

REPORT REF: 20628R01PKmdw

ACOUSTIC CONSULTANCY TO SUPPORT PLANNING APPLICATION

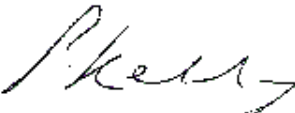
PROPOSED PARK VIEW RESIDENTIAL DEVELOPMENT, FARRIER CLOSE, (OFF HORSESHOE DRIVE/ PARKVIEW ROAD), UXBRIDGE, UB8 3XG



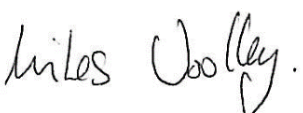
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Executive Summary

Environoise Consulting Limited has been instructed by Morgan Tucker Limited on behalf of London Borough of Hillingdon (LBH) Council to assess the potential noise which may affect a proposed Extra Care residential development with internal communal areas and external garden areas at land off Stockley Road in Uxbridge UB8 3XG.

An attended and partially attended noise survey was done between Tuesday 4th and Wednesday 5th August 2015 over a 24 hour period to establish the existing level of noise at the proposed site.

Recommendations for glazing and ventilation strategies have been made for proposed facades to habitable rooms. These are as follows:

- Façade facing Stockley Road – $\geq 36B D_{ne,w}$ acoustic ventilation units (e.g. Tito SF Extra + V25 + C25 sound attenuator and:
 $\geq 40dB R_w$ double glazed window units (e.g. 10mm / 12mm cavity / 6.4mm double glazing units).
- All other facades – Non-acoustic trickle vent units and:
 $\geq 31dB R_w$ double glazed window units (e.g. 6mm / 12mm cavity / 6mm double glazing units).

Internal noise levels would be within acceptable limits (as per LBH Council, BS8233:2014 and WHO Guidelines) with the recommended glazing and ventilation strategies and planning permission should be granted.

For the proposed garden areas, shielding offered by the proposed residential dwellings fronting Stockley Road will be sufficient to reduce road traffic noise levels to within acceptable limits (as per LBH Council, BS8233:2014 and WHO Guidelines) with no further mitigation measures and planning permission should be granted.

1 Introduction

- 1.1.1 Environoise Consulting Limited has been instructed by Morgan Tucker Limited on behalf of London Borough of Hillingdon Council to assess the potential noise which may affect a proposed Extra Care residential development with internal communal facilities and external garden areas at land off Stockley Road in Uxbridge to support a planning application.
- 1.1.2 The purpose of the assessment is to determine the level of noise affecting the site and provide recommendations for mitigation measures.
- 1.1.3 The site presently comprises of the derelict single storey building called Park View Day Centre and is bounded to the north, east and west by residential properties and to the south by Stockley Road.
- 1.1.4 A site plan is shown In Figure 1.1

Figure 1.1 Proposed site layout



2 Legislation & Planning Policy

2.1 National Planning Policy Framework

- 2.1.1 The NPPF came into force on March 2012 and represents the government's commitment to promoting sustainable development,
- 2.1.2 With regard to acoustic design and noise control, the NPPF provides a set of overarching aims, broadly reflecting those already contained in the Noise Policy Statement for England (NPSE)ⁱ. They are directed towards the avoidance of significant adverse impacts and reduction of other adverse impacts on health and quality of life; set within the context of the Government's policy on sustainable development.
- 2.1.3 Now that the NPPF has been introduced previous Planning Policy Guidance on Noise (PPG24)ⁱⁱ has been withdrawn; creating a gap between policy aims and any technical guidance available by which the realisation of those aims can be achieved.
- 2.1.4 There is an emphasis within the new framework on local planning authorities to create local policy and guidance which reflects both the NPPF and the NPSE, whilst at the same time reflecting the needs and priorities of their communities.
- 2.1.5 Further NPPF aims related to noise include:

Paragraph 109 of NPPF

- 2.1.6 The planning system should contribute to and enhance the natural and local environment by: preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability.
- 2.1.7 Planning policies and decisions should encourage the effective use of land by re-using land that has been previously developed (brownfield land), provided that it is not of high environmental value. To prevent unacceptable risks from pollution and land instability, planning policies and decisions should ensure that new development is appropriate for its location. The effects (including cumulative effects) of pollution on health, the natural environment or general amenity, and the potential sensitivity of the area or proposed development to adverse effects from pollution, should be taken into account.

