



Noise Assessment

Proposed Hotel & Commercial Units

Dearne Valley Parkway, Barnsley

For:

Hartwood Estates Limited

CRM.1122.006.NO.R.001

'Experience and expertise working in union'



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Noise Assessment

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For:	Hartwood Estates Limited
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1 Introduction

1.1 Project Introduction

- 1.1.1 Enzygo Limited has been instructed by Hartwood Estates Limited to undertake a noise assessment for their proposed hotel and commercial unit development on land to the south-west of Rockingham Roundabout on the A6195 known as Dearne Valley Parkway, Birdwell, Barnsley.
- 1.1.2 The assessment has been undertaken to assess the suitability of the site for the proposed use in accordance with the relevant standards and guidance at the nearest existing noise-sensitive receptors and on the proposed noise-sensitive receptors within the proposed development.
- 1.1.3 Details of the assessment methodology employed, together with the results of the baseline noise survey, assessment and conclusions are presented within this report.

1.2 Site Description

- 1.2.1 The proposed development would be located on a parcel of land to the west of Dearne Valley Parkway (A6195) and east of Rockingham Business Park, Birdwell, Barnsley. The site is centred at grid reference SE 434950, 400556 approximately and is shown in Figure 1-1.
- 1.2.2 To the north of the proposed development are commercial businesses including a Costa (drive through) a petrol station and Greggs, beyond the Rockingham Roundabout on the A6195 is Taco Bell, Motordepot Barnsley (used vehicle dealer) and open land as far as Hay Green Lane. To the east is the A6195 (Dearne Valley Parkway) and a cluster of roundabouts connecting the A6195, A61 and Sheffield Road, further to the east is a plot of land currently under development leading to residential development off Sheffield Road. To the south is Tankersley Roundabout and Junction 36 of the M1 motorway. To the west is Rockingham Business Park containing Green Spirit Hydroponics (hydroponic equipment supplier), Rubicon Limited (steel plate stockholders) and Auto Recovery. Further west beyond Rockingham Row is residential development and the M1 motorway.
- 1.2.3 The nearest existing and future noise-sensitive receptors have been identified as:
 - 1. Existing residential properties to the west; and
 - 2. The proposed hotel bedrooms.
- 1.2.4 The site and existing nearby noise-sensitive receptors are shown in Figure 1-1.

1.3 Project Description

- 1.3.1 The current proposal is for B1 and B8 use buildings, the remainder of the site would feature a 4-storey hotel which would include ground floor A3 class use and associated parking.

Figure 1-1: Site Location Plan



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1.4 Noise Assessment Methodology

- 1.4.1 The noise assessment has been made in accordance with the guidance contained within British Standard 4142:2014 '*Method for rating and assessing industrial and commercial sound*' (BS4142) and British Standard 8233:2014 '*Guidance on sound insulation and noise reduction for buildings*' (BS8233).
- 1.4.2 Noise levels generated by the existing businesses and road noise from Dearne Valley Parkway (A6195) have been predicted using the calculation methodology outlined in ISO9613:1996 *Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation* (ISO9613) using the proprietary noise modelling software, CadnaA.
- 1.4.3 The results of the noise predictions have been used to assess the potential impact at the nearby noise-sensitive residential receptors in accordance with the guidance contained in BS4142. Reference has also been made to the guidance levels for internal resting and sleeping during the night in accordance with the guidance contained in BS8233.
- 1.4.4 The assessment is based upon the results of a baseline noise survey undertaken at the nearby receptors over the representative daytime, evening and night-time periods.

2 Standards and Guidance

2.1 Planning Practice Guidance for Noise

2.1.1 The guidance contained within the Planning Practice Guidance for Noise indicates that noise should be considered when:

- New developments may create additional noise; and/or
- New developments would be sensitive to the prevailing acoustic environment.

2.1.2 The guidance indicates that Local Planning Authorities should take account of the acoustic environment and in doing so consider:

- Whether or not a significant adverse effect is occurring or likely to occur;
- Whether or not an adverse effect is occurring or is likely to occur; and
- Whether or not a good standard of amenity can be achieved.

2.1.3 The impact of noise is rated within the policy document in terms of the relative '*Observed Effect Level*'. The Planning Practice Guidance provides the matrix shown in Table 2-1.

Table 2-1: Planning Practice Guidance – Noise exposure hierarchy

Perception	Example of Outcomes	Increasing Effect Level	Action
Not noticeable	No effect	No Observed Effect	No specific measures required
Noticeable and not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
		Lowest Observed Adverse Effect Level	
Noticeable and intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
		Significant Observed Adverse Effect Level	

Perception	Example of Outcomes	Increasing Effect Level	Action
Noticeable and disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Adverse Effect	Avoid
Noticeable and very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation and/or awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory.	Unacceptable Adverse Effect	Prevent

2.2 British Standard 4142:2014 *Methods for rating and assessing industrial and commercial sound*

2.2.1 BS4142 provides a methodology for rating and assessing sound associated with both industrial and commercial premises. The purpose of the Standard is clearly outlined in the opening section where it states that the method is appropriate for the consideration of:

- Sound from industrial and manufacturing processes;
- Sound from fixed installations which comprise mechanical and electrical plant and equipment;
- Sound from the loading and unloading of goods and materials at industrial and/or commercial premises; and,
- 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.

2.2.2 The Standard is based around the premise that the significance of the noise impact of an industrial/commercial facility can be derived from the numerical subtraction of the background noise level (not necessarily the lowest background level measured, but the typical background of the receptor) from the measured/calculated rating level of the specific sound under consideration. This comparison will enable the impact of the specific sound to be concluded based upon the premise that typically *“the greater this difference, the greater the magnitude of the impact”*. This difference is then considered as follows:

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

- A difference of around +5dB is likely to be an indication of an adverse impact, depending upon context; and,
- 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.

2.2.3 BS4142 further states that “*where the rating level does not exceed the background sound level, this is an indication of the specific sound source having a low impact*” again depending upon the specific context of the site. The Standard further qualifies the assessment protocol by outlining conditions to the comparative assessment and stating that “*not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact*”, thus implying that all sites should be assessed on their own merits and specifics.

2.2.4 The Standard quantifies the typical reference periods to be used in the assessment of noise, namely:

Typical Daytime	07:00 – 23:00	1-hr assessment period
Typical Night-time	23:00 – 07:00	15-min assessment period

2.2.5 The Standard outlines methods for defining appropriate “*character corrections*” within the rating levels to account for tonal qualities, impulsive qualities, other sound characteristics and/or intermittency. These are a) the Subjective Method, b) the Objective Methods for tonality and c) the Reference Method. It is noted by the Standard that where multiple features are present the corrections should be added in a linear fashion to the specific level.

2.2.6 The Subjective Method is based on the following corrections:

Table 2-2: BS4142 Subjective method rating corrections

Level of Perceptibility	Tonal Correction	Impulsivity Correction	Correction for “Other sound characteristics”	Intermittency Correction
No Perceptibility	+0 dB	+0 dB	Where neither tonal nor Impulsive but clearly identifiable +3 dB	If intermittency is readily identifiable +3 dB
Just Perceptible	+2 dB	+3 dB		
Clearly Perceptible	+4 dB	+6 dB		
Highly Perceptible	+6 dB	+9 dB		

2.3 British Standard 8233:2014 *Guidance on sound insulation and noise reduction for buildings*

2.3.1 BS8233 provides guidance and recommendations for the control of noise from outside sources to maintain an internal acoustic environment appropriate for the intended use. The Standard suggests appropriate criteria and limits for differing situations which are, primarily, intended to guide the design of new or refurbished buildings undergoing a change of use rather than to assess the effect of changes to the external noise climate. However, it is considered that the guidance provides suitable criteria for the assessment of internal noise levels.

