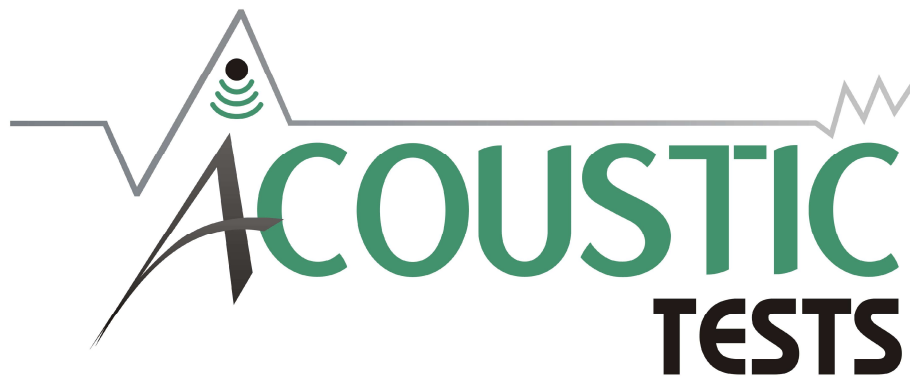




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APF/C/AFA859

30th August 2023

PLANET PAWS (BURY) LTD

Assessment of noise impact of the
proposed dog daycare centre at Unit 2,
Hulme Street, Bury.

Prepared for:-

Beth Ward, Planet Paws (Bury) Ltd

Report Prepared by:

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1.0 SUMMARY

A dog day care centre is proposed at an existing industrial unit on Hulme Street, in Bury.

The majority of the dogs will be inside during the opening hours of the facility, but there is a proposed outdoor area on the 'rear' elevation of the building, further into the industrial site grounds.

Using some assumptions provided by our client as to maximum number of dogs at the facility and the number of dog barks per dog, per 1 hour period, we have built a model and assess several scenarios likely to approach a 'worst case' of the predicted noise levels from dog barking at the nearest noise sensitive property.

With regards to BS4142:2014's interpretation of the proposed dog day care centre: The predicted 'rating level' of the noise from dogs from the day care facility falls between 13 and 9 dB below the lowest measured background sound level at the assessment location¹.

BS4142:2014 states "Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a **low impact, depending on the context**".

Please see Section 6.5 for a discussion regarding the context.



Andrew Frisby MIOA

¹ Based on client estimates regarding dog locations, and number of barks per dog per hour. See Section 6 for full details.

2.0 INTRODUCTION

Acoustic Tests were asked to carry out an independent assessment of the above site with regards to the impact of a proposed dog day care centre.

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 and context.

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
		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 BS 4142, BS 8233, etc.) and the potential impact on wildlife.

3.2 BS8233

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 15 dB 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 does not explicitly state 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 BS4142

BS 4142 was updated in November 2014. The standard is very complicated but, basically, it describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- sound from industrial and manufacturing processes
- sound from fixed installations which comprise mechanical and electrical plant and equipment

- c) sound from the loading and unloading of goods and materials at industrial and/or commercial premises
- d) sound from mobile plant and vehicles that is an intrinsic part of the overall sound emanating from premises or processes, such as that from forklift trucks, or that from train or ship movements on or around an industrial and/or commercial site.

The methods described in this British Standard use outdoor sound levels to assess the likely effects of sound on people who might be inside or outside a dwelling or premises used for residential purposes upon which sound is incident.

Characteristics and Context

Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, we need to add a character correction to the specific sound level to obtain the rating level.

These features can include tonality, impulsivity and intermittency with corrections typically ranging potentially from 0dB to 9 dB. Corrections at the higher end would represent characteristics which are highly perceptible in the context of the ambient noise as a whole. Corrections at the lower end would represent characteristics which are just perceptible in the presence of the ambient noise as a whole,

The significance of sound of an industrial and/or commercial nature depends upon both the margin by which the rating level of the specific sound source exceeds the background sound level and the context in which the sound occurs. An effective assessment cannot be conducted without an understanding of the reason(s) for the assessment and the context in which the sound occurs/will occur. When making assessments and arriving at decisions, therefore, it is essential to place the sound in context.

Assessment

We obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level and considering the following.

- a) Typically, the greater this difference, the greater the magnitude of the impact.
- b) A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.

- c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.
- d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant 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, depending on the context.

Where the initial estimate of the impact needs to be modified due to the context, pertinent factors need to be taken into consideration, including the following.

- 1) The absolute level of sound.

For a given difference between the rating level and the background sound level, the magnitude of the overall impact might be greater for an acoustic environment where the residual sound level is high than for an acoustic environment where the residual sound level is low.

Where background sound levels and rating levels are low, absolute levels might be as, or more, relevant than the margin by which the rating level exceeds the background. This is especially true at night.

Where residual sound levels are very high, the residual sound might itself result in adverse impacts or significant adverse impacts, and the margin by which the rating level exceeds the background might simply be an indication of the extent to which the specific sound source is likely to make those impacts worse.

- 2) The character and level of the residual sound compared to the character and level of the specific sound.