Noise Policy Statement for England

- 2.1.8 NPPF affirms that National Policy Statements form part of the overall framework of national planning policy, and should be a material consideration in decisions on planning applications. The Noise Policy Statement for England (NPSE) came into force in 2010 and states:
- *The aim of this document is to provide clarity regarding current policies and practices to enable noise management decisions to be made within the wider context, at the most appropriate level, in a cost-effective manner and in a timely fashion.*
 - *This Noise Policy Statement for England (NPSE) should apply to all forms of noise including environmental noise, neighbour noise and neighbourhood noise. The NPSE does not apply to noise in the workplace (occupational noise).*

Noise Policy Vision

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

Noise Policy Aims

- 2.1.10 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; and where possible, contribute to the improvement of health and quality of life.
- 2.1.11 The NPPF noise aims widely reflect those in NPSE. The NPSE does however include some context within the explanatory note to assessing noise impact and uses established concepts from toxicology currently being applied to noise impacts, these include:

NOEL

- 2.1.12 *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.

SOAEL

- 2.1.13 *Significant Observed Adverse Effect Level.* This is the level above which significant adverse effects on health and quality of life occur.

LOAEL

- 2.1.14 *Lowest Observed Adverse Effect Level.* This is the level above which adverse effects on health and quality of life can be detected.
- 2.1.15 However, it is clear that it is not possible to have a single objective noise-based measure that defines SOAEL that is applicable to all sources of noise in all situations. Consequently, the SOAEL is likely to be different for different noise sources, for different receptors and at different times. The responsibility for defining and achieving the effect levels is that of the noise consultant. Despite the lack of prescriptive indicators in the NPPF, there is useful guidance still available for traffic, plant and construction noise to inform how these assessments can sensibly be made.

2.2 London Borough of Hillingdon Council Noise Criteria

Consultation¹ to determine London Borough of Hillingdon (LBH) Council internal noise level target requirements for habitable rooms and external noise level targets for outdoor amenity areas was done. Specific guidance is included in section 5 of the LBH Noise Supplementary Planning Document 2006² and follows recommended guidance in BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'ⁱⁱⁱ and World Health Organisation (WHO) Guidelines; 'Community and Noise, 1999'^{iv} as follows:

¹ E-mails between Jenny Evans, London Borough of Hillingdon Council and Paul Kelly, Environoise Consulting Limited on 10th August 2015.

² www.hillingdon.gov.uk/media/8402/Noise-SPD--Appendix-1/pdf/noisespdfinal2_1.pdf

Internal Noise Level Criteria

- Living Rooms (daytime) < 35dB $L_{Aeq,T}$
- Bedrooms (night time) < 30dB $L_{Aeq,T}$, 45dB $L_{Amax,fast}$

Outdoor Amenity Noise Level Criteria

- As low as practicable and < 50dB $L_{Aeq,T}$

2.3 BS8233:2014

2.3.1 Table 2.1 below, is an excerpt of the relevant guidance in Table 4 of BS8233:2014 and presents “desirable” noise levels to be achieved in habitable spaces.

2.3.2 **Table 2.1:** Internal ambient noise level targets

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35dB $L_{Aeq,16hour}$	-
Dining	Dining Room/area	40dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	35 dB $L_{Aeq,16hour}$	30 dB $L_{Aeq,8hour}$

2.3.3 Appropriate time periods for the design ranges are as follows:

- Living rooms – daytime: 07:00hrs – 23:00hrs ($L_{Aeq,16 hours}$)
- Bedrooms – night time: 23:00hrs – 07:00hrs ($L_{Aeq,8hours}$)

Maximum Internal Noise Levels

2.3.4 BS8233:2014 standard does not express a limit on transient maximum noise levels in bedrooms.

2.3.5 Instead it suggests that a guideline value expressed in terms of SEL or $L_{Amax,fast}$ should be set dependent on number of events per night and the character of the noise.