2.3.2 The Standard suggests suitable guidance values for residential dwellings which are shown in Table 2-2.

Table 2-3: BS8233 Indoor ambient noise levels for dwellings

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

2.3.3 Whilst it is considered desirable to achieve these internal noise levels with the windows open, it is not stipulated with the Standard which states:

“If relying on closed windows to meet the guide values, there needs to be appropriate alternative ventilation that does not compromise the façade insulation or the resulting noise level.”

2.3.4 The standard also states that *“Where development is considered necessary or desirable, despite external noise levels being above WHO guidelines, the internal target levels may be relaxed by up to 5dB and reasonable internal conditions still achieved”*.

2.3.5 The Standard also suggests suitable guidance values for shared spaces where privacy is also important which are shown in Table 2-4.

Table 2-4: BS8233 Indoor ambient noise levels in spaces when they are unoccupied and privacy is also important

Objective	Typical Situation	Design Range dB $L_{Aeq,T}$
Typical noise levels for acoustic privacy in shared spaces	Restaurant	40 – 55
	Open plan office	45 – 50
	Night club, public house	40 – 45
	Ballroom, banqueting hall	35 – 40
	Living room	35 - 40

2.3.6 Note that the Standard suggests that the level of noise reduction provided by a partially open window would be approximately 15dB.

2.3.7 The Standard also provides guidance on external noise for outdoor amenity spaces such as gardens, patios and terraces and states that it is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$, which would be acceptable in noisier environments.

2.4 ISO9613 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation

2.4.1 The noise levels generated by the operation of the proposed development have been predicted using the calculation methodology set out in ISO9613-2. The methodology considers

the distance between the sources and the receptors and applies the amount of attenuation due to atmospheric absorption and other site-specific characteristics.

- 2.4.2 The methodology assumes downwind propagation, i.e. a wind direction that assists the propagation of noise from the source to all receptors.

3 Baseline Noise Monitoring Survey

3.1 Baseline Noise Survey

- 3.1.1 Baseline noise measurements were undertaken on Wednesday 20th and Tuesday 26th March and Tuesday 2nd April 2019 to gather ambient noise data near to the proposed development site.
- 3.1.2 The baseline noise survey was carried out in accordance with the requirements of British Standard 7445:1996 '*Description and measurement of environmental noise*', by a suitably qualified and experienced acoustic consultant.
- 3.1.3 Measurements were taken over periods considered adequate to obtain representative noise data over the daytime, evening and night-time periods.
- 3.1.4 The monitoring locations are detailed in Table 3-1 and shown in Figure 3-1 below.

Table 3-1: Approximate Noise Monitoring Locations

Location Reference	Approximate Grid Reference
MP1 – Proposed hotel façade nearest Dearne Valley Parkway	SE 34964 00578
MP2 – Rockingham Row	SE 34936 00707
MP3 – Grass verge (opposite Taco Bell)	SE 34969 00741
MP4 – Western Boundary (of site)	SE 34877 00574

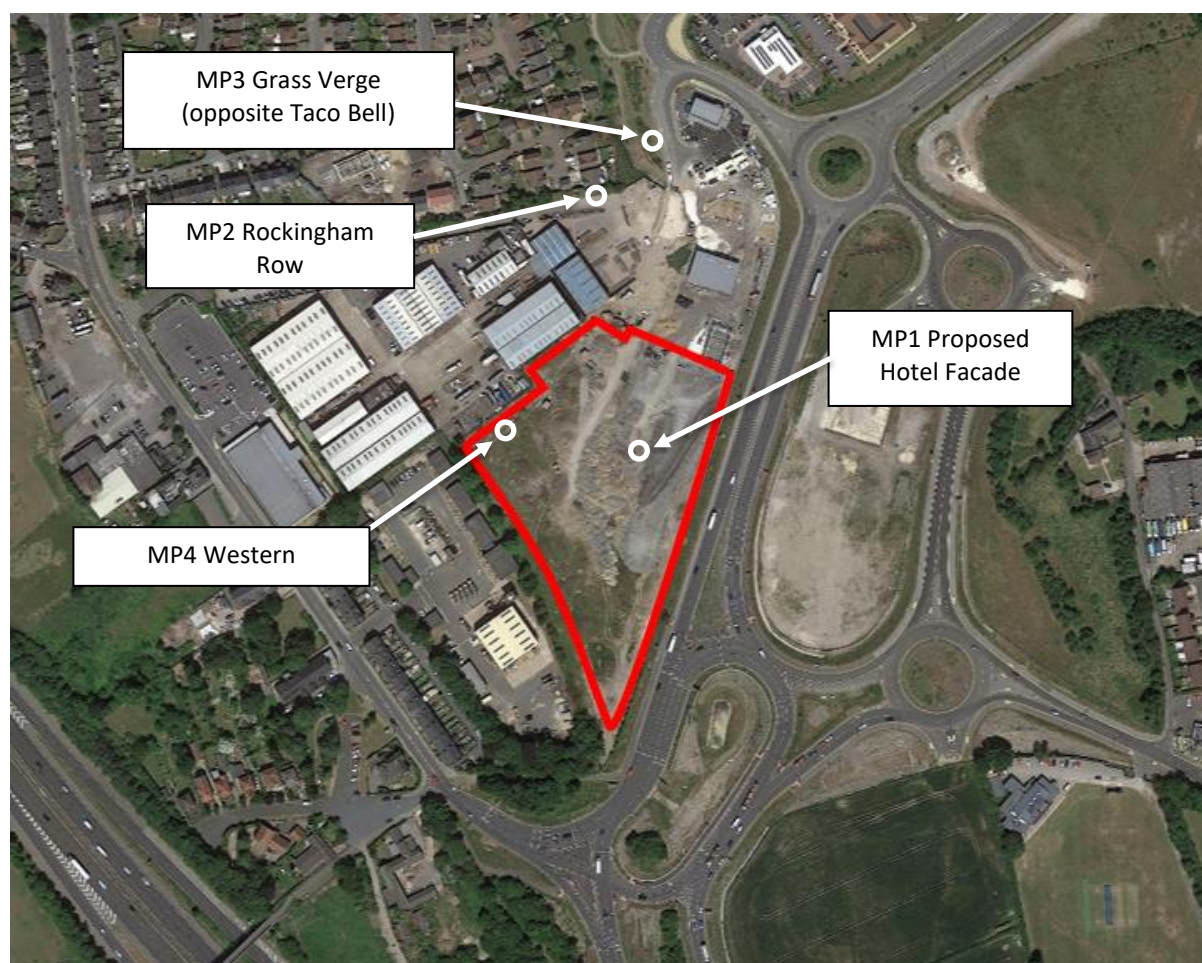
- 3.1.5 The noise monitoring equipment used during the surveys is shown in Table 3-2 and was set to record the $L_{Aeq,T}$, L_{A90} , L_{A10} and L_{Amax} parameters.

Table 3-2: Noise Monitoring Equipment

Equipment Description	Serial Number	Calibration Date
01dB Solo Class 1 sound level meter	65446	17.04.2018
Cirrus CR515 Acoustic calibrator	67243	29.01.2019

- 3.1.6 The following set-up parameters were used on the sound level meter during all the noise measurements undertaken:
- Time Weighting: Fast
- Frequency Weighting: "A"
- 3.1.7 The sound level meter was field calibrated, using an electronic calibrator, prior to commencement and upon completion of the overall survey, no drift in calibration was observed. The external calibration documentation for the equipment used is available upon request.

