Caulmert Ltd

H-Pack Packaging, Llay, Wrexham

Noise Impact Assessment

15147315/v00– September 2022

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Document Control Sheet

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1. Introduction

1.1 Bureau Veritas was instructed by Caulmert Ltd on behalf of H-Pack Packaging UK Ltd to undertake a noise impact assessment for proposed erection of 1no B8 Storage and Distribution building and associated access and external works at Land adjacent to H-Pack, Davy Way, Llay.

1.2 This assessment looks to establish the following:

- Daytime and night-time background noise levels at the nearest sensitive receptors;
- Impact of HGV deliveries at the service yard;
- Impact of car movement and parking; and
- Impacts of the change in road traffic on local highways.

1.3 The proposed building is approx. 190 m away from the nearest sensitive receptors (NSRs), so mechanical plant noise associated with the builfing is not considered as a potential significant sound source and is therefore scoped out of the assessment.

1.4 The HGV access route of the new building is via Davy Way and is more than 280m from the NSRs. The existing H-Pack Warehouse and Sharp Manufacturing are between the HGV access route and the NSRs, acting as noise barriers. Therefore, HGV movement is not considered as a potentially significant sound source and is scoped out of the assessment.

1.5 The noise impact assessment was facilitated by preparing a noise model using the CadnaA noise mapping software.

1.6 A glossary of acoustic terminology is included as Appendix A. The assessment criteria applicable to this site are reproduced in Section 3.

1.7 Site plans of the proposed development can be found in Appendix B.

2. Site Location and Details of Development

1.1 The proposed development site is in an industrial area, at the land adjacent to H-pack, Davy Way, Llay, Wrexham, LL12 0PG. The A483 is situated approx. 2.5 km to the southeast of the site.

1.2 To the south and the west of the site are industrial sites. To the north the site is mainly covered by farmland. H-Pack warehouse and Sharp Manufacturing are immediately to the east of the site, of which to the east runs Rackery Lane.

1.3 The bungalows off Rackery Lane are opposite to the proposed staff car access to the site (approx. 38 m to the site boundary), which are the nearest sensitive noise receptors. To a further distance, there are residential dwellings approx.150 m to the northwest of the site.

2.1 Although not yet defined, it is assumed that the operating times of the new building will be 24/7, as a worst-case scenario. A service yard is located to the south of the building, with 13 access doors. Deliveries will occur in the service yard. The desired delivery hours have not been confirmed, but unrestricted servicing hours are preferred if possible.

2.2 Although the number of employees has not been confirmed at this stage, it is proposed that the staff car park will comprise of 135 spaces to the north, west and south of the new building. It is assumed that the use of the car parking will be 24/7, which is the same as the operation times of the new building.

2.3 Existing ambient noise levels were measured at the nearest properties in order to establish typical ambient and background sound levels. During our site visit it was noted that the acoustic climate is dominated by road traffic on Rackery Lane.

2.4 It is considered that the potentially significant noise sources from the new building will be from delivery activities, car movement and parking.

3. Criteria for Noise Assessment

3.1. Based on previous experience it is considered that the assessment would need to conform to the following Guidance and Standards;

- Planning Policy Wales, 11, February 2021;
- Planning Guidance (Wales), Technical Advice Note (Wales) 11, Noise (TAN11);
- British Standard 4142: 2014+A1:2019, "Methods for rating and assessing industrial and commercial sound" (BS4142);
- British Standard 8233: 2014, "Guidance on sound insulation and noise reduction for buildings";
- ISO 9613-2:1996 'Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation'.

Planning Policy Wales (Ed. 11, February. 2021)

3.2. Planning Policy Wales (PPW) defines the latest land use planning policies of the Welsh Government. The consideration of noise impacts and the overall encouragement of good soundscapes is widely discussed within the document and, of particular importance to this report, paragraph 6.7.14 of PPW states:

> *"6.7.14 Proposed development should be designed wherever possible to prevent adverse effects to amenity, health and the environment but as a minimum to limit or constrain any effects that do occur. In circumstances where impacts are unacceptable, for example where adequate mitigation is unlikely to be sufficient to safeguard local amenity in terms of air quality and the acoustic environment it will be appropriate to refuse permission."*

3.3. PPW is supplemented by a series of Technical Advice Notes, including the TAN11 relating to the consideration of noise at the planning stage.

Technical Advice Note (Wales) 11, Noise

3.4. TAN11 was introduced by the Welsh Government in October 1997. Paragraph 3 on page 1 of TAN11 indicates that it is intended to provide *"advice on how the planning system can be used to minimise the adverse impact of noise without placing unreasonable restrictions on development or adding unduly to the costs and administrative burdens of business. It outlines some of the main considerations which local planning authorities should take into account in drawing-up development plan policies and when determining planning applications for development which will either generate noise or be exposed to existing noise sources."*

3.5. In relation to the assessment of new noise generating sources, TAN11 states that:

> *"8. Local planning authorities must ensure that noise generating development does not cause an unacceptable degree of disturbance. They should also bear in mind that if subsequent intensification or change of use results in greater intrusion, consideration should be given to the use of appropriate conditions.*

3.6. Annex B of TAN 11 specifies that the assessment of potential noise disturbance from industrial and commercial developments should be undertaken in accordance with BS4142:1990 (superseded by 2014 version, see below).