2.3.6 We have therefore used guidance provided in the previous standard, BS8233:1999 ‘Sound insulation and noise reduction for buildings. Code of practice’v, as follows:

- *For a reasonable standard in bedrooms at night, individual noise events (measured with F time-weighting) should not normally exceed 45dB $L_{Amax,fast}$.*

2.3.7 The term ‘normally’ is not defined in BS8233:1999. However, section 3.2 of this report provides further information regarding the number of excesses allowed for reasonable sleeping conditions.

2.4 World Health Organisation's (WHO) Guidelines

Maximum Internal Noise Levels

- 2.4.1 Maximum noise events should not typically exceed 45dB during the night-time on more than 15 occasions, given that World Health Organisation (WHO) Guidelines; 'Community and Noise', 1999 defines 10 to 15 occasions which may cause sleep disturbance³.

2.5 Outdoor Amenity Noise Levels

BS8233 and WHO Guidelines

- 2.5.1 BS8233:2014 states that "For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ which would be acceptable in noisier environments.". This is in line with recommendations given in the WHO Guidelines for Community Noise.

³ Section 3.3 of World Health Organisation (WHO) Guidelines; 'Community and Noise' 1999.

3 Noise Survey

3.1 Survey Procedure

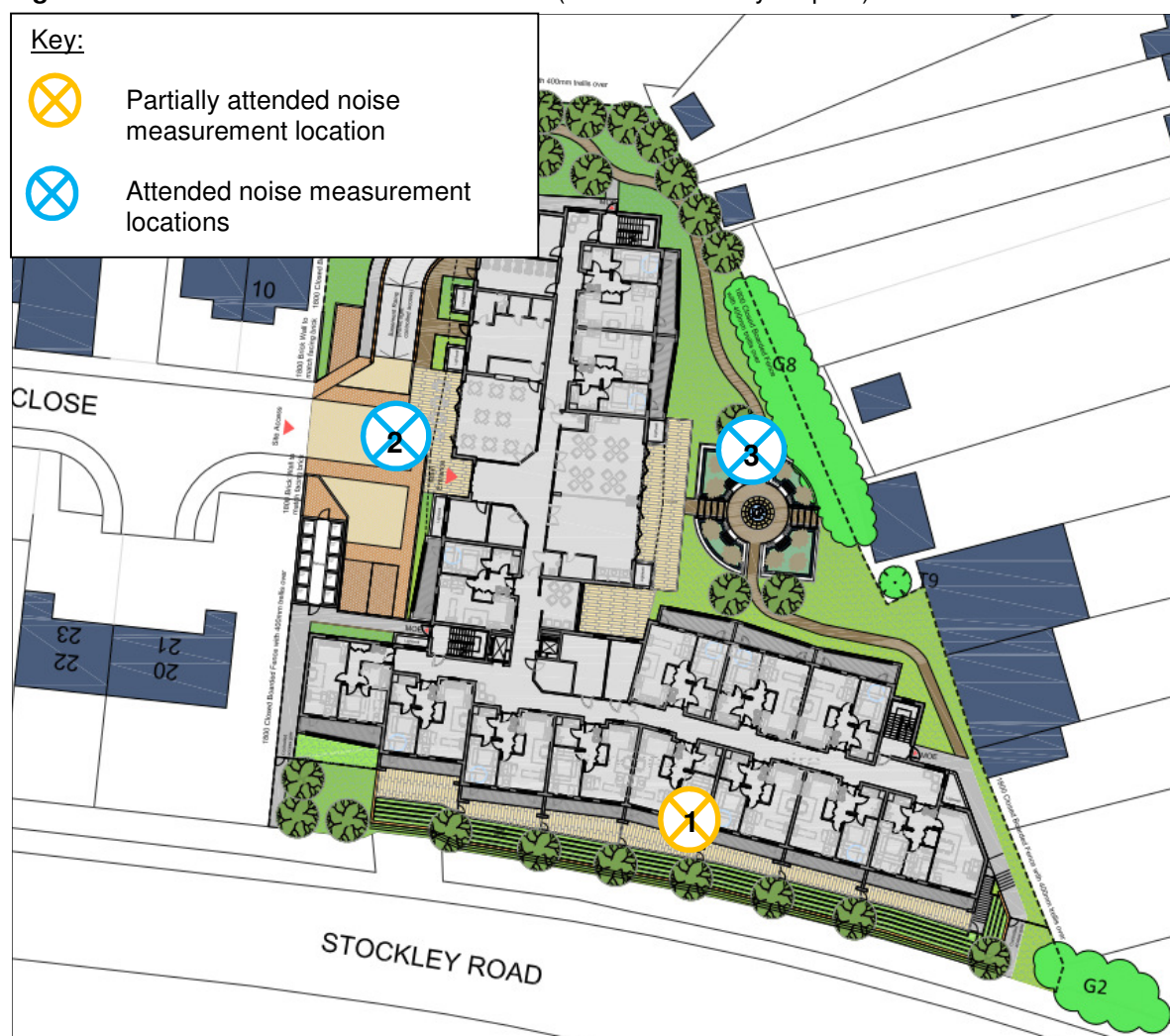
3.1.1 A partially attended noise survey was done between 13.10hrs on 04/08/2015 and 13.10hrs on 05/08/2015 at Location 1 indicated in Figure 3.1.

