

NoiseAssess

Acoustics, Noise and Vibration Consultants

Project:	Proposed fire station, Whitfield Park, Glossop
Scope of Report	Recommended noise limit for external plant noise
Client:	Derbyshire Fire and Rescue Service Butterley Hall, Ripley, Derbyshire DE5 3RS
Report Reference:	13356.01.v2 April 2023
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1.0 INTRODUCTION

- 1.1 The proposal is for a new fire station to replace the existing fire station at Whitfield Park, Glossop. The site location is shown in Figure 1. The proposed site plan, floor layouts as prepared by James Totty Partnership LLP are shown on Figures 2 and 3.
- 1.2 The fire station site is to the south of Glossop town centre on the east side of the A624 Charlestown Road. The areas around the site are mainly residential. The closest residential properties are immediately adjacent to the east boundary of the fire station site. There are industrial / commercial premises to the southwest.
- 1.3 The proposed fire station will be constructed on the same site as the existing fire station and will retain the same vehicle access. The main entrance will be on the north side of the building with a rear yard to the south which will have a gated access to the southwest.
- 1.4 Planning Authority: High Peak Borough Council (HPBC)
Planning reference: PAD/2021/0031
Christopher Humphreys, Pollution Specialist Officer, has provided pre-application advice on behalf of HPBC Environmental Health. The advice provided a 'summary of environmental impacts requiring assessment or consideration' which included 'noise from demolition and construction, use of a generator and general operational noise'. The pre-app advice went on to provide the following guidance:

"OPERATIONAL NOISE"

It is understood that the proposal is for a replacement fire station and is not expected to alter significantly the day to day noise environment. For general noise it is not expected that a noise impact assessment will be required. However, where new external fixed plant or machinery is proposed, this may require assessment to ensure neighbouring premises are not impacted.

External plant and equipment

It is understood that a backup generator and air source heat pumps are being considered. Where externally installed fixed plant and machinery is proposed, including extraction fans, it is recommended that an acoustic assessment is undertaken so that nearby premises are not affected by noise from these sources. The assessment should consider the cumulative impact from the sources of noise and where appropriate,

recommend measures for the control of noise, details of which should be included within site/façade plans or drawings.

It is recommended that the assessment is conducted in accordance with BS4142 (2014 + A1:2019) (method for rating and assessing industrial and commercial sound) and/or its subsequent amendments. The rating level of sound emitted from the fixed plant and/or machinery associated with the development should not exceed background sound levels by more than 5 dB(A) between the hours of 07:00-23:00 at any sound sensitive premises and shall not exceed the background sound level between 23:00-07:00”.

- 1.5 This report provides a limit for cumulative noise from any external plant and machinery and indicative outline recommendations for mitigation measures for the control of external plant noise.

2.0 CRITERIA & METHODOLOGY

BS4142

2.1 The noise impact of commercial/industrial noise sources on existing residential properties is normally assessed in accordance with BS4142¹.

2.2 The scope of BS4142 is given in the extract below.

"1.1 This standard describes methods for rating and assessing sound of an industrial and/or commercial nature, which includes:

- a) Sound from industrial and manufacturing processes;
- b) 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; and
- 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."

2.3 The standard compares sound from industrial / commercial sources with the background sound level. The standard states in Clause 9.1 that "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". Such features are taken into account by adding a correction to the specific sound level depending on the extent to which the distinguishing acoustic characteristics will attract attention. The standard states the following in Clause 9.2:

"Tonality: For sound ranging from not tonal to prominently tonal the Joint Nordic Method gives a correction of between 0 dB and +6dB for tonality. Subjectively, this can be converted to a penalty of 2 dB for a tone that is just perceptible at the noise receptor, 4 dB where it is clearly perceptible, and 6 dB where it is highly perceptible".

- "Impulsivity: A correction of up to 9 dB can be applied for sound that is highly impulsive, considering both the rapidity of the change in sound level and the overall change in sound level. Subjectively, this can be converted to a penalty of 3dB for impulsivity which is just perceptible at the noise receptor, 6 dB where it is clearly perceptible, and 9 dB where it is highly perceptible."
- "Note2: If characteristics likely to affect perception and response are present in the specific sound, within the same reference period, then the applicable corrections ought normally to be added arithmetically. However, if a single feature is dominant to the exclusion of the others then it might be appropriate to apply a reduced or even zero correction for the minor characteristics."
- "Intermittency: When the specific sound has identifiable on/off conditions, the specific sound level ought to be representative of the time period of length equal to the reference time interval which contains the greatest total amount of on time. This can necessitate measuring the specific sound over a number of shorter sampling periods that are in combination less than the reference time interval in total, and then calculating the specific sound level for the reference time interval allowing for time when the specific sound is not present. If the intermittency is readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied".
- "Other sound characteristics: Where the specific sound features characteristics that are neither tonal, nor impulsive, nor intermittent, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3dB can be applied."

2.4 BS4142 provides guidance on the assessment of impacts in Clause 11.

"11 Assessment of the impacts

COMMENTARY ON CLAUSE 11.

The significance of sound of an industrial / commercial nature depends upon both the margin by which the rating 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.

Obtain an initial estimate of the impact of the specific sound by subtracting the measured background sound level from the rating level, and consider the following:

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

- c) A difference of around +5dB 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”.

2.5 BS4142 recommends that the specific sound level during daytime periods 07:00 - 23:00 hrs should be determined over a reference time interval of 1 hour and during night-time periods 23:00 - 07:00 hrs over a reference time interval of 15 minutes.

3.0 BASLINE NOISE SURVEY

- 3.1 A baseline survey of the survey of the current noise levels representative of the closest residential properties was carried out from 16:00 hrs Tuesday 2 November to 17:00 hrs Monday 8 November 2021.