British Standard 4142: 2014+A1:2019 'Methods for rating and assessing industrial and commercial sound'

3.7. BS 4142 sets out a method for assessing the likelihood of complaint from industrial noise. It compares the Rating Level of the noise source under investigation with the Background Sound Level. The Rating Level is obtained by measuring or predicting the Specific Noise Level from the source, in terms of $L_{Aeq,T}$, and applying a correction factor to account for the acoustic character of the noise.

3.8. The standard states that certain acoustic features can increase the significance of impact and hence a correction should be applied if the noise in question contains any tonality, impulsivity intermittency or has any other specific sound characteristics. The Background Sound Level is the $L_{A90,T}$ measured in the absence of the source.

3.9. The Background Sound Level ($L_{A90,T}$) is then arithmetically subtracted from the Specific Noise Level. The difference between the two is considered to reflect the likelihood of complaints. The standard states the following:

"*a) Typically, the greater this difference, the greater the magnitude of the impact.*

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

c) A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

d) The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact, depending on the context."

British Standard 8233: 2014 Guidance on Sound Insulation and Noise Reduction for Buildings and World Health Organisation Guidelines for Community Noise

3.10. BS 8233:2014 "Guidance on sound insulation and noise reduction for buildings," provides recommendations for the control of noise in and around dwellings.

3.11. BS 8233:2014 suggests that an internal noise level of 30 dB $L_{Aeq,T}$ within bedrooms is desirable for the night-time (23:00 and 07:00). For living rooms and dining rooms, a design target of 35 dB and 40 dB $L_{Aeq,T}$ respectively is desired for the daytime (07:00 and 23:00). The criteria are summarised below.

Table 3.1: BS 8233:2014 Criteria

Location	Activity	Daytime (07:00 to 23:00)	Night-time (23:00 to 07:00)
Living Room	Resting	35 dB $L_{Aeq,16hr}$	-
Dining Room/area	Dining	40 dB $L_{Aeq,16hr}$	-
Bedroom	Sleeping (daytime resting)	35 dB $L_{Aeq,16hr}$	30 dB $L_{Aeq,8hr}$
Gardens	-	50-55 dB $L_{Aeq,16hr}$	-

3.12. BS 8233 further states that gardens should not exceed an upper limit of 55 dB L_{Aeq} with a noise level of 50 dB L_{Aeq} or less desirable. These limits only apply to daytime noise levels.

3.13. The now surpassed, BS 8233:1999 stated that a partially open window, which allows ventilation provides approximately 10 – 15 dB(A) attenuation, for the purposes of this assessment we have assumed 13 dB(A) attenuation.

3.14. Furthermore, the World Health Organisation (WHO) *"Guidelines for Community Noise,"* states that in dwellings, the critical effects of noise are on sleep, annoyance and speech interference.

To protect the majority of people being awakened at night, noise events should not exceed 45 dB $L_{A,max}$.

ISO 9613-2:1996 'Acoustics – Attenuation of Sound during Propagation Outdoors – Part 2: General Method of Calculation'

3.15. ISO 9613-2:1996 specifies methods for the description of sound outdoors in community environments. ISO 9613 can be applied to a wide variety of sound sources and includes methods to determine most of the major mechanisms of sound attenuation, such as:

- Geometric divergence (A_{div}) – spherical spreading of sound energy;
- Atmospheric absorption (A_{atm}) – attenuation of sound due to interaction with the air (dependant on frequency of sound and negligible at short distances);
- Ground effect (A_{gr}) – sound reflecting by the ground surface interfacing with the sound propagating directly from source to receiver;
- Reflection from surfaces (image source method, included in A_{gr} calculation) – sound is reflected from hard surfaces such as building facades due to atmospheric impedance of the surface. This effect increases the sound level when compared to a location free of buildings (i.e. free field); and
- Screening by obstacles (A_{bar}) – Hard obstacles such as close boarded timber fences and varying topography, including hills attenuate the sound from a source due to the insertion loss properties of the obstacle. However, there is an element of the sound which will diffract around the obstacle, especially at lover frequencies. The diffraction effect is determined using the path differences between the direct and diffracted sound. It should be noted that the screening effect provided by trees and foliage is negligible in the majority of cases; the exception is large areas of dense forest or plantations.

Wrexham Unitary Development Plan 1996-2011

3.16. Wrexham Council adopted the Unitary Development Plan (UDP) 1996 - 2011 on February 14, 2005. The plan covers the administrative area of Wrexham County Borough Council. Wrexham Council are preparing the Local Development Plan (LDP) which will replace the current adopted Unitary Development Plan. The LDP will be a long-term land use and development strategy.

3.17. It is stated in Policy GDP1 of UDP that:

*"**Policy GDP1** All new development should:-*

…

f) Ensure the safety and amenity of the public and safeguard the environment from the adverse effects of pollution of water, land or air, hazards from industry and quarrying, and associated noise, odour or vibration arising from development.

…"

Consultation

Prior to commencing the assessment work, Bureau Veritas discussed and agreed the scope of work and assessment methodology with Paul Campini, Enforcement Officer of Wrexham Council (WCBC).

4. Noise Survey

Background Noise Survey

4.1 Attended background noise measurements were taken between the 21st June 2022 at a location south to the nearest receptors, i.e. Rackery Bungalows. The location of the NSRs and the monitoring location are shown in Figure 4.1 below. The monitoring location is approx. 38 m from Rackery Lane.

4.2 Regards the monitoring location, access was not permitted to the properties. There are hedges along the Rackery Lane, and measurements immediately at the roadside would neither be safe nor representative of the residential amenity. The monitoring location identified has a similar distance to Rackery Lane as the NSRs and is safe for equipment deployment.

