

NOVA

ACOUSTICS

Residential Noise Assessment

Client: Midland Yorkshire Ltd

Client Address: 39 Skye Green, Leeds, West Yorkshire, LS14 3BS

Site Address: 47-51, Daisy Hill, Dewsbury, WF13 1LF

Date: 17/06/2020



Authorisation and Version Control

Report Prepared By	Mr P Soler, BEng, AMIOA
Report Checked By	Mr J Barratt Gibson, MSc, AMIOA
Report Approved By	Mr A T Martin, MSc, MIOA, MCIEH, MIET, MInstSCE
Date	17/06/2020
Project Number	4611MY
Version Reference	001

Disclaimer

The opinions and interpretations presented in this report represent our best technical interpretation of the data made available to us. However, due to uncertainty inherent in the estimation of all parameters, we cannot, and do not guarantee the accuracy or correctness of any interpretation and we shall not, except in the case of gross or willful negligence on our part, be liable or responsible for any loss, cost, damages or expenses incurred or sustained by anyone resulting from any interpretation made by any of our officers, agents or employees. The findings and opinions expressed are relevant to the dates of the site works and should not be relied upon to represent conditions at substantially later dates. If additional information becomes available which may affect our comments, conclusions or recommendations, the author reserves the right to review the information, reassess any new potential concerns and modify our opinions accordingly. Except for the provision of professional services on a fee basis, NOVA Acoustics Ltd does not have a commercial arrangement with any person or company involved in the interests that are the subject of this report. NOVA Acoustics Ltd cannot accept any liability for the correctness, applicability or validity for the information they have provided, or indeed for any consequential costs or losses in this regard. Our efforts have been made on a "best endeavours" basis and no responsibility or liability is warranted or accepted by NOVA Acoustics Ltd.

Copyright © The material presented within this report is confidential. This report has been prepared for the exclusive use of the client and shall not be distributed or made available to any other company or person without the knowledge and written consent of NOVA Acoustics Ltd and the client. All works undertaken by NOVA Acoustics Ltd are carried out in accordance with NOVA Acoustics Ltd's terms and conditions found at www.novaacoustics.co.uk.



CONTENTS

AUTHORISATION AND VERSION CONTROL	2
CONTENTS.....	3
TABLES	5
EXECUTIVE SUMMARY	6
1. INTRODUCTION.....	7
Overview	7
Context – COVID-19	7
Scope & Objectives	8
2. ENVIRONMENTAL NOISE SURVEY.....	9
Measurement Methodology	9
Context & Subjective Impression	9
Environmental Noise Survey Results	10
3. PROPG STAGE 1 INITIAL NOISE RISK ASSESSMENT	12
4. NOISE BREAK IN & EXTERNAL NOISE LEVEL ASSESSMENT	13
Noise Break In Assessment.....	13
5. NOISE BREAK THROUGH ASSESSMENT.....	14
6. SOUND INSULATION SCHEME	15
APPENDIX A – ACOUSTIC TERMINOLOGY.....	19
APPENDIX B – LEGISLATION, POLICY AND GUIDANCE	22
B.1 - National Planning Policy Framework (2019).....	22
B.2 - Noise Policy Statement for England (2010)	22
B.3 - BS8233:2014`Guidance on sound insulation and noise reduction for buildings’	23
B.4 - ProPG: Planning & Noise	24
APPENDIX C – SITE PLANS.....	26
APPENDIX D – ENVIRONMENTAL SURVEY	28
D.1 Tabulated Summary Noise Data.....	28

D.2 Surveying Equipment	29
D.3 Meteorological Conditions	29

Tables

<i>Table 1.0 – Octave Band Sound Levels during day & night</i>	<i>10</i>
<i>Table 2.0 – Maximum Sound Level Summary Results</i>	<i>10</i>
<i>Table 3.0 – Noise Risk Category for Site</i>	<i>12</i>
<i>Table 4.0 – Octave Band Internal Noise Level Analysis.....</i>	<i>13</i>
<i>Table 5.0 – Glazing Specification.....</i>	<i>16</i>
<i>Table 6.0 – Ventilation Specification</i>	<i>17</i>
<i>Table 7.0 – Adjoining Structure Specification</i>	<i>18</i>
<i>Table 8.0 – BS8233 Internal Noise Level Criteria</i>	<i>24</i>
<i>Table 9.0 – ProPG Stage 1 Initial Risk Assessment Criteria</i>	<i>25</i>
<i>Table 10.0 – Sound Survey Summary Results – MP1</i>	<i>28</i>
<i>Table 11.0 – Sound Survey Summary Results – MP1</i>	<i>29</i>
<i>Table 12.0 – Measurement Equipment</i>	<i>29</i>
<i>Table 13.0 – Weather Summary</i>	<i>30</i>

Figures

<i>Figure 1.0 - Indicative Site Layout</i>	<i>9</i>
<i>Figure 2.0 - Facade Layout.....</i>	<i>16</i>

Executive summary

An environmental noise survey and noise impact assessment have been undertaken to assess the suitability of the site at 47-51, Daisy Hill, Dewsbury, WF13 1LF for residential development. The measured ambient sound levels have allowed a BS8233:2014 noise assessment and ProPG assessment to be carried out.