We need to consider whether it would be beneficial to compare the frequency spectrum and temporal variation of the specific sound with that of the ambient or residual sound, to assess the degree to which the specific sound source is likely to be distinguishable and will represent an incongruous sound by comparison to the acoustic environment that would occur in the absence of the specific sound. Any sound parameters, sampling periods and averaging time periods used to undertake character comparisons should reflect the way in which sound of an industrial and/or commercial nature is likely to be perceived and how people react to it.

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

Please see Section 6.5 for a discussion on the appropriateness of BS4142:2014+A1 to assess noise from dogs barking.

3.4 Local Authority Criteria

We are not aware of any local authority criteria, beyond the request for a noise assessment.

4.0 GUIDE TO MODELLING

1. We begin by using data for 1 dog from the reasonably well-known 'South Holland District Council' planning guidance document for dog boarding and kennels. The values below are for 1 dog barking for 10 minutes at 10m.

Acoustic Spectrum of 1 Dog Barking.

Frequency (Hz)	125	250	500	1K	2K	TOTAL
dB(A)	26.0	38.5	60.9	63.1	55.4	65.6

Values at 63Hz and 8 kHz are extrapolated using some basic assumptions².

2. This source data is first converted into its corresponding Sound Power Level (SWL) then corrected for the expected duration of a single bark, which is assumed to be a single second., and then further adjusted for the anticipated number of barks per hour. The estimated number of barks figure was provided by the client who has experience running dog day care facilities, and in any case, we will later show that there is likely scope for significantly more total barks per hour before the measured background sound level at the assessment location is exceeded by the Rating Level.
3. We then calculate the internal noise level, including the reverberant build up, based on the number of dogs likely to be inside at any given time and predict the sound pressure level at the internal edge of the wall closest to the assessment location in question.
4. We then calculate the composite sound reduction index of this wall, including any roller shutter doors, and subtract this composite SRI from the predicted SPL at the edge of the room. In addition to this, a 6 dB correction is applied (reverberant to free-field correction, also known as an inside to outside correction).
5. The noise level just outside the wall is converted back into a SWL and then distance corrected to the assessment location to give the predicted noise level breaking out from the nearest wall of the proposed day care facility to the

² That the 63 Hz is 3 dB less than 125 Hz value, and that the 4 & 8 kHz values fall off at 3 dB per octave band, which should err on the side of caution.

assessment location. Steps 4 and 5 are repeated for the roof of the proposed day care facility.

6. We are advised that there will be up to 20 dogs in any given 1 hour period. Barking will be rare but we are advised that there could be up to two barks per dog per hour. We assume that typically 15 dogs are inside, and 5 dogs are outside, but provide differing numbers of inside / outside barks for comparison in the model.
7. The noise from barking outside is derived slightly differently from noise inside, by using the same basic data from South Holland for a single dog, correcting this to a dog barking for the whole hour at 10 metres, then the whole hour at 1m, and then down to an individual 1 second bark at 1 metre. This figure is then used as the basis for the outdoor model noise level, much like an 'SEL' (see Appendix 1). We then consider distance and barrier attenuation to the assessment location.
8. All of the three major pathways are logarithmically summed to give us the 'Specific Noise Level' at the assessment location.
9. Feature corrections are now considered, and applied, arriving at the Rating Level'. We compare the Rating Level with the lowest measured background sound level at the assessment location and draw our conclusions (depending on the context) in line with BS4142:2014+A1.

5.0 SURVEY DETAILS

5.1 Site times and Personnel

The survey was carried out by Rob Smith MIOA of Druk Limited on 23rd August 2023 at various intervals between 09:30 to 16:00 to represent what is likely to be one of the quietest times of day during the proposed opening hours of the day care centre.

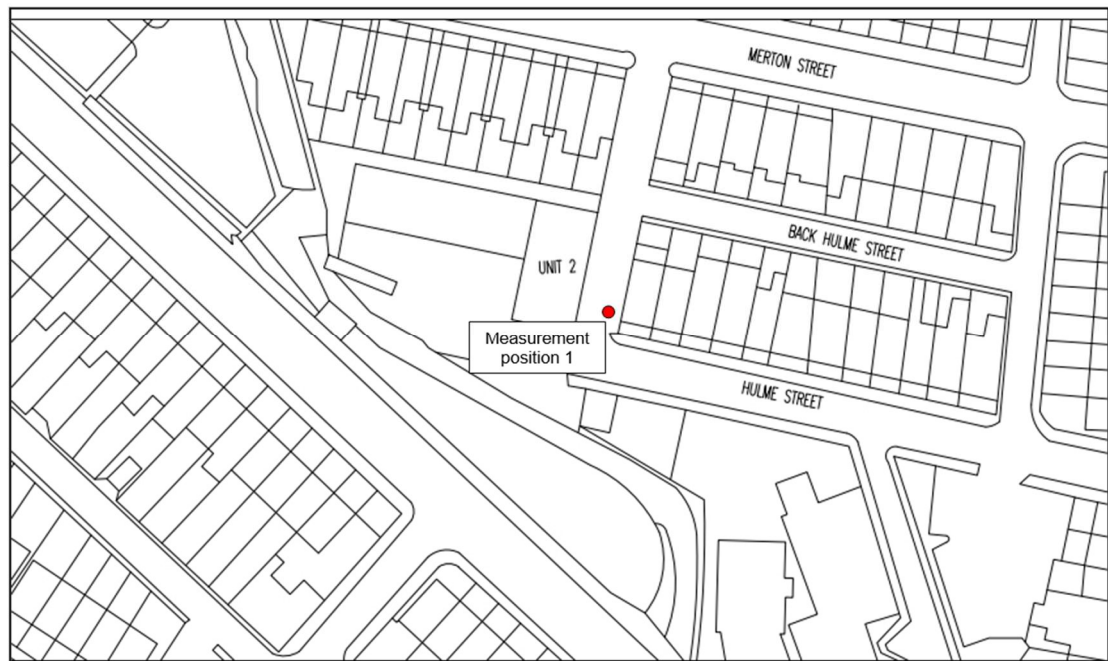
5.2 Instrumentation

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

The sound level meter was field-calibrated before and after the measurements with no drift noted.