Table 1. Noise survey

Location MP1	
Microphone position	In freefield conditions on the boundary between the fire station and rear gardens of the residential properties to the east as marked 'A' on Figure 1. The microphone was at a height of approximately 2m above ground level.
Survey type	Unattended
Sound level meter	Rion NL-52, Class 1, serial number: 00410148
Measurements	1/3 octave
- All noise levels measured using 5-minute sample periods - The sound level meter was calibrated at the start and finish of the survey using a Norsonic Nor-1251 portable calibrator, serial number: 33003. There was no calibration drift.	

- 3.2 Weather conditions during the survey are summarised below:
- No precipitation.
 - Windspeeds were less than 5 m/s except for the period 12:00 hrs 06/11/2021 – 12:00 hrs 07/11/2021 when windspeeds were up to 7 m/s.
 - The wind direction veered between a northwesterly, a westerly and a southwesterly.
 - Temperatures were generally 4 to 13°C except for 18:00 hrs 04/11/2021 - 06:00 hrs 05/11/2021 when temperatures dropped to a low of -1°C.

Source: www.timeanddate.com/weather

- 3.3 The existing fire station on the Whitfield Park site was still operating. The residential properties to the immediate east of the fire station site were unoccupied at the time of the survey.
- 3.4 The results of the baseline noise survey are summarised below and given in full in Appendix A2. The dB_{LAeq} values are the log-averages of the $dB_{LAeq,5min}$ measurements and the dB_{LA90} values are the arithmetic averages of the $dB_{LA90,5min}$ measurements.

Table 2. Summary of daytime noise survey results - free field noise levels.

Day	Period	Ambient noise level dBL _{Aeq}		Background noise level dBL _{A90}	
		Average	Range	Average	Mode
02/11/2021	16:00 - 23:00	69	50 - 77	48	†
03/11/2021	07:00 - 23:00	58	45 - 68	45	47
04/11/2021	07:00 - 23:00	56	47 - 67	45	46
05/11/2021	07:00 - 23:00	62	53 - 72	49	49
06/11/2021	07:00 - 23:00	57	49 - 61	50	50
07/11/2021	07:00 - 23:00	54	48 - 58	46	41
08/11/2021	07:00 - 17:00	56	51 - 61	47	47

† Insufficient data

Table 3. Summary of night-time noise survey results - free field noise levels.

Night of	Period	Ambient noise level dBL _{Aeq}		Background noise level dBL _{A90}	
		Average	Range	Average	Mode
02/11/2021	23:00 - 07:00	46	35 - 56	35	33
03/11/2021	23:00 - 07:00	44	33 - 52	34	32
04/11/2021	23:00 - 07:00	45	35 - 55	34	32
05/11/2021	23:00 - 07:00	44	38 - 51	37	35
06/11/2021	23:00 - 07:00	50	45 - 54	42	42
07/11/2021	23:00 - 07:00	45	32 - 56	34	31

3.5 The main noise sources while on site to install and retrieve the noise monitoring equipment were:

- Road traffic on the A624, Charlestown Road.
- Normal activities at the fire station.
- Construction work on a building site to the west.

4.0 CUMULATIVE NOISE TARGETS FOR EXTERNAL PLANT & MACHINERY

4.1 This assessment has been carried out in accordance with BS4142¹ and compared with the local authority's recommended noise limiting criterion.

4.2 At present no details are available for any external plant and machinery that may be installed to serve the fire station. Therefore, a design target has been provided for cumulative the noise from external plant and machinery at the closest sound sensitive premises. The design criteria are summarised below:

Regulatory body:	Pre-application advice provided by Christopher Humphreys of HPBC Environmental Health
Assessment methodology:	BS4142 (2014+A1:2019) ¹
Advised limits:	07:00-23:00 hrs: Rating of cumulative noise from external plant and machinery not to exceed background noise level by more than 5dB. 23:00-07:00 hrs: Rating of cumulative noise from external plant and machinery not to exceed background noise level.

4.3 The design target is the highest cumulative noise from all external plant and machinery and applies at all closest sound sensitive premises. Two noise design targets are given, one for plant which will run in the daytime only (07:00-23:00 hrs) and one for plant which may run during the night (23:00-07:00 hrs). The design targets have been derived in accordance with BS4142 (2014+A1:2019) using the lowest average or modal background dB_{LA90} noise level. A 5 dB acoustic feature penalty has been included as a precaution.

Table 4. Cumulative noise design targets for external plant and machinery

	Operating period	
	07:00-23:00 hrs	23:00-07:00 hrs
Measured background noise level, dB_{LA90}	41	31
Allowable difference (rating-background), dB	5	0
Highest permissible rating, dB	46	31
Total of all acoustic feature penalties, dB	5	5
Highest permissible specific noise level, dB_{LAeq}	41	26

- 4.4 The limits given above are for the combined level of all external plant and machinery. If there are multiple items affecting the same location the noise level limit would need to be calculated by subtracting $10\log(n)$ from the limit, where n is the number of items.
- 4.5 The noise level limits are the values at the receptors and the design level at 1m can be calculated by adding $20\log(d)$ where d is the distance from the item to the residential location. In addition, any screening attenuation could be added.

5.0 OUTLINE RECOMMENDATIONS FOR NOISE CONTROL

- 5.1 Noise from external plant can be controlled in the first instance by the careful selection of 'low-noise' items. Thereafter, noise emissions from plant can be controlled using measures such as barriers, enclosures, ductwork attenuators, lagging etc. If attenuators are used it may be necessary to use a ductwork expansion section to reduce velocities to limit re-generated noise from airflow. Plant can be mounted using anti-vibration mounts to reduce the re-radiation of noise from connected structures. Flexible connectors can be used to reduce the transmission of vibration into connected ductwork. Large steel plates can be covered with damping sheets or constructed with sound-deadened steel. Plant installed in locations where it will be screened from residential properties from the proposed building will require less attenuation measures.

