Tel: 0845 680 2624 Web: www.acoustictests.com Email: info@acoustictests.com

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Mr Seraj Patel

Assessment of noise climate at Plots 16 – 18, Hebble Court, Thornhill Less, Dewsbury, WF12 0AY with regards to proposed residential development.

Prepared for :-

Mr Seraj Patel

Prepared by :-

Andrew Frisby MIOA PgDip BSc

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1.0 SUMMARY

During the daytime the principal contributors to the background noise climate were road traffic and the activation of the AC units to the rear of the Mullaco supermarket. Private cars and taxis represented the main classes of vehicles on Slaithwaite Road. In addition, a number of buses and light and heavy goods vehicles were also observed.

In the night time, the principal contributor to the existing noise climate was the intermittent operation of the AC units to the rear of the supermarket and these units were activated quite frequently. A few cars were noted on the main Slaithwaite Road, but these were relatively infrequent.

'Desirable' conditions (ref: BS8233:2014) are easily achievable with standard thermal double glazing (4/20/4) glazing and ventilation solutions, and standard garden fencing.

Please see Section 5.3 of this report, where we detail the ventilation & glazing performance used in our assessment and the predicted internal noise levels.

A P Frisby MIOA BSc PgDip

2.0 INTRODUCTION

Acoustic Tests were asked to carry out an independent assessment of the above site with regards to its suitability for residential development from a noise perspective.

This report begins by summarising assessment standards and, where appropriate, discusses alternative interpretations.

After a brief statement of survey details we discuss basic results and the resulting assessment, along with any mitigation which might be implied. We sum-up and conclude at the end, along with brief recommendations.

3.0 ASSESSMENT STANDARDS

3.1 NPPF, NPSE and NPPG

The National Planning Policy Framework (NPPF), the Noise Policy Statement for England (NPSE) and the National Planning Practice Guidance (NPPG) provide nothing in the way of quantitative criteria but instead provide general policy aims and statements and some guidance on how certain situation can be interpreted.

The NPPF's main statement on noise is to be found in paragraph 180:-

180 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 impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life(footnote here refers to NPSE – see below);

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.

Paragraph 182 is also relevant:-

182 Planning policies and decisions should ensure that new development can be integrated effectively with existing businesses and community facilities (such as places of worship, pubs, music venues and sports clubs). Existing businesses and facilities should not have unreasonable restrictions placed on them as a result of development permitted after they were established. Where the operation of an existing business or community facility could have a significant adverse effect on new development (including changes of use) in its vicinity, the applicant (or 'agent of change') should be required to provide suitable mitigation before the development has been completed.

The NPPF refers to the NPSE which sets out the following aims:-

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.

It also introduces the concepts of:

- NOEL – No Observed Effect Level. In simple terms, below this level, there is no detectable effect on health and quality of life due to the noise.
- LOAEL – Lowest Observed Adverse Effect Level. This is the level above which adverse effects on health and quality of life can be detected.
- SOAEL – Significant Observed Adverse Effect Level. This is the level above which significant adverse effects on health and quality of life occur.

SOAEL is clearly something the policy seeks to avoid in aim 1. Aim 2 represents situations between SOAEL and LOAEL, and seeks to minimise and mitigate the effects.

The NPPG section on noise adds some further detail, much of it reproducing the NPPF and NPSE, but some useful qualitative guidance is provided in a table as reproduced below.

Perception	Examples of Outcomes	Increasing Effect Level	Action
Not noticeable	No Effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard, but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum

Perception	Examples of Outcomes	Increasing Effect Level	Action
		Significant Observed Adverse Effect Level	
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

It also makes the point that the subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation, including the level of the noise in absolute terms and how it might compare with the underlying background noise, the impulsiveness or intermittence pattern of the noise, its spectral content, and the time of day. It discusses in very general terms the issues to consider when introducing noise sources to existing noise sensitive area, new residential development in areas affected by existing noise sources (most of which have their own specific guidance, such as BS4142, BS8233, etc.) and the potential impact on wildlife.

3.2 <u>BS8233</u>

BS8233 was updated in March 2014. Quantitatively, however, the design criteria are little changed – just expressed differently to reduce ambiguity in certain situations.

