or heavyweight constructions will provide ample levels of sound insulation, for the purposes of this report it is assumed the façade provides a minimum sound reduction of 50dB R_w . The following section provides a sound insulation scheme based on the weakest elements of the façade, including the glazing, ventilation and roof construction.

a) Roof Specification

If the development has rooms within the roof space the roof system will require additional sound insulation to achieve appropriate internal noise levels. Where the roof, is being utilized as a voided loft space with thermal insulation the following detailing is not required. Where rooms are within the roof, the ceilings should consist of standard roofing slates, 100mm 45kg/m² fitted tightly between the 200mm roof joists and 1no. 15mm SoundBloc plasterboard fixed to British Gypsum RB1 resilient bars to achieve a minimum sound reduction of 50dB R_w . Any other configuration of roof that would achieve at least 50dB R_w will be suitable for the development.

b) Glazing Specification

Windows can be considered the weakest point of a façade in terms of noise reduction from external noise. The glazed elements installed in all the living rooms and bedrooms require the minimum sound reduction as shown in Section 3.0. Figure 2.0 indicates the facades where acoustic glazing is required.

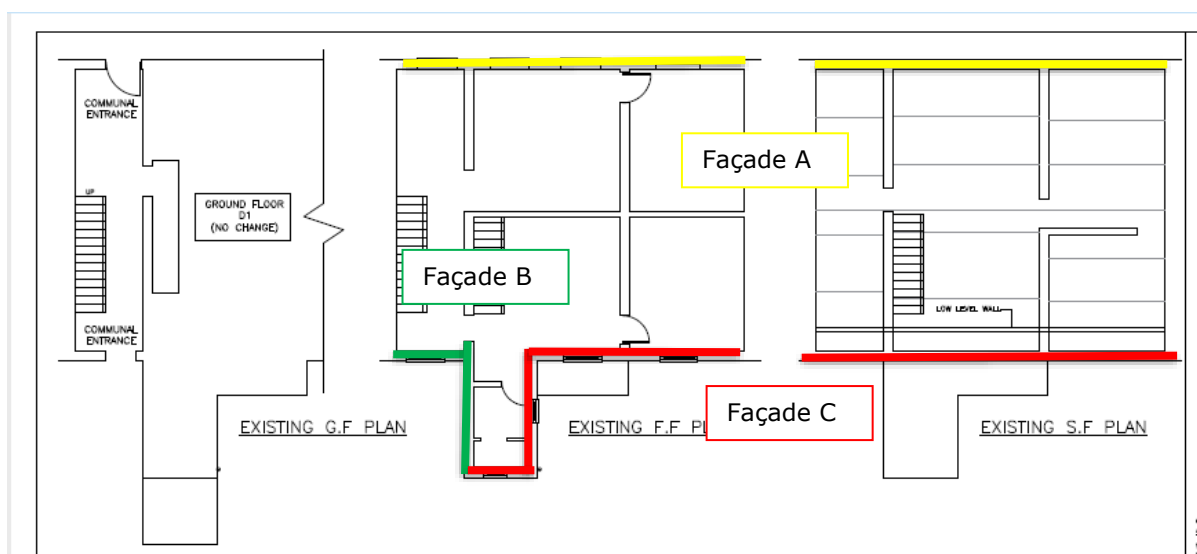


Figure 5.0 - Facade Layout

The glazing units shown in the following table provide a suitable sound reduction, any other window capable of providing this attenuation will be suitable. The performance is specified for the whole window unit, including frame and other design features. The glazing specifications have been taken from the Pilkington Optiphon Range.

Façade A	Glazing Configuration						
Living Rooms	<i>Double Glazing</i> 8mm Glass – 16mm Air Cavity – 4mm Glass						
Description	125	250	500	1k	2k	4k	R_w + C_{tr}
Sound Reduction (R _w)	22.0	21.0	28.0	38.0	40.0	47.0	29.0
Location	Glazing Configuration						
Bedrooms	<i>Pilkington Double Glazing</i> 10mm Glass – 16mm Air Cavity – 8.8mm Optiphon Glass						
Description	125	250	500	1k	2k	4k	R_w + C_{tr}
Sound Reduction (R _w)	28.0	31.0	42.0	45.0	50.0	58.0	38.0

