

**Havant Travelodge
Stantons Yard, Havant**

Noise & Vibration Assessment





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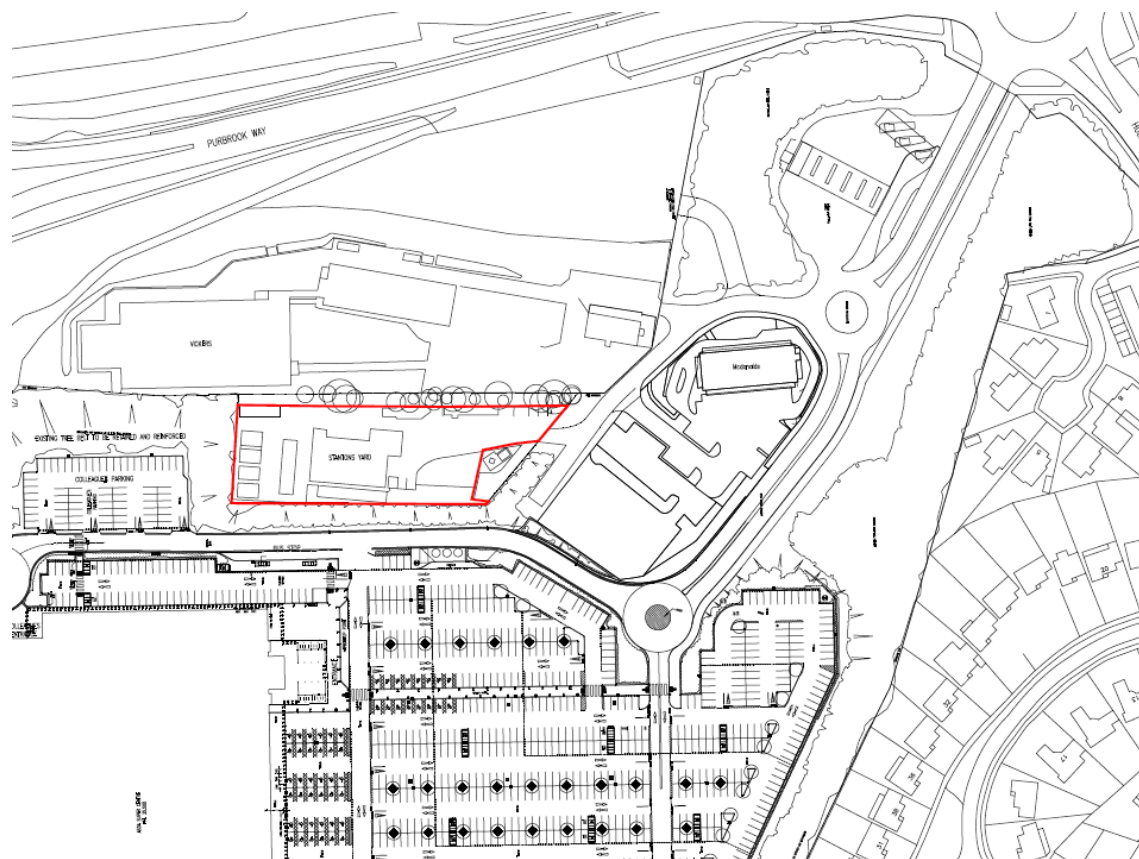
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1 INTRODUCTION

- 1.1 Entran Ltd has been commissioned by Tiger Developments Ltd to undertake a noise & vibration assessment in relation to the proposed Havant Travelodge at Stanton's Yard, Havant. The proposed Havant Travelodge has 4 floors of hotel accommodation and 85 car parking spaces with access to the site off Larchwood Avenue. The Site Location Plan is shown in Figure 1.
- 1.2 The purpose of this assessment is to establish whether existing noise and vibration levels at the site pose a constraint to the proposed residential uses. Relevant national guidance on noise and vibration is presented in Section 2. Section 3 of this report presents the results of a noise & vibration survey undertaken for the site. The assessment of noise on the proposed hotel development is considered in Section 4 together with our recommendations for mitigation. The vibration assessment is provided in section 5. The conclusions of the assessment are summarised in Section 6.
- 1.3 This report is necessarily technical in nature and contains terminology relating to acoustics and noise. Therefore, a glossary together with a brief introduction to the subject of noise, has been provided within Appendix A.

Figure 1 – Site Location Plan



2 NOISE & VIBRATION GUIDANCE

National Planning Policy

National Planning Policy Framework (NPPF) (July 2018)

2.1 The National Planning Policy Framework (NPPF) (July 2018) sets out the Government's economic, environmental and social planning policies for England. It attempts to summarise in a single document all previous national planning policy advice. Taken together, these policies articulate the Government's vision of sustainable development, which should be interpreted and applied locally to meet local aspirations.