6.0 CONCLUSIONS

- 6.1 A baseline survey of the existing noise levels representative of the closest noise sensitive premises has been carried out.
- 6.2 No details for the external plant to be installed at the site are currently available. The local authority has provided pre-application advice for the development which includes noise limiting criteria for any external plant and machinery. Noise design targets have been provided based on the noise limiting criteria and background noise survey results. The total noise from external plant and machinery should not exceed the following values at residential properties.
- 41 dBL_{Aeq,1hr} at the closest residential property during the daytime 07:00-23:00hrs
 - 26 dBL_{Aeq,15min} at the closest residential property during the night-time 23:00-07:00hrs.

7.0 REFERENCE

1. BS4142: British Standard 4142:2014+A1:2019, Methods for rating and assessing industrial and commercial sound.

FIGURE 1: SITE AND MONITORING LOCATION

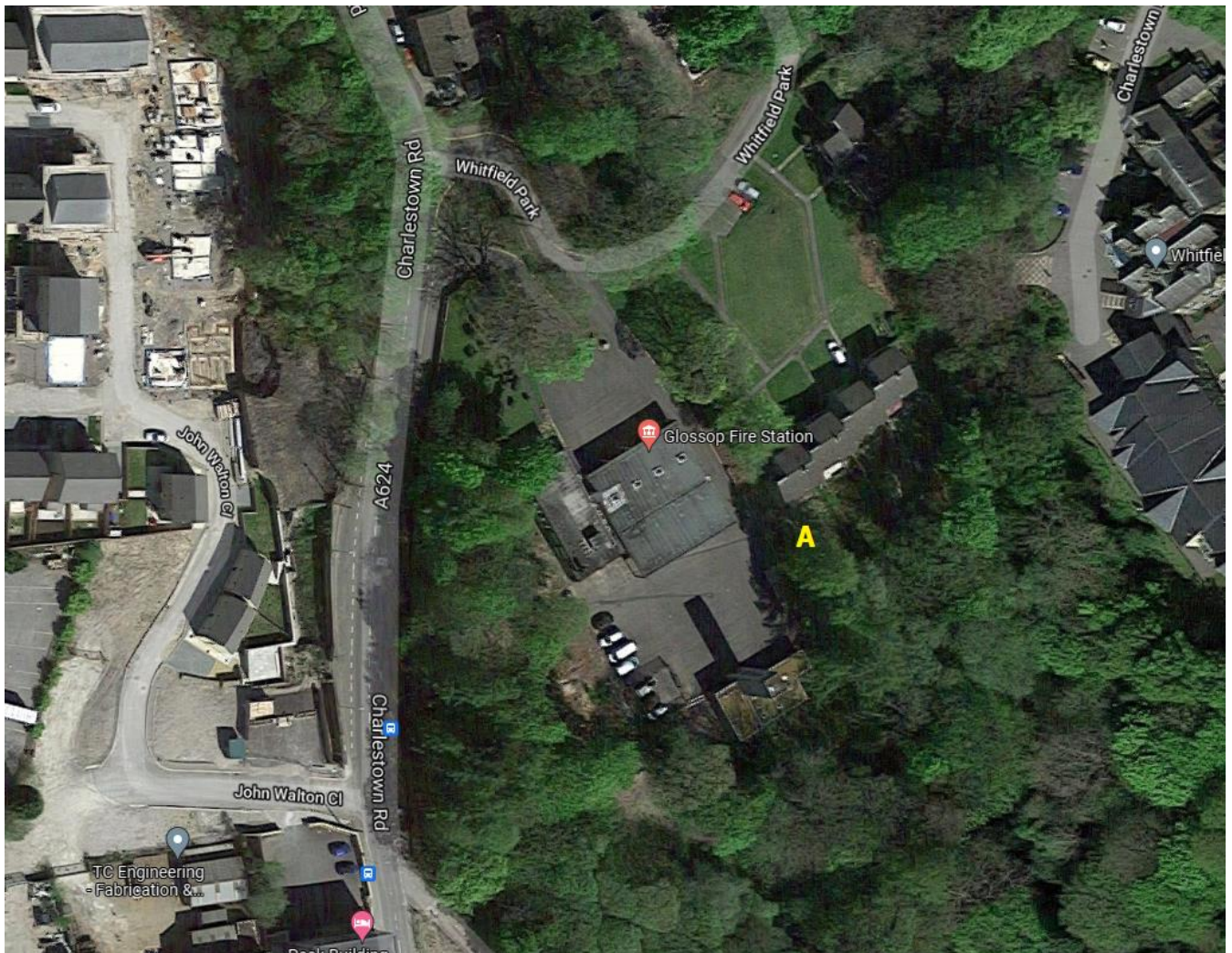


FIGURE 2: PROPOSED SITE PLAN

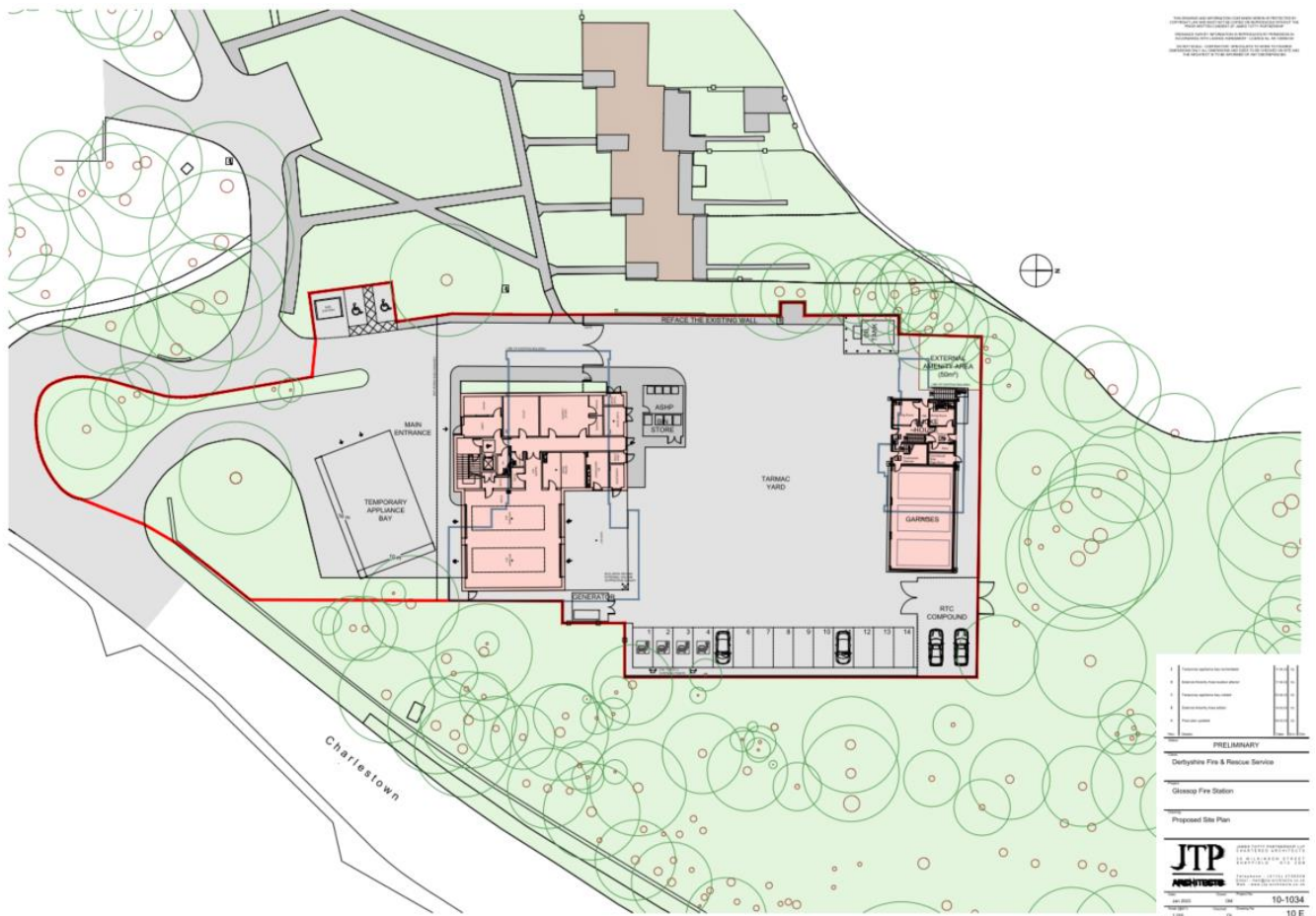
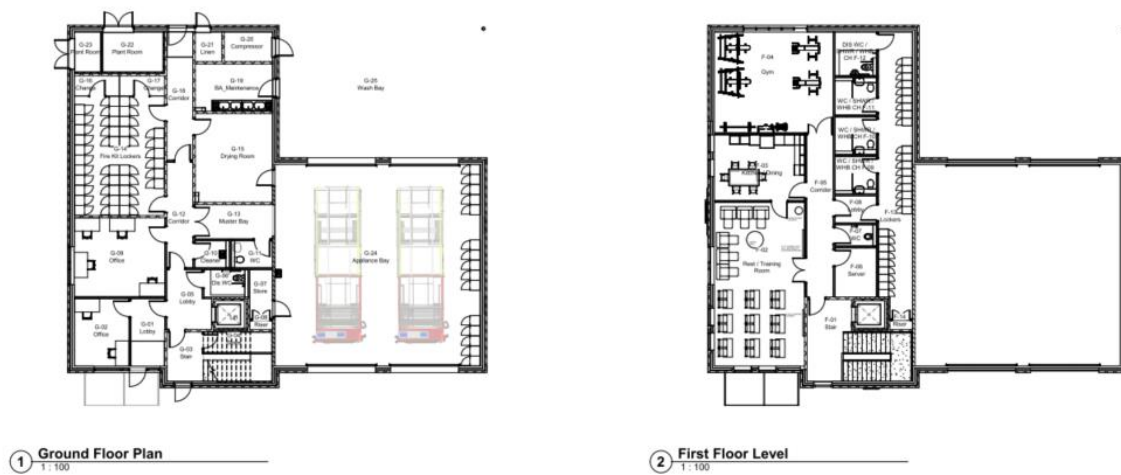


FIGURE 3: PROPOSED FLOOR LAYOUTS



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Location: Fire Station
Client: Derbyshire Fire & Rescue Service
Project: Noise Assessment
Drawing: Proposed Floor Plans
Scale: 1:100
Date: 15/05/2023
JIP
JIP
JIP

APPENDIX A1: ACOUSTIC TERMINOLOGY

Ambient noise	The sound pressure level at a given location (i.e. sound from all sources) usually measured using the L_{Aeq} parameter.
A-weighting	A weighting applied to the frequencies which make up a sound pressure level to mimic the response of the human ear which is less responsive to low frequency sounds as it is to high frequency sounds. The resultant level after application of the weighting is called the 'A-weighted sound pressure level' and is denoted by dB(A) or by using a subscript A (e.g. $dB_{L_{Aeq}}$).
