

NoiseAssess

Acoustics, Noise and Vibration Consultants

Project:	Hilton Park, off Lowman Way, Hilton Proposed business park
Scope of Report	Assessment of potential noise breakout, delivery/dispatch noise and external plant noise
Client:	P.M. Harris Ltd
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1.0 INTRODUCTION

- 1.1 NoiseAssess Ltd has been appointed by P.M. Harris Ltd to carry out an outline noise assessment for proposed business units at Hilton Park, Lowman Way, Hilton DE65 5UA. The site location is shown in Figure 1 and this assessment has been based on the proposed plans, layouts and elevations prepared by Glancy Nicholls Architects as shown in Figures 2-7.
- 1.2 The site is in a mixed industrial / residential area to the south of Lowman Way. There are existing industrial premises along the north side of Lowman Way and residential properties to the south of Lowman Way. The proposed development is at the east end of Lowman Way and to the south of Lowman Way. There are residential properties to the northwest and west of the site and industrial premises to the north and northeast. There is a wood to the east and south with a railway beyond which runs east/west approximately 100m to the south of the site. The A50 dual carriageway lies approximately 1.3 km to the north, the A38 dual carriageway approximately 2.6 km to the southeast and Derby Airfield approximately 700m to the southeast.
- 1.3 The plans show two phases.
- Phase 1: Unit 1 consisting of 2 storey offices, a workshop and a yard used for the storage and distribution of construction materials as shown on Figures 2 & 3. There is no workshop on site at present.
 - Phase 2: Units 2-5, 4 blocks of units arranged as shown on Figures 2 and 4-7. The proposed units are generally arranged so that they back onto the northwest and southeast site boundaries with access and service areas to the centre of the site.
 - It is understood that the proposed operating times will be 06:00-19:00 hrs Monday-Friday and 07:00-14:00 hrs Saturdays.
- 1.4 This report considers the potential impact of noise break out and noise due to delivery/dispatch vehicle movements on the closest residential properties in accordance with BS4142¹. A design target based on BS4142 has been provided for cumulative noise from external plant.

2.0 CRITERIA

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."
- "NOTE 2: 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 and 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.

Assessment in Context

2.6 BS4142 recommends that the industrial sound should also be assessed in context. Therefore, the sound levels have been assessed in the context of the character of the area; the derived ambient noise levels and the criteria given in BS8233².

2.7 The BS8233 recommendations for indoor ambient noise levels are given below.

Table 1: BS8233 recommendations for indoor ambient noise levels

Activity	Location	07:00 to 23:00 hrs	23:00 to 07:00 hrs
Resting	Living room	35 dBL _{Aeq,16hour}	-
Dining	Dining room/area	40 dBL _{Aeq,16hour}	-
Sleeping (daytime resting)	Bedroom	35 dBL _{Aeq,16hour}	30 dBL _{Aeq,8hour}

2.8 Paragraph 7.7.3.2 of BS8233 recommends that for traditional external amenity areas such as gardens and patios, it is desirable that during the daytime the external noise level does not exceed 50 dBL_{Aeq,T} with an upper guideline value of 55 dBL_{Aeq,T} which would be acceptable in noisier environments. The time period is not stated but is assumed to be 16 hours (07:00 hours to 23:00 hrs) as in the previous version of BS8233.

3.0 BASELINE NOISE SURVEY

- 3.1 A survey of the current noise levels at the site was carried out from 23:00 hrs Tuesday 06/02/2024 to on 07:00 hrs Friday 09/02/2024.
- 3.2 Noise levels were measured close to the northwest boundary of the site in a position representative of the closest residential properties. The microphone was in freefield conditions at a height of approximately 2.0m above ground level. The survey location is marked A on Figures 1 and 2.
- 3.3 Noise levels were measured using an unattended auto-logging Rion NL-52 sound level meter (s/n 732142). The sound level meter was calibrated using a portable Norsonic 1251 calibrator (s/n 30901) at the start and finish of the survey with no variation in the calibration level. Broadband noise levels were measured using 5-minute sample periods.
- 3.4 Weather conditions were dry with low windspeeds (<5m/s) from 23:00 hrs Tuesday 06/02/2024 – 09:00 hrs Thursday 08/02/2024. Weather conditions during the rest of the survey period were generally poor with some periods of high windspeeds and rain (source: www.timeanddate.com).
- 3.5 There was very little activity on the active Phase 1 site during the noise survey.
- 3.6 The results of the noise survey are presented in full in Appendix A2 and summarised below. Noise data is provided for the periods 06:00-07:00 hrs and 07:00-19:00 hrs which cover the proposed night-time and daytime operating times. Noise data is also summarised for the night-time period 23:00-06:00 hrs to enable a noise design target to be provided for external plant that may run through the night outside of the proposed operating period. The $dBL_{Aeq,5min}$ ambient noise levels have been logarithmically averaged and the $dBL_{A90,5min}$ background values have been arithmetically averaged. The mode of the 1-hour daytime and 15-minute night-time dBL_{A90} values has also been given.

Table 2. Location A: Summary of freefield noise levels for period 07:00-19:00 hrs

Day	Period	Ambient noise level dBL _{Aeq}		Background noise level dBL _{A90}	
		Average	Range	Average	Mode
07/02/2024	07:00 - 19:00	50	43 - 55	44	44
08/02/2024	07:00 - 19:00	53	53 - 55	52	52

Table 3. Location A: Summary of freefield noise levels for period 06:00-07:00 hrs

Day	Period	Ambient noise level dBL _{Aeq}		Background noise level dBL _{A90}	
		Average	Range	Average	Mode
07/02/2024	06:00 - 07:00	51	49 - 52	50	51
08/02/2024	06:00 - 07:00	52	51 - 53	51	51
09/02/2024	06:00 - 07:00	54	54 - 55	53	53

Table 4. Location A: Summary of freefield noise levels for period 23:00-06:00 hrs

Night	Period	Ambient noise level dBL _{Aeq}		Background noise level dBL _{A90}	
		Average	Range	Average	Mode
06/02/2024	23:00 - 06:00	47	39 - 52	44	44
07/02/2024	23:00 - 06:00	48	45 - 51	45	44
08/02/2024	23:00 - 06:00	51	49 - 53	50	50

- 3.7 During the two site visits to install and retrieve the auto-logging sound level meter the main noise sources were road traffic on the A50 and A38 and occasional train passbys on the railway to the south.
- 3.8 Noise levels in the period 06:00-07:00 hrs were noticeably higher than during the period 07:00-19:00 hrs. This was seen on each day of the survey and levels were seen to gradually increase and drop off therefore it is very unlikely that the higher morning noise levels were due to localised activity near to the noise survey location. It is likely that the noise levels during the period 06:00-07:00 hrs were due to the morning peak period on nearby main roads.
- 3.9 There was a small amount of activity on the Phase 1 site during the survey but not enough to have any noticeable impact on the noise levels at the baseline noise survey location. While onsite to install and retrieve the noise meter vehicles moving about on the Phase 1 site could be seen but not heard.