Table 4 of BS8233 gives the desirable criteria for indoor ambient noise levels for dwellings as follows:-

Activity	Location	07:00 to 23:00	23:00 to 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 $L_{Aeq,16hour}$

Note that the standard accepts the widely used rule of thumb that, for a partly open window, the levels just outside will be 15dB higher than

those just inside. This brings us to an external equivalent of the above table, as follows:-

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living room	50 dB $L_{Aeq,16hour}$	-
Dining	Dining room/area	55 dB $L_{Aeq,16hour}$	-
Sleeping (daytime resting)	Bedroom	50 dB $L_{Aeq,16hour}$	45 dB $L_{Aeq,16hour}$

It goes on to state that, where necessary, the criteria can be relaxed by up to 5 dB and still achieve reasonable conditions. Note that the new version no longer states criteria for bedroom noise in terms of dB L_{Amax}.

Garden area criteria are unchanged with 50 dB L_{Aeq} and 55 dB L_{Aeq} being considered desirable and reasonable respectively.

Note that the new version of BS8233 more explicitly specifies the assessment periods as 16 hour and 8 hour for daytime and night time respectively.

3.3 Local Authority

The local authority have requested that an external noise assessment take place.

4.0 SURVEY DETAILS

4.1 Site Times and Personnel

The measurements were carried out by Rob Smith MIOA of Druk Limited.

Daytime measurements were carried out on 8th October 2021 between approximately 07:00 to 08:30 and 15:30 – 19:00 to represent morning and afternoon rush hour respectively, and between 2300 hours and 0100 hours (on the 12th – 13th October) representing what was likely to be a noisier time of night.

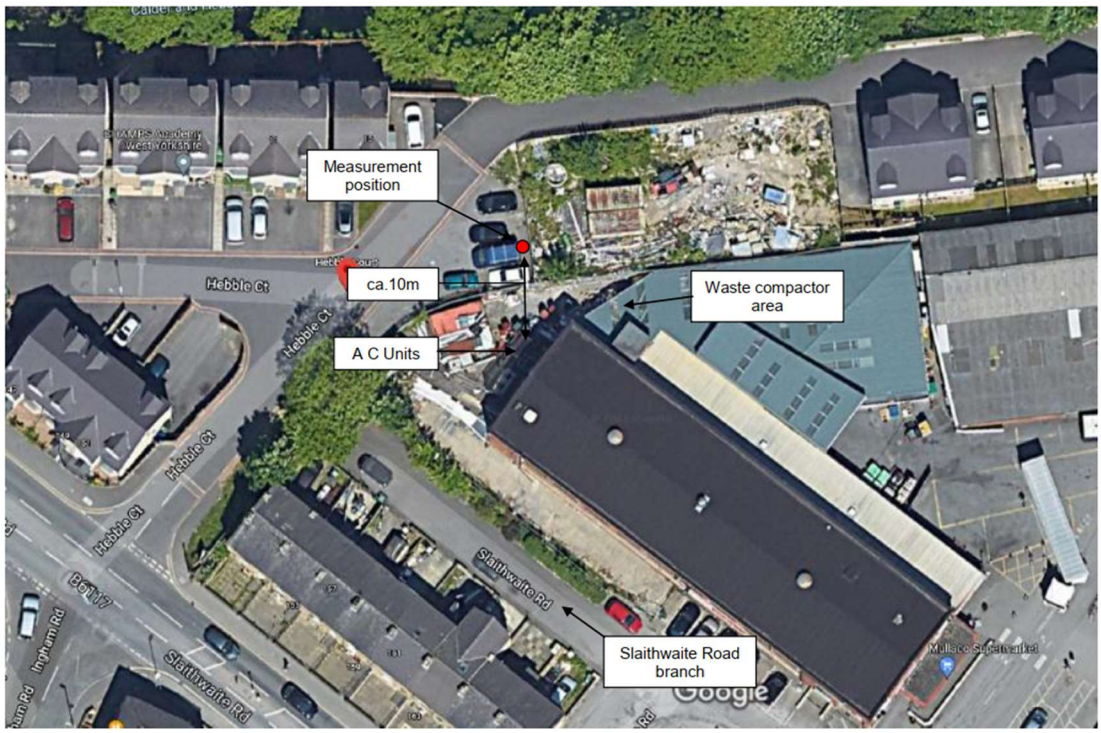
4.2 Instrumentation

Equipment description	Manufacturer	Model number	Serial number
Sound level meter	NTI Audio	XL2-TA	A2A-10232-E
Microphone pre-amplifier	NTI Audio	MA220	5537
Microphone	NTI Audio	M2230	8636
Acoustic calibrator	Norsonic AS	Nor 1251	31522

The sound level meter was calibrated before the start and at the end of each period and no deviation was noted.