Background noise	The noise measured in the absence of the noise under investigation usually using the statistical parameter L_{90} which represents the quietest parts of the measurement period.
Broadband sound	Sound which contains all the frequencies.
Decibel (dB)	A logarithmic measurement scale used for sound pressure levels. This scale is used because the simple use of sound pressures would be unwieldy as the range of pressures to which the human ear responds is very large. The normal threshold of hearing at 1kHz is 0dB. A level of $120dB_{L_{Aeq}}$ is very loud (L signifies level and the A and eq are explained under A-weighting and L_{eq}). Some night club dance floors can have sound levels of around $110 dB_{L_{Aeq}}$. In the workplace the wearing of hearing protection is compulsory for staff who experience a noise level of over $85dB_{L_{Aeq}}$ averaged over an 8-hour day and is normally used when the levels are over $80dB_{L_{Aeq}}$ averaged over the 8-hour day. Noise intrusion levels into bedrooms (e.g. from traffic noise) are often controlled to below $30dB_{L_{Aeq}}$ in the design of new properties (standards sometimes vary between authorities). Noise levels of below $20dB_{L_{Aeq}}$ are very quiet and would normally only be achieved in a well designed recording studio. Although noise calculations are normally carried out using figures to 1 decimal place the results are often presented to the nearest dB as changes of a fraction of a dB are not normally perceptible even in controlled conditions.
Facade noise level	Noise level including a contribution from the reflection from a building facade, usually measured at 1m from the facade.
Free field	Noise levels with no contribution from reflections from nearby structures.
Hertz	The units used for frequency denoted by Hz, i.e. the number of cycles of pressure fluctuation per second. K used in front of Hz represents 1000 (1kHz = 1000Hz). High frequency sounds (e.g. 8kHz) are high pitched and low frequency sounds (e.g. 63Hz) are the bass notes.