4.0 PREDICTED NOISE LEVELS AND RECOMMENDATIONS

Closest noise sensitive premises

4.1 Noise from the proposed development has been predicted for the receptor positions summarised below and as shown on Figure and 2:

R1: Dwelling to the northwest.

R2: Dwelling to the west.

4.2 Noise during the proposed daytime operating period of 07:00-19:00 hrs has been predicted for a height of 1.5m above ground level representative of external amenity areas and ground floor windows.

4.3 Noise during the proposed night-time operating period of 06:00-07:00 hrs has been predicted for a height of 4.0m above ground level representative of first floor bedroom windows.

Noise break-out from proposed industrial units

Dimensions of industrial units and internal noise levels

4.4 Based on the site plans provided and discussion with the client the predicted noise levels are based on the following:

Phase 1

- Unit 1: Part two-storey offices (to the west) and part full height workshop (to the east) with pitched roof, 7.0m to eaves and 8.0m to ridge with 2 x 4m x 5m roller shutter doors in the north elevation.

Phase 2

- Units 2A-2C: pitched roof, 7.0m to eaves and 9.1m to ridge with 1 x 4.5m x 5m roller shutter door in the northwest elevation of each unit.
- Units 3A-3F: pitched roof, 7.0m to eaves and 9.6m to ridge with 1 x 4.5m x 5m roller shutter door in the southeast elevation of each unit.
- Units 4A-4C: pitched roof, 7.0m to eaves and 9.8m to ridge with 1 x 4.5m x 5m roller shutter door in the southeast elevation of each unit.

- Units 4A-4C: pitched roof, 7.0m to eaves and 9.8m to ridge with 1 x 4.5m x 5m roller shutter door in the southeast elevation of each unit.
- Units 5A-5D: single pitch, 8.2m at the front and 5m to the rear 1 x 4m x 5m roller shutter door in the southeast elevation of each unit.

Assumed internal noise levels

- 4.5 It is understood that the proposed units will either be used for fabrication/repair/maintenance workshop or distribution purposes. The internal noise levels which will occur within the new units are not known at this time. For the purposes of this assessment, it has been assumed that the internal noise levels will be up to 70 dB(A) if the roller shutter doors are open or up to 80 dBL_{Aeq} if the roller shutter doors are closed. 70 dB(A) is typical of the upper level in a distribution / storage unit and 80 dB(A) is the upper level in a fabrication / workshop type.

Table 5. Assumed internal noise levels in proposed units

	Octave band sound insulation R, dB (Hz)								R _w
	63	125	250	500	1k	2k	4k	8k	
Fabrication / maintenance	73	73	73	73	73	73	73	73	80
Distribution	63	63	63	63	63	63	63	63	70

- 4.6 The noise level of 80 dBL_{Aeq} would result in noise exposure equivalent to the lower exposure action value of 'The Control of Noise at Work Regulations, 2005' over an 8-hour shift and in order for this level to be generated at the inner face of the sheeting of the walls and roof noise levels near machines would need to be higher. Therefore, this assumption is typical of units which are 'Hearing Protection Zones' where the use of hearing protection would be mandatory. In practice it is likely that new businesses would design their operations to control noise at source to reduce staff noise exposure which is the aim of 'The Control of Noise at Work Regulations'.
- 4.7 The assumed internal levels have been applied to the whole of each unit's external walls and roof which is conservative as normally large parts of the building envelope would be subject to lower noise levels.
- 4.8 It has been assumed that all roller shutter doors will only open onto areas with a constant noise level no greater than 70 dBL_{Aeq}.

External building envelope

- 4.9 It is understood that the proposed units will have walls and roof clad in profiled metal sheeting sandwich panels. The assumed sound insulation of the wall and roof cladding and roller shutter doors is detailed below.

Table 6. Assumed sound insulation of the walls, roof & roller shutter doors

	Octave band sound insulation R, dB (Hz)								R _w
	63	125	250	500	1k	2k	4k	8k	
Units / areas with internal noise levels of ≤ 70 dB(A)									
Walls and roofs ^a	15	16	19	23	26	22	39	39	25
Units with internal noise levels of ≤ 80 dB(A)									
Walls and roofs ^c	15	16	29	38	40	45	55	55	38
All units									
Roller shutter doors ^b	6	10	10	14	17	20	15	8	17

^a Composite type panel with no lining based on sound insulation data in the Kingspan brochure

^b Sound insulation data for roller shutter door based on NoiseAssess on-site measurements

^c Composite type panel with insulation & internal lining based on sound insulation data in the Kingspan brochure

Recommendations for the control of noise from the business units

- 4.10 The following recommendations are made for the control of noise break-out from the units:
- Units may operate 06:00-19:00 hrs with roller shutter doors open provided that the doors only open onto areas where noise levels are less than or equal to 70 dB(A).
 - Units may operate 06:00-19:00 hrs with internal noise levels less than or equal to 80 dB(A) provided that roller shutter doors are kept closed and the external walls and roof are fitted with insulation and linings that increase the sound insulation to 38 dB R_w.
- 4.11 It is recommended that the design of the external building envelope should be reviewed by a suitably qualified acoustic consultant should any unit wish to operate with internal noise levels above 80 dB(A).
- 4.12 Noise breakout from the units has been predicted as summarised below:
- All units operating with internal noise levels of 70 dB(A) with 25 dB R_w walls and roof panels and open roller shutter doors.

- All units operating with internal noise levels of 80 dB(A) with 38 dB R_w walls and roof panels and closed roller shutter doors.

Noise from HGV & van movements and JCB type shovel

- 4.13 External vehicle and activity during the period 06:00-07:00 hrs has been based on a 15-minute reference period as summarised below.

Table 7. Site activity for period 06:00-07:00 hrs

	Phase 1	Phase 2
Van movements	2 / 15-minutes	1 per unit / 15-minutes
HGV movements	2 / 15-minutes	2 / 15-minutes
HGV reverses	1 / 15-minutes	1 / 15-minutes
Loading material onto HGVs using JCB type shovel	15-minutes / 15-minutes	-
Scraping up waste material using a JCB type shovel	30-seconds / 15-minutes	-

- 4.14 External vehicle and activity during the period 07:00-19:00 hrs has been based on a 1-hour reference period as summarised below:

Table 8. Site activity for period 06:00-07:00 hrs

	Phase 1	Phase 2
Van movements	8 / hour	2 per unit / hour
HGV movements	8 / hour	8 / hour
HGV reverses	4 / hour	4 / hour
Loading material onto HGVs using JCB type shovel	15-minutes/ hour	-
Scraping up waste material using a JCB type shovel	2-minutes / hour	-

- 4.15 The following noise data has been used for vehicle movements.