2.2 Under Section 15; Conserving and enhancing the natural environment, the following is stated in paragraph 170:

"Planning policies and decisions should contribute to and enhance the natural and local environment by:

preventing new and existing development from contributing to, being put at unacceptable risk from, or being adversely affected by, unacceptable levels of soil, air, water or noise pollution or land instability"

2.3 The NPPF goes on to state in paragraph 180 that:

"Planning policies and decisions should also ensure that new development is appropriate for its location taking into account the likely effects (including cumulative effects) of pollution on health, living conditions and the natural environment, as well as potential sensitivity of the site or the wider area to impacts that could arise from the development. In doing so they should:

a) mitigate and reduce to a minimum potential adverse impacts resulting from noise from new development – and avoid noise giving rise to significant adverse impacts on health and the quality of life;

b) identify and protect tranquil areas which have remained relatively undisturbed by noise and are prized for their recreational and amenity value for this reason"

Noise Policy Statement for England NPSE (March 2010)

2.4 The Government is committed to sustainable development and the Department for Environment Food and Rural Affairs (Defra) plays an important role in this by working to secure a healthy environment in which current and future generations can prosper. One aspect of meeting these objectives is the need to manage noise for which Defra has the overall responsibility in England.

2.5 In March 2010, the Noise Policy Statement for England (NPSE) set out the long-term vision of Government noise policy as to:

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

2.6 The long-term vision is supported by the following aims:

“Through the effective management and control of environmental, neighbour and neighbourhood noise within the context of Government policy on sustainable development:

Avoid significant adverse impacts on health and quality of life;

Mitigate and minimise adverse impacts on health and quality of life: and,

Where possible, contribute to the improvement of health and quality of life.”

2.7 The explanatory note to the policy statement emphasises that sustainable development is a core principle underpinning all government policy. In this respect, there is a need to integrate consideration of the economic and social benefit of the activity under examination with proper consideration of the adverse environmental effects.

Other Guidance

The Institute of Environmental Management & Assessment (IEMA) Guidelines for Environmental Noise Impact Assessment (2014)

2.8 The Institute of Environmental Management and Assessment (IEMA) have recently published the ‘Guidelines for Environmental Noise Impact Assessment’. The guidelines are applicable to noise impact assessment for any scale of development proposal, including core principles to achieve effectively integration with the EIA, and provide advice on the issues that need to be

considered in a noise impact assessment and whether the appropriate conclusions are being reached. The factors include:

- The appropriateness of the noise parameters used for the situation;
- The reference time period used in making the assessment;
- The level, character and frequency content of the noise sources under investigation; and,
- How the predicted noise levels relate to relevant Standards and guidelines.

2.9 The guidelines also recommend that the assessor should determine the degree of impact based on evidence derived from the assessment.

World Health Organisation: Guidelines for Community Noise

2.10 The 'Guidelines for Community Noise' identify that, in dwellings, the critical effects of noise are on sleep, annoyance and speech interference. For noise affecting dwellings the guidelines state:

“To protect the majority of people from being seriously annoyed during the daytime, the sound pressure level on balconies, terraces and outdoor living areas should not exceed 55 dB L_{Aeq} for a steady, continuous noise. To protect the majority of people from being moderately annoyed during the daytime, the outdoor sound pressure level should not exceed 50 dB L_{Aeq} .”

2.11 Consequently, to avoid any possibility of sleep disturbance, indoor guideline values for bedrooms are 30 dB L_{Aeq} for continuous noise and 45 dB L_{Amax} for single sound events. These correspond to sound pressure levels at the outside façades of the living spaces which do not exceed 45 dB L_{Aeq} and 60 dB L_{Amax} , so that people may sleep with bedroom windows open. These values have been obtained by assuming that the noise reduction from outside to inside with the window partly open is 15 dB.

EEA Technical report No 11/2010 “Good practice guide on noise exposure and potential health effects”, European Environment Agency, 2010

2.12 This report provides a contemporary review of the acoustic indicators and threshold levels associated with the onset of critical health effects such as self-reported sleep disturbance, reported awakenings, and polysomnographic observations of increased motility (movement)

and reduced sleep quality. The report presents effects for which sufficient evidence exists, and also provides percentage annoyed / percentage highly annoyed dose-response relationships for noise from transportation sources. For the purposes of this assessment, the threshold values presented in this report shall be considered to represent the Significant Observed Adverse Effect Levels (SOAEL) defined in the Noise Policy Statement for England.

British Standard BS 8233: 2014 Guidance on Sound Insulation and Noise Reduction for Buildings (BS 8233)

- 2.13 The scope of BS 8233 is the provision of recommendations for the control of noise in and around buildings. It suggests appropriate criteria and limits for different 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 in the external noise climate.
- 2.14 This Standard suggests suitable internal noise levels within different types of buildings, including residential dwellings. It suggests that an internal noise level of 30 dB $L_{Aeq, T}$ within bedrooms is a 'desirable' standard. For living areas during the daytime, the standard recommends 35 dB $L_{Aeq, T}$ as a desirable standard for resting.
- 2.15 The Standard also states that *“where development is considered necessary or desirable, despite external noise levels above WHO guidelines, the internal target levels may be relaxed by up to 5 dB and reasonable internal conditions still achieved.”*

ProPG:Planning & Noise

- 2.16 The Professional Practice Guidance on Planning and Noise (ProPG) for New Residential Development was published in May 2017. ProPG recommends an initial risk assessment of the site to determine the likely importance of any noise issues. A more detailed second stage includes a systematic assessment of relevant aspects of the development proposal supported by an Acoustic Design Statement. This approach leads to a choice of the following four recommendations to the decision maker:
- A. Planning consent may be granted without any need for noise conditions;
 - B. Planning consent may be granted subject to the inclusion of suitable noise conditions;
 - C. Planning consent should be refused on noise grounds in order to avoid significant adverse effects (“avoid”); or



D. Planning consent should be refused on noise grounds in order to prevent unacceptable adverse effects (“prevent”).

- 2.17 ProPG also provides additional notes to those provided in BS8233:2014. Note 4 in Figure 2: ProPG Internal Noise Guidelines states that *‘In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB $L_{Amax,f}$ more than 10 times per night’*.