The 'ProPG Stage 1 Initial Risk Assessment' has shown that the development site is considered 'Noise Risk Category 2 - Medium Risk'. However, as there are multiple residential properties in similar proximity to the main sources of noise it is assumed that provided good acoustic design is implemented, the amenity of future residents can be fully protected.

A breakthrough noise assessment has been undertaken to ensure noise levels inside the commercial section of the development do not have an adverse effect on the residential flats above. A proposed floor build-up has been provided to ensure a minimum performance of 10 dB above the Building Regulations requirements.

A sound insulation scheme has been provided in section 6.0, including glazing and an alternative ventilation strategy. These recommendations will 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 requires the octave band sound reduction specific in Table 4.0. Appropriate glazing specifications can be found in Table 5.0.
- Appropriate background ventilation can be found in Table 6.0.
- The separating floor between the ground floor commercial and proposed development requires 53.0 dB $D_{nT,w}$ C_{tr} amount of reduction. Proposed floor construction that will achieve this can be found in Table 7.0.

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 residential development ('the Proposed Development') at 47-51, Daisy Hill, Dewsbury, WF13 1LF ('the Site').

The applicant has received conditional planning approval, 2018/94200 - Prior approval for the change of use from office (B1) to residential dwellings (within a Conservation Area) Kirklees City Council. The following planning conditions requires discharging:

"Condition 3:

Before development commences a report specifying the measures to be taken to protect the future occupants of the development from noise from the ground floor of the existing building shall be submitted to and approved in writing by the Local Planning Authority. The report shall:

- (i) Determine the existing noise climate*
- (ii) Predict the noise climate in bedrooms (night-time) and other habitable rooms of the development*
- (iii) Detail the proposed attenuation/design necessary to protect the amenity of the occupants of the new residences (including ventilation if required).*

The development shall not be occupied until all works specified in the approved report have been carried out in full and such works shall be thereafter retained."

The following technical noise assessment has been prepared to support the application to the Local Authority and discharge the condition. 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.

Context – COVID-19

The current situation due to the COVID-19 pandemic has forced the Government to take extraordinary measures as is well known by everyone. The consequence of those measures is a potential decrease in traffic flow levels, leading to a quieter sound profile of the assessed area. Regarding the above, the IOA has raised that *"...We have, therefore, recommended below some changes in working practices in the production of such reports. In so doing, it is still important to minimize uncertainties in surveying and to select appropriate baseline conditions, in a clear and transparent way. Furthermore, by good communication between those preparing the reports and those that will be reviewing them, the planning process (and other relevant processes) will be able to continue as smoothly as possible, ...*

Competence:

"Appropriate sound level surveying should always be designed to obtain data, which is representative of normal conditions, whilst taking account of variations in sound levels due to, for example, fluctuations in transportation traffic flows and industrial output. Acoustics professionals are skilled in understanding the effects of such variations and, therefore, check

that results are representative and conclusions technically robust, so that clients and decision-makers can come to well-informed judgements."

Methodology:

"For some transport scheme, there may be a heavier reliance on predicted sound levels to describe the baseline conditions, with a corresponding need to source flow/activity data. There are now many sources of transport data available and these should be used, where possible, as an alternative to, or to augment direct site measurements to describe baseline conditions.

Where sound from existing facilities is needed to uniform noise levels, or where it is the existing sound that is being assessed, enquiries will be needed to understand whether or not the facility is running as normal...

The acoustics professional will need to consider whether alternative sources of information in respect of sound levels can reasonably be used. Where appropriate, a case should be made regarding why any alternative methods are suitable for a robust assessment."

Taking this into consideration, a more restrictive assessment using the highest 1hour measurement for both day and night time will be used in the subsequent report instead of the denoted 16 hours and 8 hours criteria outlined in Bs8233:2014. This will be used to provide a detailed specification of the required sound reduction performance for each of the external building fabric elements of the proposed scheme. This is based on the internal noise criteria and the requirements of BS 8233:2014 'Sound Insulation and Noise Reduction for Buildings – Code of Practice' and the World Health Organisation – Guidelines for Community noise 1999.

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 (2019), Noise Policy Statement for England (2010), ProPG 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.