Table 9. NoiseAssess library data for HGV, van & JCB type shovel movements – freefield sound pressure levels

Noise source	Measurement distance	Octave band c.f. Hz (dB)								dB(A)
		63	125	250	500	1000	2000	4000	8000	
HGV forward movement	10m	93.2	80.5	76.3	77.4	78.4	76.7	70.3	62.8	82.7
HGV reverse inc alarm	10m	87.9	82.6	80.7	79.1	80.4	81.1	76.1	65.3	86.0
Van movement	10m	71.5	66.6	65.1	64.8	64.4	59.8	53.0	45.4	68.0
Loading HGV with shovel	10m	85.5	86.9	85.4	80.9	78.1	75.6	71.2	63.2	84.0
Scraper	10m	91.0	92.9	91.3	86.6	82.6	80.2	71.4	61.7	89.0

Recommendations for acoustic barriers

- 4.16 Initial calculations indicated that the following measures will be necessary to control the impact of noise from the proposed units on the closest residential properties.
- 4.17 It is recommended that the existing 2m high acoustic barriers along the northwest site boundary should be retained.
- 4.18 It is recommended that the existing 2.2m paladin fencing to the west of the site around the attenuation pond should be changed to a 2.0m (min) high acoustic fence.
- 4.19 The acoustic fences are shown on Figure 8.
- 4.20 The acoustic barriers should be imperforate and have a minimum mass of 12 kg/m². The acoustic barriers should be fully sealed to the ground at the base and should be designed so that gaps do not open between panels or at the base due to weathering over the lifespan of the barrier. This will normally mean that panels are interlocking or have cover strips and that gravel boards at the base are designed to limit deterioration due to contact with the ground. The barrier should also be well sealed at the corners. Consideration should be given to the procedures for maintenance or replacement of the barriers as necessary to ensure their continued effectiveness. The acoustic barrier may consist of one of the following:

- An acoustic fence meeting the above specification. Acoustic fences are available in various materials with varying lifespans as can be seen from the examples of proprietary acoustic fences below.
- A masonry wall with no gaps.

4.21 Examples of suppliers of proprietary acoustics fences are as follows:

Gramm Barriers: <http://www.grammbarriers.com/our-products/acoustic-barriers/>

Jacksons Fencing: <https://www.jacksons-fencing.co.uk/acoustic-fencing>

Premier Acoustic Fencing: <http://www.premieracousticfencing.co.uk/>

Predicted cumulative noise levels at nearest residential properties

4.22 Noise from the proposed business park units at the nearest residential properties has been predicted using CadnaA noise modelling software, produced by DataKustick GmbH.

4.23 The noise model has been used to calculate the noise propagation in accordance with ISO 9613-1996: Acoustics³. The model takes into account distance attenuation; screening attenuation; ground absorption; atmospheric absorption and reflections. The modelling has been based on hard ground (G=0) and a maximum order of reflection of 1 with a search radius of 100m. The atmospheric conditions used in the model input were a temperature of 10 °C and a relative humidity of 70%. The modelling calculations have been carried out on the basis of the receptors being downwind of all sources simultaneously and no allowance has been made for directivity. This assumption is conservative.

4.24 The predicted cumulative noise levels due to the proposed business units at the nearest residential properties are summarised below.

Table 10. Predicted cumulative freefield noise levels at closest residential properties

Internal noise level	Roller shutter doors	R1	R2
<i>06:00-07:00 hrs</i>			
70 dB(A)	Open	44 dBL _{Aeq,15min}	45 dBL _{Aeq,15min}
80 dB(A)	Closed	44 dBL _{Aeq,15min}	44 dBL _{Aeq,15min}
<i>07:00-19:00 hrs</i>			
70 dB(A)	Open	33 dBL _{Aeq,1hr}	36 dBL _{Aeq,1hr}
80 dB(A)	Closed	32 dBL _{Aeq,1hr}	32 dBL _{Aeq,1hr}

5.0 NOISE ASSESSMENT

Criteria and Methodology

- 5.1 The impact of noise from the proposed business units has been assessed in accordance with BS4142 and in context.
- 5.2 The assessment is based on the predicted noise levels from the site operating as set out in Section 4 and with the noise control measures detailed in Section 4 in place.

BS4142 Assessment

- 5.3 BS4142 assessments have been carried out for the periods 06:00-07:00hrs and 07:00-19:00 hrs Monday-Friday. It has been assumed that the results of the assessment for the period 07:00-19:00 hrs also apply to the period 07:00-13:00 hrs on Saturdays.
- The assessment of noise for the period 06:00-07:00 hrs has been based on the lowest average / mode of the background noise levels measured during the baseline noise survey between 06:00 hrs and 07:00 hrs.
 - The assessment of noise for the period 07:00-19:00 hrs has been based on the lowest average / mode of the background noise levels measured during the baseline noise survey between 07:00 hrs and 19:00 hrs.
- 5.4 A 2dB tonal penalty and a 3 dB impulsive/intermittency penalty have been added.

Table 11. BS4142 assessment of cumulative noise 06:00-07:00 hrs

	70 dB(A), RSDs open		80 dB(A), RSDs closed	
	R1	R2	R1	R2
Specific noise level, dBL _{Aeq}	44	45	44	44
Tonal Penalty, dB	2	2	2	2
Impulsive/Intermittency penalty, dB	3	3	3	3
Rating, dB	49	50	49	49
Background noise level, dBL _{A90}	51	51	51	51
Rating - background, dB	-2	-1	-2	-2

- 5.5 The differences between the rating levels and the background noise levels in the table above indicate a low noise impact at the nearest residential properties during the period 06:00-07:00 hrs.

Table 12. BS4142 assessment of cumulative noise 07:00-19:00 hrs

	70 dB(A), RSDs open		80 dB(A), RSDs closed	
	R1	R2	R1	R2
Specific noise level, dBL _{Aeq}	33	36	32	32
Tonal Penalty, dB	2	2	2	2
Impulsive/Intermittency penalty, dB	3	3	3	3
Rating, dB	38	41	37	37
Background noise level, dBL _{A90}	44	44	44	44
Rating - background, dB	-6	-3	-7	-7

- 5.6 The differences between the rating levels and the background noise levels in the table above indicate a low noise impact at the nearest residential properties during the period 06:00-07:00 hrs.
- 5.7 BS4142 recommends that the noise also be judged in context.
- 5.8 The proposed business units will be in an area of mixed industrial and residential use that is close to major road and rail routes. Noise from the proposed development is therefore unlikely to change the acoustic character of the area.
- 5.9 To assist with the consideration of the noise in context the predicted noise levels have been compared with the lowest ambient noise levels measured during the periods 06:00-07:00 hrs and 07:00-19:00 hrs of the baseline noise survey. In addition, the predicted noise levels have been compared with the criteria given in BS8233. It is recognised that this standard is generally used for anonymous noise sources, and it is used here only to provide additional information on the scale of the noise levels. The results of these comparisons are given below.

