Whittle Street
Liverpool

Environmental Noise Impact Assessment Report

25219/ENIA1

27 February 2018

For:
Rapid Growth Limited
c/o Zerum Consult Limited
4 Jordan Street
Manchester
M15 4PY

Hann Tucker Associates
Consultants in Acoustics Noise & Vibration

Head Office: Duke House, 1-2 Duke Street, Woking, Surrey, GU21 5BA (t) +44 (0) 1483 770 595
Manchester Office: First Floor, 346 Deansgate, Manchester, M3 4LY (t) +44 (0) 161 832 7041
(w) hanntucker.co.uk (e) enquiries@hanntucker.co.uk

Hann Tucker Associates

Environmental Noise Impact Assessment Report 25219/ENIA1

Document Control

Rev	Date	Comment	Prepared by	Authorised by
-	19/02/2018	Draft	-	-
			Simon Everett Assistant Consultant BSc(Hons), MSc, AMIOA	Andrew Jameson Director BSc(Hons), MIOA, MIET
0	27/02/2018	-		
			Simon Everett Assistant Consultant BSc(Hons), MSc, AMIOA	Andrew Jameson Director BSc(Hons), MIOA, MIET

Hann Tucker Associates

Environmental Noise Impact Assessment Report 25219/ENIA1

Contents

Attachments

1.0 Introduction

It is proposed to build a new multi-storey residential development with ground floor commercial units on Whittle Street in Liverpool.

An environmental noise survey has been undertaken by Hann Tucker Associates in order to establish the prevailing noise climate at the site. The data obtained has subsequently formed the basis of our assessment to determine:-

- The suitability of the site for residential use;
- The preliminary sound insulation requirements for the glazing and ventilators;
- Noise limits for new items of external plant and equipment.

Our findings and recommendations are presented herein.

2.0 Objectives

To establish, by means of fully automated environmental noise monitoring, the existing A-weighted (dBA) L_{90}, L_{eq} and L_{max} environmental noise levels at selected accessible positions around the site.

To undertake detailed acoustic analysis of road traffic and other noise intrusion into the building through the external building fabric.

To subsequently prepare preliminary sound reduction performance specifications for the external building fabric in order to achieve the specified internal acoustic design criteria.

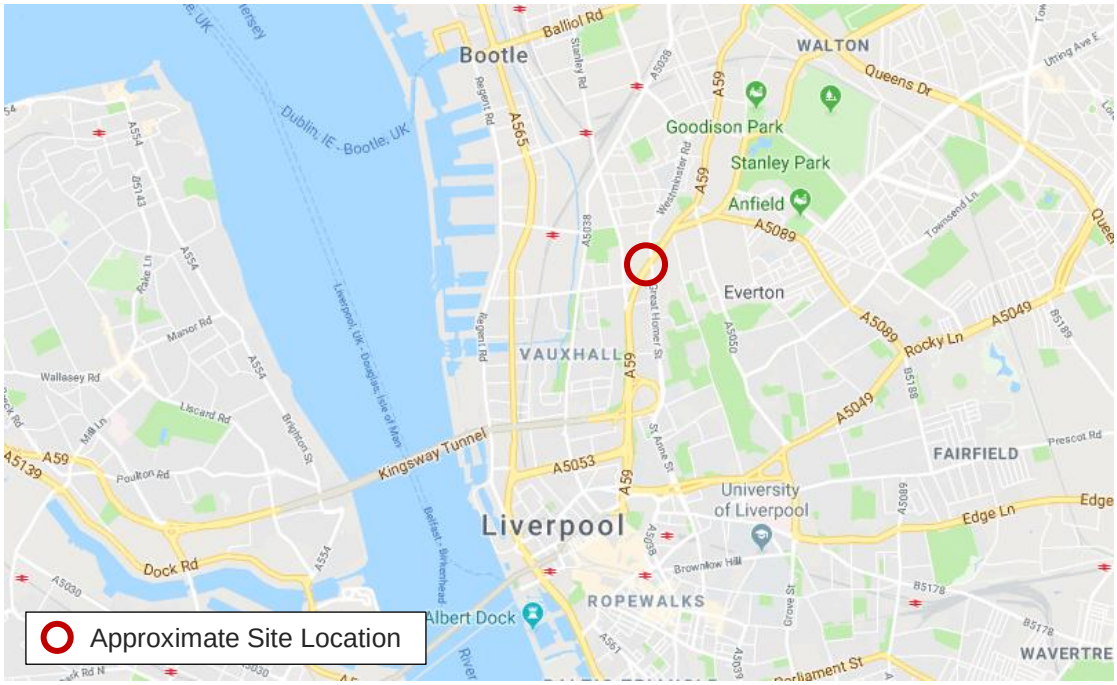
To assess the controlling of noise output to external receptors as well as noise transfer to the residential apartments directly above

To set noise limits for new items of external plant and equipment.

3.0 Site Description

3.1 Location

The site is located on Whittle Street in Liverpool. The location is shown in the Location Map below.