3.1.2 An attended noise survey was done between 12.20hrs and 12.55hrs on 04/08/2015 at Locations 2 and 3 indicated in Figure 3.1. Locations were chosen as to be representative of dwellings most affected by noise(e.g. those exposed to road traffic along Stockley Road).

- **Location 1:** Partially attended position towards Stockley Road.
- **Location 2:** Attended position towards centre of the site.
- **Location 3:** Attended position at location of proposed garden areas.

3.1.3 Noise measurements were conducted in accordance with BS7445-1:2003 'Description and measurement of environmental noise. Guide to quantities and procedures'^{vi}. Measurement locations are shown in Figure 3.1. Instrumentation details are provided in Table 3.1

Figure 3.1: Noise and measurement locations (shown on site layout plan)



3.2 Instrumentation

Table 3.1: Instrumentation details

Manufacturer	Equipment type	Serial number	Date of Calibration
Rion	NC-74 calibrator with ½" adaptor	34825715	24 th April 2015
	NA-28 sound level meter	00211582	
	NH-23 preamplifier	01627	11 th June 2015
	UC-59 Microphone	02245	

Calibration

- 3.2.1 The sound level meter was calibrated at the start and end of the noise surveys, there was no recorded drift greater than 0.3dB at 1 kHz. Therefore no correction is needed and measurements are suitable.

Weather Conditions

- 3.2.2 Weather conditions were suitable for the noise survey.

- **Start of survey:** dry, wind speed 5m/s in westerly direction, 20°C.
- **End of survey:** dry, wind speed 3m/s in south westerly direction, 21°C

4 Noise Survey Results

4.1 Noise Results

- 4.1.1 A summary of measured noise levels are summarised in Tables 4.1 to 4.4. Other noise level data is available upon request.

Table 4.1: Summary of measured daytime and night-time noise levels at Location 1.

Location	sampling period (minutes)	Maximum noise level (L _{Amax,fast}) dB range	Ambient noise level (L _{Aeq,15min}) dB range	
			Daytime	Night-time
1	1440 -24 hours	35 - 57	56 - 62	47 - 61

- 4.1.2 The logarithmically averaged daytime and night-time ambient noise levels obtained from Location 1 are presented in Table 4.2. The sample daytime noise level measurements at Locations 2 and 3 are presented in Table 4.3. The highest 'regularly occurring' (i.e. more than 10 times in accordance with WHO Guidelines, see section 2.4) night-time maximum noise level is presented in Table 4.4 as these are pertinent to the assessment.

Table 4.2: Measured daytime and night-time ambient noise levels at Location 1

Location	Period	L _{eq,T} at octave band centre frequency (Hz)							L _{Aeq, T} (dB)
		63	125	250	500	1k	2k	4k	
1	Daytime (07:00 – 23:00)	66	59	57	56	58	51	39	60
	Night-Time (23:00 – 07:00)	60	52	51	50	52	45	35	54

Table 4.3: Sample daytime ambient noise level measurements at Locations 2 and 3

Location	Start-time	L _{eq,T} at octave band centre frequency (Hz)							L _{Aeq, 15 minute} (dB)
		63	125	250	500	1k	2k	4k	
2	12:20	66	59	53	50	52	47	40	55
3	12:40	63	53	50	50	52	46	36	55

Table 4.4: Measured 'regularly' occurring maximum noise level.

