

Savills

PETS AT HOME, READING RETAIL PARK

Environmental Noise Assessment

Report No. 16-0093-0 R02



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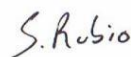
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1 INTRODUCTION

Sustainable Acoustics Ltd has been instructed to carry out a plant noise assessment of the proposed air conditioning units at Unit 6, Reading Retail Park, Reading, to support the planning application for a refurbishment to the existing Pets @ Home store. It is proposed to install six air conditioning units on the rear elevation of the site.

An environmental noise survey and assessment has been carried out, and this report details the results and recommendations for the installation, for submission alongside the planning application.

1.1 Context

Figure 1 gives an overhead view of the site, showing the intended position of the air conditioning units, at the rear of the shop. The nearest receivers are the residential buildings to the east, at Oxford Road, also shown in Figure 1. The planned elevation of the units at the back of the building is shown in Figure 2. There is a 2.5m wall between the intended location of the units and the residential receivers. The proposed units are up to 2m from ground level.

2 PLANNING GUIDANCE

2.1 National Planning Policy Framework

Current planning policy is based on the National Planning Policy Framework (NPPF), published in March 2012, which supports a presumption in favour of development, unless the adverse impacts of that development would outweigh the benefits when assessed against the policies in the Framework, taken as a whole.

The noise implications of development are recognised at paragraph 123, where it is stated that planning policies and decisions should aim to

- *avoid noise from giving rise to significant adverse impacts on health and quality of life as a result of new development;*
- *mitigate and reduce to a minimum other adverse impacts on health and quality of life arising from noise from new development, including through the use of conditions;*
- *recognise that development will often create some noise and existing businesses wanting to develop in continuance of their business should not have unreasonable restrictions put on them because of changes in nearby land uses since they were established.*

2.2 Noise Policy Statement for England

Paragraph 123 of the NPPF also refers to advice on adverse effects of noise given in the Noise Policy Statement for England¹ (NPSE). This document sets out a policy vision to

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

¹ Department for Environment, Food and Rural Affairs, *Noise Policy Statement for England*, London, 2010



To achieve this vision the Statement sets the following three aims:

- *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.*

2.3 Local planning policy

Reading Borough Council's Core Strategy provides the following relevant guidance on noise:

"Sustainable Development:

*Living with Environmental Limits: 4. Minimise air, water, soil/ground and **noise** pollution and address the factors that contribute to climate change, recognising the heightened knowledge of the severity of climate change related impacts"*

"Policy CS34: Pollution and Water Resources

*Development will only be permitted where it would not be damaging to the environment through air, land, **noise** or light pollution..."*

Their draft noise policy states the following for proposed **new** plant:

"The noise source rating level (plant noise level) should be at least 10dBA below the existing background level as measured at the nearest noise sensitive receptor (as measured in accordance with BS4142:2014)."

2.4 British Standard BS 4142: 2014

The British Standard BS 4142: 2014, *Methods for rating and assessing industrial and commercial sound* is an update of the previous edition of the standard, and describes methods for rating and assessing sound of an industrial and/or commercial nature, 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. The sound from the industrial/commercial source is rated by taking into account the sound level of the source, known as the specific sound level, and its characteristics, such as tonal, impulsive or intermittency of the source, and applying an appropriate correction to give the rating level of the sound source. To gain an initial estimate of the potential impacts of the sound source, it is compared to the background noise level, and the level by which the rating level exceeds the background noise level indicates the following potential impacts:

Difference	Assessment
Around 10 dB or more	Likely to be an indication of a significant adverse impact, depending on the context
Around 5 dB	Likely to be an indication of an adverse impact, depending on the context
0 dB or less	An indication of the specific sound source having a low impact, depending on the context



The standard states that “where an initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following:

- 1) *The absolute level of the sound*
- 2) *The character and level of the residual sound compared to the character and level of the specific sound*
- 3) *The sensitivity of the receptor”*

The standard also requires an indication of the uncertainty of the assessment made.

The previous edition of the standard was widely used by local planning authorities in order to provide limits for industrial noise sources suited to the locality and development plans. While the scope and methodology has been redefined by this edition of the standard, it is likely that the principles of the assessment will be used in a similar way.