Location Map (maps.google.com)

3.2 Description

The site currently comprises an empty plot of land, and it is proposed build a new residential property with circa 177 apartments. The site is bounded by Whittle Street to the north, Smith Street to the west and Kirkdale Road to the south east. The nearest noise sensitive windows are understood to be located approximately 18m to the west of the nearest boundary of the site. See site plan below.

Site Plan (maps.google.com)

4.0 Acoustic Terminology

For an explanation of the acoustic terminology used in this report please refer to Appendix A enclosed.

5.0 Planning Policy/Guidance

5.1 Noise Policy Statement for England

The Government's Noise Policy Statement for England (NPSE, March 2010) sets out the long term vision for Government noise policy, which is 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*".

The NPSE includes three primary aims to be achieved through effective management of environmental, neighbour and neighbourhood noise; (1) avoid "significant adverse" impacts on health and quality of life, (2) mitigate and minimise "adverse" impacts on health and quality of life, and (3) where possible, contribute to the improvement of health and quality of life.

5.2 National Planning Policy Framework

The National Planning Policy Framework (NPPF, March 2012) sets out the Government's planning policies for England and how these are expected to be applied.

It sets out the Government's requirements for the planning system only to the extent that it is relevant, proportionate and necessary to do so. It provides a framework within which local people and their accountable councils can produce their own distinctive local and neighbourhood plans, which reflect the needs and priorities of their communities.

Prior to the NPPF, Planning Policy Guidelines (PPG) 24: 1994 'Planning & Noise' was the general guidance document for assessing the suitability of a site for residential use.

5.3 Planning Practice Guidance

The Department for Communities and Local Government's Planning Practice Guidance (PPG) website was launched in 2014 and provides guidance on 'Noise' for new developments in line with NPPF policies.

Notably, the website provides a table to help recognise when noise could be a concern relevant to the NOEL, LOAEL and SOAEL effect levels described in NPSE, as below:-

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

There are no numeric values to reference in this guide; everything is descriptive and so cannot inform an objective assessment of noise.

5.4 ProPG: Planning & Noise

ProPG: The Planning & Noise '*Professional Practice Guidance on Planning & Noise*' was issued in May 2017 with the primary goal of assisting the delivery of sustainable residential development by promoting good health and well-being through the effective management of noise. It seeks to do that through encouraging a good acoustic design process in and around proposed new residential development having regard to national policy on planning and noise.

It is applicable to noise from existing transport sources (noting that good professional practice should have regard to any reasonably foreseeable changes in existing and/or new sources of noise). The recommended approach is also considered suitable where some industrial or

commercial noise contributes to the acoustic environment provided that is “not dominant”.

ProPG advocates a systematic, proportionate, risk based, 2-stage, approach. The approach encourages early consideration of noise issues, facilitates straightforward accelerated decision making for lower risk sites, and assists proper consideration of noise issues where the acoustic environment is challenging.

The ProPG considers suitable guidance on internal noise levels found in BS8233: 2014 ‘Guidance on sound insulation and noise reduction for buildings’ with the addition of an “ideal” LAmax,f requirement for bedrooms of 45 dB (10th highest) at night.

5.5 Local Authority Requirements

The aspirations of the Local Planning Authority are set out across various Policies presented within the adopted Liverpool Unitary Development Plan. However, based on several similar projects recently undertaken by Hann Tucker Associates, the following planning conditions are usually imposed in relation to acoustics:-

Plant Noise

“The rating level of the noise emitted from any plant shall not exceed the existing background noise level. The noise level shall be determined at the nearest noise sensitive premises. The measurements and assessments shall be made according to BS4142:2014.”

Internal Noise Levels

“The residential accommodation hereby approved shall be acoustically insulated in accordance with a scheme to be submitted to and approved in writing by the local planning authority (in consultation with the Council's Environmental Health Service), which shall be installed to their satisfaction prior to the first occupation of the residential accommodation. For the avoidance of doubt, sound mitigation must take the form of a package of acoustic treatment to all habitable room windows in accordance with the specifications contained within the Noise Insulation Regulations 1975, or double glazing of an equivalent or better acoustic performance, together with the provision of a scheme of acoustically attenuated mechanical ventilation, to remove the need to open windows for rapid ventilation, which complies with the performance requirements of the Noise Insulation Regulations 1975.”

5.6 BS 8233: 2014

British Standard 8233: 2014 “Sound insulation and noise reduction for buildings” recommends design criteria for internal ambient noise levels for dwellings providing a reasonable or good level of protection from external noise. It states that it is desirable that internal ambient noise levels do not exceed the following guidelines:

Activity	Location	Desirable Internal Ambient Criteria	
		07:00 – 23:00	23:00 – 07:00
Resting	Living Rooms	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 $L_{Aeq,8hour}$

For sites subject to scheduled impulsive events at night-time (such as train or aircraft passbys), BS 8233 would suggest peak noises during the night-time (23:00-07:00) should not regularly exceed 45 dB L_{Amax} in affected bedrooms.

The document goes on to state that all of the above target levels may be relaxed by 5 dB and "reasonable" internal conditions would still be achieved.

For outdoor living spaces, a desirable upper guideline value of 55dB $L_{Aeq,\,T}$ is quoted.