5.3 Measurement Positions / Assessment Location

The locations relevant to this assessment are shown on the following plan.



Unit 2 is the location of the proposed day care centre, and measurement position 1 measures the noise climate at the assessment location.

The chosen assessment location is the front corner of the gable end wall of the nearby end-terraced house, immediately next to the measurement position shown above.

The microphone was 1.5 m and as far away from other reflecting surfaces as possible given the locations involved.

5.4 Survey Conditions

‘Daytime’ weather conditions were as follows :-

Weather: surfaces damp from previous rain showers, cloud cover $\approx 90\%$, temperature $\approx 19^{\circ}\text{C}$, barometric pressure $\approx 1003\text{mb}$, wind speed $< 0.3\text{m/s}$ average.

The general noise climate over the course of the survey was assumed to be representative of typical conditions in this location.

6.0 RESULTS AND DISCUSSIONS

6.1 Basic Results

The lowest measured L90 occurred during the first hour of the survey between 10:30 and 11:30am:

Time	Index	dB(A)
10:30 - 11:30	Leq	54
	L90	47
	Lmax	79

In general the existing noise climate was regarded as being urban in character with the principal contributor being road traffic, mainly on the B6213 Tottington Road (to the South) and the B6214 Crostons Road (to the East). Some additional traffic was noted on Hulme Street, Back Hulme Street and Merton Street. Pertinently, occasional infrequent dog barking was heard from some residential properties in the vicinity.

Additional noise contributions were made by occasional emergency vehicles on Tottington Road and occasional overflying aircraft.

The general opinion was that the afternoon period was noisier than the morning period, which is corroborated by the measurement data.

By using the quietest hour measured we reduce the uncertainty inherent within the BS4142 assessment, to err on the side of caution.

Attempts were initially made to measure the 'level difference' between a generated sound pressure level of pink noise played through a loudspeaker (inside the existing unit, and the proposed 'outdoor area' to the rear) to the assessment location in question. However, a combination of the level of sound insulation / sound attenuation and the high underlying residual noise level meant measurements of the attenuation / level difference was not possible to measure reliably. Observations were that the roller shutter door directly opposite the end terraced property was the obvious weak spot in the façade, the sound insulation of which could easily be improved with a wall lining treatment on the internal side, provided access is not needed for fire, or other regulatory purposes.

Whilst this makes the assessment slightly more complex by involving more theoretical modelling, it provides a positive indication that any new noise sources introduced in this location will be subject to significant attenuation.

See discussion of uncertainty in Section 6.5.

6.2 Site Layout

The following image shows the proposed internal and external layout of the proposed dog day care facility:



For the sake of calculation, we assume the roller shutter doors are closed.

However, later in this report, we demonstrate that even with all dogs outside, barking two times each per hour³, the predicted rating level does not exceed the measured background sound at the assessment location, and as such the rear roller shutter door into the outdoor play area, should comfortably be able to be left open during the facility's opening hours from a noise perspective.

6.3 Dog Behaviour / Company Policy

Whilst barking from dogs is not within the direct control of the staff of the day care centre, barking will be actively discouraged through a variety of means such as calming spaces etc.

³ Or 10 dogs outside with each dog barking 10 times an hour.

Additionally, our client informs us that measures have been put in place to ensure that any dogs with poor behaviour and/or excessive barking will be denied future access to the facility. This is not however anticipated to be a regular occurrence.

6.4 Modelling Results & BS4142:2014+A1 Assessments

Please see Appendix 2 for full details of the modelling undertaken to reach the following predicted specific noise levels of dog barks from the proposed day care centre at the assessment location.

These specific noise levels are presented under varying scenarios, and under each BS4142 assessment we provide brief commentary on the permutations, and implications of the model and assessment shown:

Scenario 1: 15 dogs inside, 5 dogs outside, 2 barks per dog, per hour (40 barks):

BS4142:2014 'Daytime' Assessment	Index	dBA
Predicted Specific Sound Level @ Assessment Location	L _{eq}	25
10:30 - 11:30: Measured L90	L ₉₀	47
Intermittency? Yes: Any audible dog barking during quieter moments will be intermittent at the assessment location.	dB	3
Tonality? No, dog barking can not be considered tonal.	dB	0
Impulsivity? Yes: Any audible dog barking during quieter moments may be 'clearly perceptible'.	dB	6
Rating Level	L _{Ar}	34
Rating Level Vs. Background Sound Level (L90)	dB	-13

This model is based upon our client's best estimate of the likely occurrence of barking in a given 1 hour period per dog, and the distribution of dogs within the day care facility.