British Standard BS 4142: 2014: Method for rating industrial noise and commercial sound

- 2.18 BS4142:2014 provides a methodology that determines the significance of adverse impact at dwellings potentially affected by noise of an industrial nature. BS4142 refers specifically to 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.
- 2.19 The assessment is based on the difference between the noise from the industrial process (expressed in terms of the LAeq rating level including any acoustic character correction) and the existing LA90 background noise level that would otherwise prevail in the absence of the noise source. For daytime operations (0700-2300 hours) the BS4142 assessment is undertaken over a 1- hour time period, and for night-time (2300-0700 hours) the assessment is undertaken over a 15-minute period. However, when making the comparison against the background noise level, the Standard points out that the objective is not simply to ascertain a lowest measured background noise level, but rather to quantify what is typical during particular time periods. Diurnal patterns can have a major influence on background sound levels and, for example, the middle of the night can be distinctly different (and potentially of lesser importance) compared to the start or end of the night-time period for sleep purposes.
- 2.20 The basis of the standard requires a comparison to be made between the ‘background noise level’ of the assessment area and the ‘specific noise level’ of the noise source under consideration. There are five key definitions relating to this relationship;
- Background Noise Level - $L_{A90,T}$ - this is defined in the Standard as ‘the ‘A’ weighted sound pressure level of the residual noise at the assessment position which is exceeded for 90 % of the given time interval, T , measured using time weighting F and quoted to the nearest number of whole decibels.



- Specific Noise Level - $L_{Aeq,T}$ - this is the equivalent continuous 'A' weighted sound pressure level over a given time interval.
- Residual Noise - this is defined as the ambient noise remaining in a given situation when the specific noise source is suppressed to a degree such that it does not contribute to the ambient noise.
- Ambient Noise - totally encompassing sound in a given situation at a given time usually composed of sound from many sources near and far.
- Rating Level - $L_{Aeq,T}$ - the specific noise level plus any adjustment made for the characteristic features of the noise.

2.21 The background level, wherever possible should be determined at the location where the assessment is to be made. Situations will arise where, due to circumstances which influence this level unduly, for example the specific noise level is operating continuously and thus the residual noise cannot be measured at this point, the background level may be determined in other ways. This may be, for example, by measuring at a different location or a different time which are nevertheless representative of the assessment position.

2.22 A further acoustic correction to the specific noise level is made if the sound has tonal or impulsive characteristics. The character corrections are flexible according to whether the acoustic character is just perceptible at the noise receptor, or is clearly perceptible or highly perceptible, and range from 0 to 6 dB for tonal noise, 3 to 9 dB for impulsive noise, and 3 dB for other non-tonal/impulsive acoustic characteristics. The corrections can also be cumulative subject to the subjective observations at the receptor.

2.23 Once all necessary adjustments have been made, the background and the specific noise levels are compared. The standard states that the greater this difference is, the greater is the magnitude of the impact.

- A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.
- A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.

- 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.

2.24 The assessment should consider the level of uncertainty in the data and associated calculations. Where the level of uncertainty could affect the conclusion, reasonable practicable steps should be taken to reduce the level of uncertainty.

Vibration – BS6472:2008

2.25 The vibration on the site has been assessed against the criteria provided in BS6472-1:2008.

2.26 BS6472-1:2008 Evaluation of human exposure to vibration in buildings. Part 1 contains a methodology for assessing the human response to vibration in terms of either the vibration dose value, or in terms of the acceleration or the peak velocity of the vibration, which is also referred to as peak particle velocity.

2.27 The advice contained in BS6472 states that when the vibration is intermittent, as is the case at this site, the vibration dose value, or VDV, may be used to assess the potential for impacts. The vibration dose value is a single figure descriptor that represents the cumulative dose of transient vibrations, taking into account the frequency spectrum and duration of each event.