5.7 BS 4142:2014 – Method for rating and assessing industrial and commercial sound

BS 4142: 2014 describes methods for rating and assessing the effects of outdoor sound levels, of an industrial and/or a commercial nature, "*on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident*".

The impact of a specific sound is indicated by subtracting the existing background noise level from the rating level (i.e. noise level from the proposed items of plant/machinery/etc. plus any acoustic feature corrections). The standard states that:

- *"a difference of around +10dB or more is likely to be an indication of a significant adverse impact"*;
- *"a difference of around +5dB is of marginal significance is likely to be an indication of an adverse impact"*;
- *"where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact"*.

The noise from the new development is expressed in terms of a rating level and given as a $L_{Aeq,\,T}$ noise level. The existing background noise level is expressed in terms of a $L_{A90,\,T}$ noise level. T is the assessment time interval, which is 1-hour for operations during daytime hours (07:00 to 23:00 hours) and 15-minutes for operations during night-time hours (23:00 to 07:00 hours).

BS 4142:2014 states that if a noise source contains an 'acoustic feature', such as tonality, intermittency or impulsiveness, a penalty should be applied.

6.0 Baseline Noise Survey

6.1 Procedure

Due to the lack of secure locations to install unmanned monitoring equipment, manned noise level measurements were undertaken. Since road traffic is the dominant sound source at the site, the daytime noise level measurements were undertaken in accordance with the shortened measurement procedure detailed in the Department of Transport document Calculation of Road Traffic Noise (CRTN) 1988.

This involves the measurement of L_{A10} noise levels over representative time periods during any three consecutive hours between 10:00 and 17:00 hours. The three hourly L_{A10} values are then arithmetically averaged to give a 3-hour L_{A10} value. From this the 18-hour L_{A10} can be calculated by subtracting 1 dB. The 18-hour L_{A10} value can then be converted to provide the daytime 16-hour L_{Aeq} value by subtracting 2 dB as stated in BS 8233.

In our experience, this method can sometimes underestimate the 16-hour L_{Aeq} where the primary roads are major thoroughfares because the CRTN time excludes periods of rush-hour traffic.

Consequently, for the daytime survey fully manned environmental noise monitoring was undertaken from approximately 12:00 to 15:00 hours on Monday 12 February 2018.

For the night-time period there is no established shortened measurement procedure. However, it is accepted that for sites where road traffic is the dominant sound source, sound levels are typically at their highest at the start and end of the nigh-time period (23:00 to 07:00 hours). Furthermore, the decrease and increase in sound levels at the start and end of the night-time period respectively are approximately symmetrical over time.

As such, the measurement of the L_{Aeq} noise levels over representative time periods during two consecutive hours at either the start or end of the night-time period provides a good representation of the night-time 8-hour L_{Aeq} value when logarithmically averaged. Of the two possible periods, measurements in the early morning may be considered ‘worst case’ since they will include early morning delivery vehicle movements and the beginning of the morning commuter traffic period.

Consequently, for the night-time survey fully manned environmental noise monitoring was undertaken between approximately 21:30 hours on Monday 12 February 2018 to 03:00 hours on Thursday 13 February 2018.

Measurements were taken of the A-weighted (dBA) L_{90}, L_{10}, L_{eq} and L_{max} sound pressure levels over periods of not less than 15 minutes in each hour. Atypical noises were excluded as far as reasonably possible. The noise levels measured are therefore assumed to be representative of the noise climate during the hour in which the measurements were taken.

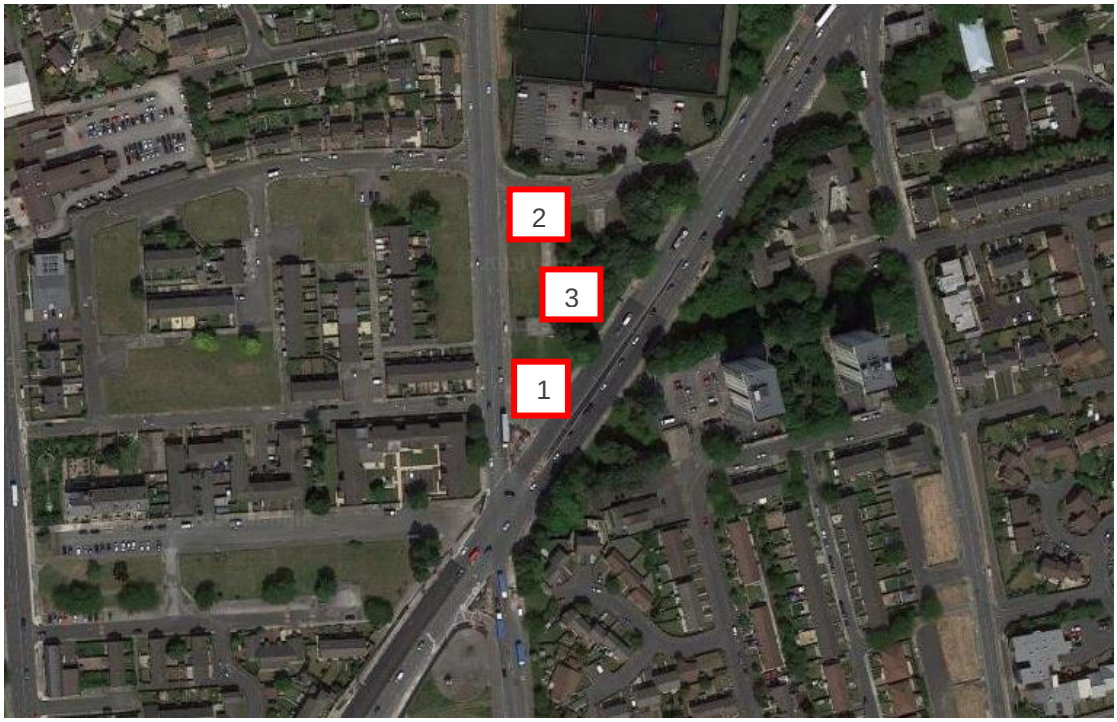
During the periods we were on site the wind conditions were light and the sky was generally overcast. We understand that generally throughout the survey period the weather conditions were generally similar to this. These conditions are considered suitable for obtaining representative measurement results.