Figure 3-1: Noise Monitoring Location Plan



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3.2 Weather

3.2.1 Weather conditions during the survey periods are detailed in Table 3-3 below:

Table 3-3: Weather Conditions

Date & Period	Precipitation	Cloud Cover	Wind	Temperature
20/03/2019 Daytime	None, dry roads	10%	<5.0ms ⁻¹	15-19°C
02/04/2019 Daytime	None, dry roads	95%	<5.0ms ⁻¹	6°C
20/03/2019 Evening	None, dry roads	15%	<5.0ms ⁻¹	12°C
20/03/2019 Night-time	None, dry roads	10%	<5.0ms ⁻¹	11°C
26/03/2019 Night-time	None, dry roads	15%	<5.0ms ⁻¹	4°C

Survey Results

3.2.2 The results of the baseline surveys are summarised in Table 3-4 and can be found in full in Appendix A.

Table 3-4: Summary of Baseline Survey Results, dB

Location	Period		L _{Aeq,T}	L _{Amax}	L _{A90}	L _{A10}
MP1	Day	11:37 – 14:37	59.8	77.6	54.4	62.1
	Evening	21:15 – 22:15	56.3	75.0	52.3	59.3
	Night	23:00 – 00:00	53.6	65.9	48.7	56.2
MP2	Day	10:12 – 11:12	54.2	78.1	50.5	56.9
MP3	Night	00:00 – 00:30	56.2	79.0	49.1	55.4
MP4	Day	15:23 – 15:38	55.2	68.5	49.6	58.8

3.3 Subjective Field Monitoring Notes

3.3.1 The subjective notes recorded by the on-site acoustic consultant during the surveys in March 2019 are summarised as follows:

3.3.2 MP1 – Proposed Hotel Façade (on site)

Daytime – During this measurement period the noise climate was dominated by road traffic noise from Dearne Valley Parkway (A6195). Construction noise from land beyond Dearne Valley Parkway and banging sounds from the industrial units along the sites western border were also noted.

Evening – During this measurement period the noise climate was dominated by road traffic noise from Dearne Valley Parkway (A6195). The background was made up of a suction sound from ongoing vacuum excavations further south along Dearne Valley Parkway, road traffic noise from the surrounding roundabouts along the A6195 was also noted.

Night – During this measurement the noise climate comprised background road traffic noise from the M1 motorway with occasional traffic movements on Dearne Valley Parkway (A6195) and the surrounding roundabouts. Other background noise noted consisted of occasional aircraft and the distant vacuum excavation previously described.

3.3.3 MP2 – Rockingham Row (opposite Rubicon Ltd)

Daytime – During the measurement the noise climate was dominated by noise from the adjacent yard belonging to Rubicon Ltd, a steel stockholder, and road traffic noise from Dearne Valley Parkway (A6195). The noise from Rubicon Ltd consisted of forklift truck movements, banging sounds and music playing. Also noted were occasional vehicles using the BP garage (24-hour filling station) and birdsong.

3.3.4 MP3 – Grass Verge (opposite Taco Bell)

Night-time – During this measurement the noise climate was made up of background road traffic noise from the M1 motorway and infrequent road traffic movements on Dearne Valley Parkway (A6195) and the surrounding roundabouts. The more noticeable noise source was vehicles using the BP garage (24-hour filling station). During the measurement Taco Bell staff were taking out their bins, Greggs had a delivery unloaded and the sound of a running engine from a stationary small flatbed lorry in the garage service area was present.

3.3.5 MP4 – Western Boundary (of site)

Daytime – During this measurement the noise climate was dominated by commercial noise from an industrial unit near the western border of the site and road traffic noise from Dearne Valley Parkway (A6195). The noise was described as sawing, welding, banging, a vacuum sound and the hiss of compressed air. Also noted was the use of a forklift truck and a lorry unloading.

4 Noise Assessment

4.1 Introduction

- 4.1.1 This section of the report outlines the prediction and assessment of noise generated by the proposed development at the nearest residential receptors.
- 4.1.2 The predictions have been made using the calculation methodology outlined in ISO9613 and the assessment of potential noise impacts has been undertaken in accordance with BS4142 and BS8233.
- 4.1.3 The significance of the calculated noise impact is then further referenced to the noise exposure hierarchy presented in Section 2. In terms of BS4142 and BS8233 the following thresholds are proposed.

Table 4-1: Effect levels relating to BS4142 impact

Threshold	BS4142 assessment of impacts
NOEL	Indication of a low impact (rating level does not exceed the background level)
LOAEL	Indication of an adverse impact (rating level is around 5dB above the background level)
SOAEL	Indication of a significant adverse impact (rating level is around 10dB above the background level)

Table 4-2: Effect levels relating to BS8233 night-time internal noise level guidance

Threshold	BS8233 assessment of impacts - Internal	
	Daytime Resting (07:00 – 23:00)	Night-time Sleeping (23:00 – 07:00)
NOEL	Noise level below 35dB $L_{Aeq,16hr}$	Noise level below 30dB $L_{Aeq,8hr}$
LOAEL	Noise levels between 35dB and 40dB $L_{Aeq,16hr}$	Noise levels between 30dB and 35dB $L_{Aeq,8hr}$
SOAEL	Noise levels above 40dB $L_{Aeq,16hr}$	Noise levels above 35dB $L_{Aeq,8hr}$

4.2 Noise Emissions

- 4.2.1 The proposed hotel development will have external fixed plant that generates noise which may impact on existing receptors. No details of the specific plant associated with the proposed development are currently available therefore, plant and noise emission data are based on those used at similar sites and are shown in Table 4-3 below.

Table 4-3: Hotel fixed plant and vent details

Description	Location	Noise Level
Heat Exchanger (x6)	Roof	78dB(A) L_w
Kitchen Extract (x2)	Roof	53dB(A) @ 3m L_p
Kitchen Condenser (x2)	Roof	75 dB(A) L_w
Linen Room Extract (x2)	Roof	39dB(A) @ 3m L_p
Heater Room Extract (x2)	Roof	51dB(A) @ 3m L_p
AHU Extract	Roof	39dB(A) @ 3m L_p
Roof Extract	Roof	33dB(A) @ 3m L_p

4.3 Noise Modelling Protocols

4.3.1 The noise model was constructed using the proprietary noise modelling software package CadnaA. The potential noise impacts at the nearby residential properties have been predicted using the calculation methodology outlined in ISO9613.

4.3.1 The noise model was constructed utilising Google Earth geo-referenced 1:1 scaled aerial photography and plan and elevation drawings supplied by the client.

4.3.2 The following assumptions have been made during the modelling process:

- All sources have a 100% on-time throughout the assessment periods;
- Wind and temperature gradient assisted sound propagation at all receptors; and
- Kitchen extracts, linen rooms and heater rooms would all vent at/above roof level.

4.4 Assessment of Existing Noise Climate and Fixed Plant Associated with the Proposed Development on the Proposed Development

4.4.1 The results of the baseline noise monitoring have been used to assess the impact of the existing noise climate on the proposed development, particularly the impacts on internal ambient noise levels within the proposed ground floor food and drink premises and internal ambient noise levels in the hotel bedrooms on the first, second and third floors.

4.4.2 The main noise source impacting on the proposed development is road traffic using the A6195 Dearne Valley Parkway and nearby roundabouts. Commercial noise from the industrial units on the western border has been considered but is not expected to affect the proposed hotel. The measured noise levels were modelled based on free-field measurements least affected by other sources in the area. These have been balanced in the noise model and the results are shown in Table 4-6.

Table 4-6: Noise Model Calibration

Location	Period	Modelled Source Level dB L _{A10}	Measured Noise Level dB L _{Aeq,T}	Resulting Model Level dB L _{Aeq,T}	Tolerance +/- dB
MP1	Day	69.2	59.8	59.8	0
	Night	62.9	53.6	53.6	0
MP4	Day	94.8	55.2	55.2	0

4.4.3 The table shows that the modelling outcomes align with the measured noise levels therefore the model is considered representative of the noise climate across the site.