Location	Period	L _{max(fast)} at octave band centre frequency (Hz)							L _{Amax(fast)} (dB)
		63	125	250	500	1k	2k	4k	
1	Night-time (23:00 – 07:00)	77	66	61	61	60	52	42	65

4.2 Discussion of Results

Ambient Noise Levels

- 4.2.1 We noted from our visit to the proposal site that it is for the most part it is affected by road traffic noise from Stockley Road (Location 1). General residential noise from the surrounding residential areas (measured at Location 2) was noted on occasion however was incidental compared to noise from Stockley Road.

-
- 4.2.2 Night-time maximum noise levels measured at Location 1 (see Table 4.4) will be used for the assessment within proposed bedrooms exposed to road traffic noise from Stockley Road.

Maximum Noise Levels

- 4.2.3 Night-time Maximum levels were as high as 78dB $L_{Amax,fast}$ measured at Location 1, however this level was measured only on one occasion. The highest $L_{Amax,fast}$ that 'regularly' occurred (i.e. more than 10 times) during the night-time period (23.00 – 07.00hrs) was 65dB.
- 4.2.4 Night-time ambient and maximum levels were not obtained at Locations 2 to 3 as subjectively the noise impact during this period was considered to be low relative to Location 1.

5 Noise Ingress Assessment

5.1 Overview

- 5.1.1 Generally it is accepted that glazing and ventilation openings within external façades will be the weakest elements acoustically when compared to robust external wall and roof constructions. Therefore, specifying glazing and ventilation that is sufficiently robust to attenuate the highest levels of noise will provide an excellent acoustic environment – any supplementary attenuation offered by the more substantial construction of the structural façade (e.g. masonry) would only serve to further reduce internal noise levels.
- 5.1.2 Noise ingress levels have been calculated considering the measured ambient and maximum noise levels detailed in Tables 4.2 and 4.4, propagation of sound across the site and assessment method given in BS EN 12354-3:2000^{viii} to determine the required performance of glazing and ventilation strategy to meet Local Authority Criteria and provide recommendations. A reverberation time of 0.5 seconds has been used for all living rooms and bedrooms, see examples calculations in Appendix C, Figure C.1 and C.2.
- 5.1.3 Details of constructions (including rooms sizes and window areas) have been assumed as follows:
- External wall comprising brick / cavity / block or brick / cavity / timber stud and plasterboard lining.
 - Typical living room dimensions will be 5m x 4m x 2.4m (h) and glazing areas will be 3m².
 - Typical bedroom dimensions will be 4m x 4m x 2.4m (h) and glazing areas will be 2m².
- 5.1.4 All noise ingress calculations assume background ventilation will be provided trickle vents / wall vents. We have assumed that opening windows are not part of the ventilation strategy but to provide additional ventilation through user discretion. An open window will typically provide between 10 to 15dBA attenuation from outside to inside according to BS8233:2014 meaning internal noise targets would be exceeded. The level of attenuation will depend on the free open area of the window and the angle of the window relative to the dominant external noise source.

6 Façade Recommendations

6.1 Glazing & Ventilation

- 6.1.1 We consider that suitable glazing and ventilation attenuation can be provided to habitable rooms, such that internal average noise levels would be within acceptable limits, as per LBH Council guidelines.
- 6.1.2 Glazing and ventilation specifications have been given see Table 6.1. Locations of recommended glazing and ventilation specifications are shown in Appendix B, Figure B.1.

Table 6.1: Recommended minimum specifications (refer to Appendix B).