L _{eq}	A parameter used to denote the 'equivalent continuous sound pressure level'. This is the sound pressure level of a continuous sound that would contain the same energy as the varying sound being measured or investigated. L _{Aeq} is the parameter used to denote the 'A-weighted equivalent continuous sound pressure level' (see A-weighting).
L ₁₀	A statistical parameter often used for the measurement of road traffic noise. It is the level exceeded for 10% of the time period being considered. If A-weighted a subscript A is included and the time period can also be included in subscript, e.g. L _{A10, 1hour} .
L ₉₀	A statistical parameter often used for the measurement of background noise levels. It is the level exceeded for 90% of the time period being considered. If A-weighted a subscript A is included and the time period can also be included in subscript, e.g. L _{A90, 5min} .
L _{max}	The maximum noise level which occurred during the monitoring period. L _{Amax,f} denotes the maximum A-weighted sound pressure level using the fast time constant of 125ms.
Loudness	Although a 3dB increase is equivalent to a doubling of the sound power level of a sound source this increase is the minimum perceptible under normal conditions. It takes a 10dB change in noise level for it to sound roughly twice (or half) as loud subjectively.

APPENDIX A2: NOISE SURVEY RESULTS

**Table A2.1: Location A: Freefield daytime noise levels
Tuesday 2 November 2021**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
02/11/2021	16:00:00	55.3	70.3	50.9
02/11/2021	17:00:00	56.3	85.9	49.9
02/11/2021	18:00:00	59.3	72.5	51.9
02/11/2021	19:00:00	77.3	104.6	45.8
02/11/2021	20:00:00	62.5	88.3	59.2
02/11/2021	21:00:00	53.2	73.8	41.2
02/11/2021	22:00:00	49.7	68.3	38.3
Average		69.1	-	48.2
Highest		77.3	104.6	59.2
Lowest		49.7	68.3	38.3
Mode		-	-	-

**Table A2.2: Location A: Freefield daytime noise levels
Wednesday 3 November 2021**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
03/11/2021	07:00:00	53.6	71.8	46.6
03/11/2021	08:00:00	68.4	105.2	50.5
03/11/2021	09:00:00	53.5	72.3	47.9
03/11/2021	10:00:00	52.0	72.5	45.8
03/11/2021	11:00:00	54.7	73.9	47.7
03/11/2021	12:00:00	51.5	70.5	46.3
03/11/2021	13:00:00	51.9	70.7	47.0
03/11/2021	14:00:00	51.0	66.1	46.4
03/11/2021	15:00:00	50.8	69.9	46.9
03/11/2021	16:00:00	56.1	89.9	47.2
03/11/2021	17:00:00	54.9	88.0	47.6
03/11/2021	18:00:00	54.8	86.7	44.9
03/11/2021	19:00:00	49.1	70.8	42.5
03/11/2021	20:00:00	45.9	64.7	38.4
03/11/2021	21:00:00	50.3	70.0	37.0
03/11/2021	22:00:00	45.3	59.9	37.2
Average		57.8	-	45.0
Highest		68.4	105.2	50.5
Lowest		45.3	59.9	37.0
Mode		-	-	47

**Table A2.3: Location A: Freefield daytime noise levels
Thursday 4 November 2021**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
04/11/2021	07:00:00	50.9	62.2	46.2
04/11/2021	08:00:00	66.7	95.6	51.8
04/11/2021	09:00:00	54.0	77.6	47.2
04/11/2021	10:00:00	51.7	72.9	45.0
04/11/2021	11:00:00	50.5	67.8	45.9
04/11/2021	12:00:00	50.9	75.5	46.2
04/11/2021	13:00:00	50.3	69.5	46.2
04/11/2021	14:00:00	50.5	62.3	46.8
04/11/2021	15:00:00	53.9	83.1	47.1
04/11/2021	16:00:00	51.6	75.8	47.2
04/11/2021	17:00:00	51.8	86.3	47.3
04/11/2021	18:00:00	51.7	80.1	45.5
04/11/2021	19:00:00	49.8	67.7	43.2
04/11/2021	20:00:00	47.4	71.4	39.7
04/11/2021	21:00:00	47.1	68.5	39.3
04/11/2021	22:00:00	47.8	64.2	37.9
Average		56.2	-	45.2
Highest		66.7	95.6	51.8
Lowest		47.1	62.2	37.9
Mode		-	-	46