4.3 The monitoring period is 15 mins during quiet daytime and evening-time, and one hour during night-time.

Figure 4.1: Monitoring Locations

4.4 Measurements were undertaken in free-field conditions with the sound level meter mounted 1.5m above local ground level. The weather was dry and clear with a very light breeze of 1-2 m/s and considered conducive to environmental noise monitoring. A protective windshield was also fitted to the microphone.

4.5 The noise monitoring equipment was calibrated before and after the measurement surveys using an acoustic calibrator, which had itself been calibrated against a reference set traceable to National and International Standards. It is considered that no unusual events occurred during the survey periods and the measurement data are considered to be a true and a fair representation of the industrial and background noise levels. No significant drift in calibration level was observed.

4.6 The sound level meters were set to record interval values for the measurement period, for the L_{A90}, L_{A10}, L_{Aeq} and L_{Amax} indices.

4.7 During the daytime measurement survey, the meteorological conditions comprised a slight (1-2 m/s) breeze from WNW. The temperature was 21 °C, sunny and dry, with 49% humidity and an atmospheric pressure of 1014 mb.

4.8 It was noted while on site that the ambient noise climate around the proposed development site is dominated by road traffic noise from Rackery Lane. Additional noise from aircraft and birdsong added to the noise climate during the daytime.

4.9 At night, the meteorological conditions were a slight (0-1 m/s) breeze from NNW. The temperature was 13 °C, clear and dry, with 90% humidity and an atmospheric pressure of 1016 mb.

4.10 During night-time, occasional road traffic noise occurred, and the hum from Sharp manufacturing and H-Packing warehouses were audible. Intermittent owl hooting was also audible.

4.11 Table 4.1 presents a summary of the sound level survey results.

Table 4.1: Summary of Derived Sound Levels at the short-term monitoring location

Date	Period	Start time	Sound Pressure Level, dB re: 20µPa (Fast, Free-field)			
			$L_{Aeq,T}$	$L_{Amax,T}$	$L_{A10,T}$	$L_{A90,T}$
21/06/2022	Daytime	12:15	51.1	78.1	55.1	36.8
21/06/2022	Evening time	19:45	46.3	65.9	49.7	37.9
22/06/2022	Night-time	00:00	40.8	66.4	43.6	32.4

1.4 As shown in Table 4.1, $L_{A90,T}$ of the measured sound levels is 37 dB and $L_{Aeq,T}$ is 46 dB at quiet daytime periods (0700-2300).

1.5 $L_{A90,T}$ of the measured sound levels is 32 dB and $L_{Aeq,T}$ is 41 dB at night.

1.6 Therefore, **37** dB L_{A90} is considered as the representative background sound level for the NSRs during daytime and **32** dB L_{A90} is the representative background sound level during night-time.

5. Noise Model

5.1 An acoustic model has been created showing the impact of the proposed building and associated development using CadnaA noise mapping software Version 2021. The software calculates the contribution from sources, input as a point, line or area source at defined locations.

5.2 The model predicts noise levels based on hemispherical propagation, atmospheric absorption, ground effects, in plant reflections, screening and directivity based on the procedure detailed in ISO 9613-2, *"Acoustics -- Attenuation of sound during propagation outdoors -- Part 2: General method of calculation".*

5.3 The model has been run using a receiver height of 1.5 metres above grade, equivalent to ear level at standing height for the daytime and at 4 metres above grade for the night-time to simulate first floor bedrooms. The model accounts for equal sound radiation of noise sources in all directions.

5.4 ISO 9613-2 gives the estimated accuracy of the noise model as ±3 dB, for the calculation of broadband A-weighted sound levels, for receiver distances of up 1 km. The standard also states that errors in the calculation of individual octave bands may be somewhat larger than the estimated errors given for broadband A-weighted sound levels.

Acoustic Model Inputs

HGV delivery activities

5.6 There will be 10 – 15 HGVs accessing the site in the morning, 4-5 HGVs in the evening and 7-8 LGVs during the day.

5.7 Bureau Veritas have used library data to assess the impact of HGV deliveries. The noise levels used for the noise model are shown in Table 5.1 below.

Table 5.1: HGV Delivery Noise – library data

Location	Duration	Source Height	L_W (dBA)
HGV Delivery – loading and unloading, trollies etc.	30min	1.5m	90
HGV Delivery – reverse alarms	1min	1m	90

5.8 We have assumed a delivery will take approximate half an hour and the daytime assessment has been based on a 1-hour reference time while the night-time has been assumed to be 15 minutes. Four access doors are assumed in operation simultaneously.

Car movement and parking

5.9 There will be a total of 150 staff employed on-site and split over two 8-hour shifts (150 split across the two shifts). The shift patterns will be 06:00 – 14:00 and 14:00 – 22:00. It would expect 50% of the staff use public transport, 20% use their own means and rest by walk and cycle.

5.10 It is assumed 20% of the staff will use their cars as worst-case scenario. The car movement is modelled as a line source, assuming 30 (75x0.2x2) total movements in a worst-case daytime hour (the shift occurs at 14:00), and 15 (75x0.2) movements in a worst-case 15-minute at night (the shift occurs at 06:00). The vehicle speed is assumed as 10mph.