Table 10.0 – Glazing Specification – Façade A

Façade B	Glazing Configuration						
Living Rooms	<i>Double Glazing</i> 6mm Glass – 16mm Air Cavity – 4mm Glass						
Description	125	250	500	1k	2k	4k	R_w + C_{tr}
Sound Reduction (R _w)	21.0	20.0	26.0	38.0	37.0	39.0	28.0
Location	Glazing Configuration						
Bedrooms	<i>Double Glazing</i> 8mm Glass – 16mm Air Cavity – 6mm Glass						
Description	125	250	500	1k	2k	4k	R_w + C_{tr}
Sound Reduction (R _w)	28.0	36.0	43.0	47.0	49.0	58.0	40.0

Table 11.0 – Glazing Specification – Façade B

Façade C	Glazing Configuration						
Living Rooms/Bedrooms	<i>Double Glazing</i> 10.8mm Optiphon Glass – 16mm Argon – 16.8mm Optiphon Glass						
Description	125	250	500	1k	2k	4k	R_w + C_{tr}

Sound Reduction (R_w)	35.0	41.0	48.0	53.0	55.0	65.0	46.0
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Table 12.0 – Glazing Specification – Façade C

The glazing suppliers are required to demonstrate the acoustic performance of their proposed system either by providing an acoustic test report in accordance with BS EN ISO 10140-2:2010 or an evidence based calculation.

c) Ventilation Specification

BS8233 States;

"If relying on closed windows to meet the guide values, there needs to be an appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level."

and

"The Building Regulations' supporting documents on ventilation [48, 49, 50] recommend that habitable rooms in dwellings have background ventilation. Where openable windows cannot be relied upon for this ventilation, trickle ventilators can be used and sound attenuating types are available. However, windows may remain openable for rapid or purge ventilation, or at the occupant's choice. Alternatively, acoustic ventilation units are available for insertion in external walls. These can provide sound reduction comparable with double glazed windows. However, ducted systems with intakes on the quiet side of the building might be required in very noisy situations, or where appearance rules out through-the-wall fans."

An alternative ventilation system, should be installed within habitable rooms to fully protect the amenity of future residents. As stated in BS8233:2014 section 5.4.4, having complete enclosure of the noise source or receiver is the most effective barrier of sound. An alternative ventilation strategy allows for maximum sound insulation from the noise source whilst still maintaining a sufficient level of ventilation. It is recommended that the alternative ventilation should provide the same resistance to sound as the glazed elements. The following table provides ventilation systems that meet the above recommendations.

Background Ventilation		
Location	Model	Attenuation (dB)
Façade C – Living Rooms/Bedroom	Background Ventilator – MA3051	$D_{n,e,w}$ 55dB(A)
Façade A & Façade B	SF Xtra Sound Attenuator - Standard Vent + Standard SF canopy	32dB Open / 48dB Closed $D_{n,e,w}$
Through Wall Ventilation (not purge)		
Location	Model	Attenuation (dB)
All Locations	Titon Sonair F+ Mechanical Input Ventilator with G3 filter and DV100F duct ¹	56 dB $D_{n,e,w}$

Table 13.0 – Ventilation Specification

¹ The self-generated noise from the Titon Sonair F+ when measured at the maximum ventilation capacity of 60m³/h emits 23.5dB L_{PA:10m2} which is below the required internal noise criteria from BS8233:2014.

The through wall ventilation specified within the table above is also capable of providing background ventilation. If the mechanical ventilation option is opted for the background trickle ventilation option is not required to be installed.

It should be noted that if a MHRV system is used, the self-generating noise from the system will need to conform to the internal noise levels outlined in BS8233:2014.

The following table outlines recommended noise levels from mechanical ventilation in dwellings.

Ventilation Condition	Possible System	Desirable Internal Ambient Noise Levels from Mechanical Services, L _{Aeq} (dB)		
		Bedrooms	Living Rooms	Bathrooms / Kitchens
Whole dwelling ventilation	Continuous MEV ¹ at low ventilation rates	≤ 26 - 30	≤ 30	-
	Continuous MVHR ² at minimum ventilation rates			
Extract ventilation	Intermittent Extract Fans	≤ 26 - 30	≤ 35	≤ 45
	Continuous MEV at high ventilation rates			

Table 14.0 – Recommended Internal Noise Levels from Mechanical Ventilation

The ventilation suppliers are required to demonstrate the acoustic performance of their proposed system either by providing an acoustic test report in accordance with BS EN ISO 10140-2:2010 or an evidence-based calculation.