Table 13. Predicted noise from proposed development for period 06:00-07:00 hrs compared with lowest ambient noise levels and BS8233 criteria

	70 dB(A), RSDs open		80 dB(A), RSDs closed	
	R1	R2	R1	R2
Source noise level, dBL _{Aeq}	44	45	44	44
Comparison with ambient noise levels				
Ambient noise level, dBL _{Aeq}	49	49	49	49
Difference between ambient & source noise level, dB(A)	-5	-4	-5	-5
Ambient + source noise level, dBL _{Aeq}	50	50	50	50
Increase in ambient noise level, dBL _{Aeq} [†]	1	1	1	1
Comparison with BS8233 internal noise limiting criteria				
Internal noise level due to source noise, dB(A) ^{††}	29	30	29	29
BS8233 recommended internal noise criteria dB(A)	≤ 30	≤ 30	≤ 30	≤ 30

[†]An increase in ambient noise level of up to 3dB(A) is not considered to be significant

^{††}Attenuation due to partially open window taken as 15dB(A)

Table 14. Predicted noise from proposed development for period 07:00-19:00 hrs compared with lowest ambient noise levels and BS8233 criteria

	70 dB(A), RSDs open		80 dB(A), RSDs closed	
	R1	R2	R1	R2
Source noise level, dBL _{Aeq}	33	36	32	32
Comparison with ambient noise levels				
Ambient noise level, dBL _{Aeq}	43	43	43	43
Difference between ambient & source noise level, dB(A)	-10	-7	-11	-11
Ambient + source noise level, dBL _{Aeq}	43	44	43	43
Increase in ambient noise level, dBL _{Aeq} [†]	0	1	0	0
Comparison with BS8233 criteria for gardens				
BS8233 Upper limit for private gardens	55	55	55	55
Difference between source noise & desired limit, dB(A)	-22	-19	-23	-23
Comparison with BS8233 internal noise limiting criteria				
Internal noise level due to source noise, dB(A) ^{††}	18	21	18	22
BS8233 recommended internal noise criteria dB(A)	≤ 35	≤ 35	≤ 35	≤ 35

[†]An increase in ambient noise level of up to 3dB(A) is not considered to be significant

^{††}Attenuation due to partially open window taken as 15dB(A)

- 5.10 The consideration in context supports the conclusion of the BS4142 assessment that the deliveries will have a low noise impact.

6.0 DESIGN TARGET FOR EXTERNAL PLANT

- 6.1 At present no details are available for any external plant, e.g. air conditioning units, extract vents etc, that may be installed to serve the new development.
- 6.2 The lowest average / mode background noise level measured during the baseline noise survey was 43 dBL_{A90} and occurred during the daytime period operating period 07:00-19:00 hrs. It is therefore recommended that the cumulative noise from all external plant installed to serve the development should not exceed 33 dBL_{Aeq} at the nearest residential properties regardless of the plant operating period.
- 6.3 The above targets are 10 dB(A) below the lowest average and modal dBL_{A90} noise levels. These recommended noise levels should result in no increase in existing noise levels and would give a low impact if assessed in accordance with BS4142.
- 6.4 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 in order 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 by the proposed buildings will require less attenuation measures.

7.0 CONCLUSIONS

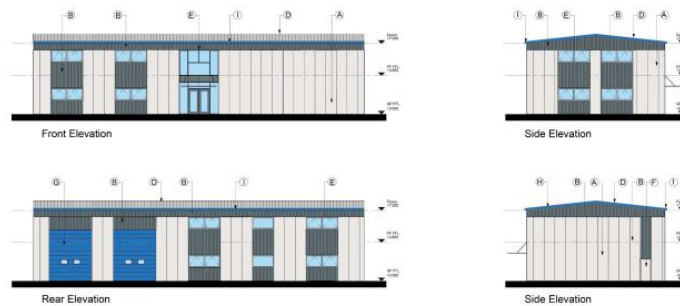
- 7.1 A survey of the current noise levels representative of the closest residential properties was carried out from 23:00 hrs on Tuesday 06/02/2024 to 07:00 hrs on Friday 09/02/2024.
- 7.2 It is understood that the proposed units will be operational during the periods 06:00-19:00 hrs, Monday to Friday and 07:00-14:00 hrs on Saturdays. External plant is expected to operate during these periods and some external plant may operate outside of the normal operating hours.
- 7.3 It is recommended that the existing 2m high acoustic barriers along the northwest site boundary should be retained. It is recommended that the existing 2.2m paladin fencing to the west of the site around the attenuation pond should be changed to an acoustic fence at least 2m in height. The location of the acoustic barriers are shown on Figure 8.
- 7.4 Noise break-out from the proposed industrial units has been predicted for the closest residential properties. When considered in accordance with BS4142 and in context, noise breakout from the proposed units during the proposed operating hours is expected to have a low noise impact at the closest residential properties provided that:
- Units may operate 06:00-19:00 hrs with roller shutter doors open provided that the doors only open onto areas where noise levels are less than or equal to 70 dB(A).
 - Units may operate 06:00-19:00 hrs with internal noise levels less than or equal to 80 dB(A) provided that roller shutter doors are kept closed and the external walls and roof are fitted with insulation and linings that increase the sound insulation to 38 dB R_w.
- 7.5 It is recommended that the design of the external building envelope should be reviewed by a suitably qualified acoustic consultant should any unit wish to operate with internal noise levels above 80 dB(A).
- 7.6 A design target for external plant has been provided.
- 7.7 The assessment indicates that noise from the proposed business park can be controlled to give a low noise impact at the closest residential properties. It is therefore recommended that, subject to certain restrictions which can be conditioned, planning permission for the proposed development should not be refused on the grounds of noise.

8.0 REFERENCES

1. BS4142: British Standard 4142:2014+AI:2019, Methods for rating and assessing industrial and commercial sound.
2. BS8233: British Standard 8233, Guidance on sound insulation and noise reduction for buildings, BSI 2014.

FIGURE 1. LOCATION OF SITE AND BASELINE NOISE SURVEY



FIGURE 3. PHASE 1: UNIT 1 - PROPOSED LAYOUT AND ELEVATIONS**7.0 Appearance****Unit 1**

The elevations of unit 1 office is a combination of vertically laid cladding systems and fenestration. The fenestration brings light into the office spaces and creates relief.