6.2 Measurement Positions

Monitoring was undertaken at three free field positions. The microphone was attached to a tripod approx. 1.3m above ground level at each position.

Position 1 lies approximately 10m to the west of Kirkdale Road and 11m to the east of Smith Street. Position 2 lies approximately 14m to the south of Whittle Street and 18m to the east of Smith Street. Position 3 lies approximately 30m to the west of Kirkdale Road, 30m to the east of Smith Street and 40m to the south of Whittle Street.

The measurement positions are illustrated on the site plan below:



Plan Showing Measurement Positions (maps.google.com)

6.3 Instrumentation

The instrumentation used during the survey is presented in the Table below:

Description	Manufacturer	Type	Serial Number	Calibration
Type 1 Data Logging Sound Level Meter	Larson Davis	LXT	4086	Calibration on 30/08/2017
Type 1 Data Logging Sound Level Meter	Larson Davis	LXT	4569	Calibration on 20/06/2017
Type 1 Calibrator	Larson Davis	CAL200	3083	Calibration on 13/04/2017

Each microphone was fitted with a Larson Davis windshield.

All equipment was calibrated prior to and on completion of the survey. No significant deviations occurred (no more than 0.1 dB).

6.4 Results

The following tables summarise the relevant readings taken from the manned surveys at Positions 1, 2, and 3.

Position	Time	Sound Pressure Level (dB)			
		L_{Aeq}	L_{Amax}	L_{A90}	L_{A10}
1	12:00 – 13:00	70	80	61	74
	13:00 – 14:00	70	81	62	74
	14:00 – 15:00	70	84	63	73
2	12:00 – 13:00	65	74	57	68
	13:00 – 14:00	66	73	58	69
	14:00 – 15:00	66	78	61	69
3	21:00 – 22:00	63	75	53	67
	22:00 – 23:00	63	74	52	65
	22:00 – 23:00	62	72	52	66
	02:00 – 03:00	58	70	48	61
	02:00 – 03:00	56	73	49	59
	03:00 – 04:00	58	72	45	58
	03:00 – 04:00	59	75	47	61

Based on the data above, we can extrapolate from the measured $L_{Aeq,15min}$ measurements a representative 16-hour L_{Aeq} for the select positions around site, and the lowest 15 min L_{A90} values for both day-time and night-time periods required for setting plant noise emission limits

7.0 Discussion Of Noise Climate

Due to the nature of the survey, i.e. unmanned, it is not possible to accurately describe the dominant noise sources, or specific noise events throughout the entire survey period. However, at the beginning and end of the survey period, the dominant noise source was noted to be traffic noise from the surrounding road network, primarily Kirkdale Road.

8.0 Assessment of Noise Levels within Apartments

8.1 Overview

This section aims to assess the impact of the prevailing environmental noise sources on the residential development in order to determine preliminary acoustic performance specifications for critical residential façade elements (namely glazing and ventilators).