Noise Breakthrough Mitigation

d) Amplified Music Limiting Device

Automated volume controls capable of limiting noise at specific frequencies to prevent significant low-frequency music should be implemented at the site. The following maximum amplified music limit level should be set as shown in the following table.

A-weighted Octave Band Sound Pressure Level, Hz (dB)

63	125	250	500	1k	2k	4k	Overall (A)
73.0	92.0	93.0	93.0	90.0	86.0	83.0	95.0

Table 15.0 – Maximum Amplified Music Limit Level

e) Distributed PA System

To minimize the internal sound level required to achieve a uniform and distributed noise level within the ground floor retail unit, a distributed and zonal PA system should be installed. This will allow the development to have full control of the maximum noise level. The speakers should be mounted as low as feasible to bring the speakers closer to the users and thus allow the overall noise level to be reduced, whilst retaining a feeling of loudness. A distributed sound system involves installing a higher quantity of speakers all emitting a lower level, this method takes advantage of the proximity of the listener to the speaker thus reducing the noise emissions of the development site. The speakers should be focused on the main operational area of the development and not located near to and directed away from entrances and exits. All speakers should be installed on appropriate anti-vibrational mounts.

Bear in mind that if any of these recommendations are not feasible to include in the retail unit. Then an upgrade of the partition floor should be considered.

Appendix A – Acoustic Terminology

Sound Pressure	Sound, or sound pressure, is a fluctuation in air pressure over the static ambient pressure.
Sound Pressure Level (Sound Level)	The sound level is the sound pressure relative to a standard reference pressure of 20µPa (20x10 ⁻⁶ Pascals) on a decibel scale.
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s ₁ and s ₂ is given by 20 log ₁₀ (s ₁ / s ₂). The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is 20µPa.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
L _{eq,T}	A noise level index called the equivalent continuous noise level over the time period T. This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded.
L _{max,T}	A noise level index defined as the maximum noise level during the period T. L _{max} is sometimes used for the assessment of occasional loud noises, 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 _{90,T}	A noise level index. The noise level exceeded for 90% of the time over the period T. L ₉₀ can be considered to be the "average minimum" noise level and is often used to describe the background noise.
L _{10,T}	A noise level index. The noise level exceeded for 10% of the time over the period T. L ₁₀ can be considered to be the "average maximum" noise level. Generally used to describe road traffic noise.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Facade	At a distance of 1m in front of a large sound reflecting object such as a building façade.
Fast Time Weighting	An averaging time used in sound level meters. Defined in BS 5969.

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided. The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB. An indication of the range of sound levels commonly found in the environment is given in the following table.

Sound Level	Location
0dB(A)	Threshold of hearing
20 to 30dB(A)	Quiet bedroom at night
30 to 40dB(A)	Living room during the day
40 to 50dB(A)	Typical office
50 to 60dB(A)	Inside a car
60 to 70dB(A)	Typical high street
70 to 90dB(A)	Inside factory
100 to 110dB(A)	Burglar alarm at 1m away
110 to 130dB(A)	Jet aircraft on take off
140dB(A)	Threshold of Pain

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

In accordance with logarithmic addition, combining two sources with equal noise levels would result in an increase of 3 dB(A) in the noise level from a single source. A change of 3 dB(A) is generally regarded as the smallest change in broadband continuous noise which the human ear can detect (although in certain controlled circumstances a change of 1 dB(A) is just perceptible). Therefore, a 2 dB(A) increase would not be normally be perceptible. A 10 dB(A) increase in noise represents a subjective doubling of loudness.

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs.

For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest. In the UK, traffic noise is measured as the L_{A10} , the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the

time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} .

This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound. To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3 dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1 dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, BS4142:2014 specifies background noise measurement periods of 1 hour during the day and 15 minutes during the night. The noise levels are commonly symbolised as $L_{A90,1hour}$ dB and $L_{A90,15mins}$ dB. The noise measurement should be recorded using a 'FAST' time response equivalent to 0.125ms.