Facade	Minimum glazing performance $\geq R_w$ (dB)	Typical Glazing specification	Minimum trickle / wall vent performance $\geq D_{new}$ (dB)	Example Trickle / Wall Vent
1	40	Pilkington 10mm pane / 12mm cavity / 6.4mm pane	36	Titon SF Extra + V25 + C25 sound attenuator
2	31	Pilkington 6mm pane / 12mm cavity / 6mm pane	-	Non-acoustic

Glazing Performance

- 6.1.3 Glazing with a larger air or inert gas (e.g. Argon) cavity is acceptable providing both recommended pane thicknesses remain the same. Laminated glazing in place of traditional glazing is acceptable providing it is the same thickness. The glazing performance should be constant across the overall assembly, so the framing should be of similar or greater performance than the glazing recommended. The performance of the glazing units will depend on quality of framing and good contact with window seals.
- 6.1.4 The sound insulation of a window is usually measured over a wide range of frequencies from low to high in accordance with BS EN ISO 140-3: 1995, but it is often convenient for specifiers to represent the insulation by a single figure, see below:
- R_w , the weighted sound reduction, more useful, as it incorporates a correction for the response of the human ear.
 - $R_w + C_{tr}$ is the weighted sound reduction with a low frequency spectrum adaptation term (C_{tr} is usually a negative number) suitable for urban traffic noise and low speed rail traffic⁴.
 - R_{TRA} , the weighted reduction against typical low speed urban road traffic noise.

Façade Construction

- 6.1.5 The façade construction should be specified with a weighted sound reduction performance (R_w) at least 10dB higher than the highest glazing performance indicated in Table 6.1 (e.g. 50dB R_w).
- 6.1.6 With regards to facades facing Stockley Road, this is likely to require a facade construction similar in performance to that of a masonry cavity construction. Or alternatively clay tile / stone / cement particle board cladded façade with ≥ 50 cavity and independent timber / metud stud construction with one layer

⁴ The C_{tr} adaption term was introduced in BS EN ISO 717-1: 1997 'Acoustics - Rating of sound insulation in buildings and building elements Part 1'

of OSB one one side and two layers of 15mm dense plasterboard ($\geq 12\text{kg/m}^2$) and mineral wool insulation in the cavity.

Roof Construction

- 6.1.7 The proposed roof construction should be suitably robust in order to adequately reduce noise levels from noise sources as road traffic particularly at low frequencies.
- 6.1.8 Low frequency reductions are best achieved in light-weight constructions by introducing isolation in the structure. For dwellings fronting Stockley Road, we recommend that the roof is clay tiled and the upper floor ceiling comprises of two layers of 15mm dense plasterboard (12kg/m^2) installed on resilient bars (e.g. British Gypsum Gyproc RB1) to the underside of the roof structure rafters. 100mm (min) thick mineral wool insulation ($\geq 10\text{kg/m}^2$) should be laid on top of the ceiling.

7 Outdoor Amenity Spaces

- 7.1.1 Guidance given in BS8233 and the WHO Guidelines for Community Noise states that it is desirable for the steady noise level in external amenity spaces (such as gardens, balconies or outdoor living areas) to be less than 50dB $L_{Aeq,16hour}$ to prevent moderate annoyance with 55dB $L_{Aeq,16hour}$ regarded as an upper limit in order to prevent serious annoyance for occupants. The target criteria is in accordance with LBH Council's target requirements for garden areas.
- 7.1.2 Outdoor amenity spaces within the proposed development include garden areas to the rear of proposed residential dwellings.
- 7.1.3 Measurements at Location 3 indicates that for the majority of the site, gardens would be exposed to noise levels at or below 55dB $L_{Aeq,16hour}$ above which serious annoyance would occur. However, the proposed layout of the site is such that shielding of noise in gardens areas will be provided by dwelling buildings fronting Stockley Road. As a result, noise levels in the proposed garden areas will be less than 50dB $L_{Aeq,16hour}$ and will meet LBH Council's target requirements. No further mitigation measures are necessary.

8 Conclusions

8.1 Noise Assessment

- 8.1.1 A 24 hour noise survey has been done at the proposed site at locations considered to be most affected by noise sources (i.e. road traffic along Stockley Road).
- 8.1.2 Noise levels at the site are such that LBH Council's internal noise level targets can be achieved an appropriate glazing and ventilation strategy for proposed dwellings and planning permission should be granted.