Where the predicted rating level does not exceed the background sound level, this is "*an indication of the specific sound source having a low impact, depending on the context*".

Scenario 2: 0 dogs inside, 20 dogs outside, 2 barks per dog, per hour (40 barks):

BS4142:2014 'Daytime' Assessment	Index	dBA
Predicted Specific Sound Level @ Assessment Location	L _{eq}	29
10:30 - 11:30: Measured L90	L ₉₀	47
Intermittency? Yes: Any audible dog barking during quieter moments will be intermittent at the assessment location.	dB	3
Tonality? No, dog barking can not be considered tonal.	dB	0
Impulsivity? Yes: Any audible dog barking during quieter moments may be 'clearly perceptible'.	dB	6
Rating Level	L _{Ar}	38
Rating Level Vs. Background Sound Level (L90)	dB	-9

This model shows confirms that the rear roller shutter door should comfortably be able to be left open for ventilation / access purposes.

Where the predicted rating level does not exceed the background sound level, this is “an indication of the specific sound source having **a low impact, depending on the context**”.

Scenario 3: 10 dogs inside, 10 dogs outside, 10 barks per dog, per hour (200 barks - overestimated worst-case example):

BS4142:2014 'Daytime' Assessment	Index	dBA
Predicted Specific Sound Level @ Assessment Location	L _{eq}	34
10:30 - 11:30: Measured L90	L ₉₀	47
Intermittency? Yes: Any audible dog barking during quieter moments will be intermittent at the assessment location.	dB	3
Tonality? No, dog barking can not be considered tonal.	dB	0
Impulsivity? Yes: Any audible dog barking during quieter moments may be 'clearly perceptible'.	dB	6
Rating Level	L _{Ar}	43
Rating Level Vs. Background Sound Level (L90)	dB	-4

This model shows that even if we increase the estimated number of barks by around a factor of 5 (i.e. from 40 barks per hour, to 200 barks per hour) the predicted rating level still falls 4 dB below the measured background sound level.⁴

Where the predicted rating level does not exceed the background sound level, this is “an indication of the specific sound source having **a low impact, depending on the context**”.

6.5 Context

With particular reference to using BS4142:2014 to assess animal noise, the document states the following:

“The standard is not intended to be applied to the rating and assessment of sound from:... e) domestic animals;”.

However, the UK’s main body for Acoustic Consultants (The Association of Noise Consultants) formed a working group and authored a technical note (“BS 4142:2014+A1:2019 Technical Note”) to comment on various facets of BS4142 and stated the following:

“The majority view of the WG was that the test for exclusion of ‘domestic animals’ (Subclause 1.3e) is applied to the setting rather than the type of animal. Animals kept

⁴ This depends slightly on the arrangement of dogs re: indoor / outdoor space, but an even split provides a reasonable representation.

on domestic premises are therefore considered to be beyond the scope of BS 4142 whilst the same animals in a commercial setting could, in theory, be within the scope, e.g. a kennel. A minority view held that BS 4142 should only apply to sound of an industrial nature and would not cover domestic animals in any setting."

It is therefore our view that a BS4142:2014+A1 assessment is relevant in this case.

The context of this assessment is that the proposed dog day care centre is in an existing industrial site, surrounded by residential housing. The existing use of the unit was for that of stair manufacturing company, and as such, this is likely to have generated significant levels of noise (sawing timber, drilling, moving large items / deliveries, etc). It's not possible to say whether the level of noise produced by Unit 2 during its previous usage was greater than that predicted here, but it is possible.

One thing that is likely to change with regards to the noise climate is its character. During quieter moments in the local noise climate - dog barking could be easily distinguishable compared to industrial type noise, however, dog barking from surrounding residences was noted on a couple of occasions during our time on site, so it is not the introduction of an entirely new source of noise.

Dog day care facilities are not the same as kennels, where dogs are often left unattended for several hours, and overnight. The day care centre has opening hours of 0700 – 18:00, Monday to Friday. The client intends to have four employees for 20 dogs - 5 dogs per employee. The client us informs us that in her experience, dogs mostly bark out of boredom, and the dogs in this facility will be continuously attended to, with measures taken to ensure excessive barking does not occur repeatedly.

BS8233:2014

Considering the maximum predicted 1 hour noise level of 34 dB L_{Aeq} at the assessment location, it is evident that no problems with regards to BS8233:2014 internal noise level recommendations should exist.

An open window provides approximately 15 dB attenuation to the external noise level incident upon it, meaning that the internal noise level in a room (resulting from dog barking over a 1 hour period) would be approximately 19 dB (34 – 15). BS8233:2014's recommendations for the upper limit for 'desirable' conditions in bedrooms during the daytime is 35 dB L_{Aeq} which the estimated 19 dB $L_{Aeq(1 \text{ hour})}$ is far below.

With regards to outdoor living areas, a similar picture emerges. BS8233:2014 recommends a 'desirable' noise limit of 50 dB L_{Aeq} during the daytime, which the predicted noise level is some 16 dB below in both garden areas modelled (34 dB $L_{Aeq(1 \text{ hour})}$)

6.6 Discussion of Uncertainty

BS4142 requires us to

“Consider the level of uncertainty in the data and associated calculations. Where the level of uncertainty could affect the conclusion, take reasonably practicable steps to reduce the level of uncertainty”.