4.4.4 Figures 4-2, 4-3, 4-5 and 4-6 show the predicted noise levels at windows on the Hotel from sources affecting the site during the day and night-time.

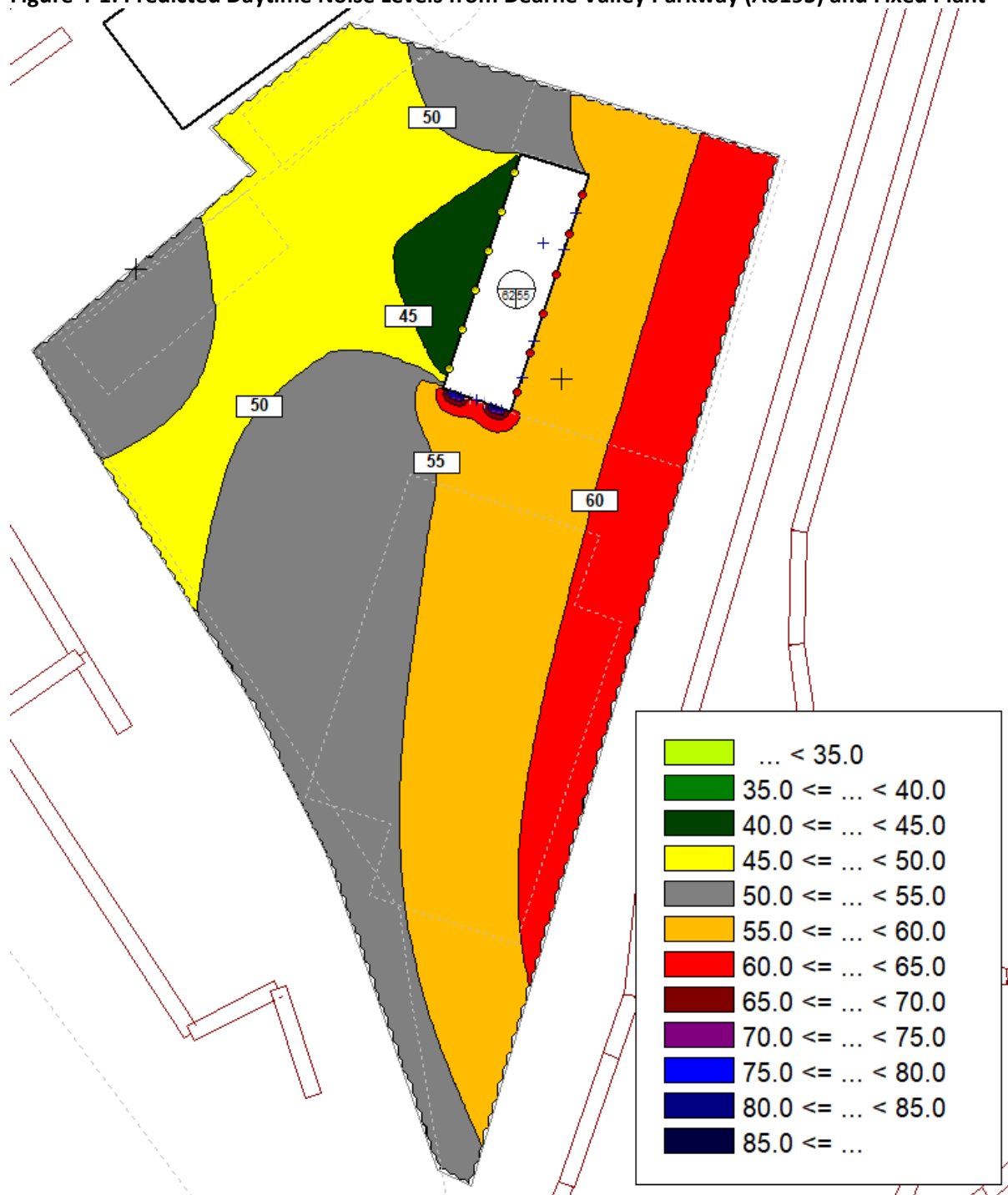
Internal Noise Level Assessment – Daytime (07:00 to 23:00 hours)

4.4.5 Table 4-7 details the predicted internal noise levels and the level of mitigation required to meet the BS8233 recommended internal ambient noise levels for food and drink uses on the ground floor and for daytime resting in bedrooms of the remaining floors. The predicted internal noise levels assume a 15dB attenuation provided by a window left partially open for ventilation purposes as advised by the guidance contained in BS8233.

Table 4-7: Daytime Internal Noise Level Assessment

Location	External Noise Level dB, L _{Aeq,16hr}	Façade Reduction dB R _w	Predicted Internal Noise Level, dB L _{Aeq,16hr}	Guidance Level dB L _{Aeq,16hr}	Level of Mitigation Required, dB
Ground Floor Use	57	15	42	45-50	0
East façade bedrooms 1st, 2nd and 3rd Floors	61		47	35	12
West façade bedrooms 1st, 2nd and 3rd Floors	47		32		0

Figure 4-1: Predicted Daytime Noise Levels from Dearne Valley Parkway (A6195) and Fixed Plant



A 3D visualization of a scene with a gray block, a yellow sphere, and a red and blue checkered floor. The scene is annotated with blue crosses and red and yellow octagons containing numbers (57, 59, 60, 61, 62).

- 4.4.6 Table 4-7 shows that predicted internal noise levels in bedrooms on the east facing façade would exceed guidelines and would require mitigation to meet the guideline values for daytime resting in bedrooms outlined in BS8233.
- 4.4.7 Outline mitigation measures are considered in Section 5 of this assessment.

Internal Noise Level Assessment – Night-time (23:00 to 00:00 hours)

- 4.4.8 Table 4-8 details the predicted internal noise levels and the level of mitigation required to meet the recommended internal ambient noise levels for sleeping in bedrooms during the worst-case night-time period, i.e. 30dB $L_{Aeq,8hrs}$. The assessment assumes the ground floor food and drink uses will not be used after 23:00 hours.
- 4.4.9 The predicted internal noise levels assume a 15dB attenuation provided by a window left partially open for ventilation purposes as advised by the guidance contained in BS8233.

Table 4-8: Night-time Internal Noise Level Assessment

Location	External Noise Level dB, $L_{Aeq,8hr}$	Façade Reduction dB R_w	Predicted Internal Noise Level, dB $L_{Aeq,8hr}$	Guidance Level dB $L_{Aeq,8hr}$	Mitigation Required, dB
Eastern façade 1st, 2nd and 3rd Floors	58	15	43	30	13
Western façade 1st, 2nd and 3rd Floors	41		26		0

Figure 4-4: Predicted Night-time (23:00 – 00:00 hours) Noise Levels from Dearne Valley Way (A6195)