2.5 British Standard 8233: 2014

The British Standard BS 8233: 2014, *Guidance on Sound insulation and noise reduction for buildings* provides additional guidance on noise levels from sources without specific character in the built environment, based on the recommendations of the World Health Organisation. The criteria desirable levels of steady state, “anonymous” noise in unoccupied spaces within dwellings, from sources such as road traffic, mechanical services and other continuously running plant, are tabulated below:

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

It is noted, however that where development is considered necessary or desirable, despite external noise level above WHO guidelines, the above target levels may be relaxed by up to 5 dB.

The standard also recommends that for traditional external amenity areas, such as gardens, it is desirable that external noise levels do not exceed 50 dB $L_{Aeq, T}$, and that 55 dB $L_{Aeq, T}$ would be acceptable in noisier environments. However, it is recognised that these values may not be achievable in all areas where development is desirable, and in such locations, development should be designed to achieve the lowest practicable levels.

It is also noted that noise limits should not be necessary for external areas, such as balconies, roof gardens and terraces, where normal external amenity space is limited. However, the general guidance for noise in amenity space used for relaxation is still appropriate in protecting these areas.

3 AMBIENT NOISE SURVEY

Existing noise levels were measured in 15 minute periods between Thursday 21st July and Monday 25th July 2016. The measurement position was chosen to be at a location outside the windows near the west façade of the closest residential block of flats, so as to capture representative levels.



Measurements were taken at approximately 3.5m from ground level, which was approximately level with the height of the first floor receiver windows due to a slight change in ground elevation between measurement location and dwellings.

It was observed during the site visit that the continuous noise levels opposite the retail park were governed by existing plant units serving the retail units in the park. Other noises included traffic movements from Oxford Road (A329), and some people noise from employees talking by the back doors of one of the shopping units. Maximum noise levels were observed to be from accelerating vehicles.

The weather was generally calm and warm, with temperatures ranging between 16-26 °C at day and 13-20 °C during night-times for the measurement period. Winds were generally southerly with speeds below 3m/s for the duration of the survey. No rainfall occurred for the duration of the survey.

3.1 Instrumentation

Continuous monitoring of sound levels was undertaken using a Rion sound level meter, type NL-32 (serial number 0024066790), with a Rion type NX-22J Sound Monitor Card installed (serial number 00630553, version 2.1) and a Rion type UC-53A ½ - inch free field microphone (serial number 305924) and a Rion type NH-21 pre-amplifier (serial number 10711) fitted. The microphone was fitted with a windshield during measurements. The sound level meter, microphone and preamplifier were last calibrated in a calibration laboratory on 3 February 2015 and calibration and conformance certificates are available.

Prior to and on completion of the survey, the sound level meter and microphone calibration was checked using a Rion type NC-74 Sound Level Meter Calibrator (serial number 00830811). The Calibrator was last calibrated on 14 January 2015, in accordance with the requirements of ISO 10012 and a calibration and conformance certificate is available. No significant change in the calibration level occurred during the survey.

3.2 Measured Noise Levels

The measured noise levels outside at the chosen measurement position are given below in Table 1, and a graphical representation shown in Figure 3

Period	L _{Aeq} (dB)		L _{A90} (dB)	
	Range (15min)	Average	Range (15min)	L _{Amax,f} (dB)
		(Day/Eve/Night 12/4/8hr)		Range (15min)
Daytime	54 – 70	60	46 – 56	65 – 95
Evening	56 – 65	59	48 – 56	64 – 91
Night-time	46 - 72	57	38 - 51	62 - 89
Proposed Running time (0630 – 2000)	54 - 70	60	45 – 56	65 – 95

Table 1 – Measured noise levels outside the building



It can be seen from Figure 3 that the existing background noise levels during the night-time vary over the 4-night survey period. The background levels only dropped below 40 dB L_{A90} during two of the nights.

4 PLANT NOISE

4.1 Plant Noise Assessment

British Standard: 4142 is deemed the appropriate methodology to establish criteria for the plant noise limits. The rating level can be defined as the final plant noise level, including any corrections for the character of the noise, compared with the existing background noise level; with a difference of 0dB giving an indication of the specific noise source having a low impact (when taking account of the context)

Minimum Existing Background Noise Level, (L_{A90} , 15min)	
Daytime (07:00-19:00)	46
Evening (19:00-23:00)	48
Night time (23:00-07:00)	38
Proposed Running time (06:30 – 20:00)	45

Table 2 – Background noise levels

It is important to note that the intended running time of the plant units is only from 0630 to 2000, and an even shorter period on Sundays. As such, it is not necessary to consider the minimum background levels measured during the night hours.