Extract taken from GNA Drawing: 20008-GNA-XX-XX-DR-A-1001-Unit 1-Plan and Elevations

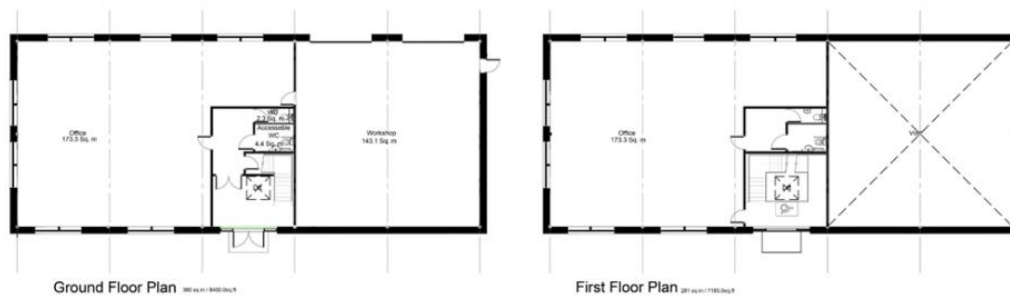


FIGURE 4. PHASE 2: UNIT 2 - PROPOSED LAYOUT AND ELEVATIONS

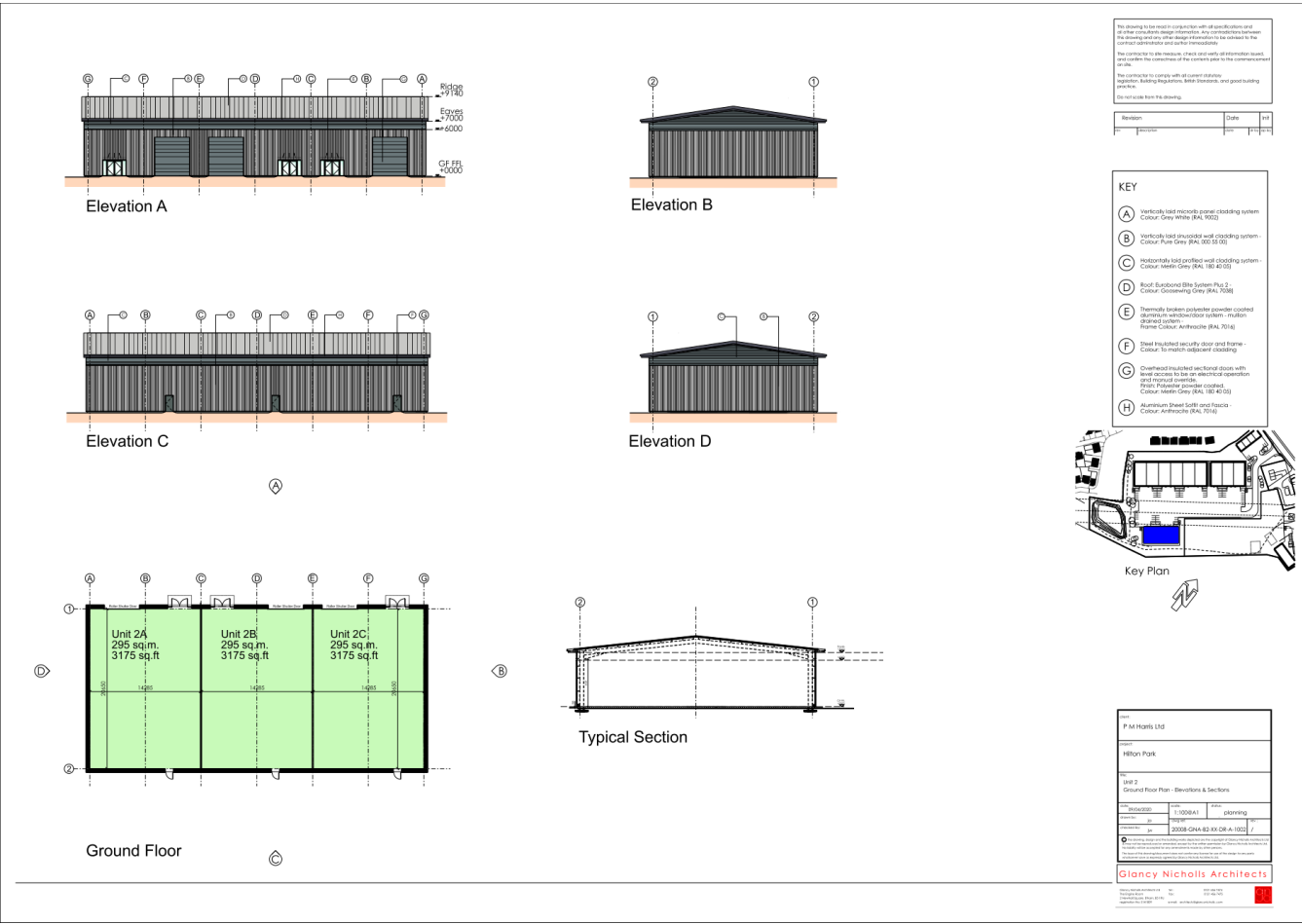