2. Environmental Noise Survey

Measurement Methodology

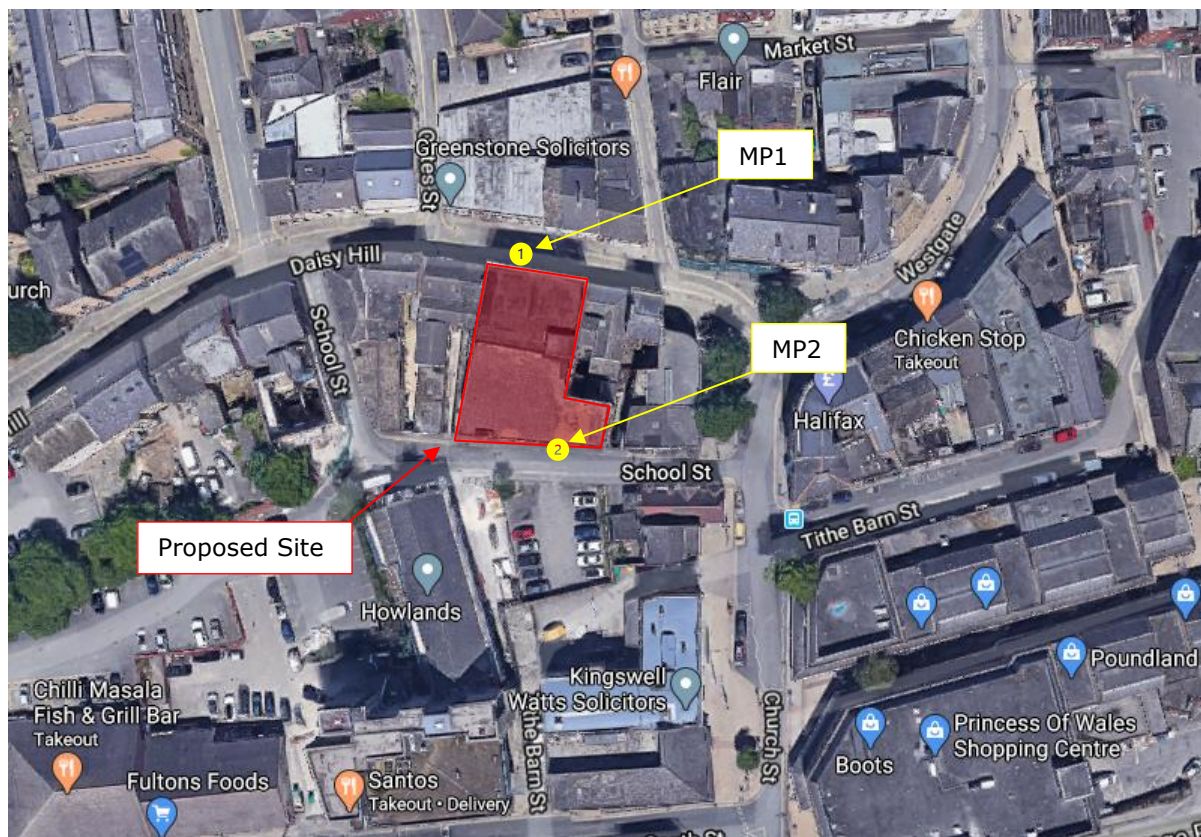


Figure 1.0 - Indicative Site Layout

In order to characterise the sound profile of the area at the proposed development, an environmental sound survey has been carried out from 07/06/2020 to 09/06/2020. The monitoring positions were chosen in order to collect representative sound levels at the proposed development during the day and night. The monitoring locations are shown in Figure 1.0.

Context & Subjective Impression

The area surrounding site is a mixture of residential, commercial and industrial premises. To the north, runs Daisy Hill, which facilitates low traffic flow levels. Along Daisy Hills there multiple commercial units located at the ground floor level, with residential dwellings on the levels above. To the south, runs School Street again providing low traffic flow levels. Across School Street is a car park and several commercial units. Adjacent to the proposed site, to the west and east, are a mixture of commercial and residential.

During the site visit, the engineer found that the noise profile of the area is dominated by road traffic and pedestrians using Daisy Hill and by road and car park noise at School Street. The engineer also found that the sound profile of the area was low during the site visits.

Environmental Noise Survey Results

The following table outlines the highest octave band $L_{eq,1hour}$ sound levels measured during the day and night periods that will be used in the noise break in assessment and external noise level assessment. A full summary of all results can be found in Appendix D.

Measurement Position MP1							
Measurement Period ('t')	Octave Band $L_{eq,1h}$						$L_{Aeq,1h}$
	125	250	500	1K	2K	4K	
Highest $L_{eq,1hour}$ (Day)	71.0	62.0	60.0	63.0	58.0	52.0	66.0
Highest $L_{eq,1hour}$ (Night)	59.0	57.0	50.0	52.0	47.0	40.0	55.0
Measurement Position MP2							
Measurement Period ('t')	Octave Band $L_{eq,1h}$						$L_{Aeq,1h}$
	125	250	500	1K	2K	4K	
Highest $L_{eq,1hour}$ (Day)	68.0	66.0	65.0	66.0	65.0	63.0	70.0
Highest $L_{eq,1hour}$ (Night)	61.0	51.0	45.0	47.0	45.0	44.0	51.0

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 $L_{AFMax,15min}$	No. of exceedances of 80 dB $L_{AFMax,15min}$
Night 1 – 23:00 – 07:00	84.0	84.0	5
Night 2 – 23:00 – 07:00	80.0	78.0	0
Measurement Position MP2			
Measurement Period ('t')	$L_{AFMax,15min}$	*SMR $L_{AFMax,15min}$	No. of exceedances of 74 dB $L_{AFMax,15min}$
Night 1 – 23:00 – 07:00	80.0	60.0	4
Night 2 – 23:00 – 07:00	75.0	65.0	1

Table 2.0 – Maximum Sound Level Summary Results

*Statistically Most Repeated

Discussion:

MP1 - According to the statistical analysis the lowest most repeated $L_{A_{Max},15min}$ value during the nighttime period was 78.0 dBA, this $L_{A_{Max},t}$ value has not been exceeded more than 10 times during the night time, however, considering the Covid-19 situation, a more restrictive value is represented by 80.0 dB $L_{A_{Max}}$ which was exceeded less than 5 times throughout the night time period. For this reason, **80.0 dB** $L_{A_{Max}}$ is deemed to be 'typical' and will be used in the following assessment.