It is understood that the Mitsubishi air conditioning units to be installed at the rear of unit 6 are as listed below. The sound power levels are calculated from the manufacturer's data.

Unit	Quantity	dB(A)	Octave centre band frequency, Hz							
			63	125	250	500	1k	2k	4k	8k
MUZ-SF25VE	4	58	61	63	60	55	52	49	42	37
MUZ-SF35VE	1	62	62	66	63	60	57	53	47	42
MUZ-SF50VE	1	65	69	68	65	62	60	57	50	45

Table 3 – Octave band sound power levels of external air conditioning units

To calculate the rating level of the plant, the corrections for the character of the plant noise must be added to the specific noise level of the plant. These inverter driven units turn on gradually and will gradually vary in speed depending on the demand for heating or cooling and are therefore unlikely to have an adverse impulsive or intermittent character.

BS 4142:2014 specifies that a penalty is to be applied to a noise source with a tonal noise character, with the penalty ranging from 2dB for a tone which is just perceptible, to 6dB for a tone that is highly perceptible.



The method typically used to assess this would be an analysis of the $\frac{1}{3}$ -octave band frequency spectrum of the noise, or a subjective method, either of the specific unit, or similar units where a subjective assessment of the unit to be installed is not possible. Only octave band frequency data is available for the units, so it is appropriate to consider a subjective assessment of similar units. Generally the noise from these types of units is not found to have significant tonal character. Therefore it is not considered that any correction should be added for the tonal nature of the plant noise.

The low frequency nature of the noise from this type of unit can be noticeable against most background noise environments; and in such situations, a 3dB penalty may be added where noise is “readily distinctive against the residual acoustic environment”, in accordance with BS4142:2014. The existing background noise levels were observed to be already dominated by various existing plant units, so it is not expected that the new units will be readily distinctive against the others.

The closest receiver windows are at those to the east (11m ground length), and those to the north-east (13m ground length), respectively marked as A and B in Figure 1. It is worth considering potential noise at both positions; though the receivers at position A benefit from being further away from the proposed plant, some receivers in this location do not benefit from the screening as they are at a significant height. Additionally, the receivers at location B are likely to have a higher background level than was measured near A, as those receivers are closer to existing plant.

The wall at the rear of the service yard acts as a barrier, blocking line of sight between the plant and the receiver windows on ground floor, and partially blocking line of sight between the plant and units on the first and second floors. The overall attenuation provided by the barrier varies with receiver height, and so at position A, the worst-case is represented by the receptors that are high enough up the building to have complete line of sight to the proposed plant, where it is assumed there would be no mitigation due to the barrier. At position B, the worst-case is taken as the top storey (second floor).

It is assumed that over this distance, the noise from the units will propagate as point source, and generally there are two reflecting surfaces, and therefore it can be assumed that the noise propagates quarter-spherically. The attenuation expected from a point source radiating quarter-spherically, 18m metres away (third floor/fourth storey at A) would be 30 dB, and when 14m away (second floor/third storey at B), would be 28 dB. Position B would benefit from a minor amount of attenuation at low frequencies due to screening.

An overall level at the receiver has been calculated by undergoing propagation calculations of each unit individually, based on their highest potential noise levels, and then combining the noise levels at the receiver position. The resulting noise levels at the receiver window, with all the units running, are calculated to be 39 dB(A) at receiver point A, and 41 dB(A) at receiver point B.

BS 4142: 2104 assesses the rating of the plant noise level against the background noise level, in order to indicate the likelihood of an adverse impact on the occupants of the residential property. To anticipate a worst case, the higher rating level (calculated to point B) is used against the measured background. This comparison is shown below:



	Minimum Existing Background Noise Level, ($L_{A90, 15min}$)	Calculated rating level of the proposed plant at the neighbouring windows, (L_{Aeq})	BS4142 Assessment level
Daytime (07:00-19:00)	46	41	-5
Evening (19:00-23:00)	48	41	-7
Night time(23:00-07:00)	38	41	n/a
Proposed Running time (06:30 – 20:00)	45	41	-4

Table 4 – BS 4142: 2014 assessment of air conditioning unit noise against background

It is noted that the data used in the calculation is based on the units operating at their full capacity simultaneously; in reality it is unlikely that this would be the case. It is also likely that the background level would be slightly greater at position B, due to the closer proximity to existing plant units.