The measurements of Background/Residual Sound were taken at times regarded as representing what are likely to be one the ‘worst case’ (quietest) time of the day during the proposed opening hours.

We have used estimates from our client of the number of dog barks per dog, per hour. If this were to differ significantly from what actually occurs, then this could affect the predicted 1 hour noise level proportionally to whether the model was over or underestimating the number of barks. Underestimating would mean that the predicted noise level in this report would be lower than in actuality, and overestimating would mean the predicted noise level in this report would be higher than in actuality.

We have assessed the maximum number of dogs that our client intends to accommodate and have assumed that all of the dogs bark, when there is no guarantee that any will bark in a given hour. This, again, would qualify as a ‘worst case’ assessment as far as number of ‘sources’ is concerned, as it is entirely possible that in any given hour, less than 20 dogs may be present on site.

We have not taken into account the additional absorption of the mezzanine floor, and have made generally pessimistic assumptions regarding the amount of absorption internally within the space. Were more absorption to be present in the space, the internal noise levels (and hence subsequent external noise levels from the inside space) would be reduced proportional to this increase.

Meteorological conditions are unlikely to have had the most significant impact on the uncertainty of the assessment conclusions, as all significant noise sources will be local to the assessment location.

7.0 CONCLUSIONS

With regards to BS4142:2014's interpretation of the proposed dog day care centre: The predicted 'rating level' of the noise from dogs from the day care facility falls between 13 and 9 dB below the lowest measured background sound level at the assessment location⁵.

The estimated number of barks per dog per hour may be increased by a factor of around 5 and the predicted rating level still falls significantly below the measured background sound level.

BS4142:2014 states "*Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a **low impact, depending on the context***".

Please see Section 6.5 for a discussion regarding context.

With regards to BS8233:2014: The predicted $L_{Aeq(1 \text{ hour})}$ levels from 'dog barking' at the day care centre in both the nearby residential gardens, and inside the nearest rooms (with a partially open window) should fall comfortably below the recommend upper limits for 'desirable' conditions for both the gardens, and internal rooms.

We recommend this report is submitted to the local authority. If the local authority have any queries, we would be happy to be contacted directly by them to discuss.

⁵ Based on client estimates regarding dog locations, and number of barks per dog per hour. See Section 6 for full details.

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 it really should be stated. The threshold of human hearing is a sound pressure of 20µPa or a sound power of 1pW.

A sound pressure level or SPL should be expressed in dB(re. 20µPa). 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 give 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 levels are discussed below.

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

NR and NC Levels

NR curves and NC curves are a series of curves representing noise levels across the frequency range. A given noise climate has an NR level or NC level if it equals a point on the curve at any frequency. They are particularly, although by no means exclusively, used as a means of specifying noise limits in an indoor environment, for instance from mechanical services or traffic noise break-in from the outside. They are typically expressed as NR or NC followed by a number, e.g. NR40, NC55, etc.

Equivalent Continuous Sound Level, L_{eq}

This can be simplistically described as a way of expressing the average 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} .

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 $L_{A\max}$.

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 exceeded 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.

SEL

"SEL" (Single Event Level) is a metric that is valuable for assessing the impact of impulsive or transient noises by squashing the sound energy of the event into a 1-second interval, providing a comprehensive measure of intensity and duration within a concise standardised time frame.

Frequency Analysis

Here the audible frequency range is divided up into bands and the noise level is expressed in each frequency band from 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.

Sound Insulation

Sound insulation is best expressed across the frequency range in octave bands or third octave bands. Often, however, in known environments such as domestic sound insulation and speech privacy, it is simpler to express the sound insulation as a single figure. A higher value means better sound insulation.

The most common ways are $dB D_{nTw}$, $dB R_w$ and $dB_{(mean\ 100-3150Hz)}$. The first two are ways of expressing average sound insulation, weighted to account for speech frequencies. The third is simply an un-weighted mean value.

The Building Regulations Approved Document E (ADE) routinely refer to $D_{nTw} + C_{Tr}$. The C_{Tr} term is a negative number which is used to modify the D_{nTw} value for the insulation properties at lower frequencies.

ADE also uses the L_{nTw} index for impact sound transmission. It is a measure of the level of noise in the room below a room in which a standard tapping machine is being used. It represents the impact sound transfer such as footfall noise, scraping chairs, washing machines, etc. A lower value means better insulation.

Reverberation Time

The most common measure of Reverberation Time is, effectively the time taken for sound from a steady source to decay by 60 dB after it has been abruptly cut off. In practice it is often difficult to measure a 60 dB decay and so decays of 30 dB, 20 dB, or even 10 dB are often used and adjusted pro rata, although the exact measure is not quite the same.

Reverberation Time is generally expressed as RT in seconds. We may, if we are being precise, add subscripts 60, 30, etc to show whether the basis of the measure is 60 dB decay, 30 dB decay, etc. E.g. the $RT_{60} = 0.52s$, the $RT_{30} = 0.49s$, etc.

RT can be expressed in octave bands or 1/3 octave bands across the frequency range, or at central frequencies such as 500 Hz or 1kHz.