MP2 - According to the statistical analysis the lowest most repeated $L_{A_{Max},15min}$ value during the nighttime period was 60.0 dBA, however, this $L_{A_{Max},t}$ value has been exceeded more than 10 times during the night time, and according to the ProPG document such an exceedance may generate "...unacceptable adverse effect on health and quality of life". Considering the Covid-19 situation, a more restrictive value is represented by 74.0 dB $L_{A_{Max}}$ which was exceeded less than 5 times throughout the night time period. For this reason, **74.0 dB** $L_{A_{Max}}$ is deemed to be 'typical' and will be used in the following assessment.

3. ProPG Stage 1 Initial Noise Risk Assessment

Considering the noise levels measured across the entire measurement period, the development site falls into Noise Risk Category (NRC) 2. As shown in the following table.

Noise Risk Category	Potential Effect if Unmitigated	Pre-Planning Application Guidance
2 - Medium $L_{Aeq, 16\text{hour}} < 60 - 70\text{dB}$ $L_{Aeq, 8\text{hour}} < 50 - 60\text{dB}$	Significant adverse effect on health and quality of life	As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimize, and which clearly demonstrated that a significant adverse noise impact will be avoided in the finished development.

Table 3.0 – Noise Risk Category for Site

Discussion

As can be seen in the assessment above, the development site is considered 'Medium Risk'. However, as there are multiple residential properties in similar proximity to the main sources of noise it is assumed that provided good acoustic design is implemented, the amenity of future residents can be fully protected.

4. Noise Break In & External Noise Level Assessment

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 five times.
- The highest $L_{eq,1hour}$ during the day and nighttime periods.

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								
Measurement Period ('t')	Octave Band $L_{eq,t}$						$L_{Aeq,t}$	$L_{AMax,t}$
	125	250	500	1K	2K	4K		
Highest $L_{eq,1hour}$ (Day)	71.0	62.0	60.0	63.0	58.0	52.0	66.0	
NR30 Curve (dB)	48.1	39.9	34.0	30.0	26.9	24.7	35.0	
Min. Sound Reduction (R_w)	23.0	23.0	26.0	33.0	32.0	28.0	31.0	
Highest $L_{eq,1hour}$ (Night)	59.0	57.0	50.0	52.0	47.0	40.0	55.0	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)	16.0	22.0	21.0	27.0	26.0	21.0	25.0	35.0
Measurement Position MP2								
Measurement Period ('t')	Octave Band $L_{eq,t}$						$L_{Aeq,t}$	$L_{AMax,t}$
	125	250	500	1K	2K	4K		
Highest $L_{eq,1hour}$ (Day)	68.0	66.0	65.0	66.0	65.0	63.0	70.0	
NR30 Curve (dB)	48.1	39.9	34.0	30.0	26.9	24.7	35.0	
Min. Sound Reduction (R_w)	20.0	27.0	31.0	36.0	39.0	39.0	35.0	
Highest $L_{eq,1hour}$ (Night)	61.0	51.0	45.0	47.0	45.0	44.0	51.0	74.0
NR25 Curve (dB)	43.7	35.2	29.2	25.0	21.9	19.5	30.0	45.0
Min. Sound Reduction (R_w)	18.0	16.0	16.0	22.0	24.0	25.0	21.0	29.0

Table 4.0 – Octave Band Internal Noise Level Analysis

5. Noise Break Through Assessment

As the development has commercial units on the ground floor and residential units on the 1st floor, the noise level breaking through the floor partition must be assessed. It is recommended that the partition should score a minimum of 10 dB above the regulations stated in Part E of Building Regulations to ensure the amenity of future residents is fully protected. This means the partition must score a minimum of 53 dB $D_{nT,w+Ctr}$ when tested for airborne sound attenuation.

During the site visit, it was found that the existing floor build-up is comprised of 150-200mm beam and blocks. The current build-up (150mm has been model as a worst-case scenario) has been modelled with INSUL 9.0 software and it is predicted to score approximately 38 dB $D_{nT,w+Ctr}$.

To achieve the necessary attenuation, the following upgrade is recommended:

Ensure all holes and gaps within the existing partition floor are fully sealed to ad airtight condition. Install an MF suspended ceiling with a minimum drop of 150mm. The cavity of the MF suspended ceiling to be filled with at least 100mm of mineral wool insulation (min. density of 10 kg/m³). Finally, the ceiling to be lined with 2 No. 15mm SoundBloc plasterboards (min. density of 12.6 kg/m² per board).

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 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 is 200mm masonry brick and 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/m³ insulation 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.