**Table A2.4: Location A: Freefield daytime noise levels
Friday 5 November 2020**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
05/11/2021	07:00:00	54.0	90.2	46.4
05/11/2021	08:00:00	71.7	102.4	49.8
05/11/2021	09:00:00	60.2	77.3	48.9
05/11/2021	10:00:00	65.5	86.9	50.8
05/11/2021	11:00:00	53.6	75.4	49.1
05/11/2021	12:00:00	53.7	72.6	49.9
05/11/2021	13:00:00	55.1	75.2	49.7
05/11/2021	14:00:00	56.3	70.3	52.9
05/11/2021	15:00:00	56.0	73.7	51.9
05/11/2021	16:00:00	53.8	66.3	50.7
05/11/2021	17:00:00	52.8	69.8	49.1
05/11/2021	18:00:00	56.6	86.3	48.8
05/11/2021	19:00:00	62.7	92.8	48.1
05/11/2021	20:00:00	60.1	89.5	46.2
05/11/2021	21:00:00	58.2	93.6	43.5
05/11/2021	22:00:00	63.5	94.2	44.0
Average		62.4	-	48.7
Highest		71.7	102.4	52.9
Lowest		52.8	66.3	43.5
Mode		-	-	49

**Table A2.5: Location A: Freefield daytime noise levels
Saturday 6 November 2021**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
06/11/2021	07:00:00	49.0	73.7	42.3
06/11/2021	08:00:00	51.1	74.5	45.0
06/11/2021	09:00:00	56.6	93.2	47.1
06/11/2021	10:00:00	53.5	79.0	49.7
06/11/2021	11:00:00	53.7	70.6	50.3
06/11/2021	12:00:00	60.5	98.9	51.2
06/11/2021	13:00:00	55.6	68.4	51.7
06/11/2021	14:00:00	58.4	83.4	54.1
06/11/2021	15:00:00	54.4	71.3	51.1
06/11/2021	16:00:00	55.8	73.1	52.2
06/11/2021	17:00:00	58.6	75.5	53.5
06/11/2021	18:00:00	60.0	87.5	53.4
06/11/2021	19:00:00	56.4	77.4	49.6
06/11/2021	20:00:00	55.0	82.1	47.9
06/11/2021	21:00:00	58.1	85.5	47.7
06/11/2021	22:00:00	56.7	81.4	48.0
Average		56.7	-	49.7
Highest		60.5	98.9	54.1
Lowest		49.0	68.4	42.3
Mode		-	-	50

**Table A2.6: Location A: Freefield daytime noise levels
Sunday 7 November 2021**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
07/11/2021	07:00:00	47.7	69.3	41.1
07/11/2021	08:00:00	51.3	71.7	45.1
07/11/2021	09:00:00	50.3	69.9	44.3
07/11/2021	10:00:00	54.6	67.8	49.2
07/11/2021	11:00:00	57.4	70.2	52.0
07/11/2021	12:00:00	56.5	70.8	51.3
07/11/2021	13:00:00	57.6	69.7	52.4
07/11/2021	14:00:00	55.8	69.2	51.0
07/11/2021	15:00:00	54.7	70.1	50.8
07/11/2021	16:00:00	52.9	77.6	48.0
07/11/2021	17:00:00	55.3	77.2	46.5
07/11/2021	18:00:00	54.4	79.9	43.4
07/11/2021	19:00:00	50.6	78.7	40.6
07/11/2021	20:00:00	55.4	91.9	41.2
07/11/2021	21:00:00	48.8	70.8	38.6
07/11/2021	22:00:00	48.3	67.7	39.1
Average		54.2	-	45.9
Highest		57.6	91.9	52.4
Lowest		47.7	67.7	38.6
Mode		-	-	41

**Table A2.7: Location A: Freefield daytime noise levels
Monday 8 November 2020**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
08/11/2021	07:00:00	57.7	92.1	46.7
08/11/2021	08:00:00	61.4	87.5	50.7
08/11/2021	09:00:00	51.3	69.4	46.7
08/11/2021	10:00:00	54.1	87.1	45.7
08/11/2021	11:00:00	53.6	88.4	46.0
08/11/2021	12:00:00	50.8	69.7	45.6
08/11/2021	13:00:00	50.6	67.6	44.7
08/11/2021	14:00:00	51.7	74.8	47.1
08/11/2021	15:00:00	53.6	73.9	48.0
08/11/2021	16:00:00	56.6	80.5	49.0
Average		55.6	-	47.0
Highest		61.4	92.1	50.7
Lowest		50.6	67.6	44.7
Mode		-	-	47

**Table A2.8: Location A: Freefield night-time noise levels
Tuesday 2 November - Wednesday 3 November 2021**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
02/11/2021	23:00:00	46.5	61.1	36.3
02/11/2021	23:15:00	47.2	66.2	36.4
02/11/2021	23:30:00	43.3	52.7	36.5
02/11/2021	23:45:00	41.5	56.0	34.4
03/11/2021	00:00:00	41.0	55.8	34.3
03/11/2021	00:15:00	39.4	55.5	34.2
03/11/2021	00:30:00	36.6	50.3	33.2
03/11/2021	00:45:00	39.9	59.2	32.7
03/11/2021	01:00:00	39.0	52.6	33.1
03/11/2021	01:15:00	35.9	52.9	32.5
03/11/2021	01:30:00	37.3	53.5	32.6
03/11/2021	01:45:00	46.3	64.1	32.6
03/11/2021	02:00:00	36.0	52.3	32.8
03/11/2021	02:15:00	41.6	57.1	32.4
03/11/2021	02:30:00	38.6	53.1	32.6
03/11/2021	02:45:00	36.0	48.9	32.4
03/11/2021	03:00:00	38.4	54.5	31.8
03/11/2021	03:15:00	38.6	52.7	32.1
03/11/2021	03:30:00	35.3	50.2	31.9
03/11/2021	03:45:00	38.2	54.3	32.1
03/11/2021	04:00:00	40.2	54.3	33.9
03/11/2021	04:15:00	40.1	54.7	33.1
03/11/2021	04:30:00	45.0	59.8	33.0
03/11/2021	04:45:00	43.9	58.5	33.7
03/11/2021	05:00:00	44.7	60.0	35.0
03/11/2021	05:15:00	44.5	55.3	36.0
03/11/2021	05:30:00	46.6	57.8	39.0
03/11/2021	05:45:00	52.7	67.8	46.7
03/11/2021	06:00:00	48.4	58.1	42.1
03/11/2021	06:15:00	47.1	55.6	39.8
03/11/2021	06:30:00	55.6	83.3	43.5
03/11/2021	06:45:00	53.4	77.6	44.4
Average		46.3	-	35.2
Highest		55.6	83.3	46.7
Lowest		35.3	48.9	31.8
Mode		-	-	33