4.3 Measurement Positions

The main measurement positions are as shown on the following plan.



The measurement position was approximately the same distance from the rear elevation of the supermarket as would be the front elevation of the houses. The microphone was mounted on a boom such that it was approximately 3.5m above ground level (roughly the height of a first floor window) in order to ensure that the parked vehicles did not impede transmission.

4.4 Survey Conditions

Overall the existing noise climate was characteristic of a suburban environment

We have no reason to believe that the conditions we found on the survey were anything other than representative of normal conditions.

Weather conditions were as follows :-

8th October 2021 – morning rush

Surfaces dry, cloud cover ≈ 40%, temperature ≈ 14 C, barometric pressure : 1021 mb, wind < 0.3m/s.

8th October 2021 – afternoon rush

Surfaces dry, cloud cover ≈ 30%, temperature ≈ 21 C, barometric pressure: 1022 mb, wind ≈ 0.6m/s.

12th-13th October 2021 - early nighttime

Surfaces dry, the sky was partially overcast, temperature ≈ 11 C, barometric pressure: 1021 mb, wind ≈ 0.4m/s.

5.0 RESULTS AND DISCUSSIONS

5.1 Basic Results

During the daytime the principal contributors to the background noise climate were road traffic and the activation of the AC units to the rear of the Mullaco supermarket. Private cars and taxis represented the main classes of vehicles on Slaithwaite Road. In addition a number of buses and light and heavy goods vehicles were also observed.

Towards the end of the afternoon rush hour period an increasing number of cars entered and left the residential houses on Hebble Court. During this period the activation of the AC units to the rear of the Mullaco supermarket was very frequent and again the emission of noise was broadband in nature.

At times, the noise from the AC units did dominate the existing noise climate during the lulls in the road traffic. The relatively frequent operation of the waste compactor to the rear of the supermarket was also clearly audible and included an hydraulic type drone. Some voices, presumably from staff members, were also intermittently audible at the rear of the supermarket.

Additional noise sources include: noise from pedestrians on Slaithwaite Road, some noise from the surrounding houses including children playing in the gardens during the mid afternoon period, a number of cars entering and leaving Hebble Court and a few light aircraft overflights.

In the night time, the principal contributor to the existing noise climate was the intermittent operation of the AC units to the rear of the supermarket and these units were activated quite frequently. A few cars were noted on the main Slaithwaite Road, but these were relatively infrequent.

Full details are given in Appendix 2. A summary is as follows:-

Measurement Summary

Time	Position	Index	dB(A)
Overall Rush Hour	1	Leq	**56**
		Lmax	**79**
		L90	**49**
Overall Early Night	1	Leq	**50**
		Lmax	**65**
		L90	**42**

5.2 Assessments

In terms of BS8233, we are mainly concerned with the dB(A) L_{eq} values, or the dB L_{Aeq} levels. See definition of Acoustic terms in Appendix 1. The new version of BS8233 no longer has night time criteria in terms of dB(A) L_{max} values, or dB L_{Amax} values, but some local authorities still like to see them presented.

The above results give the following assessments:

Required Reductions for BS8233 Guidelines

Environment	Position	Required Reductions	
		Desirable	Reasonable
Living Rooms	1	21 dB	16 dB
Bedrooms	1	20 dB	15 dB
Outdoor Living Areas	1	6 dB	1 dB

Any solid garden fence (e.g fence panels) will be sufficient to provide the necessary attenuation required to bring the noise level in the proposed garden down to 'desirable' criteria, especially when the noise level is averaged out over the course of the 16 hour day period, instead of being based on the noisiest 3 hour period measured.

Note, of course, that these assertions are based upon the assumption that night-time noise levels are represented by measurements around midnight and that daytime noise levels are represented by measurements around afternoon at rush hour. It also assumes that the facades of the proposed houses do not benefit from any screening or barrier effect from its own location. In other words, they should represent a worst-case.

5.3 Mitigation

A partly open window can be expected to provide about 15 dB reduction.

Based on the measured noise levels at the noisier times of day and night, windows will need to be kept closed on all elevations to meet BS8233:2014 'desirable' conditions.

This implies that ventilation will be required such that occupants have the realistic option of keeping windows shut. This can be achieved using active or passive ventilation which provides a suitable sound insulation. This could take the form of active or passive ventilation through acoustic or non-acoustic vents or a whole house-type system which does not require any wall or window vents.