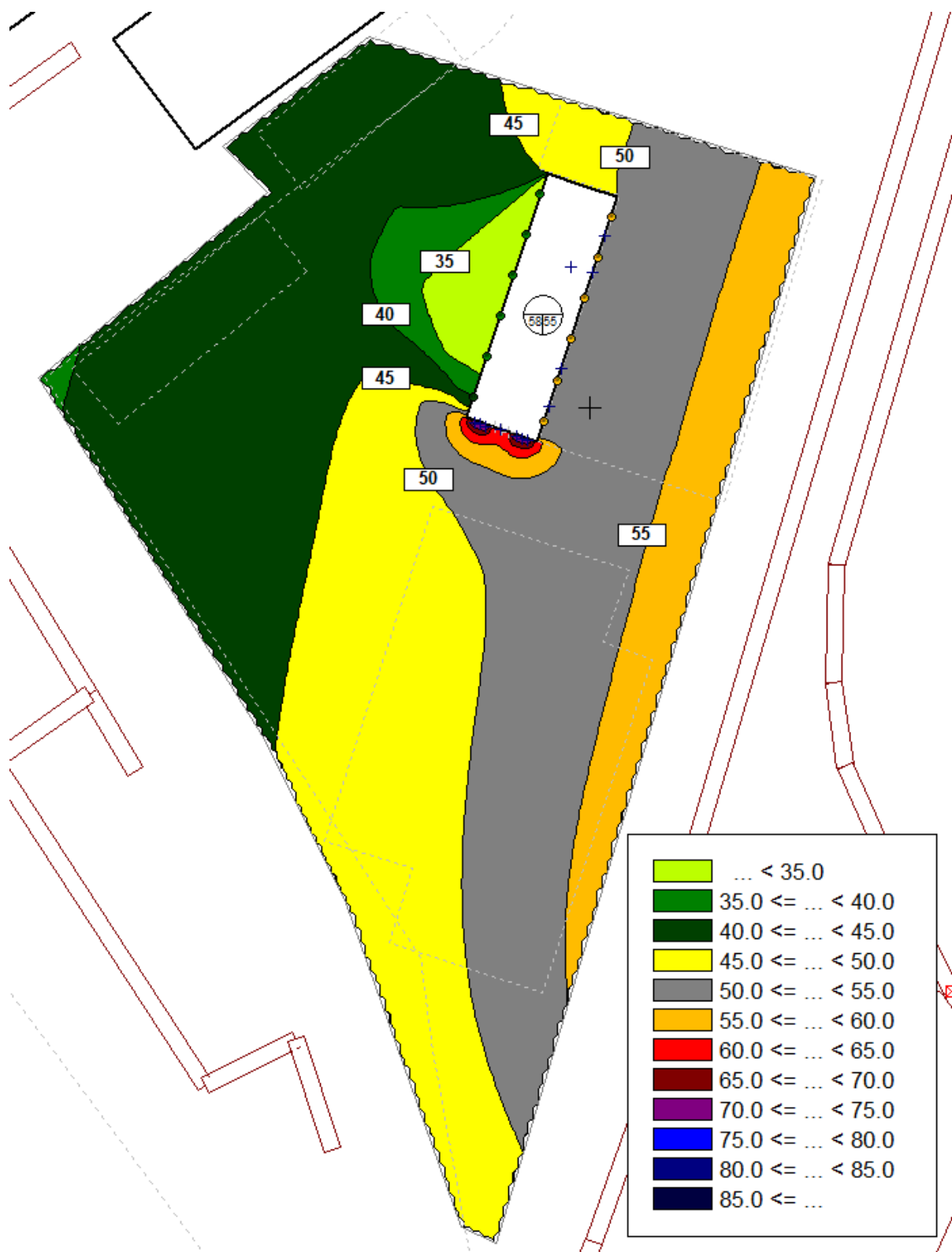


Figure 4-5: Predicted Night-time Façade Noise Levels from Dearne Valley Parkway (A6195) and Fixed Plant (View from North of site)

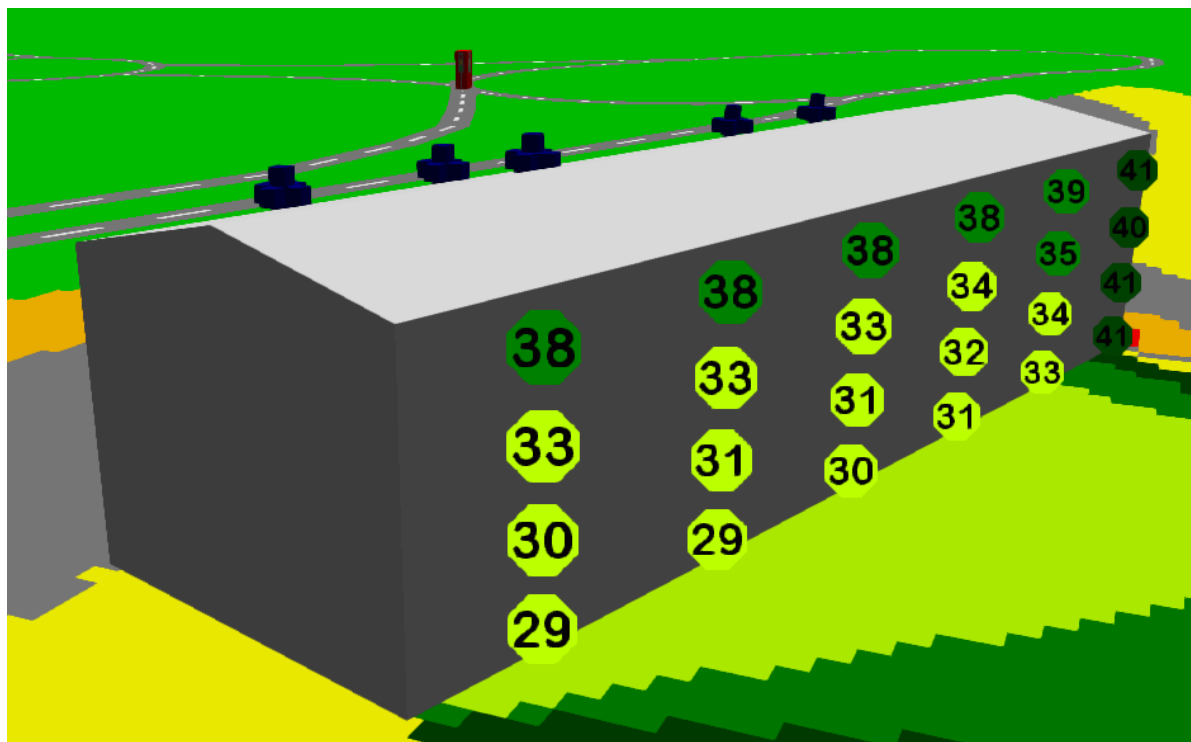
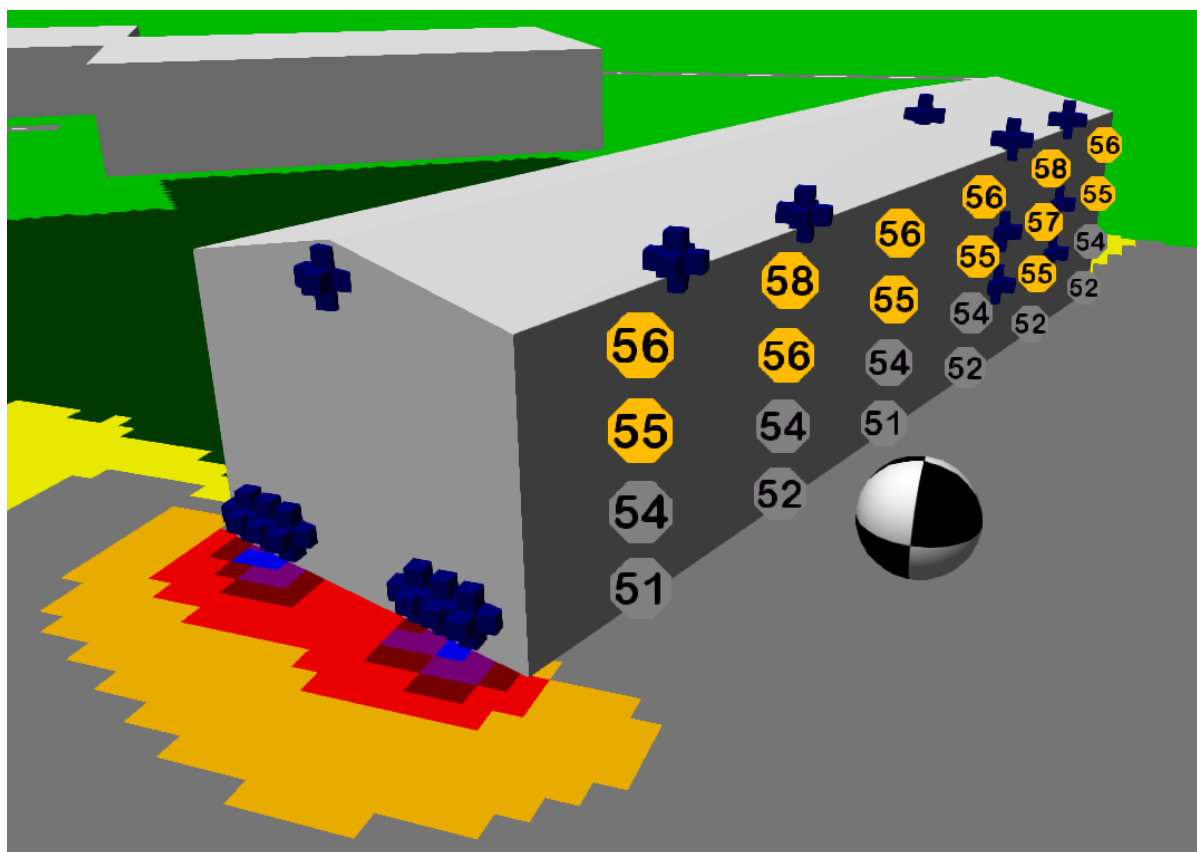