8.2 Facades facing Stockley Road

- 8.2.1 For facades facing Stockley Road the following strategy has been recommended:
- $\geq 36\text{dB } D_{ne,w}$ acoustic ventilation units and $\geq 40\text{dB } R_w$ double glazed window units are required to facades to meet Local Authority internal noise level target criteria in habitable spaces during the daytime (07.00hrs – 23.00hrs) and night-time (23.00hrs – 07.00hrs) period.

8.3 All other Facades

- 8.3.1 For all other facades the following strategy has been recommended:
- Non-acoustic ventilation unit and $\geq 31\text{dB } R_w$ double glazed window units are required to facades to meet Local Authority internal noise level target criteria in habitable spaces during the daytime (07.00hrs – 23.00hrs) and night-time (23.00hrs – 07.00hrs) period.

8.4 Outdoor Amenity Spaces

- 8.4.1 BS8233, WHO Guideline and LBH Council's target values for the proposed garden areas will be met where they are shielded from noise from Stockley Road by the proposed intervening dwelling buildings and no further mitigation measures are required.

References

- ⁱ Noise Policy Statement for England (NPSE) DEFRA March 2010.
- ⁱⁱ Planning Policy Guidance on Noise (PPG24)
- ⁱⁱⁱ BS8233 'Guidance on sound insulation and noise reduction for buildings', 2014
- ^{iv} World Health Organisation (WHO) Guidelines; 'Community and Noise'1999.
- ^v BS8233: 'Sound Insulation and Noise Reduction for Buildings': Code of Practice (1999).
- ^{vi} BS7445-1:2003 'Description and measurement of environmental noise. Guide to quantities and procedures'.
- ^{vii} BS EN 12354-3:2000 Building acoustics. Estimation of acoustic performance in buildings from the performance of elements. Airborne sound insulation against outdoor sound.

Appendix A: Acoustic Terms

Between the quietest audible sound and the loudest tolerable sound there is a million to one ratio in sound pressure (measured in Pascal, Pa). Because of this wide range a noise level scale based on logarithms is used in noise measurement called the decibel (dB) scale. Audibility of sound covers a range of approximately 0 to 140 dB.

The human ear system does not respond uniformly to sound across the detectable frequency range and consequently instrumentation used to measure noise is weighted to represent the performance of the ear. This is known as the 'A weighting' and annotated as dB (A). The following lists the sound pressure level in dB (A) for common situations.

Table A.1: Noise levels for common situations

Typical noise level dB(A)	Example
0	Threshold of hearing
30	Rural area at night, still air
40	Public library, refrigerator humming at 2m
50	Quiet office, no machinery Boiling kettle at 0.5m
60	Normal conversation
70	Telephone ringing at 2m Vacuum cleaner at 3m
80	General factory noise level Heavy goods vehicle from pavement
90	Powered lawn motor, operators ear
100	Pneumatic drill at 5m
120	Discotheque – 1m in front of loudspeaker
140	Threshold of pain

The noise levels at a measurement point are rarely steady, even in rural areas, and vary over a range dependent upon the effects of local noise sources. Close to a busy motorway, the noise levels may vary over a range of 5 dB(A), whereas in a suburban area this may increase up to 40 dB(A) and more due to the multitude of noise sources in such areas (cars, dogs, aircraft etc.) and their variable operation. Furthermore, the range of night-time noise levels will often be smaller and the levels significantly reduced compared with daytime levels. When considering environmental noise, it is necessary to consider how to quantify the existing noise (the ambient noise) to account for these second to second variations.

Human subjects are generally only capable of noticing changes in steady levels of no less than 3 dB(A). It is generally accepted that a change of 10 dB(A) in an overall, steady noise level is perceived to the human ear as a doubling (or halving) of the noise level. (These findings do not necessarily apply to transient or non-steady noise sources such as changes in noise due to change in road traffic flow, or intermittent noise sources). The equivalent continuous A-weighted sound pressure level, L_{Aeq} , is the single number that represents the average sound energy measured over that period. The L_{Aeq} is the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period. It is commonly used to express the energy value from individual sources that vary in level over their operational cycle.

Appendix B: Façade Recommendations

Figure B.1: Recommended glazing & ventilation Locations.