A summary of mitigation (or building elements assumed in our calculations) is as follows:-

Mitigation Summary

Room Type	Make-Up on Which Calulations are Based
Kitchen / Dining Room (Rear Elevation)	Walls: Traditional Masonry Glazing: Rw = 31 dB (e.g Standard double glazing, 4+20+4) Vents: Non-acoustic eg. Simon Airstrip 300
Bedroom 4 (front elevation, second floor)	Roof: With performance equal to: Tiled / Slated Roof, 25mm plasterboard ceiling with 100mm mineral wool. Glazing: Rw = 31 dB (e.g Standard double glazing, 4+20+4) Vents:Dn,e,w 33 dB (e.g. Simon acoustic TTF slimline 3000, frame vent)
Lounge (front elevation)	Walls: Traditional Masonry Glazing: Rw = 31 dB (e.g Standard double glazing, Vents: Non-acoustic eg. Simon Airstrip 300

Whilst we have used passive trickle ventilation and certain glazing specifications in the calculations above, any glazing or ventilation product with the same (or greater) R_w (for glazing) or $D_{n,e,w}$ performance (ventilation) will be sufficient.

Note that a <u>higher</u> specification of ventilation (33 dB $D_{n,e,w}$, as opposed to standard non-acoustic trickle vents everywhere else) is required for Bedrooms only due to the lower internal noise criteria within BS8233:2014.

The above mitigation yields the following predicted internal noise levels:

Predicted Summary

Façade	Time	Index	dB(A)
Position 1 Kitchen / Dining Room (Rear Elevation)	Rush	Leq	**33**
	Night	Leq	**27**
		Lmax	**42**
Position 1 Lounge (front elevation)	Rush	Leq	**35**
	Night	Leq	**30**
		Lmax	**43**
Position 1 Bedroom 4 (front elevation, second floor)	Rush	Leq	**33**
	Night	Leq	**27**
		Lmax	**42**

With regards to outdoor living spaces, any solid garden fence (e.g fence panels) will be sufficient to provide the necessary attenuation required to bring the noise level in the proposed garden down to 'desirable' criteria, especially when the noise level is averaged out over the course of the 16 hour day period, instead of being based on the noisiest 3 hour period measured.

Full calculation details may be found in Appendix 2 of this report.

Of course, these assessments are very robust as they use what are likely to be the noisier times of day and night instead of the average of the entire 16 hour day, and 8 hour night periods.

6.0 CONCLUSIONS/RECOMMENDATIONS

'Desirable' conditions (ref: BS8233:2014) are easily achievable with standard thermal double glazing (4/20/4) glazing and ventilation solutions, and standard garden fencing.

Please see Section 5.3 of this report, where we detail the ventilation & glazing performance used in our assessment and the predicted internal noise levels.

Appendix 1

Definition of Acoustic Terms

The Decibel

The decibel is the basic unit of noise measurement and is denoted dB. Technically, it is a means of expressing the difference in noise level between the measured noise and a standard level of noise. Most often the threshold of human hearing is used as the standard reference but is really should be stated. The threshold of human hearing is a sound pressure of 20□Pa or a sound power of 1pW.

A sound pressure level or SPL should be expressed in dB(re. 20□Pa). A sound power level or SWL should be expressed in dB(re. 1pW). If the reference levels are omitted, it will often (but not always) be safe to assume that they are referenced to the threshold of human hearing.

A-Weighting and dB(A)

The human hearing system responds differently to different frequencies. The A-weighting system takes account of this by emphasising mid and high frequencies more than low frequencies to given an overall level. An A-Weighted noise level, therefore, reflects the way normal, healthy hearing would perceive the overall level of the noise. The basic unit is dB(A), although other systems of expressing an A-weighted level are discussed below.

Other weighting systems, such as C-Weighting, denoted dB(C), reflect the human hearing system's response at higher noise levels.

Equivalent Continuous Sound Level, L_{eq}

This is a kind of mean noise level.

The unit is dB L_{eq}. For A-weighted levels the unit is dB(A) L_{eq} or, in more modern units, dB L_{Aeq}. The Noise at Work Regulations use $L_{eq(s)}$ which refers to a sample level.

Maximum Level, L_{max}

This is the maximum level reached (usually for a fraction of a second) in the measurement period.

The unit is dB L_{max}. For A-weighted levels the unit is dB(A) L_{max} or, in more modern units, dB L_{Amax}.