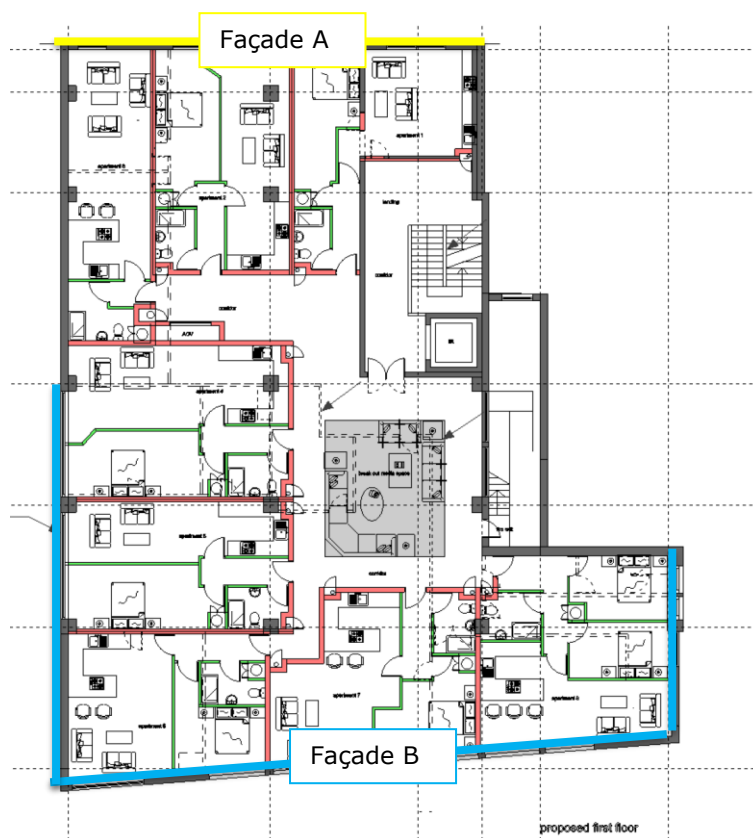


Figure 2.0 - Facade Layout

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					
Bedrooms & Living Rooms		Double Glazing					
		6mm Glass – 16mm Argon – 8.8mm Optiphon					
Description	125	250	500	1k	2k	4k	R _w + C _{tr}
Sound Reduction (R _w)	25.0	27.0	38.0	48.0	47.0	55.0	34.0
Façade B		Glazing Configuration					
Bedrooms & Living Rooms		Double Glazing					
		6mm Glass – 16mm Argon – 6.6mm Optiphon					
Description	125	250	500	1k	2k	4k	R _w + C _{tr}
Sound Reduction (R _w)	21.0	28.0	37.0	48.0	48.0	54.0	34.0

Table 5.0 – Glazing Specification

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, such as trickle ventilators, 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 meets the above recommendations.

Background Ventilation		
Location	Model	Attenuation (dB)
Façade A & B	Titon SF Xtra Sound Attenuator V75 Vent + Standard Canopy	38dB Open / 49dB Closed $D_{n,e,w}$

Table 6.0 – Ventilation Specification

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.

d) Adjoining wall Construction Detail

To ensure the noise breaking through the adjoining floor is sufficiently suppressed the following sound insulation upgrades should be implemented at the site, any other construction capable of providing the attenuation outlined in section 4.0 will be suitable.

Proposed Separating Construction Detail								
- Existing 150mm beam & block floor - 150mm drop MF suspended ceiling - 100mm Mineral Wool (min. density of 10 kg/m³) - 2 No. 15mm SoundBloc (min. density of 12.6 kg/m² per board)								
Description	63	125	250	500	1k	2k	4k	D _{nT,w} + C _{tr}
Expected Sound Reduction Rw	41.0	54.0	48.0	55.0	62.0	67.0	85.0	58.0

Table 7.0 – Adjoining Structure Specification

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 $L_{A90,1\text{hour}}$ dB and $L_{A90,15\text{mins}}$ 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 $L_{Aeq,16hour}$	--
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

Table 8.0 - 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.

B.4 - ProPG: Planning & Noise

The Professional Practice Guidance on Planning and Noise (ProPG) has been produced to provide practitioners with guidance on the management of noise within the planning system in England.

Noise can have a significant effect on the environment and on the quality of life enjoyed by individuals and communities. For these reasons, noise is a material consideration in the planning process and a key aspect of sustainable development. Noise must therefore be considered and given serious attention when new developments might create additional noise and when new developments would be sensitive to the prevailing acoustic conditions.

It aims to:

- Advocate full consideration of the acoustic environment from the earliest possible stage of the development control process;
- Encourage the process of good acoustic design in and around new residential developments;
- Outline what should be taken into account in deciding planning applications for new noise-sensitive developments.
- Promote appropriate noise exposure standards; and
- Assist the delivery of sustainable development.