2.28 The vibration dose value is determined over a 16-hour daytime period or 8-hour night-time period, and the guidance in BS6472 is set out as follows:

Table 2.1 - Vibration dose values (ms^{-1.75}) above which various degrees of adverse comment may be expected in residential buildings

Place and time	Low Probability of Adverse Comment	Adverse Comment Possible	Adverse Comment Probable
Residential Buildings 16 hr day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential Buildings 8 hr night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8



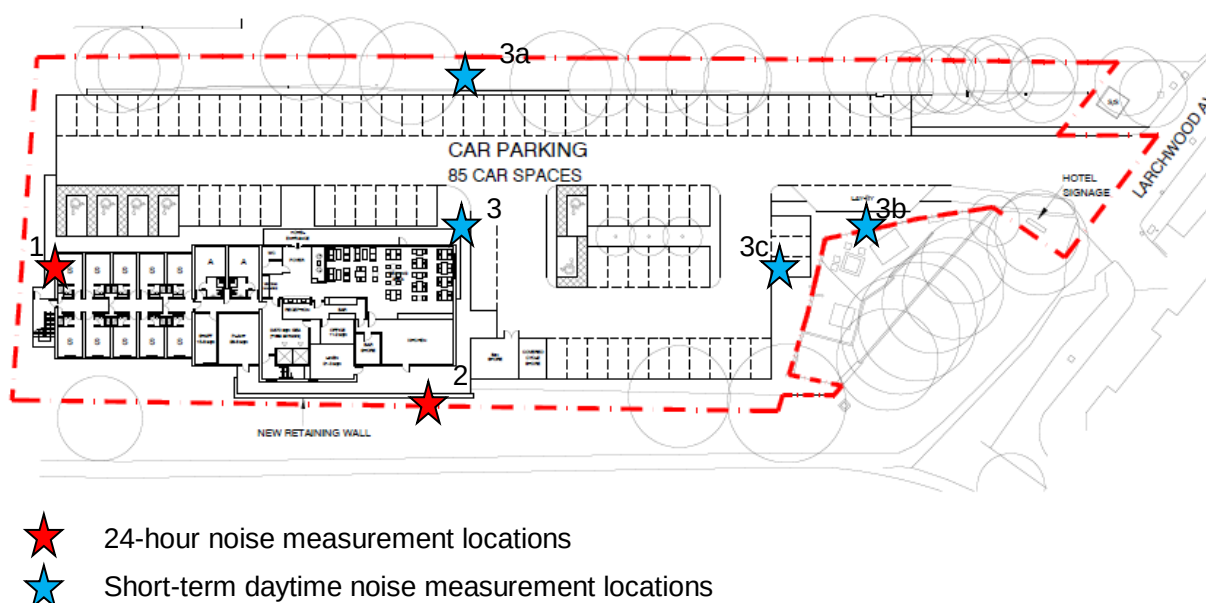
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- 2.29 The above guidance relates to vibration measured at the point of entry into the human body, which is usually taken to mean the ground surface or at a point mid-span of an upper storey floor, rather than the point of entry into the building, for example a foundation element. Where the vibration is measured at another location, BS6472 states that a transfer function should be applied; however, BS6472 does not contain any guidance on suitable transfer functions.
- 2.30 To extrapolate the measured vibration levels up the building to a suspended upper storey, an amplification factor of 2.8 has been used. This is based on figures presented in Transmission of Ground-borne Vibration in Buildings by Jorgen Jakobsen, Journal of Low Frequency Noise and Vibration, Vol. 8 No. 3, 1989.
- 2.31 At this stage, the foundations of the proposed residential properties are not known. However, it is anticipated that they will be spread footing foundations although 'worst case' piling data has been used for the vibration assessment (based on published data). In assessing the effect that the different foundations may have, guidance has been sought from the Handbook of Urban Rail Noise and Vibration Control (HURNVC), published by the Federal Transit Administration, USA, written by H J Saurenham, J T Nelson and G P Wilson.
- 2.32 The HURNVC sets out attenuation factors that can be applied to calculate the transfer function between vibrations measured on unloaded ground and vibration at a foundation. It is noted that the multiplication factor for piling is approximately 0.5 (based on the 31.5 Hz frequency band).
- 2.33 An overall transfer function, or multiplication factor, of 1.4 (2.8×0.5) has been assumed.

3 NOISE & VIBRATION SURVEY

Noise Survey

- 3.1 Measurements of the baseline noise climate were taken on 17/18 July 2018 at two representative positions on the development site. The noise measurements were undertaken to determine the existing ambient levels, which are of interest when considering noise ingress to the proposed hotel units, and the background noise levels which are used to establish suitable limits for building services noise emissions. Additional short-term daytime noise measurements were also taken to determine the existing noise sources at the site.
- 3.2 The noise monitoring equipment was located in free-field positions at the proposed development site. The noise and vibration measurements at site 1 represent the noise levels at the nearest boundary of the site to the A3(M). The microphone was located 1.8m above the ground. Further noise measurements were taken at site 2 to determine the noise levels from activities at the adjacent ASDA site including vehicles on the ASDA access road such as cars, buses and HGV deliveries, car parking noise and the nearby bottle bank. The microphone was located 1.8m above the ground and a further 1m above the lowest height of the site. The short-term measurements were taken 1.5m above ground floor level of the site.
- 3.3 The long and short term measurement locations are shown in Figure 2.

Figure 2: Noise Monitoring Locations



- 3.4 Sound level measurements at sites 1 and 2 were undertaken over a continuous period between 1300 hrs on Tues 17th July and 1400 hrs on Weds 18th July 2018. The weather

during this period was suitable for environmental noise measurements with a light south westerly breeze (1 m/s) throughout the survey, warm but overcast daytime conditions with a daytime temperature of 21 degrees C and no rain.