Appendix B – Legislation, Policy and Guidance

This report is to be primarily based on the following legislation, policy and guidance.

B.1 - National Planning Policy Framework (2019)

Government policy on noise is set out in the National Planning Policy Framework (NPPF), published in 2019. This replaced all earlier guidance on noise and places an emphasis on sustainability. In section 15, Conserving and enhancing the natural and local environment, paragraph 170e, it states:

Preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability. Development should, wherever possible, help to improve local environmental conditions such as air and water quality, taking into account relevant information such as river basin management plans;

Paragraph 180 states:

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 impact 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; and*
- c) Limit the impact of light pollution from artificial light on local amenity, intrinsically dark landscapes and nature conservation.*

B.2 - Noise Policy Statement for England (2010)

Paragraph 180 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England (NPSE). This document sets out a policy vision to:

Promote good health and a good quality of life through the effective management of noise within the context of Government policy on sustainable development.

To achieve this vision the Statement identifies the following three aims:

Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

- Avoid significant adverse impacts on health and quality of life;*
- Mitigate and minimise adverse impacts on health and quality of life;*
- Where possible, contribute to the improvement of health and quality of life.*

In achieving these aims the document introduces significance criteria as follows:

SOAEL – Significant Observed Adverse Effect Level

This is the level above which significant adverse effects on health and quality of life occur. It is stated that “significant adverse effects on health and quality of life should be avoided while also considering the guiding principles of sustainable development”.

LOAEL – Lowest Observed Adverse Effect Level

This is the level above which adverse effects on health and quality of life can be detected. It is stated that the second aim above lies somewhere between LOAEL and SOAEL and requires that: “all reasonable steps should be taken to mitigate and minimise adverse effects on health and quality of life while also considering the guiding principles of sustainable development. This does not mean that such adverse effects cannot occur.”

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. This can be related to the third aim above, which seeks: “where possible, positively to improve health and quality of life through the pro-active management of noise while also considering the guiding principles of sustainable development, recognising that there will be opportunities for such measures to be taken and that they will deliver potential benefits to society. The protection of quiet places and quiet times as well as the enhancement of the acoustic environment will assist with delivering this aim.”

The NPSE recognises that it is not possible to have a single objective noise-based measure that is mandatory and applicable to all sources of noise in all situations and provides no guidance as to how these criteria should be interpreted. It is clear, however, that there is no requirement to achieve noise levels where there are no observable adverse impacts but that reasonable and practicable steps to reduce adverse noise impacts should be taken in the context of sustainable development and ensure a balance between noise sensitive and the need for noise generating developments.

Any scheme of noise mitigation outlined in this report will, therefore, aim to abide by the above principles of the NPPF and NPSE whilst recognizing the constraints of the site.

B.3 - BS8233:2014` Guidance on sound insulation and noise reduction for buildings`

The British Standard BS 8233: 2014, Guidance on Sound insulation and noise reduction for buildings provides additional guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organization; specifically, WHO Guidelines on Community Noise, 1999. The criteria desirable levels of steady state, “anonymous” noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below:

Activity	Location	07:00 – 23:00	23:00 – 07:00
Resting	Living Room	35 dB L _{Aeq,16hour}	--

Dining	Dining Room/Area	40 dB $L_{Aeq,16\text{hour}}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16\text{hour}}$	30 dB $L_{Aeq,8\text{hour}}$

Table 16.0 - BS8233 Internal Noise Level Criteria

It is noted, however that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

The standard also recommends that for traditional external amenity areas, such as gardens, it is desirable that external noise levels do not exceed 50 dB $L_{Aeq,T}$, and that 55 dB $L_{Aeq,T}$ would be acceptable in noisier environments. However, it is recognised that these values may not be achievable in all areas where development is desirable and in such locations, development should be designed to achieve the lowest practicable levels.

General recommendations for mitigation to enable these targets to be achieved are provided, including the use of bunds and barriers to reduce external noise and space planning and sound insulation for the control of internal noise levels.

For this assessment, the above criteria are considered to be the LOAEL as defined in the NPSE above.