Appendix 2: Measurement and Calculation Details

Measurement Data @ 'Assessment Location'

Unit 2, Hulme Street, Bury

Existing noise climate survey. Position 1

23rd August 2023

Octave Band Centre Frequency, Hz.	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
10:30											
L_{eq}	52	59	61	52	48	45	49	45	37	28	19
L_{max}	61	72	72	64	60	57	56	53	47	45	42
L_{10}	55	62	65	55	50	48	53	48	40	30	19
L_{90}	45	53	52	45	42	40	43	38	28	18	10
10:35											
L_{eq}	54	60	61	52	50	48	51	46	39	30	21
L_{max}	67	78	71	64	61	59	63	62	54	46	47
L_{10}	56	63	64	56	53	51	54	49	42	33	21
L_{90}	47	54	53	46	44	42	45	40	31	20	11
10:40											
L_{eq}	55	64	62	53	50	49	52	48	42	36	26
L_{max}	72	80	75	64	64	64	70	63	56	58	48
L_{10}	56	68	65	57	52	51	53	48	43	37	25
L_{90}	49	54	53	47	45	43	47	42	32	22	12
10:45											
L_{eq}	53	63	62	54	49	47	50	46	38	30	20
L_{max}	65	75	74	68	59	57	58	61	55	52	39
L_{10}	56	67	65	55	51	49	53	49	41	32	20
L_{90}	48	57	56	48	45	42	46	41	31	22	11
10:50											
L_{eq}	53	63	62	53	49	47	50	46	39	32	24
L_{max}	65	78	74	69	62	60	60	58	51	43	47
L_{10}	56	67	66	56	52	50	53	50	42	35	23
L_{90}	47	55	56	46	43	41	45	39	30	25	14
10:55											
L_{eq}	54	61	63	56	49	48	51	46	38	30	20
L_{max}	64	73	77	73	61	59	58	56	49	41	36
L_{10}	56	64	65	55	52	50	54	49	40	33	23
L_{90}	46	56	56	47	43	41	44	38	30	23	13
11:00											
L_{eq}	53	60	64	53	50	48	50	45	37	29	18
L_{max}	67	73	77	64	62	62	63	61	56	47	39
L_{10}	56	63	67	56	53	50	53	48	39	31	20
L_{90}	46	54	55	46	43	40	44	39	29	20	11
11:05											
L_{eq}	53	59	63	55	48	47	50	45	38	29	19
L_{max}	61	71	76	72	56	54	56	52	50	45	44
L_{10}	56	62	67	57	51	50	53	48	41	32	19
L_{90}	43	54	52	45	41	38	41	36	27	18	11
11:10											
L_{eq}	52	61	62	52	48	45	49	44	36	29	17
L_{max}	62	71	75	64	58	55	58	53	48	51	37
L_{10}	54	64	66	54	50	48	51	47	39	31	18
L_{90}	44	53	51	45	41	39	42	37	28	19	11
11:15											
L_{eq}	56	64	61	59	51	50	52	50	41	34	26
L_{max}	79	79	73	79	66	68	72	77	55	52	48
L_{10}	56	66	64	57	52	52	53	48	41	35	24
L_{90}	49	57	54	48	45	43	46	42	33	23	12
11:20											
L_{eq}	53	61	59	52	51	48	49	45	42	35	21
L_{max}	65	76	69	62	69	61	56	59	51	43	30
L_{10}	55	64	62	55	52	51	52	48	45	38	25
L_{90}	44	54	52	46	41	39	41	38	31	23	12
11:25											
L_{eq}	54	65	61	51	47	46	50	47	44	37	28
L_{max}	62	83	77	61	54	53	58	53	50	51	50
L_{10}	56	64	64	53	50	49	53	49	46	39	26
L_{90}	48	53	52	46	43	42	45	42	36	28	14