5.11 Although there are no specific British standards for the calculation of sound levels from car park activities, the German car park noise calculation method BayLfU (Bavarian State Agency for the Environment 2007, Parking Area Noise, 6th Edition, Bavarian State Ministry for the Environment, Germany) provides a means by which the sound levels from car park activity can be calculated. The calculation methodology is included as a module within the CadnaA sound propagation software package. The calculation method allows for the prediction of average and maximum sound levels due to car park activity. The modelling takes account of the number of car park spaces and the frequency of use. The model assumes 135no. staff car park spaces with 0.02 movements per hour per space during the day and 0.01 movements per 15min night-time based on the total taff car movements.

Assumptions and Limitations

5.12 In terms of ground effect, a low ground absorption will be used, i.e., hard terrain.

5.13 Conservative climatic conditions, favourable to noise propagation were selected i.e., downwind conditions. It is envisaged however that due to the short propagation distance with which the receptors lie, atmospheric conditions will have very little impact of projected noise levels.

6. Assessment

HGV Deliveries

6.1 Table 6.1 below shows the results of a daytime BS 4142 assessment for noise arising from the store HGV deliveries at the NSRs during the daytime.

Table 6.1: HGV Delivery BS 4142 assessment - Daytime

Results	Noise Level/dB	Notes
Specific Sound Level (L_{Aeq})	34	Specific sound level calculated from the CadnaA noise model (see Appendix C)
Character Correction	0	The ambient sound level is much higher than the specific sound level and potentially masks the specific sound.
Rating Level (L_{ArT})	34	
Background Sound Level (L_{A90})	37	Daytime background taken from Table 4.1
Excess of rating over background sound level	-3	Assessment indicates **low impact** due to context, see below.
Context	During the daytime, the desirable noise level for garden amenity as stipulated in BS8233 is 50 dB and it can be seen that the Specific Noise Level of the HGV is likely to meet this. Noise from Rackery Lane is also considered to be dominant and the ambient noise level of the traffic noise (46 dB) is significantly higher than the HGV delivery noise meaning this noise will be masked. Furthermore, assuming a 13 dB reduction through an open window, the internal noise levels will still be met for the BS8233 criteria of 35 dB during the daytime.	

*Note: All noise levels rounded to the nearest whole number in line with BS 4142 requirements

6.2 For the above assessment, BS 4142 stipulates that, *"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."*

6.3 It can be seen from the results above, that mitigated noise from deliveries is likely to produce a Rating Level of -3 dB below the Background Sound Level, hence there is a low likelihood of adverse impact during the daytime.

6.4 Table 6.2 below shows the results of a night-time BS 4142 assessment for noise arising from HGV deliveries at the NSRs.

Table 6.2: HGV Delivery BS 4142 assessment – Night-time

Results	Noise Level	Notes
Specific Sound Level (L_{Aeq})	32	Specific sound level calculated from the CadnaA noise model (see Appendix C)
Character Correction	0	The ambient sound level is much higher than the specific sound level and potentially masks the specific sound.
Rating Level (L_{ArT})	32	
Background Sound Level (L_{A90})	32	Night-time background taken from Table 4.1
Excess of rating over background sound level	0	Assessment indicates **low impact** due to context, see below.
Context	The noise from deliveries is likely to be masked. Furthermore, it should be noted that the noise-sensitive location is indoors with open windows at night. Assuming 13 dB reduction through an open window, the internal noise levels will comfortably meet the BS8233 criteria of 30 dB.	

*Note: All noise levels rounded to the nearest whole number in line with BS 4142 requirements

6.5 It can be seen from the results above that noise from deliveries during the night-time are likely to produce a Rating Level 0 dB above the Background at the most exposed dwellings. The impact, given the context is considered to be low.

Car Movement and Parking

6.6 The results of the CadnaA noise model have been used to generate colour contour noise maps (see Appendix C). As stated in Section 2, the use of the car parking occurs 24/7, along with the operation of the proposed building.

6.7 The results of the noise modelling have shown that the impact of the car park will be highest for NSRs which be exposed to a noise level of $L_{Aeq,16h}$ 33 dB during the daytime (ground floor) and 30 dB (first floor) during night-time.

6.8 Table 6.3 below shows the significance of effect for noise arising from the car movement and car park associated with the proposed building at the most exposed dwelling during daytime.

Table 6.3: Car Movements and Parking BS 4142 assessment - Daytime

Results	Noise Level/dB	Notes
Specific Sound Level (L_{Aeq})	22	Specific sound level calculated from the CadnaA noise model (see Appendix C)
Character Correction	0	The dominant sound in the area is road traffic noise, of which the acoustic characters are similar as the specific sounds. The ambient sound level is also much higher than the specific sound level. As such, no correction is applied.
Rating Level (L_{ArT})	22	
Background Sound Level (L_{A90})	37	Daytime background taken from Table 4.1
Excess of rating over background sound level	-15	Assessment indicates **No impact** due to context, see below.

Context	During the daytime, the desirable noise level for garden amenity as stipulated in BS8233 is 50 dB and it can be seen that the Specific Noise Level of the car movement and parking is likely to meet this. Noise from Rackery Lane is also considered to be dominant and the Ambient noise level of the traffic noise (46 dB) is significantly higher than the car movement and parking noise meaning this noise will be masked. Furthermore, assuming a 13 dB reduction through an open window, the internal noise levels will still be met for the BS8233 criteria of 35 dB during the daytime.

*Note: All noise levels rounded to the nearest whole number in line with BS 4142 requirements

6.9 The table above shows that the closest receptors are likely to experience an insignificant impact. Existing residents will not perceive any change in noise levels due to the operation of the new car access route and car parks.