Appendix C – Site Plans



Appendix D – Environmental Survey

D.1 Tabulated Summary Noise Data

Measurement Position MP1								
Measurement Period ('t')	Octave Band $L_{eq,t}$						$L_{Aeq,t}$	$L_{Amax,t}$
	125	250	500	1K	2k	4K		
Day 1 – 25/11/2021 – 10:30 – 23:00	63.0	59.0	55.0	56.0	54.0	50.0	61.0	94.0
Night 1 – 25/11/2021- 23:00 – 07:00	58.0	54.0	51.0	52.0	52.0	49.0	58.0	83.0
Measurement Position MP2								
Measurement Period ('t')	Octave Band $L_{eq,t}$						$L_{Aeq,t}$	$L_{Amax,t}$
	125	250	500	1K	2K	4K		
Day 1 – 25/11/2021 – 10:30 – 23:00	52.0	49.0	48.0	47.0	45.0	39.0	51.0	84.0
Night 1 – 25/11/2021- 23:00 – 07:00	48.0	44.0	44.0	44.0	44.0	40.0	49.0	70.0
Day 2 – 26/11/2021 – 07:00 – 23:00	54.0	51.0	49.0	49.0	46.0	40.0	53.0	80.0
Night 2 – 26/11/2021- 23:00 – 07:00	60.0	57.0	55.0	54.0	51.0	49.0	59.0	98.0
Day 3 – 27/11/2021 – 07:00 – 23:00	57.0	53.0	52.0	51.0	47.0	42.0	55.0	86.0
Night 3 – 27/11/2021- 23:00 – 07:00	50.0	43.0	45.0	42.0	37.0	28.0	46.0	73.0
Day 4 – 28/11/2021 – 07:00 – 23:00	53.0	46.0	46.0	44.0	41.0	34.0	48.0	75.0
Night 4 – 28/11/2021- 23:00 – 07:00	50.0	42.0	43.0	39.0	36.0	28.0	43.7	71.0
Day 5 – 29/11/2021 – 07:00 – 10:00	51.0	47.0	47.0	47.0	42.0	35.0	50.0	81.0
Graphical Time History								