Figure 4-6: Predicted Night-time Façade Noise Levels from Dearne Valley Parkway (A6195) and Fixed Plant (View from South of site)

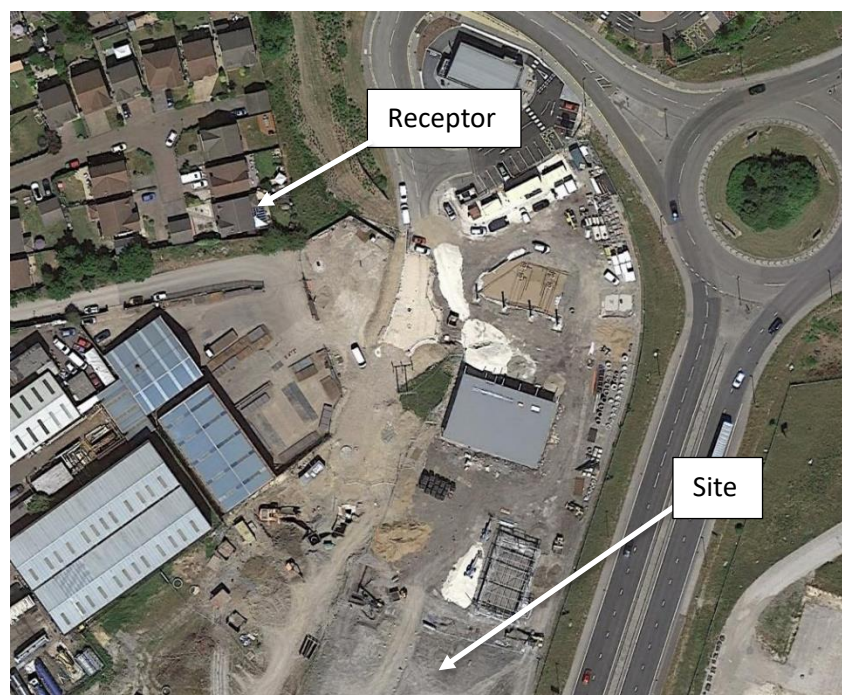


4.4.10 Table 4-8 shows that worst-case predicted internal noise levels at the eastern facade bedrooms at night would require mitigation to meet the guideline values for night-time sleeping stated in BS8233.

4.5 Assessment of Development Proposal on Existing Residential Receptor

4.5.1 Noise levels generated by fixed plant associated with the hotel and ground floor A3 uses have been predicted to the nearest existing residential receptor shown in Figure 4-7 below.

Figure 4-7 Nearest Noise Sensitive Receptor



4.5.2 Noise predictions at the nearby residential property have been made to 1.5m and 4.0m to represent a downstairs and upstairs window respectively.

4.5.3 Table 4-12 details the predicted noise levels generated by fixed plant, the predictions are based on plant at the hotel operating 24-hours per day. Predicted noise levels have been rounded up to the nearest whole number.

Table 4-12: Worst-case Predicted Noise Levels at the Assessment Locations

Location	Period	Assessment Height, m	Predicted Noise Level dB L _{Aeq,T}
No.53 Locksley Gardens – Ground Floor	Day	1.5	16
No.53 Locksley Gardens – 1 st Floor	Night	4.0	17

4.5.4 In accordance with the guidance contained in BS4142 the specific sound level has been corrected for tonal, impulsive, intermittent or other acoustic characteristics which may be present at the receptors to determine the sound rating level.

4.5.5 It is considered that the specific noise sources would not have any tonal, impulsive or intermittent content that would be distinguishable from those generated by existing noise sources in the area, therefore no acoustic feature corrections have been applied.

4.5.6 It is noted that BS4142 assessments are undertaken using whole dB values with 0.5dB being rounded up. Table 4-13 details the BS4142 assessment.

4.6 BS4142 Assessment

- 4.6.1 A comparative assessment has been undertaken to determine the potential impact of the predicted sound rating levels at these nearest residential receptors upon the prevailing background noise levels. Table 4-13 details the results of the assessment.

Table 4-13: BS4142 Assessment

Location	Period	Floor	Sound Rating Level dB L _{Ar,T}	Background Noise Level dB L _{A90}	Difference
No.53 Locksley Gardens	Day	GF	16	51	-35
	Night	1F	17	49	-32

- 4.6.2 Table 4-14 shows that the predicted sound rating levels are significantly below the measured background noise levels during both the daytime and overnight periods indicating that the specific sound generated by the proposed development would have a **low impact**.

4.7 BS4142 Assessment of Proposed B1 and B8 Use Units

- 4.7.1 As there are no specific details of the end uses for the proposed B1 and B8 units, and therefore no details of specific plant, a full BS4142 assessment cannot be undertaken. However, as the nearest residential receptor is approximately 75m from the nearest B1 use building and approximately 175m from the B8 use building, it is unlikely that noise would have an impact on the existing residential receptors.

4.8 Cumulative Effect Levels

- 4.8.1 An assessment of the cumulative effect of existing road traffic noise levels (without the proposed development) and the predicted noise levels including the proposed development have been made to the existing residential receptor nearby.

Table 4-14: Cumulative Effect Level Assessment

Location	Period	Predicted Traffic Noise Level from Colwick Loop Road dB L _{Aeq}	Predicted Noise Level from Proposed development dB L _{Aeq}	Predicted Total Future Noise Level dB L _{Aeq}	Predicted Change dB L _{Aeq}
No.53 Locksley Gardens	Day	54.9	16	54.9	0
	Night	56.2	17	56.2	0

- 4.8.2 Table 4-14 shows the results of the cumulative effect. The table shows that there would be no increase in ambient noise levels at the nearby residential receptor.

5 Outline Mitigation

5.1.1 The assessment has shown that the site is suitable for the intended use subject to the implementation of mitigation measures to reduce potential impacts on the hotel bedrooms on the floors above.

5.2 Internal Noise Mitigation – Hotel Bedrooms

5.2.1 The assessment has shown that mitigation measures are required to hotel room windows to ensure that internal noise levels meet the guideline values for daytime resting and night-time sleeping outlined in BS8233. Tables 5-1 and 5-2 summarise the mitigation for daytime and night-time noise levels respectively.