6.10 Table 6.4 below shows the significance of effect for noise arising from the car movement and car park associated with the proposed building at the most exposed dwelling during night-time.

Table 6.4: Car Movements and Parking BS 4142 assessment – Night-time

Results	Noise Level/dB	Notes
Specific Sound Level (L_{Aeq})	19	Specific sound level calculated from the CadnaA noise model (see Appendix C)
Character Correction	0	The dominant sound in the area is road traffic noise, of which the acoustic characters are similar as the specific sounds. The ambient sound level is also much higher than the specific sound level. As such, no correction is applied.
Rating Level (L_{ArT})	19	
Background Sound Level (L_{A90})	32	Night-time background taken from Table 4.1
Excess of rating over background sound level	-13	Assessment indicates **No impact** due to context, see below.
Context	Noise from Rackery Lane is also considered to be dominant and the Ambient noise level of the traffic noise (41 dB) is significantly higher than the car movement and parking noise meaning this noise will be masked. Furthermore, assuming a 13 dB reduction through an open window, the internal noise levels will still be met for the BS8233 criteria of 30 dB during the night-time.	

*Note: All noise levels rounded to the nearest whole number in line with BS 4142 requirements

Road Traffic Change

6.11 An increase of traffic flow in and out the site will bring about the increase in traffic noise levels of local roads. An increase in traffic flows in excess of 25% can bring about increases in noise levels above 1 dB.

6.12 There is no traffic flow data available for Rackery Lane, however, the assumption in Section 5 shows 45 car movements during 16 hr daytime (30 movements at 14:00, 15 movements at 22:00) and 15 car movements during 8hr night-time (06:00), which is mainly via Rackery Lane. Therefore, there is 30 car movement increased on Rackery Lane per hour as worst case (during 05:00 – 06:00), which is a very smaller number compared with the traffic flow on main roads. The percentage increase in total vehicles on Rackery Lane would be very likely below 25% (less than 1dB increase), as observed during site surveys. The noise impact, based on the number of vehicle movements generated and the potential traffic noise change is therefore assessed as negligible.

7. Conclusions

1.8 Bureau Veritas was instructed by Caulmert Ltd on behalf of H-Pack Packaging UK Ltd to undertake a noise impact assessment for proposed erection of 1no B8 Storage and Distribution building and associated access and external works at Land adjacent to H-Pack, Davy Way, Llay.

7.1 A daytime and night-time site visit to the proposed development site was undertaken between 21st and 22nd June 2022. Road traffic noise from Rackery Lane was found to be dominant on site.

7.2 A noise model was prepared using the modelling software CadnaA in order to predict the impact of the HGV deliveries, car movement and parking. The noise model predicted daytime and night-time noise levels at the nearest properties.

7.3 The noise model inputs were based on Bureau Veritas library data for HGV deliveries. Noise from the car park was based on the number of spaces and the German car park noise calculation method BayLfU (Bavarian State Agency for the Environment 2007, Parking Area Noise, 6th Edition, Bavarian State Ministry for the Environment, Germany).

7.4 Using the results of the noise modelling study, the significance of impact for the new car route access and car park was carried out in accordance with the guidance set out in BS4142. The assessment showed that the impact will be 'negligible'. Therefore, the existing residents will not perceive any change in noise levels.

7.5 Furthermore, a BS4142 assessment was undertaken to assess the impact of HGV deliveries during the daytime and night-time. The assessment showed that the noise level of the HGV deliveries was below Background during the daytime, hence, this is considered to have a low impact given the context.

7.6 Given the low traffic volume caused by the operation of the new building, the potential traffic noise is assessed as negligible.

7.7 Therefore, the noise impacts of the proposed new building are assessed as 'negligible' and no specific noise mitigation measures would be required.

Appendix A

Glossary of Acoustic Terminology

"A" Weighting (dB(A)) — The human ear does not respond uniformly to different frequencies. "A" weighting is commonly used to simulate the frequency response of the ear. It is used in the assessment of the risk of damage to hearing due to noise.

Decibel (dB) — The range of audible sound pressures is approximately 2 x 10^{-5} Pa to 200 Pa. Using decibel notation presents this range in a more manageable form, 0 dB to 140 dB.
Mathematically:
Sound Pressure Level (dB) = 20 log {p(t) / P_o}
where P_o = 2 x 10^{-5} Pa

Frequency (Hz) — The number of cycles per second, for sound this is subjectively perceived as pitch.

Frequency Spectrum — Analysis of the relative contributions of different frequencies that make up a noise.

L_{eq}(T) — The equivalent continuous sound level. It is that steady sound level which would produce the same energy over a given time period T as a specified time varying sound.

L_{Amax}(T) — The maximum RMS A-weighted sound pressure level occurring within a specified time period.

L_{AE} or SEL — A measure of A-weighted sound energy used to describe noise events such as the passing of a train or aircraft; it is the A-weighted sound pressure level which, if occurring over a period of one second, would contain the same amount of A-weighted sound energy as the event. The relationship between $L_{Aeq,(T)}$ and SEL is as follows:

$$L_{Aeq,(T)} = 10 \log [\underline{\text{antilog } SEL_1/10 + \text{antilog } SEL_2/10 + ...}$$

Total time period in seconds
where SEL_n is the measured single event level for a given event

$L_{A10,T}$ — Road traffic noise level. The A-weighted sound pressure level of the residual noise in decibels exceeded for 10% of a given time interval.

$L_{A90,T}$ — Background noise level. The A-weighted sound pressure level of the residual noise in decibels exceeded for 90% of a given time interval.