Statistical (Percentile) Levels, L_n

During a measurement of fluctuating noise, it is often useful to establish the levels exceed for a percentage of the time. L_n is the index representing the level exceeded for n% of the measurement period.

The unit is dB L_n. For A-weighted levels, the unit is dB(A) L_n or, in more modern units, dB L_{An}.

Common examples are as follows :-

dB L_{A90} is the A-weighted level exceeded for 90% of the time and is often used to describe the underlying background noise.

dB L_{A50} is the A-weighted level exceed for 50% of the time. Mathematically, it is the median, another kind of average.

dB L_{A10} is the A-weighted level exceeded for 10% of the time and has traditionally been used to describe the intermittent highs in the noise climate such as passing cars or aircraft.

Frequency Analysis

Here the audible frequency range is divided up into bands and the noise level is expressed in each frequency band form low pitches to high pitches.

Octave Band analysis is where the frequency range is divided into 8 bands from 63 Hz to 8kHz, or sometimes into 10 bands from 31.5 Hz to 16kHz.

1/3 Octave Band analysis provides more detailed subdivision into 24 bands from 50 Hz to 10kHz, or sometimes into 30 bands from 20Hz to 20kHz.

Narrow Band analysis takes this further with the possibility of many thousands of bands, possibly only 1Hz wide, or even less.

In all types of frequency analysis, the level in each band can be expressed in terms of L_{eq}, L_{max}, L_n, etc. as defined above.

Appendix 2

Measurement and Calculation Details

8th October 2021

START TIME / INDEX	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
07:00											
L_{eq}	**50**	60	60	56	50	46	45	40	34	31	27
L_{max}	**66**	72	75	71	65	57	62	56	54	56	59
L_{10}	**52**	62	62	59	53	48	48	42	36	30	18
L_{90}	**44**	55	55	48	45	41	40	34	26	18	10
07:15	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**51**	61	62	58	51	47	46	42	35	30	15
L_{max}	**68**	72	79	65	65	67	58	61	57	52	41
L_{10}	**53**	64	64	61	53	49	48	43	35	32	15
L_{90}	**46**	56	56	48	47	43	41	36	26	18	10
07:30	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**51**	62	62	58	51	46	45	40	41	34	16
L_{max}	**63**	73	79	67	65	56	52	55	56	52	44
L_{10}	**54**	64	64	61	54	49	48	42	45	38	15
L_{90}	**45**	57	56	49	46	43	41	35	28	19	10
07:45	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**51**	63	61	58	51	47	46	40	35	30	15
L_{max}	**65**	71	73	73	62	57	61	56	53	49	37
L_{10}	**52**	65	63	60	53	49	48	42	36	32	16
L_{90}	**45**	58	56	50	46	42	41	35	29	20	10
08:00	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**51**	63	62	57	51	47	46	41	35	27	15
L_{max}	**68**	77	78	74	64	66	63	61	56	48	41
L_{10}	**53**	65	63	60	54	49	48	43	37	29	15
L_{90}	**45**	59	56	48	46	42	41	36	28	18	10
08:15	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**51**	62	61	56	51	48	46	43	39	32	20
L_{max}	**73**	72	76	72	72	71	62	68	61	59	47
L_{10}	**53**	65	63	60	52	49	48	43	40	32	16
L_{90}	**46**	58	55	47	46	43	42	37	29	19	10

8th October 2021

START TIME / INDEX	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
15:30											
L_{eq}	**54**	61	61	61	54	50	50	45	41	32	27
L_{max}	**71**	76	73	77	69	64	64	66	61	51	51
L_{10}	**56**	63	64	62	55	52	52	47	41	34	22
L_{90}	**50**	56	56	56	50	46	46	40	32	22	11
15:45	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**56**	64	62	60	54	51	51	47	45	40	31
L_{max}	**78**	78	77	72	68	72	73	70	70	66	58
L_{10}	**56**	64	65	62	56	53	52	47	42	37	24
L_{90}	**48**	57	56	51	47	44	44	40	33	25	12
16:00	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**55**	62	62	60	56	51	51	45	38	33	27
L_{max}	**71**	77	75	76	75	68	62	60	54	55	54
L_{10}	**56**	64	65	62	56	53	52	47	40	32	20
L_{90}	**49**	57	56	53	50	46	46	40	31	22	12
16:15*	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**61**	61	65	65	63	60	54	50	44	35	20
L_{max}	**79**	72	81	78	77	77	75	69	64	55	44
L_{10}	**63**	64	70	69	65	62	56	53	46	38	22
L_{90}	**50**	56	54	57	50	46	46	40	32	22	12