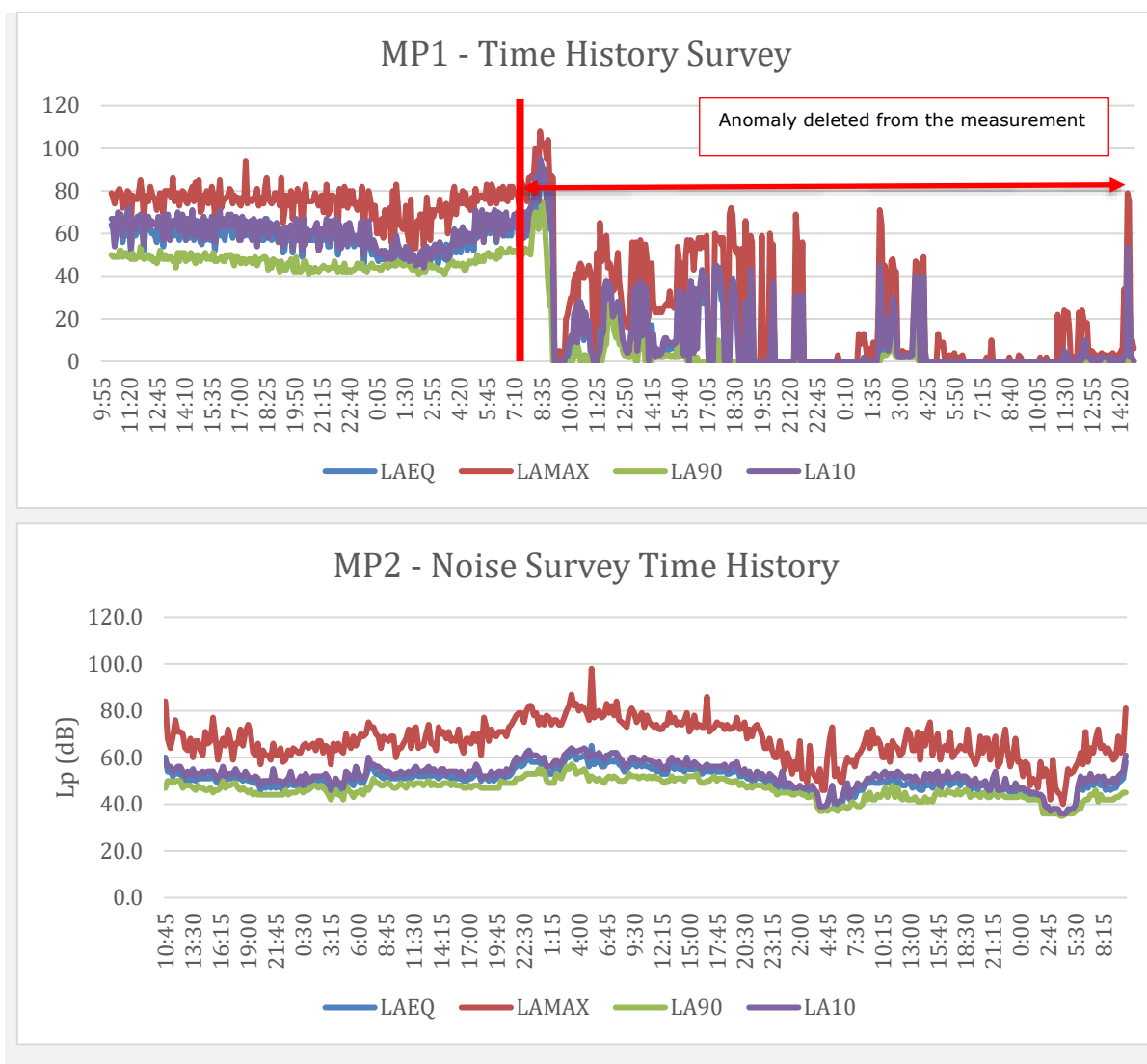


Table 17.0 – Sound Survey Summary Results

D.2 Surveying Equipment

Piece of Equipment	Serial No	Calibration Deviation
CESVA SC420 Class 1 Sound level meter	T244498	≤0.5
CESVA CB006 Class 1 Calibrator	901910	
CESVA SC420 Class 1 Sound level meter	T246471	≤0.5
CESVA CB006 Class 1 Calibrator	901955	

Table 18.0 – Measurement Equipment

All equipment used during the survey was field calibrated at the start and end of the measurement period with a negligible deviation of ≤0.5 dB. All sound level meters are calibrated every 24 months and all calibrators are calibrated every 12 months, by a third-party calibration laboratory. All microphones were fitted with a protective windshield for the entire measurements period. Calibration certificates can be provided upon request.

D.3 Meteorological Conditions

As the environmental noise survey was carried out over a long un-manned period no localized records of weather conditions were taken. However, during the set up and collection of the monitoring equipment the weather conditions have been documented in the following table. All measurements have been compared with met office weather data of the area, specifically the closest weather station, the data from the weather station is outlined in the table below. When reviewing the time history of the noise measurements, any scenarios that were considered potentially to be affected by the local weather conditions have been omitted. The analysis of the noise data includes statistical and percentile analysis and review of minimum and maximum values, which aids in the preclusion of any periods of undesirable weather conditions. The weather conditions were deemed suitable for the measurement of environmental noise in accordance with BS7445 Description and Measurement of Environmental Noise. The table below presents the average temperature, wind speed and rainfall range for each 24-hour period during the entire measurement.

Weather conditions – Chadderton, 10km				
Time period	Air temp (°C)	Rainfall mm/h	Prevailing Wind Direction	Wind Speed (m/s)
Day 1 – 25/11/2021 – 10:30 – 23:59	4.9 – 2.3	0.0	NNW	1.0 – 0.0
Day 2 – 26/11/2021 – 00:00 – 23:59	5.7 – 3.8	0.0	NW	3.5 – 0.0
Day 3 – 27/11/2021 – 00:00 – 23:59	2.8 – -0.5	0.0	NNW	2.5 – 0.0
Day 4 – 28/11/2021 – 00:00 – 23:59	0.2 – -4.4	0.0	NNE	1.0 0.0
Day 5 – 29/11/2021 – 00:00 – 10:30	0.0 – -4.8	0.4	SSW	1.0 – 0.0

Table 19.0 – Weather Summary