Noise — Unwanted sound.

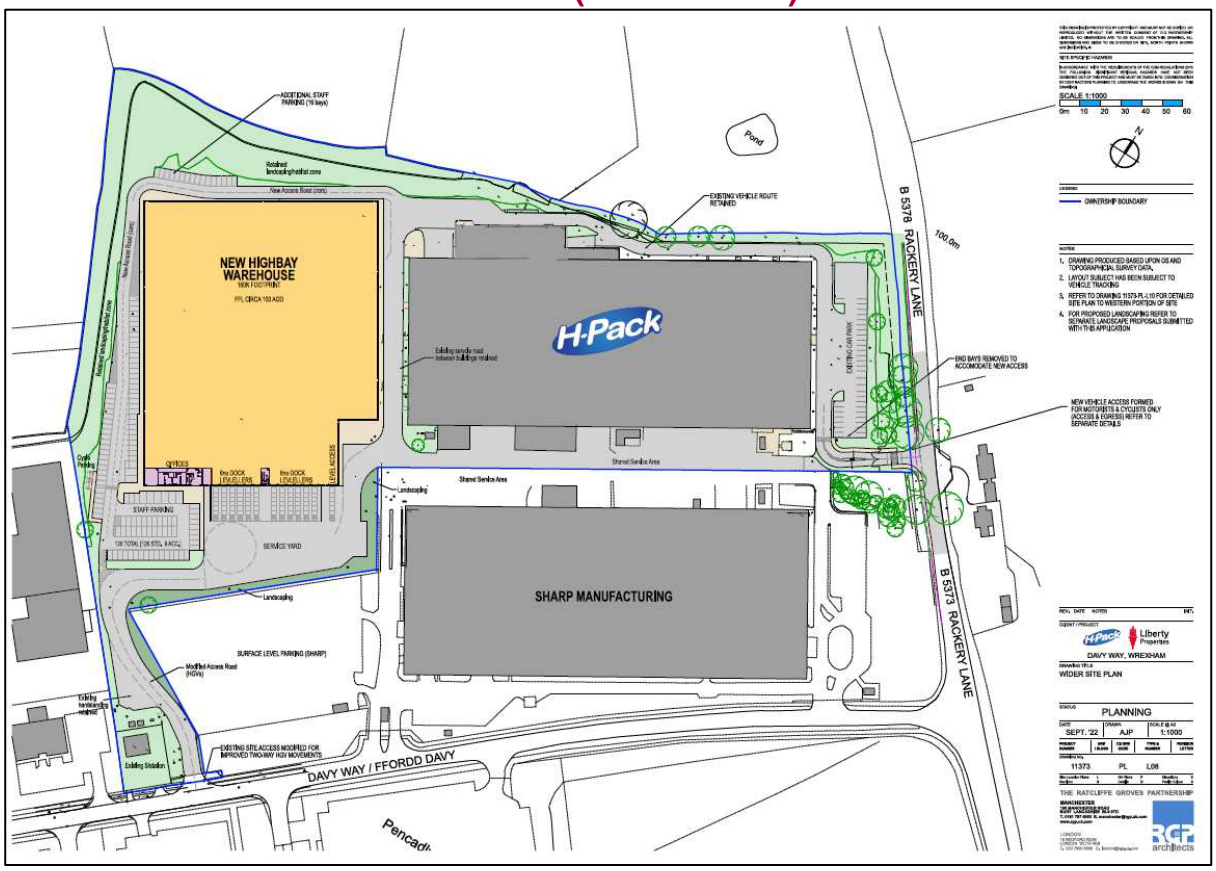
Octave Band — A range of frequencies defined by an upper limit which is twice the lower limit. Octave bands are identified by their centre frequency.

R_{TRA} (dB) — The Traffic Noise Reduction Sound Insulation is derived by taking into account a typical spectrum of road traffic in town and city centres

R_W (dB) — The weighted sound reduction incorporates a correction for the ear's response and has been derived in accordance with BS 5821:1984.

Specific Noise	The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source over a given reference time interval.
Rating Level, $L_{Ar,T}$	The specific noise level plus any adjustment for the character of the noise.
Ambient Noise	Totally encompassing sound in a given situation at any given time composed of noise from many sources, near and far.
Residual Noise	The ambient noise remaining at a given position in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.

Appendix B
Site Plan (not to scale)