FIGURE 5. PHASE 2: UNIT 3 - PROPOSED LAYOUT AND ELEVATIONS

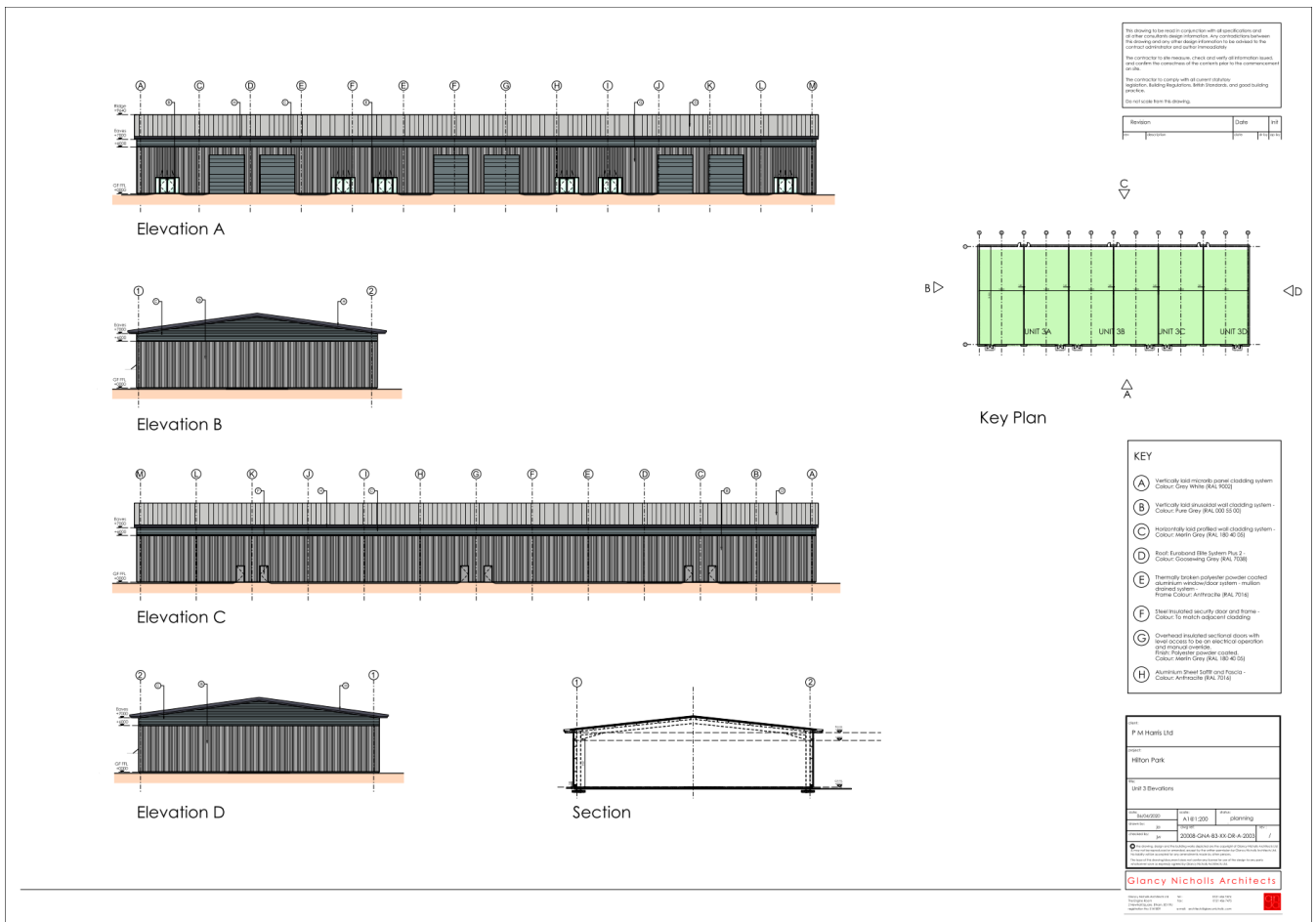


FIGURE 6. PHASE 2: UNIT 4 - PROPOSED LAYOUT AND ELEVATIONS

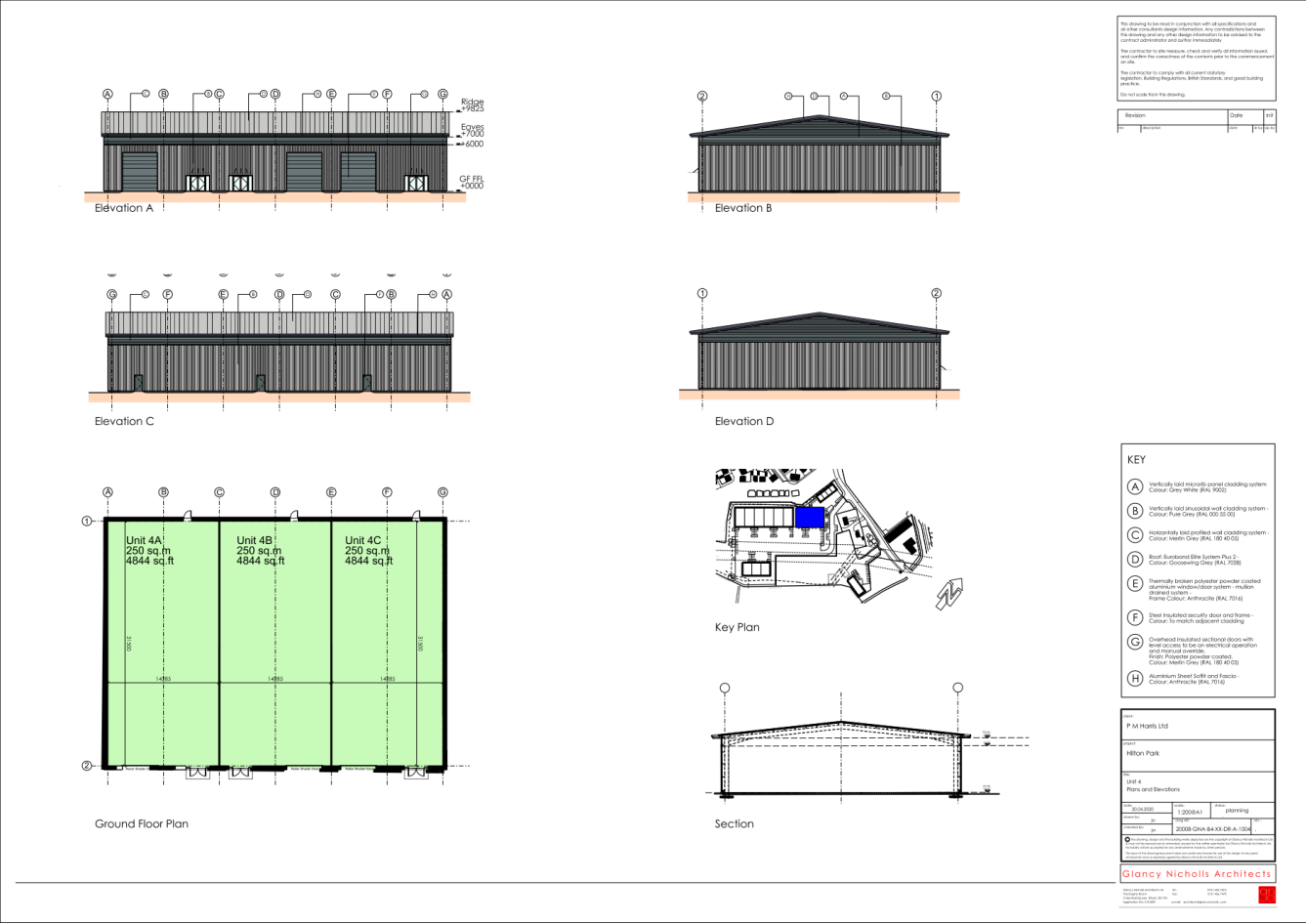
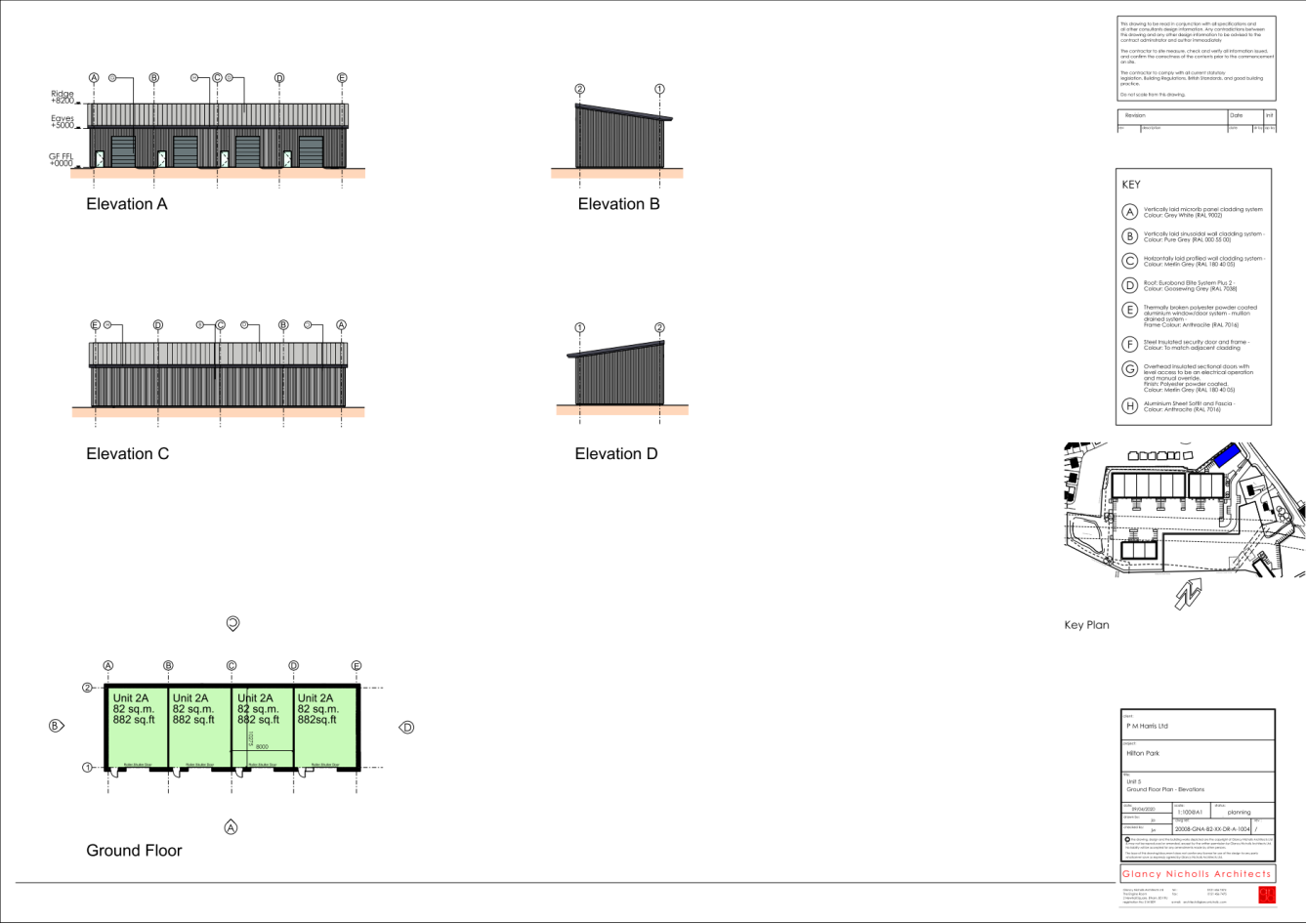