Appendix C: Example Calculations

Figure C.1: Noise break-in calculations into living rooms nearest Stockley Road

ENVIRONOISE		Leq - Living							
Project	Stockley Road - Park View								
Client	LBH								
Room	Living	TYPE	LIVING AREA						
Enter Facade Correction	0 dB	Notes: ☐ Bedroom ☒ Living Area							
Receiving Room									
Height of room	2.4 m								
Width of room	4.0 m								
Length of room	5.0 m								
Volume of room	48.0 m³								
Element									
Area 1 - Glazing	0.0 m²	10/12/6.4 Double Glazing							
Area 2 - Glazing & TV	3.0 m²	10/12/6.4 Double Glazing and Titen SF Xtra							
Area 3 - Non Glazed									
Area 4 - Non Glazed	15.0 m²	Timber frame wall with lightweight cladding							
Angle of incidence	0 deg								
Frequency Hz	63	125	250	500	1000	2000	4000	8000	
Reverberation time (sec)	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	
Absorption (sabines)	15.5	15.5	15.5	15.5	15.5	15.5	15.5	15.5	
Frequency Hz	63	125	250	500	1000	2000	4000	8000	dB(A)
External dB	66.0	59.0	57.0	56.0	58.0	51.0	39.0	37.0	60
External Freefield									
External Freefield Leq dB	66	59	57	56	58	51	39	37	60
Additional Correction	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
10log(cos(angle))	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
SRI Ref	Area								
30	0.0 m²	23	27	29	36	41	42	52	54
Glazing and Trickle Vent	3.0 m²	21	24	27	30	31	31	30	30
	0.0 m²	0	0	0	0	0	0	0	0
56	15.0 m²	21	24	34	40	45	49	52	55
Combined SRI		21	24	32	36	38	38	37	37
Criterion (NR at 1kHz)		59	48	40	34	30	27	25	23
Additional SRI Required		0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
		To Meet NR30							
Internal Leq dB		54	44	34	28	29	22	10	8
		34 dB(A)							

Figure C.2: Noise break-in calculations into bedrooms nearest Stockley Road

ENVIRONOISE		Leq - Bedrooms																																																																			
Project	Stockley Road - Park View																																																																				
Client	LBH																																																																				
Room	Bedrooms	TYPE	BEDROOM																																																																		
Enter Facade Correction	0 dB	Notes: ☒ Bedroom ☐ Living Area																																																																			
Receiving Room																																																																					
Height of room	2.4 m																																																																				
Width of room	4.0 m																																																																				
Length of room	4.0 m																																																																				
Volume of room	38.4 m³																																																																				
Element																																																																					
Area 1 - Glazing	0.0 m²	10/12/6.4 Double Glazing																																																																			
Area 2 - Glazing & TV	2.0 m²	10/12/6.4 Double Glazing and Titen SF Extra																																																																			
Area 3 - Non Glazed																																																																					
Area 4 - Non Glazed	15.0 m²	Timber frame wall with lightweight cladding																																																																			
Angle of incidence	0 deg																																																																				
<table border="1" style="width: 100%; border-collapse: collapse; text-align: center;"> <tr> <th>Frequency Hz</th> <th>63</th> <th>125</th> <th>250</th> <th>500</th> <th>1000</th> <th>2000</th> <th>4000</th> <th>8000</th> </tr> <tr> <td>Reverberation time (sec)</td> <td>0.50</td> <td>0.50</td> <td>0.50</td> <td>0.50</td> <td>0.50</td> <td>0.50</td> <td>0.50</td> <td>0.50</td> </tr> <tr> <td>Absorption (sabines)</td> <td>12.4</td> <td>12.4</td> <td>12.4</td> <td>12.4</td> <td>12.4</td> <td>12.4</td> <td>12.4</td> <td>12.4</td> </tr> </table>				Frequency Hz	63	125	250	500	1000	2000	4000	8000	Reverberation time (sec)	0.50	0.50	0.50	0.50	0.50	0.50	0.50	0.50	Absorption (sabines)	12.4	12.4	12.4	12.4	12.4	12.4	12.4	12.4																																							
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