BS 4142:2014 states that where the rating level does not exceed the existing background noise level, it is an indication of low impact, depending on the context. The assessment therefore gives an indication that there would be a low impact during operating hours of the units; however, the local authority have specified that the levels would need to be 10dB below background; indicating that an additional 6dB of attenuation would be required in order to meet this criteria.

It is relevant to consider the absolute plant noise levels incident on the residential property. BS 8233 gives guideline values for internal ambient noise levels of ‘anonymous’ noise sources. The standard gives a recommendation of 35 dB $L_{Aeq, 16hr}$ to be achieved in a bedroom during the daytime, and 30dB $L_{Aeq, 8hr}$ to be achieved during the night-time. The standard also indicates that a level of 15dB attenuation would be expected through an open window partially open for ventilation (Annex G.1 of BS 8233:2014). An external level of 41 dB(A) would therefore result in internal levels of approximately 26 dB(A) when windows are ajar, which is significantly below the criteria given in BS:8233 for recommended daytime resting levels in bedrooms. Similarly, this level is also below the criteria given in BS:8233 for recommended night-time sleeping levels in bedrooms.

The absolute plant noise levels incident on the closest residential properties would cause internal ambient levels that are significantly below the criteria given in BS 8233:2014, though to achieve 10dB below background levels, additional mitigation is recommended to the units.



5 MITIGATION

5.1 Predicted Plant Noise Level

The following table outlines the predicted noise level at the nearest receiver window.

	Overall level, dB(A)	Octave centre band frequency, Hz							
		63	125	250	500	1k	2k	4k	8k
Predicted Leq Level of plant	41	41	44	42	38	35	32	25	20
Target mitigated noise level	35	35	38	36	32	29	26	19	14

Table 5 – Predicted Plant noise level and target noise level at 1m from receiver (free field) to meet criteria

A reduction of **6dB(A)** is required to achieve the Local Authority requirements of 10dB below night time background noise levels.

5.2 Mitigation Options

The following options were considered for mitigation:

- Mitigation of mechanical service noise at source; selecting quieter plant
- Moving the plant further from the receiver window
- Installation of an acoustic barrier

If alternative plant is to be selected, it would need to be reviewed and checked with the manufacturer. It may not be practicable to move the units far enough away, and so if the same units are proposed, it is recommended to install an acoustic barrier to mitigate the noise levels to the levels required.

Mitigation with a noise barrier

A barrier should be made continuous, and made of material (such as closed board wooden fencing or marine plywood) that has a surface mass of not less than 10kg/m². It is calculated that the following approximate attenuation can be achieved through a solid barrier 1 meter from the units, and blocks line of sight by 0.5 meters.

	Overall level, dB(A)	Octave centre band frequency, Hz							
		63	125	250	500	1k	2k	4k	8k
Barrier reduction		5	5	5	5	6	6	7	7
Calculated plant noise level at receiver	35	36	39	36	33	30	26	18	18

Table 6 – Effect of a barrier on predicted plant noise levels at B

The barrier should be installed at a distance of 1 meter or closer from the units, and block line of sight to the windows by 0.5 meters or more. With such a barrier, the level at position A is calculated to be lower than that at position B. It should be determined that the units will not be under any constraints in terms of getting fresh air and exhausting heat. This may require design liaison with M&E designer to establish a solution that will work. With these mitigation measures in place, it is calculated that the levels at both closest receiver locations would be lower than the lowest measured background.



6 SUMMARY AND CONCLUSION

A noise assessment has been carried out at Reading Retail Park, Reading, to establish if the proposed air conditioning units will be acceptable in terms of noise impact on the nearby residential buildings. The plant noise levels have been assessed using methodology within BS 4142:2014, the requirements of the Local Authority, and also compared against guidance given in BS 8233:2014.

The results of the survey show that the noise levels affecting the site would be greater than the 10dB below background level as recommended by the Local Authority, and so mitigation measures are required in order to reduce the noise levels at the nearest noise sensitive receivers to be 10dB lower than existing background during all times of operation.