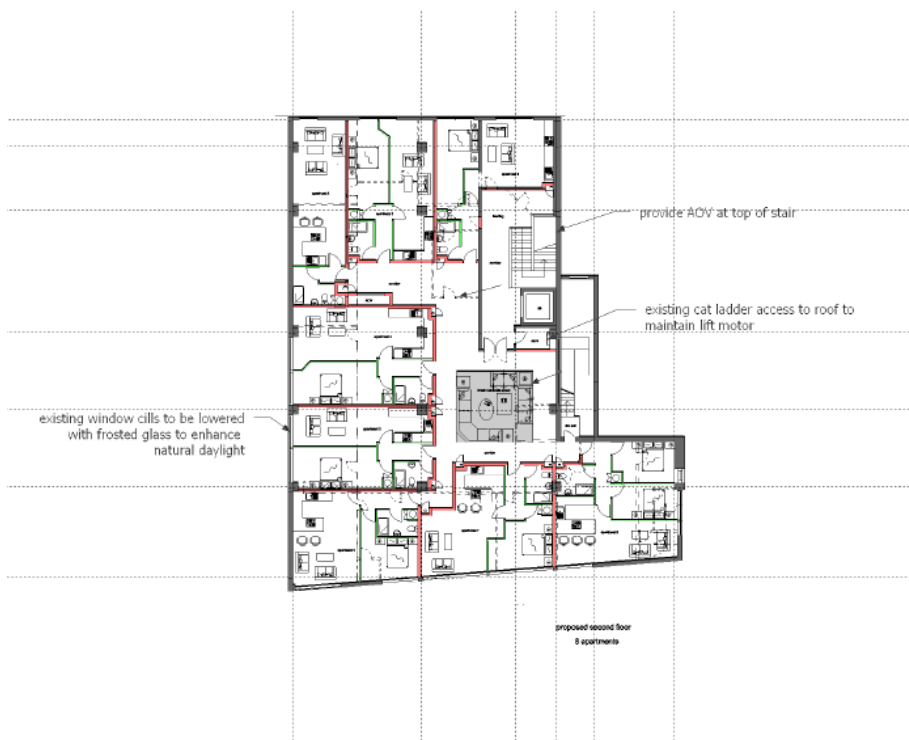
This document describes an acoustic design process which is multi-faceted and that seeks to deliver the best acoustic outcome for a particular site. The advice and procedures contained in the ProPG are restricted to the consideration of new residential development that will be exposed predominantly to airborne noise from existing transport sources. New housing is the most common

type of new residential development, however the ProPG can also be applied to other types of residential developments such as residential institutions, care homes etc.

The document a Stage 1 Initial Site Risk Assessment, as follows:

Noise Risk Category	Potential Effect if Unmitigated	Pre-Planning Application Guidance
0 – Negligible $L_{Aeq, 16hour} < 50dB$ $L_{Aeq, 8hour} < 40dB$	No adverse effect	These noise levels indicate that the development site is likely to be acceptable from a noise perspective, and the application need not normally be delayed on noise grounds.
1 - Low $L_{Aeq, 16hour} < 50 - 60dB$ $L_{Aeq, 8hour} < 40 - 50dB$	Adverse effect on health and quality of life	At low noise levels, the site is likely to be acceptable from a noise perspective provided that a good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and the minimized in the finished development.
2 - Medium $L_{Aeq, 16hour} < 60 - 70dB$ $L_{Aeq, 8hour} < 50 - 60dB$	Significant adverse effect on health and quality of life	As noise levels increase, the site is likely to be less suitable from a noise perspective and any subsequent application may be refused unless good acoustic design process is followed and is demonstrated in an ADS which confirms how the adverse impacts of noise will be mitigated and minimize, and which clearly demonstrated that a significant adverse noise impact will be avoided in the finished development.
3 - High $L_{Aeq, 16hour} > 70dB$ $L_{Aeq, 8hour} > 60dB$	Unacceptable adverse effect on health and quality of life	High noise levels indicate that there is an increased risk that development may be refused on noise grounds. The risk may be reduced by following a good acoustic design process that is demonstrated in a detailed ADS. Applicants are strongly advised to seek expert advice.

Table 9.0 – ProPG Stage 1 Initial Risk Assessment Criteria



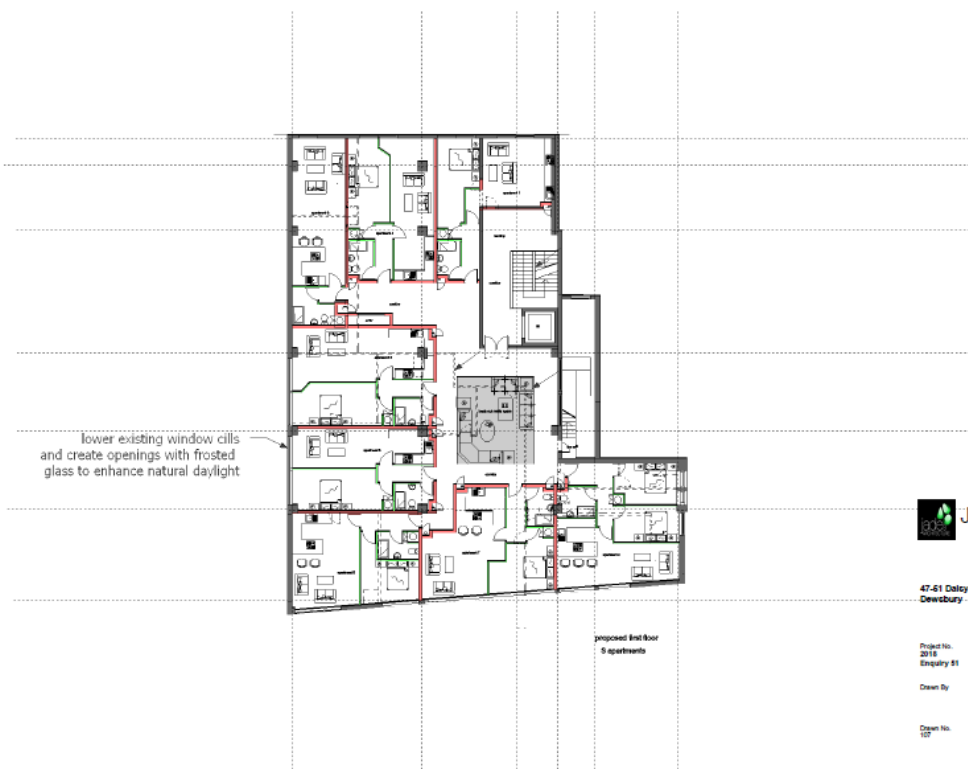
Jade3 Architecture Ltd
Jade3 Architecture Ltd, Studio 12, Silver Street, Wakefield WF1 1DT
Calderdale, WF1 1DT
www.jade3architecture.co.uk