Octave Band Centre Frequency, Hz.	dB(A)	31.5	63	125	250	500	1k	2k	4k	8k	16k
15:00											
L_{eq}	59	63	63	57	50	48	50	47	56	46	42
L_{max}	88	75	80	73	64	64	63	71	86	74	66
L_{10}	55	66	64	55	51	48	52	47	41	38	41
L_{90}	49	55	54	47	45	43	45	41	36	37	40
15:05											
L_{eq}	54	67	63	57	51	49	50	47	41	38	41
L_{max}	74	82	81	77	74	70	68	66	61	56	49
L_{10}	55	72	65	59	53	49	52	48	42	39	41
L_{90}	47	55	55	47	45	40	43	39	35	37	40
15:10											
L_{eq}	60	61	62	53	51	58	56	53	43	40	41
L_{max}	83	81	79	69	73	83	78	76	67	59	49
L_{10}	56	62	65	55	51	49	53	49	41	39	41
L_{90}	48	55	54	47	44	41	45	40	36	37	40
15:15											
L_{eq}	54	63	65	55	50	47	50	46	39	38	41
L_{max}	61	79	74	64	57	57	55	53	49	42	41
L_{10}	55	65	68	59	53	49	52	48	40	38	41
L_{90}	47	57	58	49	46	42	43	39	36	37	40
15:20											
L_{eq}	64	62	60	52	49	46	59	61	47	38	41
L_{max}	84	77	74	62	59	57	79	81	66	50	42
L_{10}	58	64	62	54	50	49	54	54	44	39	41
L_{90}	49	55	54	47	45	42	46	42	36	37	40
15:25											
L_{eq}	55	70	63	56	51	49	51	47	42	39	41
L_{max}	71	82	76	68	62	63	67	66	55	50	43
L_{10}	57	74	64	59	54	52	53	49	44	40	41
L_{90}	48	57	56	48	45	43	44	40	36	37	40
15:30											
L_{eq}	55	73	61	54	52	51	51	47	41	39	41
L_{max}	69	81	73	69	67	68	61	61	58	57	47
L_{10}	57	74	64	56	54	53	53	49	43	39	41
L_{90}	50	64	56	49	47	46	46	42	37	37	40
15:35											
L_{eq}	55	65	65	54	51	48	51	48	42	39	41
L_{max}	68	79	81	71	66	61	63	62	57	51	43
L_{10}	57	68	67	57	53	50	54	50	44	40	41
L_{90}	48	56	55	47	46	42	44	40	35	37	40
15:40											
L_{eq}	54	61	62	52	49	49	50	46	39	38	41
L_{max}	64	81	76	64	61	66	56	52	45	43	50
L_{10}	56	63	65	55	51	50	53	48	42	38	41
L_{90}	48	54	54	46	46	42	45	41	36	37	40
15:45											
L_{eq}	54	60	60	51	48	46	51	46	41	39	41
L_{max}	70	75	72	66	60	58	66	65	55	47	42
L_{10}	55	62	62	53	50	48	53	48	42	40	41
L_{90}	48	53	55	46	44	40	44	40	36	37	40
15:50											
L_{eq}	53	63	61	53	49	48	50	46	41	39	41
L_{max}	64	77	72	69	55	57	61	58	50	43	44
L_{10}	55	64	64	55	51	50	52	48	43	40	41
L_{90}	49	56	56	48	45	43	46	42	37	37	40
15:55											
L_{eq}	55	66	65	57	53	50	52	47	42	39	41
L_{max}	70	79	80	69	70	67	65	60	57	49	47
L_{10}	57	68	68	61	56	53	53	49	44	40	41
L_{90}	50	59	56	48	46	44	47	43	36	37	40

10:30 – 11:30 Average⁶

Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Leq	54	62	54	49	47	50	46	40	33
L90	47	53	46	43	41	44	39	31	22
Lmax	79	73	79	66	68	72	77	55	52

Modelling⁷:

<i>Item / Process (Outside model)</i>	<i>Index</i>	dB(A)	63	125	250	500	1k	2k	4k	8k
South Holland: 1 dog barking for 10 minutes @ 10 metres in 1 hour	Leq	66	41	42	47	64	63	57	54	43
If dog was barking all the 1 hour period @ 10m	Leq	74	49	50	55	72	71	64	62	51
Dog barking @ 1 meter instead of 10m	Leq	94	69	70	75	92	91	84	82	71
Dog bark only 1 second in 1 hour period	Leq	58	33	34	39	56	55	49	46	35
100 x 1 second dog barks SPL spread over 1 hour @ 1m	Leq	78	53	54	59	76	75	69	66	55

<i>Item / Process (Outside model)</i>	dB(A)	63	125	250	500	1k	2k	4k	8k
Barrier correction for outdoor area 'over top'	-	-13	-16	-19	-22	-25	-28	-31	-34
Barrier correction for outdoor area 'around side'	-	-10	-13	-16	-19	-22	-25	-28	-31
Barrier attenuation considering both pathways	-	-8	-11	-14	-17	-20	-23	-26	-29

<i>Item / Process (Inside Model)</i>	<i>On Time</i>	<i>Index</i>	dB(A)	63	125	250	500	1k	2k	4k	
Sound Power of Single Dog Barking (10 minutes out of 1 hour)	600	SWL	95	78	71	76	93	92	83	80	79
Correction for single bark (1 bark = 1 second)	1	-	-	-28	-28	-28	-28	-28	-28	-28	-28
Correction for 100 barks (inside)	100	SWL	-	20	20	20	20	20	20	20	20
Overall Correction for inside	-	-	-	-8	-8	-8	-8	-8	-8	-8	-8
SWL of dog barks (inside)	-	SWL	87	70	63	68	85	84	75	73	72

⁶ Leq and L90 are logarithmic averages

⁷ Overestimated worst-case' variables presented, for other model details, please contact us directly.

Room dimensions

Length	12.34	m
Width	7.55	m
Height	5	m
Room Volume	465.835	m3
Surface Area	385.234	m2