Through the use of barriers as outlined in this report, it is possible to reduce noise levels to 35dB, 10dB below background at the nearest residential windows.

It is concluded that the noise levels incident on the closest residential properties can be sufficiently minimised through mitigation measures, and that the permission could be suitably conditioned to avoid adverse impact on the existing quality of resident's lives.

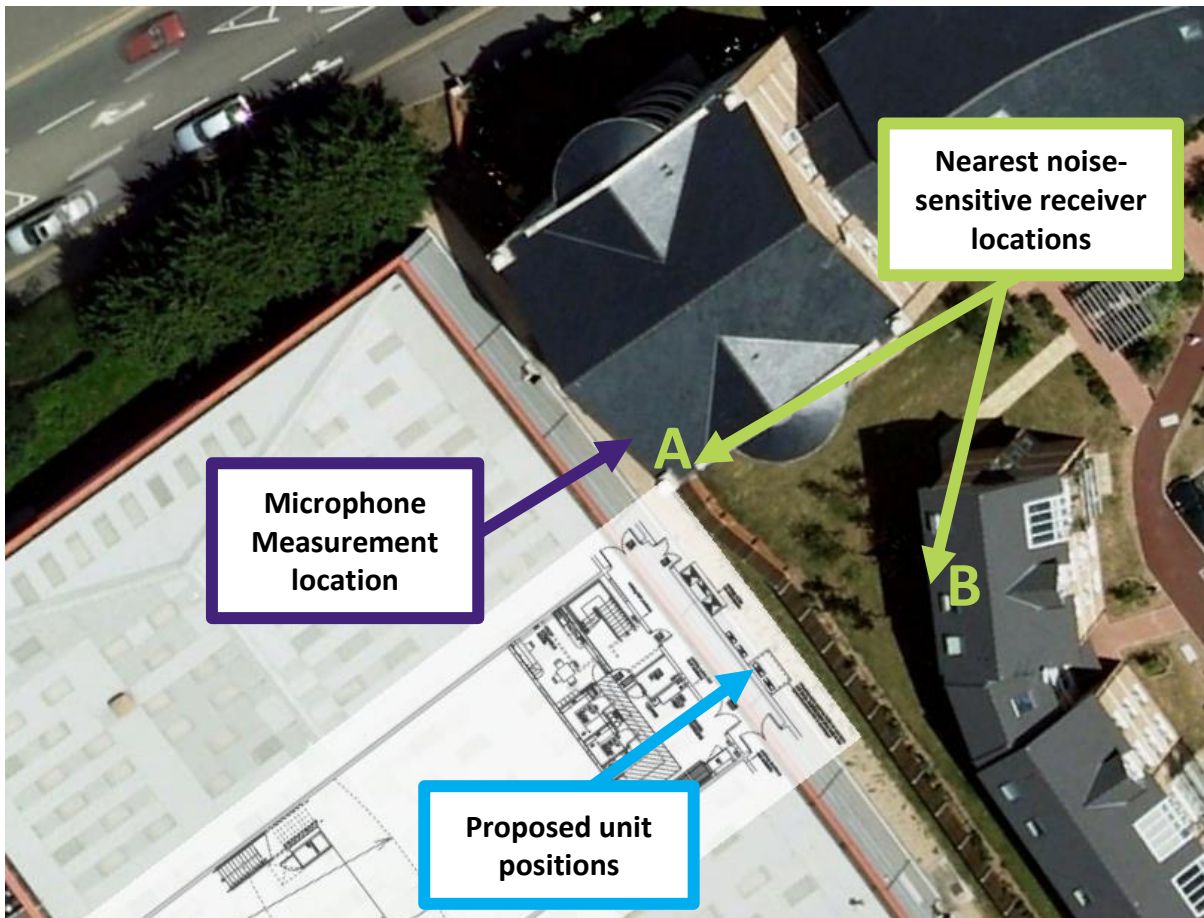


Figure 1 – Overhead view of site