- 3.5 All noise measurements were undertaken by an experienced consultant competent in environmental noise monitoring, and, in accordance with the principles of BS 7445: 2003: Description and measurement of environmental noise and following the guidance given in BS4142.
- 3.6 All acoustic measurement equipment used during the noise surveys conformed to Type 1 specification of British Standard 61672: 2003: Electroacoustics. Sound level meters. Part 1 Specifications. A full inventory of this equipment is shown in Table 3.1 below:

Table 3.1: Inventory of Acoustic Measurement Equipment

Item	Make & Model	Serial Number
Sound Level Meters	Larson Davis 824	A1419
	Larson Davis 820	A1350
Calibrator	Larson Davis Cal200	3723

- 3.7 The noise measurement equipment used during the survey was calibrated at the start and end of the measurement period. The calibrator used had itself been calibrated by an accredited calibration laboratory within the twelve months preceding the measurements. No significant drift in calibration was found to have occurred on the sound level meter.
- 3.8 The dominant noise source at the site was from road traffic on the A3(M), Purbrook Way and the ASDA access road. A steady plant noise hum from external mechanical services plant was audible across the site from the neighbouring industrial premises. Other noise sources included the occasional use of the ASDA bottle bank, aircraft noise, trees rustling in the breeze and birdsong.
- 3.9 The summary results of the noise survey are presented below and the full data set is presented in Appendix B, Figures B1 and B2. The noise levels have been provided for the daytime and night-time (2300-0700 hrs) periods, in Table 3.2.

Table 3.2: Noise Measurement Results at Sites 1 & 2

Site	Date	L _{Aeq}	L _{A10}	L _{A90}
		dB		
	Daytime (0700-2300 hrs)			
1	17/18 July 18	50.4	62.6	47.7
2		53.9	67.6	50.7
	Night-time (2300-0700 hrs)			
1	17/18 July 18	45.6	58.3	40.6
2		49.1	49.5	43.8

3.10 The ambient noise levels considered in the guidance provided by BS82333:2014 and the WHO Community Noise Guidelines refer to the L_{Aeq,T} noise levels shown in Table 3.2.

3.11 A summary of the short term noise measurements along with the site observations are shown in Table 3.3.

Table 3.3: Short Term Daytime Noise Measurements

Site	Time Hours	Observations	L _{Aeq}	L _{A10}	L _{A90}
			dB		
3	1405-1410	Industrial noise was audible with a tone in the 315 Hz 1/3 rd octave band at centre of the site.	50.3	51.6	48.1
	1410-1415		52.2	53.7	49.0
	1415-1420		51.3	51.9	49.0
3a	1420-1425	Tone slightly more noticeable than at site 3	52.3	53.3	51.2
3b	1430-1435	Very little noise contribution was observed from sub-station	51.9	53.6	50.1
3c	1435-1440	Sub-station not audible behind 2m high wall	50.4	51.2	49.3

Vibration Survey

3.12 Vibration measurements were undertaken at Site 1, with the geophone located next to the noise meter. The tri-axial vibration transducer was set up on the ground such that the X-direction was parallel with the distant A1(M), the Y-direction was perpendicular to the A1(M) and the Z-direction was vertical.



- 3.13 The noise equipment comprised a Vibrock 901 Digital Seismograph with a Tri-axial Geophone. All equipment is within current manufacturer's periods of calibration. The V901 is a self-calibrating meter capable of simultaneously measuring vibration in the three orthogonal axes. The equipment, which has a frequency range of 1Hz to 200Hz, was set to record vibration dose values over the day and night-time periods in each orthogonal direction.
- 3.14 The transducer was located on the ground and positioned using a built-in spirit level such that there was no movement of the geophone. A summary of the measured VDV levels for the day and night-time periods is shown in Table 3.4.

Table 3.4 – Baseline Vibration Levels, Site 1

Period Hours	Vibration Dose Value (VDV) $\text{ms}^{-1.75}$		
	X	Y	Z
Day (0700-2300)	0.026	0.021	0.022
Night (2300-0700)	0.022	0.018	0.020

- 3.15 Subjectively, no vibration at the proposed development site was perceptible from the surrounding industrial area and road network.

4 NOISE ASSESSMENT

- 4.1 The noise measurement data gathered at the existing site has been utilised to determine potential noise levels at the façades of the proposed Travelodge.
- 4.2 The summary of the measured noise levels shown in Table 3.2 indicate that the development will experience free-field noise levels at site 1 of 50 dB $L_{Aeq,T}$ during the day and 46 dB $L_{Aeq,T}$ at night. At site 2 the development will experience free-field noise levels of 54 dB $L_{Aeq,T}$ during the day and 49 dB $L_{Aeq,T}$ at night.
- 4.3 The internal target noise levels that have been adopted for the hotel development are the same as for a residential development as shown in BS8233:2014; at night, $L_{Aeq,T}$ 30 dB and $L_{Aeq,T}$ 35 dB during the daytime. The internal maximum night-time noise level target from the WHO guidelines in $L_{Amax,f}$ 45 dB.
- 4.4 To meet the BS8233:2014 internal target noise levels the assessment considers appropriate sound insulation measures on the elevations of the building based on the baseline noise measurements. These noise mitigation measures are discussed below.