** car idling for some time on Hebble Court*

16:30	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**53**	61	61	59	53	50	49	44	38	31	20
L_{max}	**74**	83	81	71	69	69	69	66	64	58	49
L_{10}	**55**	63	63	61	56	52	51	46	39	32	19
L_{90}	**48**	56	55	51	49	45	45	39	31	22	12
16:45	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**54**	60	61	58	53	49	50	45	40	35	24
L_{max}	**76**	78	81	72	68	72	70	69	68	62	53
L_{10}	**55**	62	64	61	56	51	51	46	40	33	19
L_{90}	**47**	55	54	50	47	44	44	39	30	21	11
17:00	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**56**	62	62	59	56	51	52	47	42	35	23
L_{max}	**79**	73	80	78	78	69	76	69	70	60	49
L_{10}	**57**	64	64	61	57	53	53	48	43	36	22
L_{90}	**49**	57	56	51	49	46	46	40	31	22	12
17:15	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**53**	61	60	58	52	48	49	44	36	28	15
L_{max}	**69**	74	77	69	68	61	67	60	54	46	40
L_{10}	**55**	63	63	61	54	51	51	46	38	29	16
L_{90}	**48**	56	54	50	48	45	45	39	30	20	11
17:30	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**55**	64	61	59	53	49	50	48	40	42	18
L_{max}	**77**	80	77	71	67	70	67	67	60	76	45
L_{10}	**56**	65	63	61	55	51	52	50	42	35	19
L_{90}	**49**	56	55	51	49	45	45	40	31	21	11

17:45	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**54**	62	60	59	54	49	50	46	41	36	25
L_{max}	**74**	78	78	76	72	65	66	66	68	63	53
L_{10}	**56**	66	62	61	57	52	52	47	42	37	21
L_{90}	**48**	55	54	52	49	45	45	39	31	22	11

18:00	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**55**	59	60	58	54	50	51	47	44	37	26
L_{max}	**78**	72	82	68	71	67	67	70	74	63	53
L_{10}	**57**	62	62	60	56	53	53	49	46	38	22
L_{90}	**48**	55	53	52	48	45	45	39	31	22	11

18:5	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**55**	60	59	62	56	51	50	46	39	32	20
L_{max}	**74**	73	75	83	76	71	66	62	59	53	42
L_{10}	**56**	62	62	60	56	52	52	48	40	35	21
L_{90}	**48**	55	54	51	48	45	44	38	30	21	11

18:30	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**55**	60	61	57	54	51	51	47	41	37	27
L_{max}	**75**	77	77	71	75	66	71	67	66	64	54
L_{10}	**57**	62	62	59	56	53	53	49	42	36	21
L_{90}	**49**	55	55	51	48	46	45	40	32	23	12

18:45	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**56**	63	59	55	56	55	50	47	42	35	22
L_{max}	**79**	89	76	66	77	81	69	68	64	54	45
L_{10}	**56**	64	62	58	57	52	51	47	43	37	23
L_{90}	**48**	56	53	50	48	45	44	39	32	23	12

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START TIME / INDEX	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
23:00											
L_{eq}	**49**	58	55	58	49	45	44	39	33	25	13
L_{max}	**62**	65	79	67	58	55	59	50	44	40	30
L_{10}	**53**	61	55	63	52	49	49	43	36	28	15
L_{90}	**41**	52	46	49	43	40	34	29	21	15	10
23:15	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**50**	58	52	60	49	46	45	39	32	24	12
L_{max}	**61**	67	69	67	58	57	58	53	44	37	16
L_{10}	**53**	61	55	63	52	48	49	44	34	27	14
L_{90}	**42**	52	46	51	44	40	37	31	22	15	10
23:30	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**52**	59	54	60	51	50	46	41	39	32	16
L_{max}	**75**	71	72	66	70	74	64	67	67	61	42
L_{10}	**53**	62	57	63	53	49	47	43	38	30	16
L_{90}	**43**	53	46	51	44	41	37	31	23	16	10
23:45	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**50**	58	52	60	49	46	44	38	32	25	13
L_{max}	**63**	64	64	67	59	65	56	50	46	40	28
L_{10}	**53**	61	55	63	52	49	48	42	35	28	14
L_{90}	**42**	52	46	51	44	40	36	31	23	16	10
00:00	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**50**	58	53	60	49	46	44	39	32	25	13
L_{max}	**65**	67	68	67	58	60	63	57	46	42	23
L_{10}	**52**	61	55	63	51	47	48	42	34	28	14
L_{90}	**42**	52	47	50	44	40	36	31	23	16	10
00:15	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**49**	59	52	57	49	45	44	38	32	25	12
L_{max}	**62**	65	67	67	59	59	59	52	43	35	24
L_{10}	**52**	61	54	63	52	47	47	40	35	28	14
L_{90}	**40**	53	46	46	43	39	34	28	21	15	10
00:30	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**48**	60	51	58	48	45	43	37	32	25	12
L_{max}	**61**	68	66	66	58	56	57	51	48	43	24
L_{10}	**51**	63	54	63	51	47	46	40	34	28	14
L_{90}	**41**	53	45	49	43	40	34	27	22	15	10
00:45	**dB(A)**	**31.5**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**	**16k**
L_{eq}	**49**	60	50	60	49	46	43	37	32	24	12
L_{max}	**61**	65	60	66	58	55	59	52	48	37	19
L_{10}	**52**	62	53	63	51	48	47	41	34	27	14
L_{90}	**41**	54	45	51	44	40	34	27	22	15	10