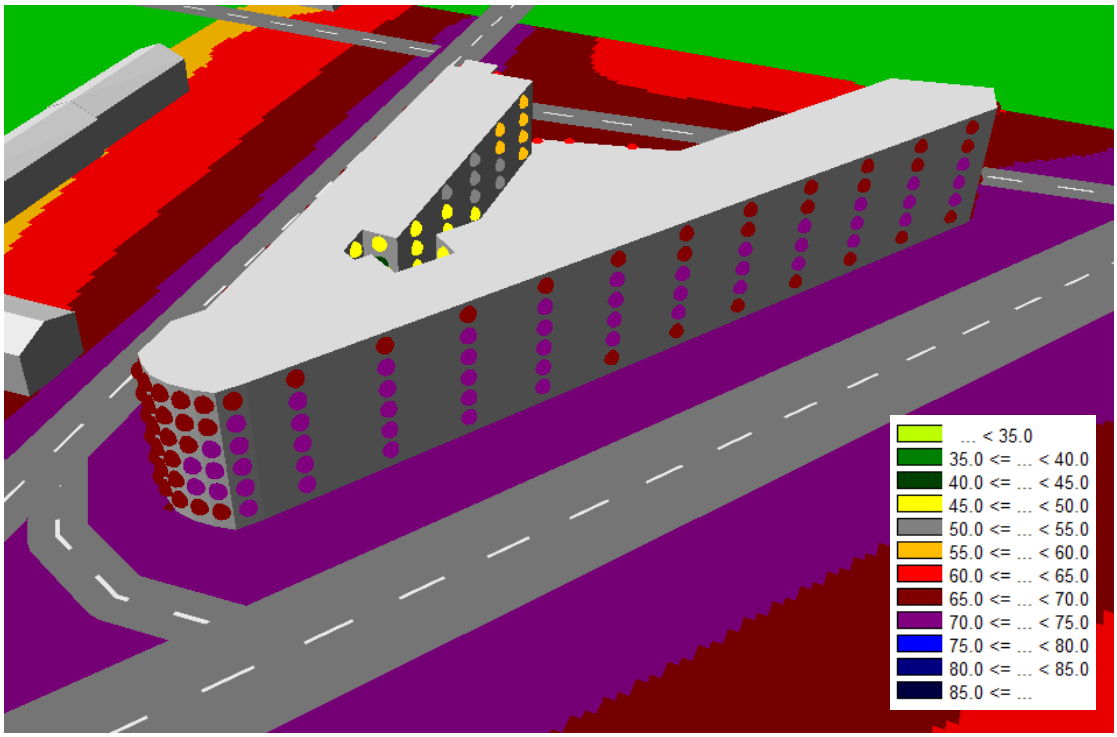
The information presented herein is intended as planning guidance only, with the aim of demonstrating that solutions are available to suitably mitigate noise intrusion. Detailed acoustic façade specifications shall be produced through detailed design.

Our preliminary calculations are based on BS 8233 procedures and consider typical apartment bedroom/living room dimensions and existing window sizes, which have been approximately measured using external proposed elevation plans. Our assessment considers the proposed background ventilation strategy of local mechanical ventilation heat recovery (MVHR) units to all apartments, but explores the viability of an 'MEV with trickle ventilation' solution.

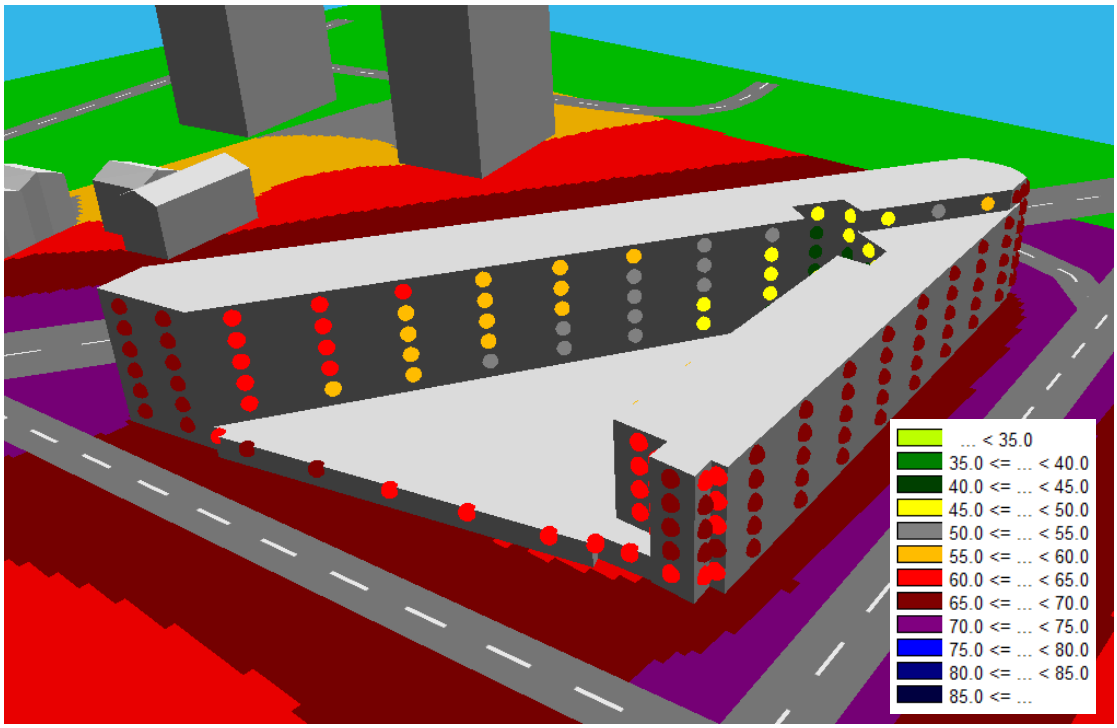
8.2 Incident Noise Levels

In order to accurately determine the spread of noise across the entire site, we have constructed a computer-based 3-dimensional model of the development. The software produces a 'noise map' of the site using ISO 9613 sound dissipation principles (including distance loss, screening, ground absorption, etc.) and is calibrated based on the results of our baseline environmental noise survey. All buildings have a reflection loss of 0dB (i.e. fully reflective).