Sound Insulation Measures

- 4.5 The mitigation strategy is formulated on the following basis:
- Ensure that internal noise levels comply with WHO/BS8233 criteria;
- 4.6 For internal noise, it has been assumed that the minimum amelioration measure available to an hotel occupant will be to close bedroom windows. Therefore, in order to assess the acoustic performance of the proposed dwellings, it is appropriate in the first instance to explore the level of protection that will be afforded by the performance of the glazing elements.
- 4.7 To meet the daytime target noise levels at the hotel rooms represented by the measurements at Site 1, the glazing would need to provide $R_w + C_{tr}$ 18 dB and at night the glazing would need to provide $R_w + C_{tr}$ 22 dB. To meet the night-time noise target would require standard glazing such as 6mm / 6 to 20 mm airgap / 4mm construction or similar, which provides $R_w + C_{tr}$ 28 dB and R_w 32 dB. These figures take the façade reflection effects into account.
- 4.8 To meet the daytime target noise levels at the hotel rooms represented by the noise levels at Site 2 the glazing would need to provide $R_w + C_{tr}$ 19 dB and at night the glazing would need to



provide $R_w + C_{tr}$ 22 dB. To meet the night-time noise target the same glazing as shown for site 1 is recommended.

- 4.9 Due to the increased angle of view at the higher hotel floors and as the ground floor level is lower than the ASDA perimeter road and car parking areas the noise levels at the higher floors are estimated to be 1 to 2 dB(A) higher than those measured at sites 1 and 2. This indicates that the glazing should be designed to provide $R_w + C_{tr}$ 24 dB, which would be achieved by the proposed 6mm / 6 to 20 mm airgap / 4mm construction glazing.
- 4.10 The external noise measurements indicate that at Site 1 the 10th highest night-time maximum free-field noise level was $L_{Amax,f}$ 63 dB and at Site 2 the 10th highest night-time maximum free-field noise level was $L_{Amax,f}$ 66 dB. The source of these maximum noise levels is not known as the night-time measurements were unattended but are likely to be due to passing HGV movements on the ASDA perimeter road.
- 4.11 The proposed glazing would provide R_w 32 dB and when taking the façade correction into account the 10th highest internal noise level would not exceed $L_{Amax,f}$ 37 dB based on the measured night-time maximum noise levels.
- 4.12 Section 3.4 of the WHO Guidelines states that for good sleep, indoor noise levels should not exceed approximately 45 dB $L_{Amax,f}$ more than 10-15 times/night. Furthermore, ProPG states that *'In most circumstances in noise-sensitive rooms at night (e.g. bedrooms) good acoustic design can be used so that individual noise events do not normally exceed 45 dB $L_{Amax,f}$ more than 10 times per night'*. With the proposed glazing the 10th highest indoor noise level would be 8 dB below the target level of 45 dB $L_{Amax,f}$ at night based on the measured noise levels.
- 4.13 To enable the option for windows to be closed to meet the noise targets, acoustically treated ventilation should be provided to habitable rooms. The windows should be operable such that the choice of meeting the internal noise levels is with the occupants.

Outdoor Living Areas

- 4.14 The WHO guidance provides daytime noise limits for outdoor living areas of between $L_{Aeq,16\text{ hr}}$ 50 to 55 dB. The measured noise levels indicate that the proposed residential development will experience free-field noise levels of between 50 to 54 dB $L_{Aeq,16\text{ hr}}$ during the day.
- 4.15 The measured daytime noise levels on the boundary of the site are within the range of acceptable levels for outdoor living areas as provided in BS8233:2014. Furthermore, the site



plan indicates that there are no outdoor living areas/open spaces on the proposed Travelodge site.

Traffic Noise

- 4.16 Access to the site is via Larchwood Avenue, which has industrial units, drive-through fast food outlets and no residential properties. The nearest residential properties to the site are the bungalows located on Willowdene Close, where the rear gardens are approx. 20m from the ASDA access road. The noise impact of the additional vehicles from the Travelodge will be negligible when compared to the existing traffic accessing ASDA, the fast food outlets and the Industrial area.

Industrial Noise

- 4.17 The site observations indicated that there was an audible hum at the site from mechanical services plant at the adjacent industrial unit to the site. During the attended part of the survey the hum was continuous and it was not possible to measure the noise on the site with and without the hum. Furthermore, there was no site available to measure a representative noise level where the hum was not audible as this would have required measurements in the ASDA car parking area or nearer to the access roads, which would have produced higher noise levels from other sources. Traffic noise was the dominant noise source on the site and the mechanical service plant hum provided a small contribution to the overall noise levels.
- 4.18 ProPG states in para 2.41 that where industrial and/or commercial noise is present on site but is 'not dominant', its contribution may be included in the noise level used to establish the degree of risk and may also be included in the consideration of internal noise level guidance.
- 4.19 Para 2.43 indicates that professional judgement will be required and one approach may be to apply BS4142:2014 character corrections to the noise levels guideline values in order to derive suitable effect thresholds and/or mitigation design targets.
- 4.20 As the hum was continuous and it was not possible to measure the noise on the site with and without the hum and no representative measurement sites were available it was not possible to undertake a BS4142:2014 noise assessment. However, based on the advice in ProPG a 'BS4142:2014 character correction' is considered to provide an appropriate methodology to consider noise mitigation measures. The site observations indicated that the mechanical services plant was 'clearly perceptible' and BS4142 therefore applies a +4 dB correction for tonality.