FIGURE 7. PHASE 2: UNIT 4 - PROPOSED LAYOUT AND ELEVATIONS



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_{LAeq}).
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 $120dB_{LAeq}$ 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 $110 dB_{LAeq}$. In the workplace the wearing of hearing protection is compulsory for staff who experience a noise level of over $85dB_{LAeq}$ averaged over an 8-hour day and is normally used when the levels are over $80dB_{LAeq}$ averaged over the 8-hour day. Noise intrusion levels into bedrooms (e.g. from traffic noise) are often controlled to below $30dB_{LAeq}$ in the design of new properties (standards sometimes vary between authorities). Noise levels of below $20dB_{LAeq}$ 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.
Rating Level	A term used in BS4142. The 'Specific Noise Level' plus a weighting if the noise has certain characteristic features which may make it more disturbing.
Residual noise	The ambient noise remaining when the specific noise source being investigating is not contributing to the noise level at that location (normally measured using the L _{Aeq} parameter).
Specific Noise Level	A term used in BS4142. The L _{Aeq} noise level produced at the assessment position by the noise source being investigated over the reference time period (1-hour in the day and 15-mins at night).
SEL	Single Event Level. The total sound energy of a noise event (e.g. a train pass-by) compressed into 1 second. i.e. . the 1 second L _{Aeq} which has the same total A-weighted energy as the entire event.

APPENDIX A2: NOISE SURVEY RESULTS

**Table A2.1: Location A: Freefield daytime noise levels
Wednesday 07/02/2024**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
07/02/2024	07:00:02	53.2	63.0	51.8
07/02/2024	08:00:02	54.9	69.5	53.6
07/02/2024	09:00:02	52.1	70.7	49.5
07/02/2024	10:00:02	51.8	74.3	44.4
07/02/2024	11:00:02	47.3	68.0	41.7
07/02/2024	12:00:02	43.3	61.6	40.2
07/02/2024	13:00:02	43.9	65.6	37.3
07/02/2024	14:00:02	44.4	61.7	35.5
07/02/2024	15:00:02	45.0	68.1	36.7
07/02/2024	16:00:02	45.0	62.2	42.6
07/02/2024	17:00:02	47.0	62.6	45.3
07/02/2024	18:00:02	46.7	67.5	43.9
Average		49.7	-	43.5
Highest		54.9	74.3	53.6
Lowest		43.3	61.6	35.5
Mode		-	-	44

**Table A2.2: Location A: Freefield daytime noise levels
Thursday 08/02/2024**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
08/02/2024	07:00:02	52.6	72.9	51.2
08/02/2024	08:00:02	53.4	69.3	52.0
08/02/2024	09:00:02	52.9	70.9	51.5
08/02/2024	10:00:02	54.5	68.4	52.8
08/02/2024	11:00:02	53.8	63.6	52.8
08/02/2024	12:00:02	53.5	71.6	52.4
08/02/2024	13:00:02	53.2	68.4	52.1
08/02/2024	14:00:02	52.9	59.8	51.8
08/02/2024	15:00:02	53.4	68.3	52.3
08/02/2024	16:00:02	54.2	66.6	52.9
08/02/2024	17:00:02	53.5	70.4	52.5
08/02/2024	18:00:02	52.6	67.6	51.5
Average		53.4	-	52.2
Highest		54.5	72.9	52.9
Lowest		52.6	59.8	51.2
Mode		-	-	52