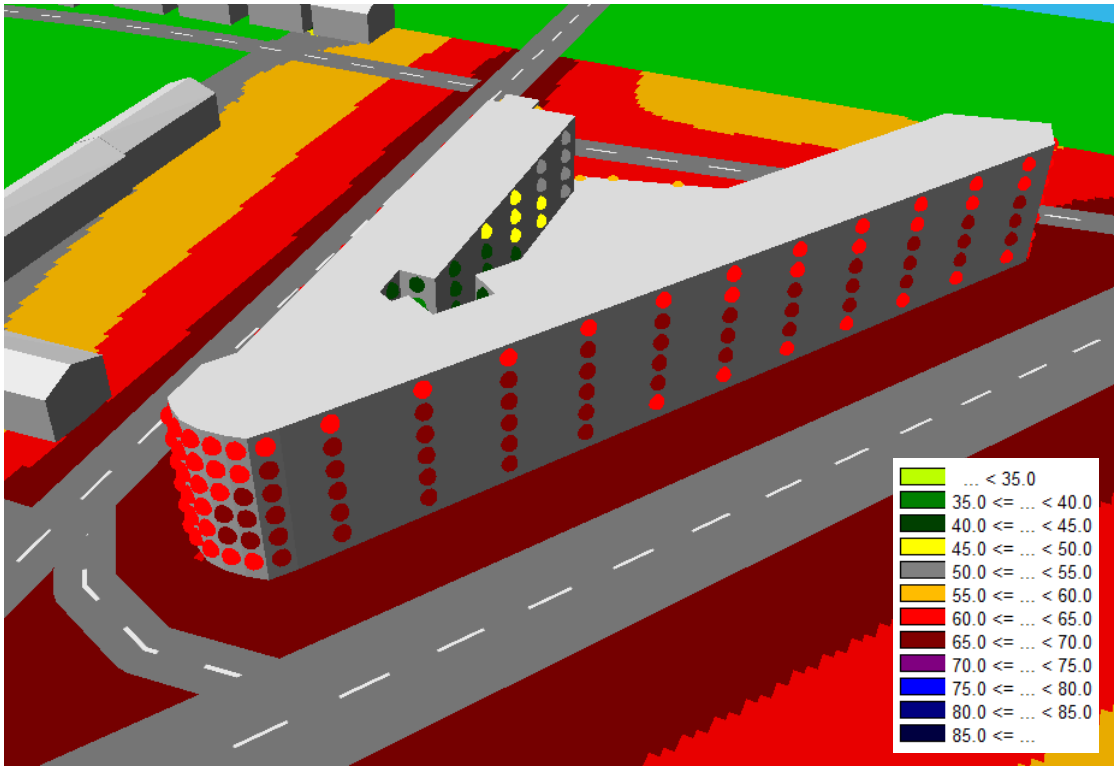
The following noise maps show incident of daytime (16-hr) and night-time (8-hr) L_{Aeq} external free-field noise levels on all facades. We have not considered L_{Amax} events in this instance as the dominant noise source is road traffic, as supposed to a source with specific scheduled intermittent events (e.g. train or aircraft).



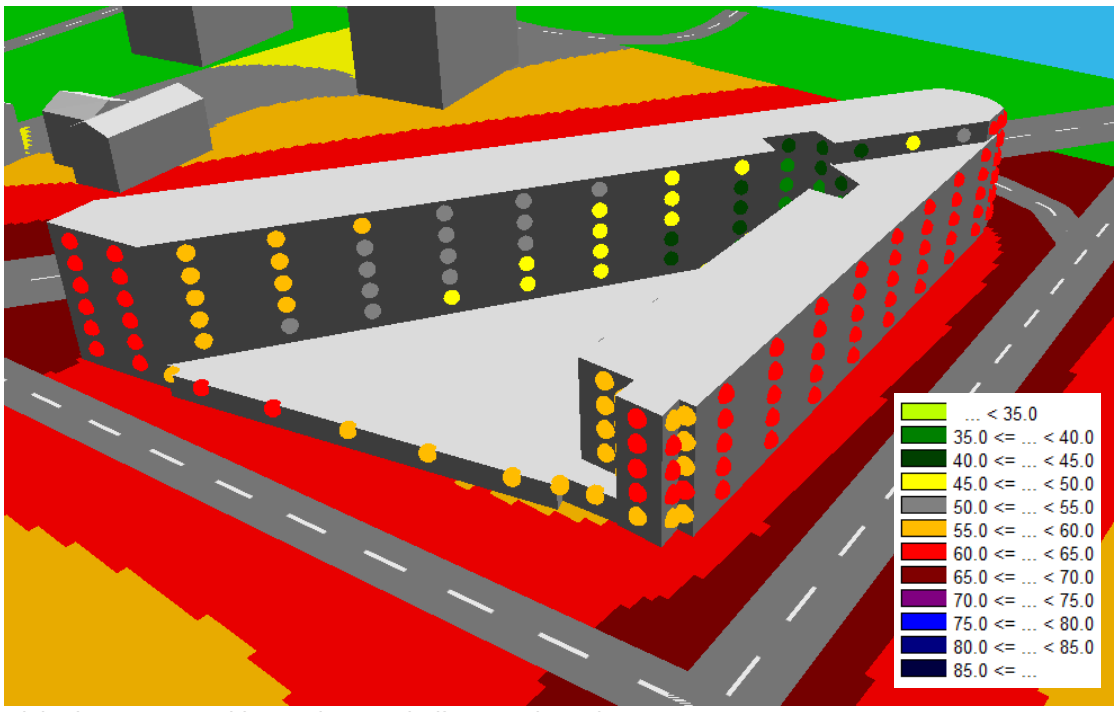
Daytime $L_{Aeq,16hr}$ Incident Noise Levels (from southeast)