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- 4.21 As stated in para 4.9 of this report, the glazing should be designed to provide $R_w + C_{tr}$ 24 dB. With a 4 dB correction added for tonality the glazing specification should be increased to $R_w + C_{tr}$ 28 dB. The proposed 6mm / 6 to 20 mm airgap / 4mm construction glazing provides $R_w + C_{tr}$ 28 dB and meets the target when taking the tonality from the neighbouring mechanical services plant into account.
- 4.22 There is a small sub-station on the eastern boundary of the site with a 2m high wall between the sub-station and the proposed Travelodge. The noise levels from the sub-station were observed to be at a very low level on the boundary of the sub-station and were not audible at the proposed Travelodge and no further noise mitigation is required.

5 VIBRATION ASSESSMENT

- 5.1 The vibration measurement data gathered at the existing site has been utilised to determine potential noise levels at the proposed development.
- 5.2 The measured VDV's at the representative location (site 1) have been assessed against the guidance provided in BS6472 and as discussed, a transfer function of 1.4 has been applied to the measured levels. The estimated VDV's are shown in Table 5.1, below.

Table 5.1 – Estimated Vibration Dose Values, Site 1

Period Hours	Estimated Vibration Dose Value (eVDV) $\text{ms}^{-1.75}$		
	X	Y	Z
Day (0700-2300)	0.036	0.029	0.031
Night (2300-0700)	0.031	0.025	0.028

- 5.3 The estimated VDV's at the representative measurement location with the transfer function of 1.4 applied provide vibration levels that BS6472 considers are well below the 'low probability of adverse comment' in both the day and night-time periods. This correlates with the subjective observation that vibration was not perceptible.



6 CONCLUSIONS

- 6.1 Entran Ltd has been commissioned by Tiger Developments Ltd to undertake a noise & vibration assessment in relation to the Havant Travelodge at Stanton's Yard, Havant. The proposed Havant Travelodge has 4 floors of hotel accommodation and 85 car parking spaces with access to the site off Larchwood Avenue.
- 6.2 The noise assessment indicates that mitigation measures for the hotel rooms in the form of standard double glazing will be required to meet the internal noise targets provided by BS8233:2014. Additional acoustically treated ventilation will be required in order not to compromise the sound reduction index of façades. The required glazing specification is provided in Section 4 of the report.
- 6.3 The measured daytime noise levels on the boundary of the site are within the range of acceptable levels for outdoor living areas provided by BS8233:2014.
- 6.4 The noise impact of the additional vehicles from the Travelodge will be negligible at the nearest residential properties when compared to the existing traffic accessing ASDA, the fast food outlets and the Industrial area.
- 6.5 The BS6472 assessment of the vibration levels provides eVDV's that are 'below the low probability of adverse comment', which correlates with the subjective observations that vibration was not perceptible.
- 6.6 Consequently, it is considered that noise & vibration does not present a constraint to the granting of planning permission for the application proposal.



APPENDIX A – INTRODUCTION TO NOISE

In order to assist the understanding of acoustic terminology and the relative change in noise, the following background information is provided.

The human ear can detect a very wide range of pressure fluctuations, which are perceived as sound. In order to express these fluctuations in a manageable way, a logarithmic scale called the decibel, or dB scale is used. The decibel scale typically ranges from 0 dB (the threshold of hearing) to over 120 dB.

The ear is less sensitive to some frequencies than to others. The A-weighting scale is used to approximate the frequency response of the ear. Levels weighted using this scale are commonly identified by the notation dB(A).

A noise impact on a community is deemed to occur when a new noise is introduced that is out of character with the area, or when a significant increase above the pre-existing ambient noise level occurs. For levels of noise that vary with time, it is necessary to employ a statistical index that allows for this variation. These statistical indices are expressed as the sound level that is exceeded for a percentage of the time period of interest.

In the UK, traffic noise is measured as the L_{A10} , the noise level exceeded for 10% of the measurement period. The L_{A90} is the level exceeded for 90% of the time and has been adopted to represent the background noise level in the absence of discrete events. An alternative way of assessing the time varying noise levels is to use the equivalent continuous sound level, L_{Aeq} . This is a notional steady level that would, over a given period of time, deliver the same sound energy as the actual fluctuating sound.

To put these quantities into context, where a receiver is predominantly affected by continuous flows of road traffic, a doubling or halving of the flows would result in a just perceptible change of 3dB, while an increase of more than 25%, or a decrease of more than 20%, in traffic flows represent changes of 1dB in traffic noise levels (assuming no alteration in the mix of traffic or flow speeds).