Acoustic Data

Mean Absorption or RT60 (a or RT) a ok

<u>Element Surface Covering</u>	<u>Element Area</u>		63	125	250	500	1k	2k	4k	8k
Rough Concrete	0	m ²	0.02	0.02	0.03	0.03	0.03	0.04	0.07	0.10
Carpet, thin, over thin felt on concrete	93.167	m ²	0.03	0.10	0.15	0.25	0.30	0.30	0.30	0.20
Seats (No. of, not m ²)	6	m ²	0.12	0.24	0.26	0.27	0.31	0.37	0.38	0.38
Painted Brick	0	m ²	0.00	0.01	0.01	0.02	0.02	0.02	0.03	0.04
Wood Panelling	10	m ²	0.33	0.31	0.33	0.14	0.10	0.10	0.12	0.15
Plasterboard on Battens	276.067	m ²	0.30	0.29	0.10	0.05	0.04	0.07	0.09	0.10
Medium Velour Curtains (Stage)	0	m ²	0.03	0.07	0.31	0.49	0.75	0.70	0.60	0.50
X	0	m ²	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
25mm mineral wool	0	m ²	0.02	0.03	0.07	0.20	0.41	0.78	0.98	0.98
Medium Velour Curtains	0	m ²	0.03	0.07	0.31	0.49	0.75	0.70	0.60	0.50
Mean Absorption Coefficient, a	385.234	m ²	0.23	0.24	0.12	0.10	0.11	0.13	0.15	0.13

Basic Acoustic Properties Summary

	63	125	250	500	1k	2k	4k	8k
Total Absorption, A	90	94	46	40	42	50	56	50
Mean Absorption Coefficient, a	0.23	0.24	0.12	0.10	0.11	0.13	0.15	0.13
RT60	0.84	0.80	1.61	1.87	1.79	1.49	1.33	1.50
Room Constant, R	117	124	53	45	47	58	66	57
Critical Distance	2	2	1	1	1	1	1	1

RT Criteria

	63	125	250	500	1k	2k	4k	8k
Classroom	1	1.05	0.90	0.75	0.60	0.60	0.45	0.30
Church/theatre for speech or amp'd musi	2	1.45	1.30	1.15	1.00	1.00	0.85	0.70
Church/theatre for music - Lower	3	1.95	1.80	1.65	1.50	1.50	1.35	1.20
Church/theatre for music - Upper	4	2.10	2.00	1.90	1.80	1.80	1.70	1.60
Convention facility	5	1.95	1.80	1.65	1.50	1.50	1.35	1.20
Gymnasium for teaching - Lower	6	1.95	1.80	1.65	1.50	1.50	1.35	1.20
Gymnasium for teaching - Upper	7	2.10	2.00	1.90	1.80	1.80	1.70	1.60
Small arena (500 -2000 seats)	8	3.13	2.75	2.38	2.00	2.00	1.63	1.25
Large arena (2000+ seats)	9	3.50	3.25	3.00	2.75	2.75	2.50	2.25

Sound Pressure Level in the Room

	Index	dB(A)	63	125	250	500	1k	2k	4k	8k
Equivalent Point Source SWL (notional)	-	SWL	87	70	63	68	85	84	75	73
Predicted Point Source SPL	1	m	79	61	54	60	77	76	67	64
	2	m	77	58	50	58	76	74	65	62
	4	m	76	56	49	57	75	74	64	61
	8	m	76	56	48	57	75	74	64	60
	16	m	76	56	48	57	75	74	64	60
	32	m	76	56	48	57	75	74	64	60
	64	m	76	56	48	57	75	74	64	60
	128	m	76	56	48	57	75	74	64	60
	256	m	76	56	48	57	75	74	64	60
	512	m	76	56	48	57	75	74	64	60

<u>Item / Process (Inside Model)</u>	<u>On Time</u>	<u>Index</u>	<u>dB(A)</u>	63	125	250	500	1k	2k	4k	
SPL at edge of room		SPL	76	56	48	57	75	74	64	60	60
Inside to Free-Field Correction		SPL	-	-6	-6	-6	-6	-6	-6	-6	-6

<u>Item / Process</u>	<u>area (m2)</u>	<u>Index</u>	<u>dB(A)</u>	63	125	250	500	1k	2k	4k	8k
SRI of brick wall	58.0	-	n/a	23	32	41	47	49	53	58	55
SRI of roller shutter door	2.0	-	n/a	10	11	16	16	18	19	19	20

<u>Item / Process</u>	<u>Index</u>	<u>dB(A)</u>	63	125	250	500	1k	2k	4k	8k
Composite SRI of Wall on Hulme Street	-	-	23	31	40	46	48	52	57	54
SPL just outside wall on Hulme Street	SPL	23	27	11	11	23	20	6	-2	0
Convert back to SWL (area = 60m2)	SWL	41	45	29	29	41	37	24	16	18
SPL at assessment location (r=11, Q=2)	Leq	12	16	0	0	12	9	-5	-13	-11

<i>Item / Process (Outside model)</i>	<i>Index</i>	<i>dB(A)</i>	63	125	250	500	1k	2k	4k	8k
Roof SRI (based on lightweight roof cladding)	-	n/a	15	19	26	32	37	38	38	35
SPL just inside roof	Leq	76	56	48	57	75	74	64	60	60
Inside to outside free field correction	-	-	-6	-6	-6	-6	-6	-6	-6	-6
SPL just outside roof on Hulme Street	Leq	36	35	23	25	37	31	20	16	19
Convert back to SWL (area = 90m ²)	SWL	55	54	43	45	56	50	39	36	39
SPL at assessment location (r=14, Q=2)	Leq	24	23	12	14	25	19	8	5	8

<i>Outside and Inside model totals</i>	<i>Index</i>	<i>dB(A)</i>	63	125	250	500	1k	2k	4k	8k
Cumulative total at assessment location	L _{Aeq(1 hour)}	34	25	18	20	34	30	20	14	8