Daytime $L_{Aeq,16hr}$ Incident Noise Levels (from northwest)



Night-time $L_{Aeq,8hr}$ Incident Noise Levels (from southeast)



Night-time $L_{Aeq,8hr}$ Incident Noise Levels (from northwest)

8.3 Achieving Internal Noise Levels

8.3.1 Overview

Provision exists to provide appropriate façade sound insulation solutions to achieve the above limits. Based on the above noise maps, we have carried out preliminary calculations to determine the likely façade sound insulation performance requirements for a typical apartment on each elevation. The proposed façade make up and parameters for a 'typical' apartment are presented below. Our calculation methods follow those outlined in BS 8233.

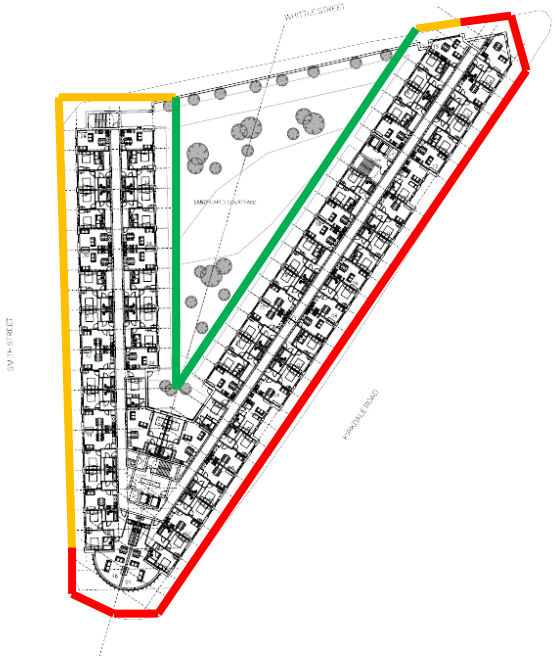
Bedroom:
Width (façade) = 3 m
Length = 4 m
Height = 2.5 m
Façade Area, S = 4.5 m^2 (50% glazed)

Living Room:
Width (façade) = 3 m
Length = 6 m
Height = 2.5 m
Façade Area, S = 4.5 m^2 (60% glazed)

Windows: Double glazing, specified to suit.
Walls: SFS with external brick/cladding.
Background ventilation: MVHR or MEV (with trickle vents) as required

Our calculations indicate the following minimum guideline acoustic performance specifications for windows and ventilators would be required to typical apartments on each elevation. These specifications will need to be developed into octave band sound reduction performance figures through detailed design.

Further guidance is provided on systems likely to be capable of meeting our specification, although it will ultimately be the responsibility would always be imperative that suppliers demonstrate compliance with the specifications.



Preliminary Acoustic Performance Specifications

Colour	Preliminary Minimum Sound Reduction Specification		Example Configurations (For Guidance Only)
	Window, $R_w + C_{tr}$	Ventilator, $D_{n,e,w} + C_{tr}$	
Red	38 dB	44 dB	• Specialist acoustic double glazing. • No trickle vents in window heads. • Mechanical ventilation (e.g. MVHR).
Orange	34 dB	40 dB	• 10 / 16 / 6.4 mm lam. double glazing or secondary glazing. • Attenuated in-wall ventilators or mechanical (e.g. MVHR).
Green	30 dB	36 dB	• 8 / 16 / 6 mm conventional double glazing. • 1 x 2,500 mm^2 acoustic trickle vent per habitable room & MEV.

Acoustic trickle ventilators may be sufficient in some areas of the green zone. Please note that this will be subject to detailed design review.

The above presents solutions to satisfy the proposed internal ambient noise limits within apartments during normal ventilation conditions where windows are closed but ventilators (to meet Part F minimum ventilation requirements) are operational.

When windows are opened, i.e. for purge, internal noise levels will be compromised. For noisier facades – those highlighted red & orange above – we would recommend provisions are made to remove or significantly limit the need to open windows to avoid overheating in summer. MVHRs with a manually operable boost setting would be a sensible mitigation solution.

9.0 Plant Noise Emission Limits

9.1.1 Proposed Limits

On the basis of Liverpool City Council's guidance and the results of the environmental noise survey, we propose that the following cumulative plant noise emission criteria be achieved at 1 metre from the nearest noise sensitive residential windows.