**Table A2.9: Location A: Freefield night-time noise levels
Wednesday 3 November -Thursday 4 November 2021**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
03/11/2021	23:00:00	42.4	52.9	35.6
03/11/2021	23:15:00	41.2	51.6	35.2
03/11/2021	23:30:00	42.1	55.8	33.8
03/11/2021	23:45:00	41.1	53.1	33.7
04/11/2021	00:00:00	38.8	54.8	32.5
04/11/2021	00:15:00	40.1	63.5	31.9
04/11/2021	00:30:00	37.1	51.7	31.7
04/11/2021	00:45:00	36.2	54.6	31.6
04/11/2021	01:00:00	37.4	51.0	31.8
04/11/2021	01:15:00	40.9	57.0	32.3
04/11/2021	01:30:00	40.5	53.1	34.0
04/11/2021	01:45:00	34.7	45.0	31.9
04/11/2021	02:00:00	35.0	45.4	32.3
04/11/2021	02:15:00	34.1	47.5	31.4
04/11/2021	02:30:00	39.1	55.9	32.1
04/11/2021	02:45:00	33.2	46.0	31.6
04/11/2021	03:00:00	35.6	49.2	32.3
04/11/2021	03:15:00	36.5	46.9	32.8
04/11/2021	03:30:00	39.5	55.4	31.9
04/11/2021	03:45:00	36.6	52.6	32.1
04/11/2021	04:00:00	38.1	54.4	32.2
04/11/2021	04:15:00	41.0	53.0	32.8
04/11/2021	04:30:00	41.0	55.3	33.0
04/11/2021	04:45:00	40.5	55.2	33.1
04/11/2021	05:00:00	44.9	58.1	34.6
04/11/2021	05:15:00	44.2	55.1	35.4
04/11/2021	05:30:00	44.2	55.6	35.7
04/11/2021	05:45:00	45.1	59.2	37.3
04/11/2021	06:00:00	46.8	59.8	38.6
04/11/2021	06:15:00	49.9	67.5	40.5
04/11/2021	06:30:00	51.1	70.8	42.1
04/11/2021	06:45:00	51.6	70.0	43.6
Average		43.6	-	34.1
Highest		51.6	70.8	43.6
Lowest		33.2	45.0	31.4
Mode		-	-	32

**Table A2.10: Location A: Freefield night-time noise levels
Thursday 4 November – Friday 5 November 2021**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
04/11/2021	23:00:00	42.6	52.2	35.4
04/11/2021	23:15:00	42.8	54.6	34.9
04/11/2021	23:30:00	44.7	60.4	34.8
04/11/2021	23:45:00	41.7	57.2	32.6
05/11/2021	00:00:00	38.2	51.8	32.5
05/11/2021	00:15:00	44.9	60.1	33.7
05/11/2021	00:30:00	36.6	47.8	32.8
05/11/2021	00:45:00	36.4	46.6	32.4
05/11/2021	01:00:00	42.9	59.5	32.8
05/11/2021	01:15:00	37.9	54.2	33.3
05/11/2021	01:30:00	36.9	49.2	32.2
05/11/2021	01:45:00	41.5	58.0	31.7
05/11/2021	02:00:00	37.6	55.0	31.3
05/11/2021	02:15:00	36.3	52.8	31.4
05/11/2021	02:30:00	36.4	49.5	31.9
05/11/2021	02:45:00	36.1	50.3	32.2
05/11/2021	03:00:00	35.3	46.4	32.0
05/11/2021	03:15:00	35.2	57.0	31.4
05/11/2021	03:30:00	37.3	54.3	31.8
05/11/2021	03:45:00	36.6	58.2	32.2
05/11/2021	04:00:00	38.2	56.7	32.5
05/11/2021	04:15:00	39.8	51.4	33.5
05/11/2021	04:30:00	41.7	57.8	33.3
05/11/2021	04:45:00	40.8	54.7	34.7
05/11/2021	05:00:00	46.5	61.5	36.3
05/11/2021	05:15:00	45.8	57.2	37.3
05/11/2021	05:30:00	45.3	55.4	37.4
05/11/2021	05:45:00	44.6	57.2	37.9
05/11/2021	06:00:00	44.6	61.2	37.5
05/11/2021	06:15:00	46.1	57.0	40.6
05/11/2021	06:30:00	51.4	74.6	42.8
05/11/2021	06:45:00	54.6	79.0	44.7
Average		44.5	-	34.4
Highest		54.6	79.0	44.7
Lowest		35.2	46.4	31.3
Mode		-	-	32