Measurement Summary

Time	Position	Index	**dB(A)**	63	125	250	500	1k	2k	4k	8k
Overall Rush Hour	1	Leq	**56**	61	60	56	53	51	46	42	36
		Lmax	**79**	76	66	77	81	69	68	64	54
		L90	**49**	54	52	48	45	45	39	31	22
Overall Early Night	1	Leq	**50**	53	59	49	46	44	39	34	27
		Lmax	**65**	68	67	58	60	63	57	46	42
		L90	**42**	46	50	43	40	35	29	22	15

Position 1 *Kitchen / Dining Room (Rear Elevation)*			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Width of Exposed Façade 1	13.80 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00 m		-	-	-	-	-	-	-	-	-
Total Exposed Façade Width	13.80 m		-	-	-	-	-	-	-	-	-
Element Height	2.50 m		-	-	-	-	-	-	-	-	-
Room Depth (re. Exposed façade 1)	0.00 m										
Element Area	34.50 m2		-	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	44.50 m2		-	-	-	-	-	-	-	-	-
Room Volume	57.40 m3		-	-	-	-	-	-	-	-	-
Assumed RT	0.50 s		-	-	-	-	-	-	-	-	-
Element Area Correction			-	16	16	16	16	16	16	16	16
Room Correction 10 x Log (RT/0.163/V)			-	-13	-13	-13	-13	-13	-13	-13	-13
Walls: Traditional Masonry	30.35 m2		-	23	32	41	47	49	53	58	55
Glazing: Rw = 31 dB (e.g Standard double glazing, 4+20+4)	4.15 m2		-	15	24	20	25	35	38	35	32
Vents: Non-acoustic eg. Simon Airstrip 300	10.00 m2		-	23	28	26	26	29	29	29	36
Composite SRI	44.50 m2		-	21	29	28	31	35	35	35	39
Level Difference (Reverberant only)			-	-17	-25	-24	-27	-31	-31	-31	-36
Allowance for flanking/workmanship	5 dB		-	5	5	5	5	5	5	5	5
Predicted Internal Levels	Rush	Leq	**33**	49	39	36	31	25	20	15	6
	Night	Leq	**28**	40	39	30	25	18	12	7	-4
		Lmax	**41**	55	46	39	38	37	30	20	12

Position 1 *Lounge (front elevation)*			***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Width of Exposed Façade 1	7.60 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00 m		-	-	-	-	-	-	-	-	-
Total Exposed Façade Width	7.60 m		-	-	-	-	-	-	-	-	-
Element Height	2.50 m		-	-	-	-	-	-	-	-	-
Room Depth (re. Exposed façade 1)	0.00 m										
Element Area	19.00 m2		-	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	29.00 m2		-	-	-	-	-	-	-	-	-
Room Volume	31.00 m3		-	-	-	-	-	-	-	-	-
Assumed RT	0.50 s		-	-	-	-	-	-	-	-	-
Element Area Correction			-	15	15	15	15	15	15	15	15
Room Correction 10 x Log (RT/0.163/V)			-	-10	-10	-10	-10	-10	-10	-10	-10
Walls: Traditional Masonry	15.25 m2		-	23	32	41	47	49	53	58	55
Glazing: Rw = 31 dB (e.g Standard double glazing, 4+20+4)	3.75 m2		-	15	24	20	25	35	38	35	32
Vents: Non-acoustic eg. Simon Airstrip 300	10.00 m2		-	23	28	26	26	29	29	29	36
Composite SRI	29.00 m2		-	21	28	27	29	33	33	33	38
Level Difference (Reverberant only)			-	-16	-24	-22	-24	-29	-29	-29	-33
Allowance for flanking/workmanship	5 dB		-	5	5	5	5	5	5	5	5
Predicted Internal Levels	Rush	Leq	**35**	50	41	39	33	27	23	18	8
	Night	Leq	**30**	41	40	32	27	21	15	10	-2
		Lmax	**43**	57	48	41	40	40	33	22	14