**Table A2.3: Location A: Freefield night-time noise levels
Tuesday 06/02/2024 – Wednesday 07/02/2024**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
06/02/2024	23:00:02	39.1	55.1	37.3
06/02/2024	23:15:02	40.2	45.3	38.1
06/02/2024	23:30:02	42.4	49.0	40.4
06/02/2024	23:45:02	46.3	53.5	43.7
07/02/2024	00:00:02	46.0	51.4	43.7
07/02/2024	00:15:02	46.5	52.4	44.1
07/02/2024	00:30:02	45.6	53.3	43.5
07/02/2024	00:45:02	43.9	52.4	41.0
07/02/2024	01:00:02	43.0	50.3	40.5
07/02/2024	01:15:02	44.4	52.1	41.7
07/02/2024	01:30:02	45.7	51.4	42.6
07/02/2024	01:45:02	44.8	51.3	42.2
07/02/2024	02:00:02	45.6	52.6	42.1
07/02/2024	02:15:02	46.2	51.6	44.0
07/02/2024	02:30:02	46.2	52.1	44.3
07/02/2024	02:45:02	46.6	52.7	44.5
07/02/2024	03:00:02	45.6	51.5	43.4
07/02/2024	03:15:02	46.5	52.7	44.8
07/02/2024	03:30:02	46.9	52.6	45.1
07/02/2024	03:45:02	46.7	53.3	44.3
07/02/2024	04:00:02	47.6	52.9	45.7
07/02/2024	04:15:02	48.4	53.4	46.3
07/02/2024	04:30:02	48.9	53.4	47.0
07/02/2024	04:45:02	48.9	53.8	47.3
07/02/2024	05:00:02	48.5	52.8	47.1
07/02/2024	05:15:02	50.6	55.1	49.3
07/02/2024	05:30:02	51.8	55.6	50.6
07/02/2024	05:45:02	50.6	54.5	49.4
07/02/2024	06:00:02	49.1	53.5	48.0
07/02/2024	06:15:02	51.0	53.8	49.9
07/02/2024	06:30:02	51.8	58.8	51.0
07/02/2024	06:45:02	51.9	68.9	50.7
23:00-06:00 hrs				
Average		47.0	-	44.1
Highest		51.8	55.6	50.6
Lowest		39.1	45.3	37.3
Mode		-	-	44.0
06:00-07:00 hrs				
Average		51.1	-	49.9
Highest		51.9	68.9	51.0
Lowest		49.1	53.5	48.0
Mode		-	-	51.0

**Table A2.4: Location A: Freefield night-time noise levels
Wednesday 07/02/2024 – Thursday 08/02/2024**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
07/02/2024	23:00:02	45.4	50.2	43.7
07/02/2024	23:15:02	46.3	57.4	43.0
07/02/2024	23:30:02	46.9	59.0	43.3
07/02/2024	23:45:02	45.7	49.8	44.1
08/02/2024	00:00:02	51.1	68.5	44.6
08/02/2024	00:15:02	45.8	50.8	43.8
08/02/2024	00:30:02	45.8	51.4	43.7
08/02/2024	00:45:02	46.2	50.8	44.3
08/02/2024	01:00:02	45.1	51.2	41.9
08/02/2024	01:15:02	45.5	52.1	43.6
08/02/2024	01:30:02	45.1	52.0	43.0
08/02/2024	01:45:02	45.9	51.7	44.2
08/02/2024	02:00:02	47.8	54.6	45.6
08/02/2024	02:15:02	47.3	53.1	45.2
08/02/2024	02:30:02	48.2	53.3	46.3
08/02/2024	02:45:02	47.1	53.5	44.6
08/02/2024	03:00:02	49.2	58.3	47.4
08/02/2024	03:15:02	48.6	54.7	46.9
08/02/2024	03:30:02	47.5	52.5	45.5
08/02/2024	03:45:02	48.4	54.0	46.9
08/02/2024	04:00:02	48.5	54.9	46.9
08/02/2024	04:15:02	47.4	52.7	46.0
08/02/2024	04:30:02	47.9	55.9	46.5
08/02/2024	04:45:02	48.7	53.9	47.3
08/02/2024	05:00:02	48.3	52.3	47.3
08/02/2024	05:15:02	49.0	53.0	48.0
08/02/2024	05:30:02	50.4	54.5	49.3
08/02/2024	05:45:02	50.5	55.8	49.5
08/02/2024	06:00:02	50.8	54.4	49.9
08/02/2024	06:15:02	51.5	54.9	50.7
08/02/2024	06:30:02	52.5	73.2	51.4
08/02/2024	06:45:02	52.7	59.5	51.9
23:00-06:00 hrs				
Average		47.8	-	45.4
Highest		51.1	68.5	49.5
Lowest		45.1	49.8	41.9
Mode		-	-	44.0
06:00-07:00 hrs				
Average		51.9	-	51.0
Highest		52.7	73.2	51.9
Lowest		50.8	54.4	49.9
Mode		-	-	51.0

**Table A2.5: Location A: Freefield night-time noise levels
Thursday 08/02/2024– Friday 09/02/2024**

Date	Time	dBL _{Aeq}	dBL _{Amax}	dBL _{A90}
08/02/2024	23:00:02	50.6	56.3	49.9
08/02/2024	23:15:02	51.1	60.8	50.3
08/02/2024	23:30:02	51.7	62.3	50.9
08/02/2024	23:45:02	51.0	58.9	50.2
09/02/2024	00:00:02	51.6	54.8	50.9
09/02/2024	00:15:02	51.3	62.6	50.1
09/02/2024	00:30:02	50.6	55.6	49.7
09/02/2024	00:45:02	52.4	67.2	50.6
09/02/2024	01:00:02	50.3	57.0	49.5
09/02/2024	01:15:02	50.4	53.8	49.5
09/02/2024	01:30:02	50.2	55.4	49.3
09/02/2024	01:45:02	51.3	65.0	49.3
09/02/2024	02:00:02	50.5	60.2	49.7
09/02/2024	02:15:02	50.0	54.8	49.2
09/02/2024	02:30:02	50.0	55.5	49.1
09/02/2024	02:45:02	50.3	58.2	49.3
09/02/2024	03:00:02	50.2	54.5	49.2
09/02/2024	03:15:02	49.3	54.4	48.1
09/02/2024	03:30:02	49.3	53.8	48.1
09/02/2024	03:45:02	50.2	54.3	48.7
09/02/2024	04:00:02	50.5	55.7	49.4
09/02/2024	04:15:02	51.1	63.1	49.7
09/02/2024	04:30:02	51.0	55.8	49.8
09/02/2024	04:45:02	51.1	56.4	49.8
09/02/2024	05:00:02	51.3	54.9	50.3
09/02/2024	05:15:02	51.8	55.9	50.8
09/02/2024	05:30:02	52.7	56.3	51.7
09/02/2024	05:45:02	52.5	57.7	51.5
09/02/2024	06:00:02	53.8	60.6	52.8
09/02/2024	06:15:02	53.9	59.0	53.1
09/02/2024	06:30:02	54.8	57.6	54.1
09/02/2024	06:45:02	54.5	69.0	53.6
23:00-06:00 hrs				
Average		51.0	-	49.8
Highest		52.7	67.2	51.7
Lowest		49.3	53.8	48.1
Mode		-	-	50.0
06:00-07:00 hrs				
Average		54.3	-	53.4
Highest		54.8	69.0	54.1
Lowest		53.8	57.6	52.8
Mode		-	-	53.0