**Table A2.10: Location A: Freefield night-time noise levels
Friday 5 November – Saturday 6 November 2021**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
05/11/2021	23:00:00	48.2	62.1	42.9
05/11/2021	23:15:00	45.2	56.0	38.5
05/11/2021	23:30:00	45.8	63.2	38.7
05/11/2021	23:45:00	46.7	63.5	39.2
06/11/2021	00:00:00	44.9	71.0	37.3
06/11/2021	00:15:00	44.7	54.6	38.6
06/11/2021	00:30:00	45.4	61.5	39.0
06/11/2021	00:45:00	45.5	58.4	35.9
06/11/2021	01:00:00	44.4	55.3	37.6
06/11/2021	01:15:00	43.3	58.6	36.2
06/11/2021	01:30:00	44.6	55.2	37.1
06/11/2021	01:45:00	42.1	58.0	35.1
06/11/2021	02:00:00	40.2	52.3	34.5
06/11/2021	02:15:00	38.8	47.6	35.0
06/11/2021	02:30:00	39.9	52.0	35.1
06/11/2021	02:45:00	39.5	48.8	35.2
06/11/2021	03:00:00	39.6	53.5	35.1
06/11/2021	03:15:00	37.8	50.3	33.8
06/11/2021	03:30:00	41.7	56.7	35.1
06/11/2021	03:45:00	40.3	54.5	34.8
06/11/2021	04:00:00	40.6	51.8	35.2
06/11/2021	04:15:00	39.5	55.1	35.0
06/11/2021	04:30:00	41.2	54.9	34.7
06/11/2021	04:45:00	42.1	53.1	36.5
06/11/2021	05:00:00	42.6	54.9	36.4
06/11/2021	05:15:00	46.3	63.5	36.9
06/11/2021	05:30:00	43.9	56.3	36.2
06/11/2021	05:45:00	42.9	60.2	36.7
06/11/2021	06:00:00	44.1	56.8	36.9
06/11/2021	06:15:00	45.5	57.9	39.5
06/11/2021	06:30:00	46.6	65.1	39.4
06/11/2021	06:45:00	50.8	72.6	43.0
Average		44.3	-	36.9
Highest		50.8	72.6	43.0
Lowest		37.8	47.6	33.8
Mode		-	-	35

**Table A2.11: Location A: Freefield night-time noise levels
Saturday 6 November – Sunday 7 November 2021**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
06/11/2021	23:00:00	52.2	61.9	46.3
06/11/2021	23:15:00	53.3	61.8	47.5
06/11/2021	23:30:00	47.9	61.9	42.5
06/11/2021	23:45:00	48.1	62.1	41.6
07/11/2021	00:00:00	51.4	66.7	44.4
07/11/2021	00:15:00	51.6	63.3	44.2
07/11/2021	00:30:00	50.1	58.9	42.1
07/11/2021	00:45:00	49.6	59.4	42.1
07/11/2021	01:00:00	45.2	54.5	39.2
07/11/2021	01:15:00	48.3	57.2	42.7
07/11/2021	01:30:00	50.4	73.8	42.1
07/11/2021	01:45:00	49.2	60.8	42.4
07/11/2021	02:00:00	49.1	62.5	41.6
07/11/2021	02:15:00	49.0	61.1	38.9
07/11/2021	02:30:00	47.9	62.2	38.2
07/11/2021	02:45:00	47.5	57.8	40.2
07/11/2021	03:00:00	45.4	58.0	37.8
07/11/2021	03:15:00	47.6	61.1	40.3
07/11/2021	03:30:00	50.1	61.1	43.4
07/11/2021	03:45:00	53.9	65.1	46.2
07/11/2021	04:00:00	52.5	65.1	45.0
07/11/2021	04:15:00	53.7	63.0	45.4
07/11/2021	04:30:00	52.0	63.7	45.0
07/11/2021	04:45:00	49.0	57.1	43.1
07/11/2021	05:00:00	50.7	65.1	42.2
07/11/2021	05:15:00	48.9	61.3	42.3
07/11/2021	05:30:00	49.4	63.8	41.5
07/11/2021	05:45:00	48.9	58.6	41.8
07/11/2021	06:00:00	47.1	56.2	38.3
07/11/2021	06:15:00	44.5	56.6	38.1
07/11/2021	06:30:00	48.2	69.7	38.4
07/11/2021	06:45:00	50.8	75.7	42.0
Average		50.1	-	42.1
Highest		53.9	75.7	47.5
Lowest		44.5	54.5	37.8
Mode		-	-	42

**Table A2.12: Location A: Freefield night-time noise levels
Sunday 7 November – Monday 8 November 2021**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
07/11/2021	23:00:00	45.4	63.0	39.3
07/11/2021	23:15:00	40.3	50.5	34.6
07/11/2021	23:30:00	40.1	53.0	33.4
07/11/2021	23:45:00	40.8	53.0	35.4
08/11/2021	00:00:00	40.6	61.1	34.3
08/11/2021	00:15:00	36.6	53.1	31.4
08/11/2021	00:30:00	37.0	51.8	31.2
08/11/2021	00:45:00	35.0	49.4	30.9
08/11/2021	01:00:00	37.5	51.3	31.3
08/11/2021	01:15:00	32.7	44.2	30.2
08/11/2021	01:30:00	33.9	46.9	30.3
08/11/2021	01:45:00	40.0	58.5	30.2
08/11/2021	02:00:00	31.7	50.7	30.3
08/11/2021	02:15:00	34.0	48.2	30.3
08/11/2021	02:30:00	38.1	54.9	31.5
08/11/2021	02:45:00	37.8	54.8	30.9
08/11/2021	03:00:00	35.2	50.3	29.8
08/11/2021	03:15:00	37.6	58.9	29.9
08/11/2021	03:30:00	36.8	49.8	30.8
08/11/2021	03:45:00	39.1	56.4	31.0
08/11/2021	04:00:00	39.1	56.6	31.5
08/11/2021	04:15:00	40.7	56.7	32.2
08/11/2021	04:30:00	41.5	56.0	33.1
08/11/2021	04:45:00	45.8	62.5	33.0
08/11/2021	05:00:00	44.2	59.9	33.9
08/11/2021	05:15:00	44.0	55.7	36.5
08/11/2021	05:30:00	47.8	61.9	37.8
08/11/2021	05:45:00	49.6	73.8	37.8
08/11/2021	06:00:00	46.8	62.9	38.3
08/11/2021	06:15:00	48.8	69.5	40.5
08/11/2021	06:30:00	51.3	71.3	42.3
08/11/2021	06:45:00	55.9	75.6	44.4
Average		45.3	-	33.7
Highest		55.9	75.6	44.4
Lowest		31.7	44.2	29.8
Mode		-	-	31