Position 1 *Bedroom 4 (front elevation, second floor)*			*dB(A)*	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
Width of Exposed Façade 1	6.91 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 2	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 3	0.00 m		-	-	-	-	-	-	-	-	-
Width of Exposed Façade 4	0.00 m		-	-	-	-	-	-	-	-	-
Total Exposed Façade Width	6.91 m		-	-	-	-	-	-	-	-	-
Element Height	2.42 m		-	-	-	-	-	-	-	-	-
Room Depth (re. Exposed façade 1)	0.00 m										
Element Area	16.72 m2		-	-	-	-	-	-	-	-	-
Effective Area (ie. with vents)	26.72 m2		-	-	-	-	-	-	-	-	-
Room Volume	21.78 m3		-	-	-	-	-	-	-	-	-
Assumed RT	0.50 s		-	-	-	-	-	-	-	-	-
Element Area Correction			-	14	14	14	14	14	14	14	14
Room Correction 10 x Log (RT/0.163/V)			-	-9	-9	-9	-9	-9	-9	-9	-9
Roof: With performance equal to: Tiled / Slated Roof, 25mm plasterboard ceiling with 100mm mineral wool.	15.24 m2		-	18	37	43	48	52	55	51	45
Glazing: Rw = 31 dB (e.g Standard double glazing, 4+20+4)	1.49 m2		-	15	24	20	25	35	38	35	32
Vents:Dn,e,w 33 dB (e.g. Simon acoustic TTF slimline 3000, frame vent)	10.00 m2		-	32	38	35	35	31	32	35	40
Composite SRI	26.72 m2		-	20	34	31	35	35	36	38	40
Level Difference (Reverberant only)			-	-14	-28	-26	-30	-29	-30	-32	-35
Allowance for flanking/workmanship	5 dB		-	5	5	5	5	5	5	5	5
Predicted Internal Levels	Rush	Leq	**33**	52	37	35	28	26	21	14	7
	Night	Leq	**27**	44	36	29	22	20	13	6	-3
		Lmax	**42**	59	43	38	35	39	31	19	13

Mitigation Summary

Room Type	Make-Up on Which Calulations are Based
Kitchen / Dining Room (Rear Elevation)	Walls: Traditional Masonry Glazing: Rw = 31 dB (e.g Standard double glazing, 4+20+4) Vents: Non-acoustic eg. Simon Airstrip 300
Bedroom 4 (front elevation, second floor)	Roof: With performance equal to: Tiled / Slated Roof, 25mm plasterboard ceiling with 100mm mineral wool. Glazing: Rw = 31 dB (e.g Standard double glazing, 4+20+4) Vents:Dn,e,w 33 dB (e.g. Simon acoustic TTF slimline 3000, frame vent)
Lounge (front elevation)	Walls: Traditional Masonry Glazing: Rw = 31 dB (e.g Standard double glazing, Vents: Non-acoustic eg. Simon Airstrip 300

Predicted Summary

Façade	Time	Index	**dB(A)**	63	125	250	500	1k	2k	4k	8k
Position 1 Kitchen / Dining Room (Rear Elevation)	Rush	Leq	**33**	49	39	36	31	25	20	15	6
	Night	Leq	**27**	44	36	29	22	20	13	6	-3
		Lmax	**42**	59	43	38	35	39	31	19	13
Position 1 Lounge (front elevation)	Rush	Leq	**35**	50	41	39	33	27	23	18	8
	Night	Leq	**30**	41	40	32	27	21	15	10	-2
		Lmax	**43**	57	48	41	40	40	33	22	14
Position 1 Bedroom 4 (front elevation, second floor)	Rush	Leq	**33**	52	37	35	28	26	21	14	7
	Night	Leq	**27**	44	36	29	22	20	13	6	-3
		Lmax	**42**	59	43	38	35	39	31	19	13