**47-61 Daisy Hill
Dewsbury**

Project No: 2018 Enquiry #1	Project Title: Proposed second	Scale: 1:200 @A3 size	Date: 21/12/2018
Drawn By: MC	Reviewed By:	Scale:	Date:
Open No: 125	Reviewed Title:	Scale:	Revision:

Important Notes:
Do not scale off the drawing. Critical dimensions should be checked on site prior to work commencing. Unchecked details should be brought to the attention of the architect as soon as they become apparent. Failure to do so could involve the contractor being liable for subsequent losses. Copyright in this drawing and any work included from this drawing remains the property of Jade3 Architecture Ltd.

© Copyright Jade3 Architecture Ltd.



Jade3 Architecture Ltd
Jade3 Architecture Ltd, Studio 12, Silver Street, Wakefield WF1 1DT
Calderdale, WF1 1DT
www.jade3architecture.co.uk

**47-61 Daisy Hill
Dewsbury**

Project No: 2018 Enquiry #1	Project Title: Proposed first	Scale: 1:200 @A3 size	Date: 21/12/2018
Drawn By: MC	Reviewed By:	Scale:	Date:
Open No: 127	Reviewed Title:	Scale:	Revision:

Important Notes:
Do not scale off the drawing. Critical dimensions should be checked on site prior to work commencing. Unchecked details should be brought to the attention of the architect as soon as they become apparent. Failure to do so could involve the contractor being liable for subsequent losses. Copyright in this drawing and any work included from this drawing remains the property of Jade3 Architecture Ltd.

© Copyright Jade3 Architecture Ltd.