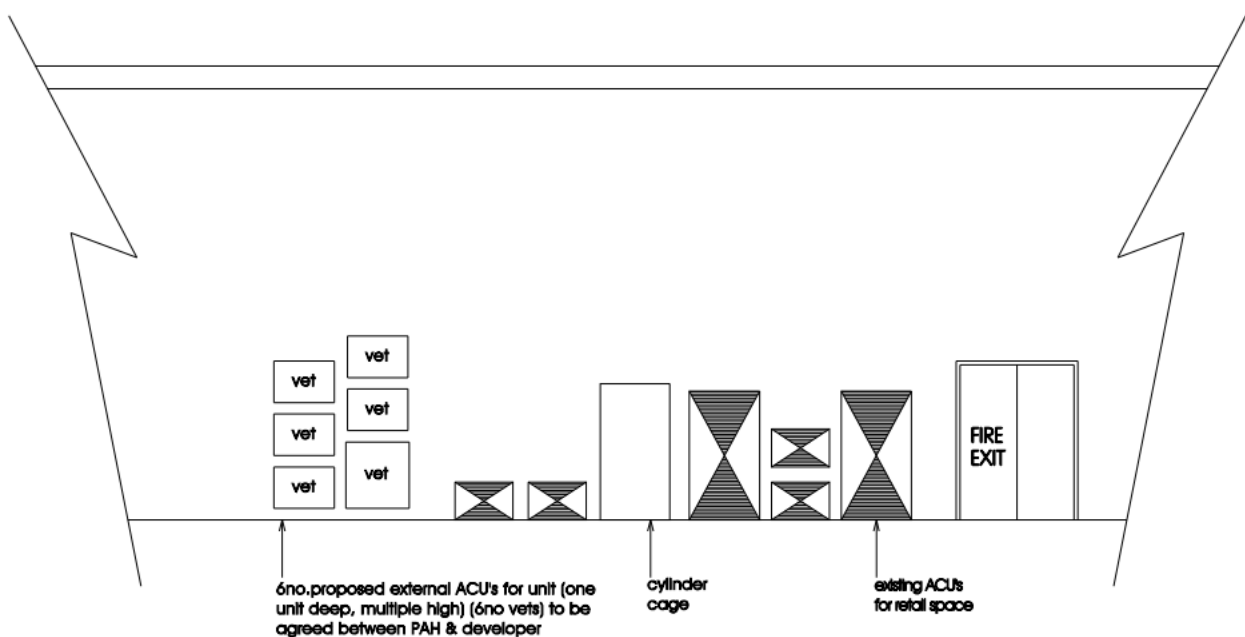


Figure 2 – Proposed Rear Elevation

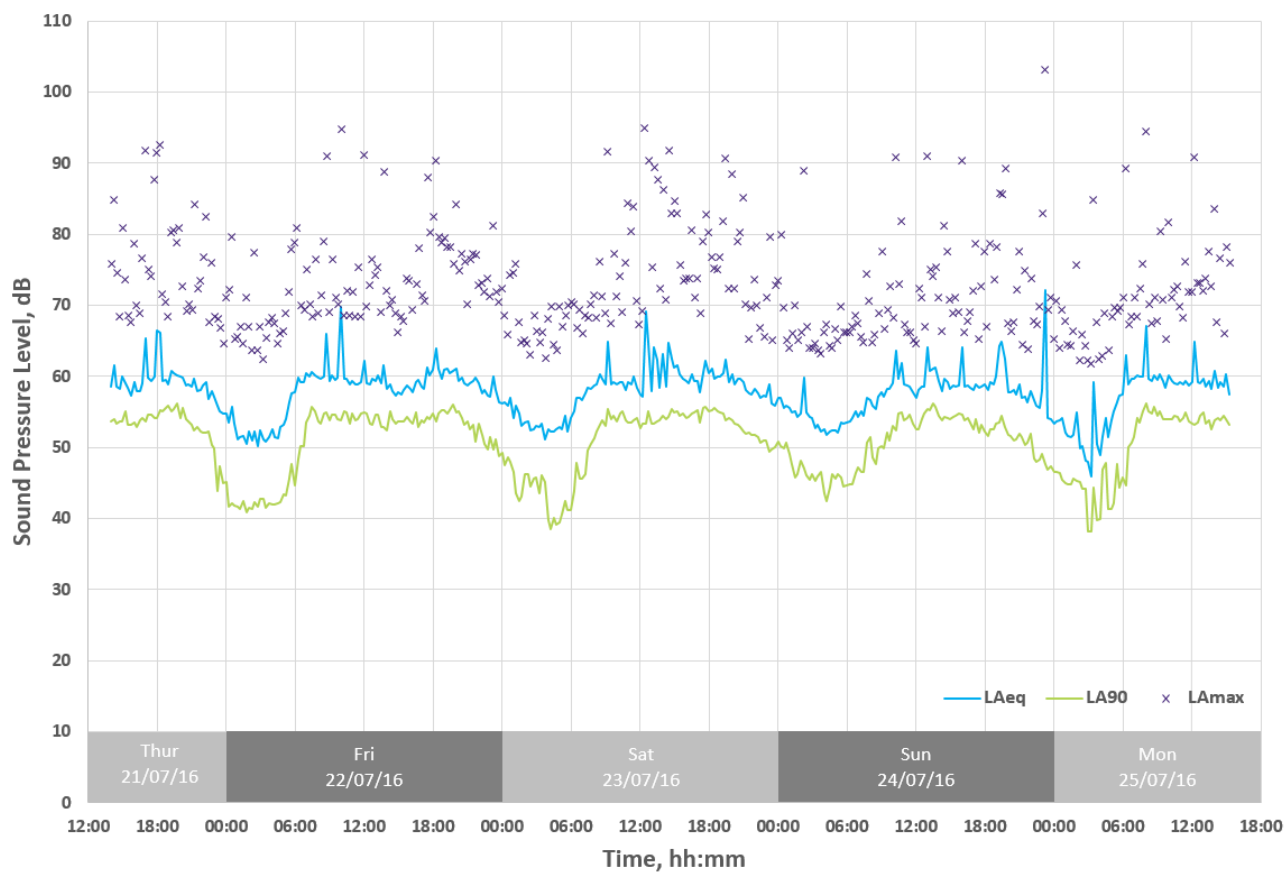


Figure 3 – Time history of acoustic parameters

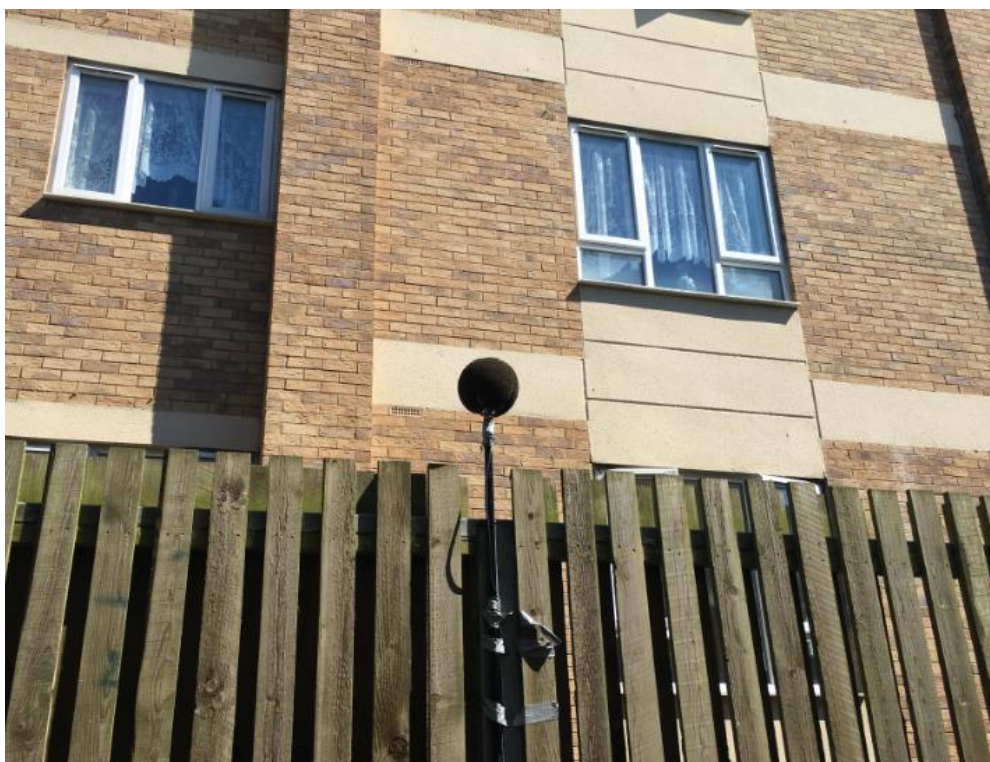


Figure 4 – Monitoring position