5.2.2 The mitigation levels for glazing units are based on Pilkington Glass standard double-glazed units.

Table 5-1: Daytime Internal Noise Levels

Location	Predicted Internal Noise Level dB, $L_{Aeq,16hr}$	Internal Guideline Noise Level $L_{Aeq,16hr}$ dB	Mitigation Required dB $R_W + C_{tr}$	Double Glazing Element Configuration Pane/Gap/Pane ($R_{W,+C_{tr}}$)
Eastern Façade Bedrooms 1st, 2nd and 3rd Floors	47	35	12	4mm/6 -16mm/4mm (25dB)

Table 5-2: Night-time Internal Noise Levels

Location	Predicted Internal Noise Level dB, $L_{Aeq,8hr}$	Internal Guideline Noise Level $L_{Aeq,8hr}$ dB	Mitigation Required dB $R_W + C_{tr}$	Double Glazing Element Configuration Pane/Gap/Pane ($R_{W,+C_{tr}}$)
Eastern Façade Bedrooms 1st, 2nd and 3rd Floors	46	30	16	4mm/6 -16mm/4mm (25dB)

5.2.3 The above tables show that the glazing elements specified would ensure that the internal noise levels within rooms at the proposed hotel would meet the guideline values outlined in BS8233. Windows should retain the ability to open to aid rapid/purge ventilation if required.

6 Conclusion

- 6.1.1 Enzygo Limited has been instructed by Hartwood Estates Limited to undertake a noise assessment for their proposed development on land to the south-west of Rockingham Roundabout on the A6195 known as Dearne Valley Parkway, Birdwell, Barnsley.
- 6.1.2 The proposed development would include B1 and B8 use buildings and a 4-storey hotel which would include ground floor A3 class use and associated parking
- 6.1.3 The assessment is based on the results of a series of noise predictions undertaken in accordance with the calculation methodology contained in ISO9613 'Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation' and the results of baseline noise surveys undertaken at the site.

6.2 Noise Assessment Conclusions

- 6.2.1 Noise levels from existing road traffic movements on Dearne Valley Parkway and those generated by the proposed development have been predicted using the proprietary noise modelling software CadnaA. Assessments have been made in accordance with the guidance contained in BS4142 and BS8233. Reference has also been made to the noise exposure hierarchy described in the planning practice guidance.
- 6.2.2 A site visit has been made to establish the prevailing ambient noise levels at the site. Based on observations at site, the main noise source in the area is road traffic noise from Dearne Valley Parkway.

Internal Noise Assessment – Background Noise Impacts and Noise Generated by Fixed Plant on the Proposed Development

- 6.2.3 An assessment of the suitability of the site for daytime and night-time bedroom resting in the proposed hotel bedrooms has been made based on the propagation of road traffic noise across the site and noise from fixed plant on the proposed hotel.
- 6.2.4 The glazing elements and trickle vents specified in the design of the building envelope would adequately attenuate external noise so that internal resting and sleeping conditions would be met without the need for additional or enhanced mitigation measures and the proposed development would fall into the **NOEL** threshold of impact.

Noise Generated by the Proposed Development on Existing Noise Sensitive Receptors

- 6.2.5 A BS4142 assessment has shown that the predicted sound rating levels are below the prevailing background noise levels which would indicate that the specific sound levels from the proposed development would have a **low impact** and fall into the **NOEL** threshold of impact.
- 6.2.6 As there are no specific details of the end uses for the proposed B1 and B8 units, and therefore no details of specific plant, a full BS4142 assessment cannot be undertaken. However, as the nearest residential receptor is approximately 75m from the nearest B1 use building and approximately 175m from the B8 use building, it is unlikely that noise would have an impact on the existing residential receptors.

Cumulative Effect

- 6.2.7 A cumulative assessment of noise generated by road traffic and the proposed development has been made to determine any increase in ambient noise levels at the existing nearest residential receptors. The assessment has shown that there is no cumulative impact on existing residential receptors.

6.3 Case for Acceptability

- 6.3.1 Based on the results of the assessment, the proposed development is unlikely to generate sufficient levels of noise to materially affect the residential amenity at existing receptor locations.
- 6.3.2 Predicted noise levels from the proposed development would be below, or equal to at worst, the background noise levels at the nearest residential receptor.
- 6.3.3 Predicted noise levels from the proposed development would be below the current ambient noise levels generated by road traffic on Dearne Valley Parkway.
- 6.3.4 Subject to the installation of suitable glazing elements and trickle vents to control internal noise levels in the hotel bedrooms, noise should not pose a material constraint to the development proposals and the site is considered suitable for its intended use.

Glossary of Terminology

Noise is defined as unwanted sound. The range of audible sound is known to be from 0dB (threshold of hearing) to 140dB (threshold of pain). Examples of typical noise levels relating to 'everyday' occurrences are given in Table G-1 below.

Table G-1: Typical Noise Levels

Source	Sound Pressure Level in dB(A)	Subjective Level
Gun shot	160	Perforation of eardrum
Military Jet take-off	140	Threshold of pain
Jet Aircraft at 100m	120	Very Loud
Rock Concert, front seats	110	Threshold of Sensation
Pneumatic Drill at 5m	100	Very Loud
Heavy goods vehicle from pavement	90	
Traffic at kerb edge	70 – 85	Loud
Vacuum Cleaner, Hair Dryer	70	
Normal conversation at 1m	60	Moderate
Typical Office	50 – 60	
Residential area at night	40	Quiet
Rural area at night, still air	30	
Leaves Rustling	20	
Rubbing together of fingertips	10	
	0	Threshold of hearing

The frequency response of the human ear to noise is usually taken to be around 18Hz (number of oscillations per second) to 18,000Hz. However, the human ear does not respond equally to different frequencies at the same level; it is more sensitive in the mid-frequency range than lower and higher frequencies and, because of this, when undertaking the measurement of noise the low and high frequency components of any given sound are reduced in importance by applying a filtering (weighting) circuit to the noise measuring instrument. The weighting which is widely accepted to correlate best with the subjective nature of human response to noise and is most widely used to quantify this is the A-weighted filter set. This is an internationally accepted standard for noise measurement.

For variable noise sources within an area an increase of 3dB(A) would be the minimum perceptible to the human ear under normal conditions. It is generally accepted that an increase/decrease of 10dB(A) corresponds to a doubling or halving in perceived loudness. The 'loudness' of a noise is a purely subjective parameter, dependant not only upon the sound pressure of the event but also on the dynamics of the listener's ear, the time of the day and the general mood of the person.

With regard to environmental noise levels (in the open air), these are rarely steady but rise and fall according to the activities being undertaken within the surrounding area at any given time. In an attempt to produce a figure that relates this variable nature of noise to human subjective response, a number of statistical noise metrics have been developed. These and other useful terminology and descriptors are presented in Table G-2 below.

Table G-2: Terminology

Term	Definition
Sound	Pressure fluctuations in a fluid medium within the audible range of amplitudes and frequencies which stimulate the organs of hearing.
Noise	Unwanted sound emitted from a source and received by the sensitive receptor.
Decibel (dB)	Unit most often used to describe the sound pressure level. A logarithmic number, it correlates closely to the way in which humans perceive sound. Its wide range of values helps quantify sound pressures from a large variety of magnitudes.
A-Weighting (dB(A))	Human perception of sound is frequency dependant. A-weighting applies a range of corrections at each frequency to provide a 'human-averaged'. Can be frequency band or broadband values.
Frequency (Hz)	The number of cycles per second, for sound this is closely related (and often mistaken for) pitch.
Frequency Spectrum	A more detailed analysis of the frequency components that comprise a sound source.
$L_{A10,T}$	The 10 th statistical percentile of a measurement period, i.e. the level that is exceeded for 10% of the measurement duration. Closely correlates with traffic sources, A-weighted.
$L_{A90,T}$	The 90 th statistical percentile of a measurement period, i.e. the level that is exceeded for 90% of the measurement duration. Used to describe background sound levels, as this value is affected less by short, transient sound sources, A-weighted.
L_{Amax}	The root mean square (RMS) maximum sound pressure level within a measurement period, A-weighted.
Ambient Sound	The total sound climate of all sources incident at one location, both in the near- and far-field (<i>The ambient sound comprises the residual sound and the specific sound when present</i>).
Ambient Sound Level $L_a = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T.
Background Sound Level $L_{A90,T}$	A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T, measured using time weighting F and quoted to the nearest whole number of decibels.