Appendix C

Noise Model Results

Figure C. 1 Car movement and parking (1hr daytime), at 1.5 m high

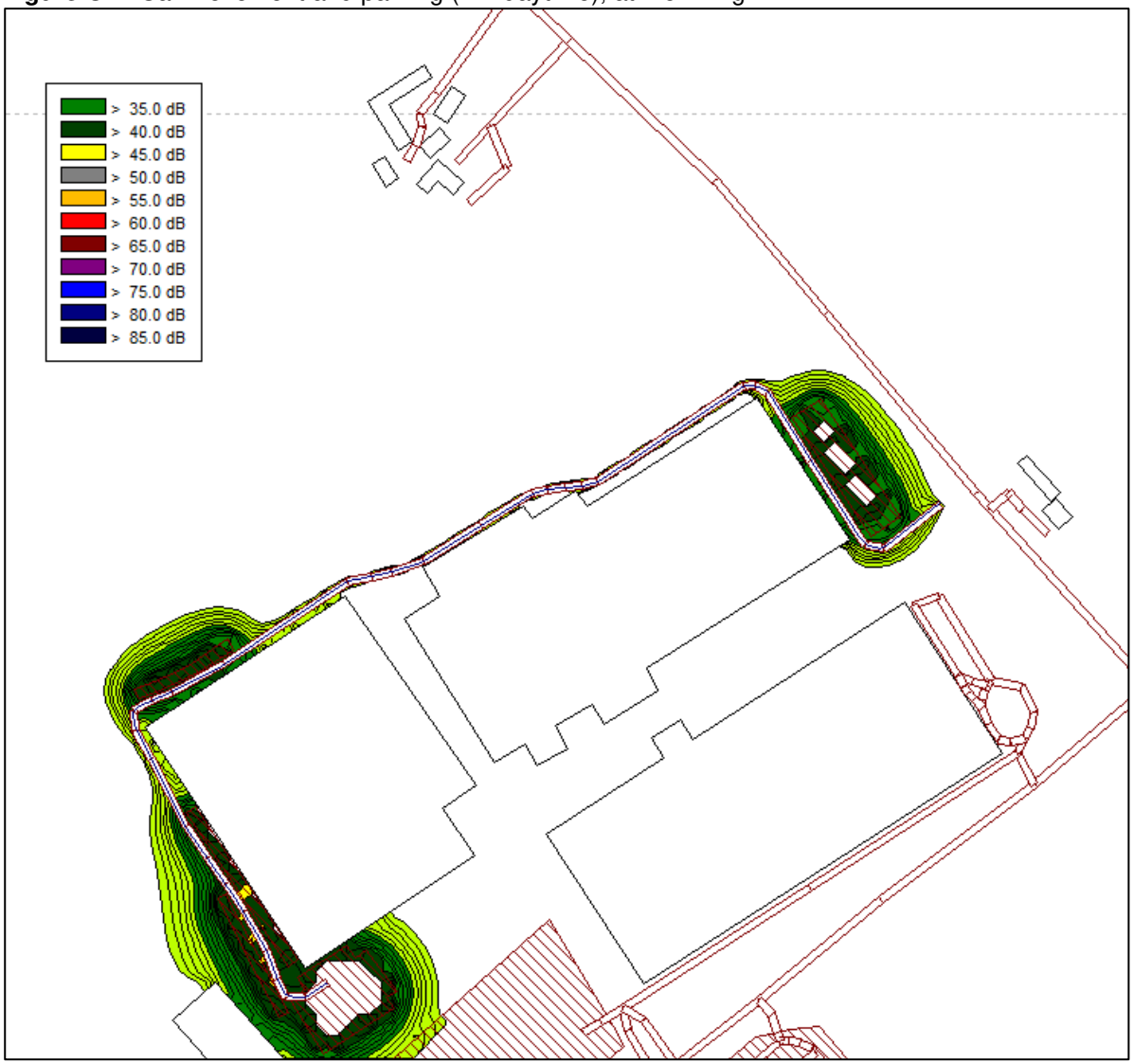


Figure C. 2 Car movement and parking (15min night-time), at 4 m high