Note that the time constant and the period of the noise measurement should be specified. For example, measurements of background noise lasting 1 hour during the day and 15 minutes during the night would be symbolised as $L_{A90,1\text{hour}}$ and $L_{A90,5\text{mins}}$ respectively. Where maximum sound levels are concerned, the noise measurement refers to a 'FAST' time response (0.125 ms) unless otherwise stated.



Table A1: Glossary of Terms

Term	Definition
Decibel (dB)	A scale for comparing the ratios of two quantities, including sound pressure and sound power. The difference in level between two sounds s_1 and s_2 is given by $20 \log_{10} (s_1/s_2)$. The decibel can also be used to measure absolute quantities by specifying a reference value that fixes one point on the scale. For sound pressure, the reference value is $20 \mu\text{Pa}$.
A-weighting, dB(A)	The unit of sound level, weighted according to the A-scale, which takes into account the increased sensitivity of the human ear at some frequencies.
Noise Level Indices	Noise levels usually fluctuate over time, so it is often necessary to consider an average or statistical noise level. This can be done in several ways, so a number of different noise indices have been defined, according to how the averaging or statistics are carried out.
$L_{eq,T}$ and $L_{Aeq,T}$	A noise level index called the equivalent continuous noise level over the time period T . This is the level of a notional steady sound that would contain the same amount of sound energy as the actual, possibly fluctuating, sound that was recorded. When the subscript begins with the letter 'A' it denotes that the quantity is an A-weighted decibel.
$L_{max,T}$ and $L_{Amax,T}$	A noise level index defined as the maximum noise level during the period T . L_{max} is sometimes used for the assessment of occasional loud noises, which may have little effect on the overall L_{eq} noise level but will still affect the noise environment. Unless described otherwise, it is measured using the 'fast' sound level meter response. When the subscript begins with the letter 'A' it denotes that the quantity is an A-weighted decibel.
$L_{90,T}$ and $L_{A90,T}$	A noise level index. The noise level exceeded for 90% of the time over the period T . L_{90} can be considered to be the "average minimum" noise level and is often used to describe the background noise. When the subscript begins with the letter 'A' it denotes that the quantity is an A-weighted decibel.
Free-Field	Far from the presence of sound reflecting objects (except the ground), usually taken to mean at least 3.5m
Ambient Noise Level	The totally encompassing sound in a given situation at a given time, usually composed of a sound from many sources both distant and near ($L_{Aeq,T}$).
Residual Noise Level	The ambient noise remaining at a given position in a given situation when specified sources are suppressed to a degree such that they do not contribute to the ambient noise level ($L_{Aeq,T}$)
Specific Noise Level	The equivalent continuous A-weighted sound pressure level at the assessment position produced by the specific noise source (the noise source under investigation) over a given time interval ($L_{Aeq,T}$)
Rating Noise Level	The specific noise level plus any adjustment for the characteristic features of the noise ($L_{Ar,Tr}$).
$R_w + C_{tr}$	R_w is the weighted sound reduction and C_{tr} is an adjustment made to the R_w scale to account for noise sources such as urban road traffic.
VDV	When assessing intermittent vibration it is necessary to use the Vibration Dose Value (VDV), a cumulative measurement of the vibration level received over an 8-hour or 16-hour period

APPENDIX B – BASELINE NOISE LEVELS

Figure B1 – Baseline Noise at Site 1

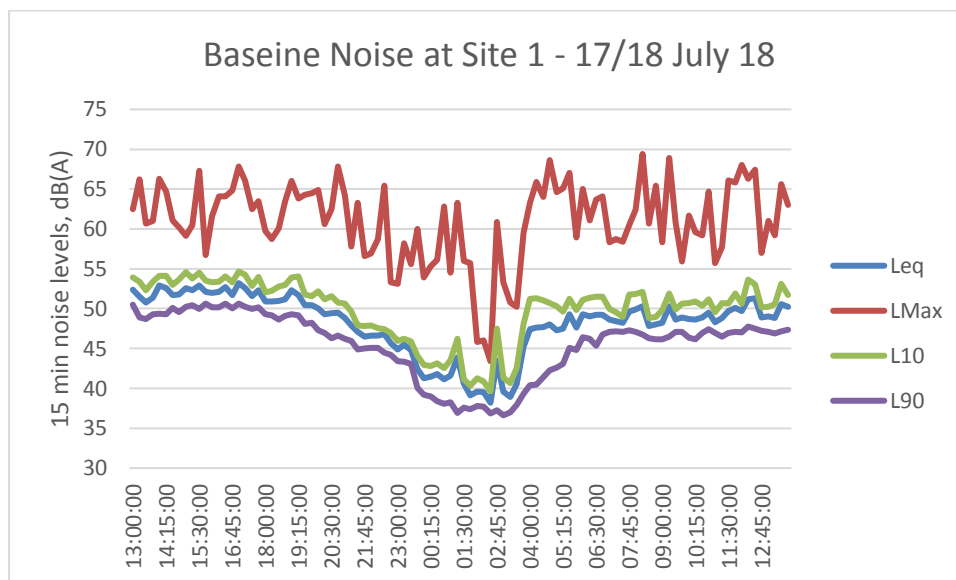


Figure B2 – Baseline Noise at Site 2