Appendix D – Environmental Survey

D.1 Tabulated Summary Noise Data

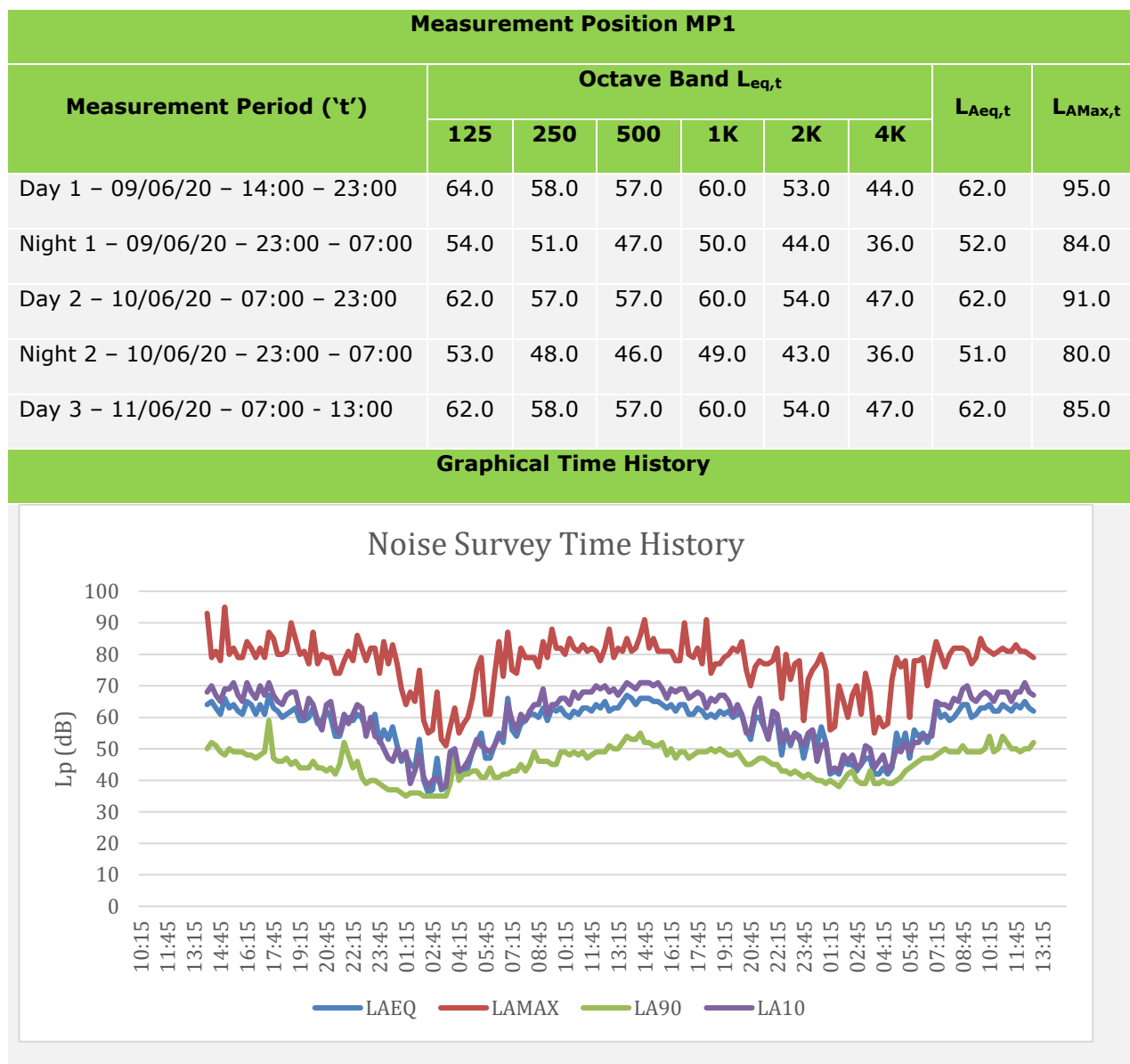


Table 10.0 – Sound Survey Summary Results – MP1

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 – 09/06/20 – 13:30 – 23:00	62.0	58.0	58.0	61.0	59.0	56.0	65.0	106.0
Night 1 – 09/06/20 – 23:00 – 07:00	54.0	47.0	43.0	44.0	42.0	37.0	49.0	80.0
Day 2 – 10/06/20 – 07:00 – 23:00	63.0	61.0	58.0	60.0	60.0	54.0	65.0	107.0
Night 2 – 10/06/20 – 23:00 – 07:00	48.0	45.0	43.0	43.0	41.0	38.0	48.0	75.0

Day 3 – 11/06/20 – 07:00 – 12:45 60.0 58.0 54.0 56.0 54.0 51.0 60.0 102.0

Graphical Time History

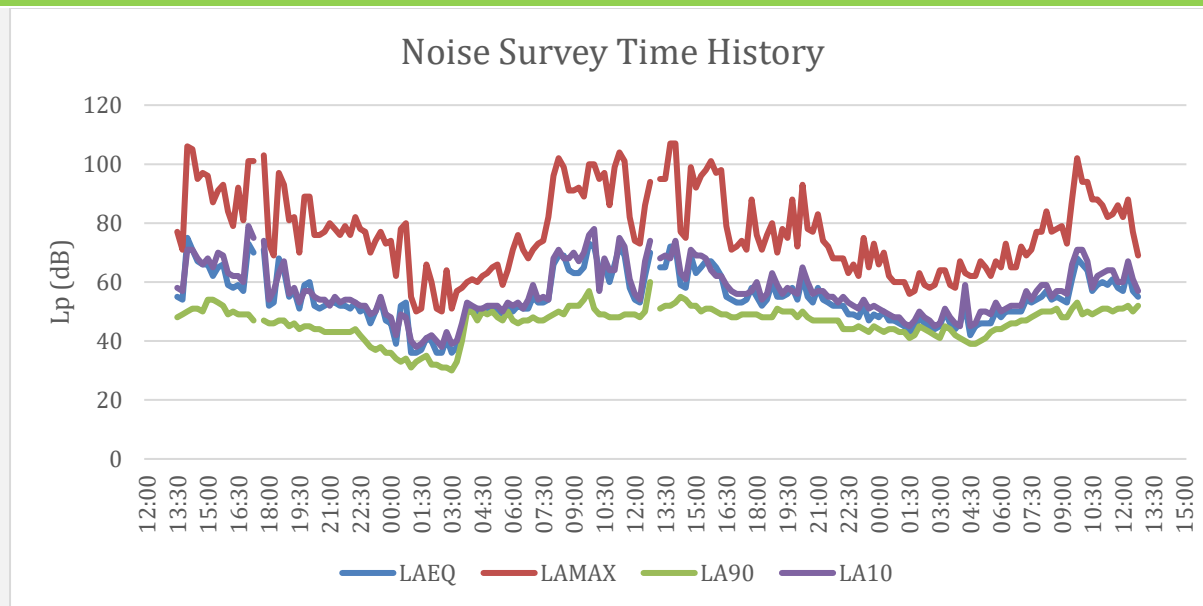


Table 11.0 – Sound Survey Summary Results – MP1

D.2 Surveying Equipment

Piece of Equipment	Serial No	Calibration Deviation
CESVA SC420 Class 1 Sound level meter	T246452	≤0.5
CESVA CB006 Class 1 Calibrator	901997	
CESVA SC420 Class 1 Sound level meter	T246471	≤0.5
CESVA CB006 Class 1 Calibrator	901955	

Table 12.0 – 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 setup 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 – Batley Weather				
Time period	Air temp (°C)	Rainfall mm/h	Prevailing Wind Direction	Wind Speed (m/s)
Day 1 – 09/06/2020 – 00:00 – 23:59	6.4 – 17.6	0.0 – 1.0	NE	0.0 – 0.8
Day 2 – 10/06/2020 – 00:00 – 23:59	11.5 – 15.0	0.0 – 0.3	NNE	0.0
Day 3 – 11/06/2020 – 00:00 – 23:59	11.1 – 15.0	0.0 – 0.3	NE	0.0 – 2.1

Table 13.0 – Weather Summary