Period	BS 4142 Noise Rating Limit
Daytime / Evening (07:00-23:00)	52 dB $L_{Aeq,1hr}$
Night-time (23:00-07:00)	45 dB $L_{Aeq,15min}$

Noise shall be assessed in accordance with BS 4142: 2014 with corrections applied for any plant emitting noise of a tonal or irregular quality. Emergency plant items (e.g. standby generators, smoke extract equipment) should be subject to more relaxed criteria.

It should be noted that the above are subject to the final approval of the Local Authority.

Given the nature of the development, there are unlikely to be any significant items of fixed building services plant introduced to the prevailing noise climate, with the exception of commercial tenant equipment. Subsequently, at this stage it is envisaged that the risk of excessive building services noise can be mitigated by design and can be secured by a suitably worded condition of planning.

10.0 Commercial Unit Noise Impact on Surroundings

10.1 Commercial Noise Breakout

Given the location of the site and the prevailing daytime/evening ambient noise climate, noise breakout from typical retail/café/restaurant tenants playing no louder then 'background' music is unlikely to have an adverse noise impact on surrounding properties or properties lying above the retail unit.

If the commercial unit is to have tenants which may play music greater then 'background' such as live music and/or DJs or contain noisy machinery and/or equipment measures should be in place to suitably control noise breakout.

The control of noise output from commercial units should be secured with suitable wording and detailed acoustic noise limits set within tenant's handbook. The Local Planning Authority may also wish to secure this with a condition of planning.

10.2 Commercial-to-Residential Noise Transfer

The separating floor between commercial and residential spaces must, at a minimum, meet the standards for airborne sound insulation as set out in the current Building Regulations' Approved Document E but should ideally achieve 60 dB $D_{nT,w}$. If units are to be designated for A3/A4 (restaurant/bar) use, extra attention will be required to ensure operational noise does not unduly impact on residents in apartments above.

For guidance, we would expected a 250 mm pre-cast concrete slab (density greater than 2,300 kg/m^3 and suitably designed for sound flanking control) to be capable of providing sufficient sound reduction for the majority of prospective tenants and A3/A4 uses. However, this should not prevent noisier uses where additional noise mitigation measures can be applied (e.g. mass barrier ceilings).

At this stage, the proposed party floor construction is not known. It is therefore recommended that, as part of design development, noise limits are assigned to all commercial spaces and imposed on prospective tenants through an acoustic section within the tenants handbook. N.B.

Such limits should also consider the potential for noise breakout via unit fronts (or outdoor seating areas) and in through apartment windows.

Should prospective tenants wish to generate higher levels of noise to those specified in the handbook, it would be usual for the tenant to be made responsible for any additional acoustic treatment to satisfy the above criteria within apartments.

11.0 Conclusions

A detailed environmental noise survey has been undertaken in order to establish the prevailing environmental noise climate at the development site.

The acoustic requirements of national/local policies and current industry guidelines have been reviewed and used to inform a detailed noise impact assessment of incident noise affecting the development as well as potential noise output from the development.

Our assessment indicates that acceptable internal noise levels should be achievable within apartments with double glazed windows and standard/acoustic trickle ventilators within window heads in all areas.

Plant noise emissions have been reviewed and limits/measures to control these have been set.

Appendix A

The acoustic terms used in this report are defined as follows:

dB — Decibel - Used as a measurement of sound level. Decibels are not an absolute unit of measurement but an expression of ratio between two quantities expressed in logarithmic form. The relationships between Decibel levels do not work in the same way that non-logarithmic (linear) numbers work (e.g. 30dB + 30dB = 33dB, not 60dB).

dBA — The human ear is more susceptible to mid-frequency noise than the high and low frequencies. The 'A'-weighting scale approximates this response and allows sound levels to be expressed as an overall single figure value in dBA. The $_A$ subscript is applied to an acoustical parameter to indicate the stated noise level is A-weighted

It should be noted that levels in dBA do not have a linear relationship to each other; for similar noises, a change in noise level of 10dBA represents a doubling or halving of subjective loudness. A change of 3dBA is just perceptible.

$L_{90,T}$ — L_{90} is the noise level exceeded for 90% of the period *T* (i.e. the quietest 10% of the measurement) and is often used to describe the background noise level.

$L_{eq,T}$ — $L_{eq,T}$ is the equivalent continuous sound pressure level. It is an average of the total sound energy measured over a specified time period, *T*.

L_{max} — L_{max} is the maximum sound pressure level recorded over the period stated. L_{max} is sometimes used in assessing environmental noise where occasional loud noises occur, which may have little effect on the L_{eq} noise level.

Sound Pressure Level (L_p) is the sound pressure relative to a standard reference pressure of 2×10^{-5} Pa. This level varies for a given source according to a number of factors (including but not limited to: distance from the source; positioning; screening and meteorological effects).

Sound Power Level (SWL or L_w) is the total amount of sound energy inherent in a particular sound source, independent of its environment. It is a logarithmic measure of the sound power in comparison to a specified reference level (usually 10^{-12} W).