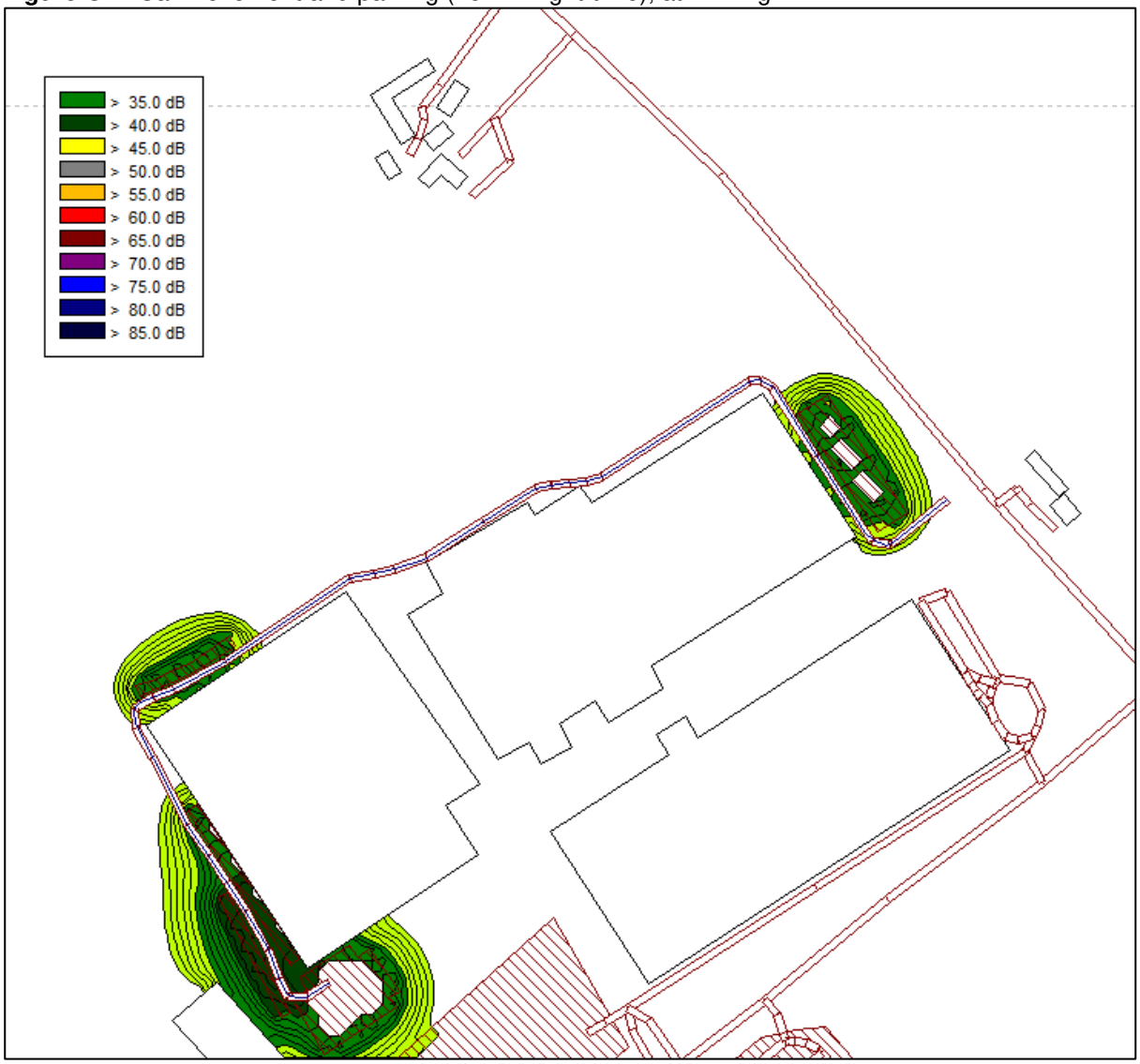


Figure C. 3 HGV deliveries -daytime, at 1.5 m high

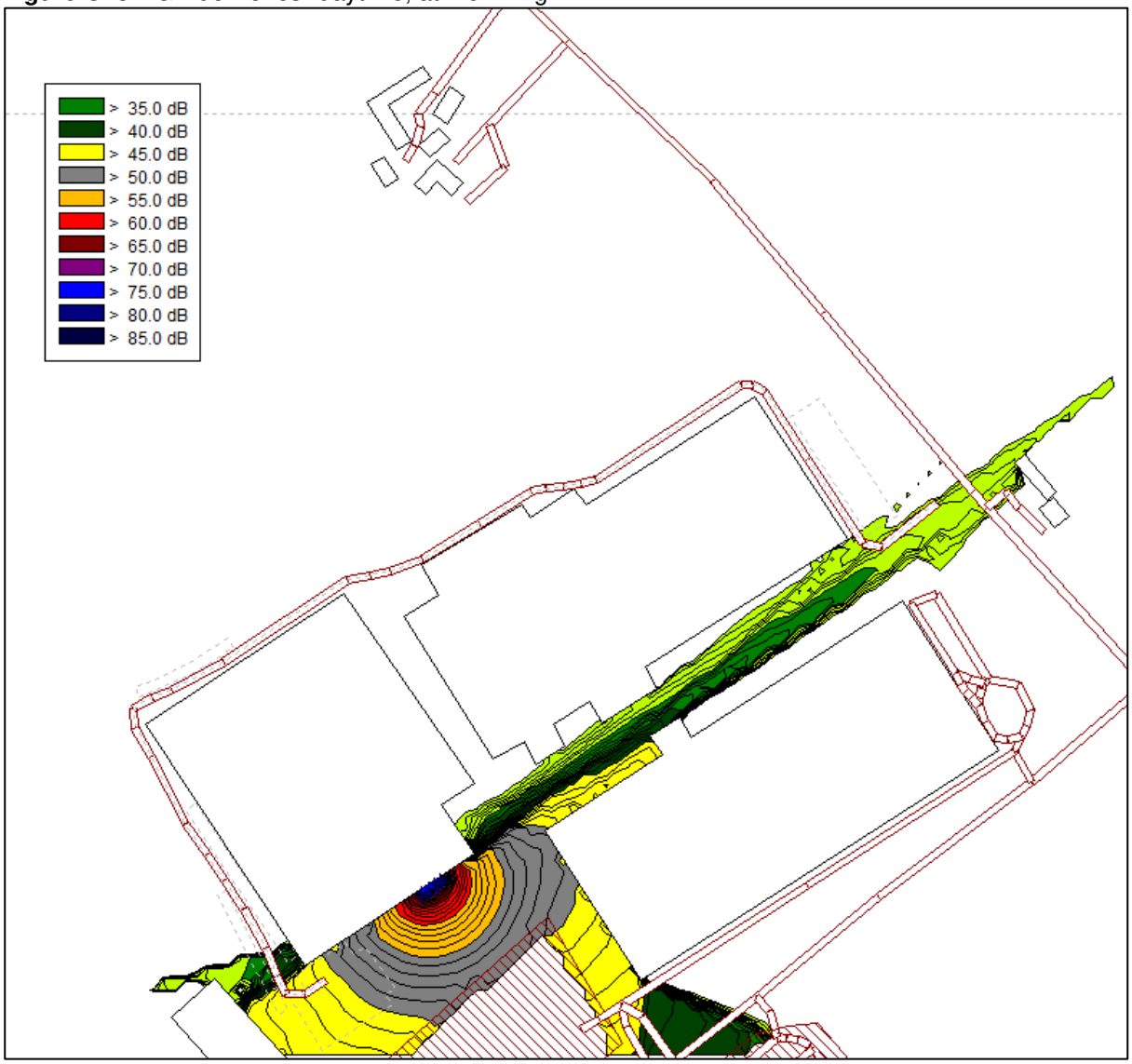


Figure C. 4 HGV deliveries -night-time, at 4 m high