Term	Definition
Equivalent Continuous A-weighted Sound Pressure Level $L_{Aeq,T}$	Value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time, and is given by the following equation: $L_{Aeq,T} = 10 \lg_{10} \left\{ \left(\frac{1}{T} \right) \int_{t_1}^{t_2} \left[p_A \frac{(t)^2}{p_0^2} \right] dt \right\}$ Where p_0 is the reference sound pressure (20μPA); and $p_A(t)$ is the instantaneous A-weighted sound pressure level at time t.
Measurement Time Interval T_m	Total time over which measurements are taken (<i>This may consist of the sum of a number of non-contiguous, short-term measurement time intervals</i>)
Rating level $L_{Ar,Tr}$	Specific sound level plus any adjustment for the characteristic features of the sound, over a period of time, T .
Reference Time Interval, T_r	Specified interval over which the specific sound level is determined (This is 1hr during the day from 07:00 to 23:00 hours and a shorter period of 15-min at night from 23:00 to 07:00 hours).
Residual Sound	Ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound.
Residual sound level $L_r = L_{Aeq,T}$	Equivalent continuous A-weighted sound pressure level of the residual sound in a given situation at the assessment location over a given time interval, T .
Sound Pressure Level	The level of fluctuation in air pressure, caused by airborne sound sources. Measured in Pascals (Pa).
Sound Power Level	The rate at which sound is radiated by a source. This parameter is useful as it describes sound energy before environmental or decay factors. Quantified in dB and notated usually as L_w or SWL.
Specific sound level $L_s = L_{Aeq,Tr}$	Equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given time interval, T .
Specific Sound Source	Sound source being assessed.

Statement of Uncertainty

This report is based upon a range of measurements, a system of calculations and noise predictions. As such, this report attempts to quantify fluctuations in air pressure and is subject to the effects of meteorology, physical and perceived anomalies, tolerances within the measuring and monitoring equipment and accuracy margins within the noise modelling software. In the interests of repeatability, this report must be considered as being affected by common factors involved in the measurement and calculation of noise propagation.

All measurement values, outcomes and assumptions are subject to a margin of uncertainty. This has been quantified and assessed as follows:

- Rounding errors – systemic tolerance of $\pm 1\text{dB}$;
- Type 1 sound level meter – operational tolerance of $\pm 1.1\text{dB}$;
- Meteorology – allowance of $\pm 1.9\text{dB}$; and
- CadnaA noise propagation modelling software – operational accuracy of $\pm 2.1\text{dB}$

The most influential uncertainty factors for the assessment of noise are deemed to be equipment tolerances, meteorology and software accuracy. A root-sum-square statistical average has been used to provide an overall margin of uncertainty of $\pm 3\text{dB}$.

Appendix A – Baseline Noise Survey Data

Table A-1: Location MP1, Proposed Hotel Façade (on the land of the proposed site)

Meter	01dB Solo – 065446			
Date	20/03/2019 – Daytime Measurement			
Period start	L _{Aeq}	L _{Amax}	L _{A90}	L _{A10}
20/03/2019 11:37	60.1	69.0	55.8	62.4
20/03/2019 11:52	59.1	71.2	54.6	61.7
20/03/2019 12:07	60.0	69.6	54.6	62.4
20/03/2019 12:22	58.9	72.0	53.8	61.6
20/03/2019 12:37	58.6	69.9	52.6	61.4
20/03/2019 12:52	59.3	76.3	53.1	61.4
20/03/2019 13:07	60.4	67.6	55.9	63.1
20/03/2019 13:22	60.4	74.9	55.8	62.5
20/03/2019 13:37	60	70.7	54.5	62.6
20/03/2019 13:52	59.9	77.6	53.8	61.7
20/03/2019 14:07	60.1	73.9	54.5	62.1
20/03/2019 14:22	59.9	71.7	55.1	62.8
Overall	59.8	77.6	54.4	62.1
Date	20/03/2019 – Evening Measurement			
20/03/2019 21:15	58.6	75	52.6	61.4
20/03/2019 21:30	56.3	65.2	51.9	58.9
20/03/2019 21:45	55.2	61.1	51.9	57.6
20/03/2019 22:00	56.4	64	52.8	58.6
Overall	56.8	75.0	52.3	59.3
Date	20/03/2019 – Night-time Measurement			
20/03/2019 23:00	54.2	61.3	50.7	56.5
20/03/2019 23:15	53.9	63.9	49.0	56.5
20/03/2019 23:30	51.9	61.5	47.5	54.9
20/03/2019 23:45	54.0	65.9	49.2	56.9
Overall	53.6	65.9	48.7	56.2

Table A-2: Location MP2, Rockingham Row (property at the end of the road)

Meter	01dB Solo – 065446			
Date	02/04/2019 – Daytime Measurement			
Period start	L _{Aeq}	L _{Amax}	L _{A90}	L _{A10}
02/04/2019 10:12	52.7	62	50.4	54.5
02/04/2019 10:27	52.2	59.7	49.9	53.9
02/04/2019 10:42	57.4	78.1	51	60
02/04/2019 10:57	55.2	64.8	51.4	57.4
Overall	54.9	78.1	50.5	56.9

Table A-3: Location MP3, Grass Verge (opposite Taco Bell)

Meter	01dB Solo – 065446			
Date	26/03/2019 – Night-time Measurement			
Period start	L _{Aeq}	L _{Amax}	L _{A90}	L _{A10}
26/03/2019 00:00	54.1	69.9	49.0	54.9
26/03/2019 00:05	53.7	66.5	48.9	54.9
26/03/2019 00:10	58.4	74.4	49.4	58.1
26/03/2019 00:15	54.9	69.3	49.4	55.0
26/03/2019 00:20	53.2	65.1	49.4	55.5
26/03/2019 00:25	59.1	79.0	48.8	53.1
Overall	56.2	79.0	49.1	55.4

Table A-4: Location MP4, Site Fence Boundary (near factories)

Meter	01dB Solo – 065446			
Date	20/03/2019 – Daytime Measurement			
Period start	L _{Aeq}	L _{Amax}	L _{A90}	L _{A10}
20/03/2019 15:23	51.9	58.6	49.6	53.1
20/03/2019 15:24	53.3	59.7	50.4	55.4
20/03/2019 15:25	58.6	63.3	53.5	61.3
20/03/2019 15:26	55.1	60.6	51.1	57.7
20/03/2019 15:27	52.4	57.2	50.3	53.9
20/03/2019 15:28	51.3	53.8	49.6	52.7
20/03/2019 15:29	50.1	52.4	48.9	51.1
20/03/2019 15:30	53.1	59.2	50.1	55.3
20/03/2019 15:31	58.7	64.1	50.5	62.7
20/03/2019 15:32	60.6	63.8	57.5	62.9
20/03/2019 15:33	55.2	61.6	51.3	58.2
20/03/2019 15:34	55.6	68.5	51.0	57.0
20/03/2019 15:35	50.2	53.5	48.5	51.7
20/03/2019 15:36	51.5	57.1	48.9	53.6
20/03/2019 15:37	51.2	55.1	49.4	52.8
Overall	55.2	68.5	49.6	58.8



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