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**NOISE ASSESSMENT
Malting Lane, Donington
Spalding, PE11 4XA**

Client: Cemex UK Properties

Report by
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1.0 INTRODUCTION

Fisher German LLP, acting on behalf of their client Cemex UK Properties, instructed Martec Environmental Consultants Ltd, to assess the impact of environmental noise on a proposed development site on Land off Malting Lane, Donington, Spalding, PE11 4XA to accompany an outline planning application for 73 dwellings.

Pre-application advice from the local authority had raised concerns about potential noise complaints from future residents of the site about an existing adjacent haulage facility.

This report considers noise measurements made on site, the requirements of relevant legislation and makes recommendations as necessary. Acoustic terminology is explained at Appendix 1; consultants' qualifications at Appendix 2; References at Appendix 3; Graphs showing night time noise levels at Appendix 4, aerial view at Appendix 5 and illustrative site plan at Appendix 6.

2.0 SITE DESCRIPTION

The site of the proposed development is to the west of Malting Lane and used as farmland and is currently under the cultivation of sugar beet.

There is a haulage facility at Station Yard, which is immediately to the west

of the site and operated by Turners (Soham) Ltd [Seen in Appendix 5]; it is understood that container lorries are loaded/unloaded and despatched from the site, particularly during late afternoon, evening and night time (typically until about 23:00hrs) with seasonal periods of activity, including the Christmas period, connected to green grocery transportation, typically until about 01:00hrs.

The haulage site consists of a storage warehouse located at the southern end of the haulage yard where container trailers are loaded/unloaded by forklift trucks and large parking areas for tractor units and trailers

The Lincoln to Peterborough railway line is also to the west of the site at an approximate distance of 40m from the site boundary to the nearest railhead. This line carries both suburban passenger and freight traffic.

The adjacent site to the east is currently being developed into a residential development and at the time of monitoring, building works were ongoing.

There are areas of existing housing to the north and east of the site.

The dominant noise sources affecting the site are likely to be from the haulage facility and from railway traffic.

The illustrative Masterplan for the site, shown at Appendix 6, shows an Eco buffer around the western and northern boundaries and that proposed dwellings are set back by some 42m from the western boundary. In

addition the nearest properties all face towards the Haulage Yard and Railway, with no external amenity areas at the front; therefore, the gardens lies further from the boundary [60m] and are screened from noise by the houses themselves and the boundary treatments around the gardens.

3.0 NOISE CRITERIA

3.1 National Planning Policy Guidance - Noise

3.1.1 The Use of Quantitative Standards

The first comment to make about the new guidance, issued in March 2014, is that it is qualitative, lacking quantitative guidance on acceptable noise levels for general industrial or commercial noise. In addition, there is no direct reference to using British (or other) Standards to assess noise; i.e. previously PPG24 directly referred to both BS8233 and BS4142; therefore, the current government guidance does not appear to endorse directly the use of these documents.

At paragraph 10 of the Noise Guidance, it is stated that local plans can include noise standards, which presumably would/could be based upon relevant British Standards. Paragraph 10 states: "Care should be taken, however, to avoid these being implemented as fixed thresholds as specific circumstances may justify some variation being allowed."

So that it is clear that current guidance envisages that quantitative standards can be used, provided that there is flexibility in their application.

3.1.2 The Qualitative Guidance in NPPG - Noise

In paragraph 5 various noise categories and thresholds are set out; up to and including “Noticeable and Intrusive” it seems likely that the intention would be to recognise that whilst the noise levels are not desirable, planning consent should be granted provided that the noise can be mitigated and the intrusion reduced to a minimum. “Noticeable and Intrusive” noise occurs when:

“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.”

Above the “Significant Observed Adverse Effect Level” threshold, noise becomes “Noticeable and Disruptive” because:

“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.”

Noise which is “Noticeable and disruptive” should be avoided; however, it is the next level of disturbance “Noticeable and very disruptive” that should be prevented.

It can be seen that the NPPG noise guidance envisages that if properties are provided with alternative ventilation and acoustic glazing, designed to ensure “acceptable” internal noise levels, then internal noise levels would not exceed the “Significant Observed Adverse Effect Level” and that planning consent could be granted. The guidance states “If the exposure is above this level the planning process should be used to avoid this effect occurring, by use of appropriate mitigation such as by altering the design and layout.”

Clearly the provision of acoustic glazing and ventilation cannot change external noise levels; therefore it follows that the NPPG-Noise is not based on assessments of external noise such as BS4142, i.e. the wording of the Guidance does not support the use of BS4142.

The remaining question would then be whether the noise “Affects the acoustic character of the area such that there is a perceived change in the quality of life.” OR “Quality of life diminished due to change in acoustic

character of the area". It should be noted that these definitions relating to external noise use the term "...the acoustic character of the area", i.e. no specific requirements are placed on amenity space noise levels, whether private or communal.

At Paragraph 9, the Guidance states that there are other matters that can mitigate the impact of noise on residential developments if residents *"...have access to:*

- 1. a relatively quiet facade (containing windows to habitable rooms) as part of their dwelling, and/or;*
- 2. a relatively quiet external amenity space for their sole use, (e.g. a garden or balcony). Although the existence of a garden or balcony is generally desirable, the intended benefits will be reduced with increasing noise exposure and could be such that significant adverse effects occur, and/or;*
- 3. a relatively quiet, protected, nearby external amenity space for sole use by a limited group of residents as part of the amenity of their dwellings, and/or;*
- 4. a relatively quiet, protected, external publically accessible amenity space (e.g. a public park or a local green space designated because of its tranquillity) that is nearby (e.g. within a 5 minutes walking distance)"*

It can be seen that in noise terms it is not a requirement that residents have access to either a public or communal external “quiet” amenity space, although if they have access to such a space it can “partially off-set” the impact of noise on residential developments.

3.2 British Standard 8233:2014

The latest version of BS8233:2014 ‘Guidance on Sound Insulation and Noise Reduction for Buildings’ recently published (February 2014) supersedes the 1999 version and states the following:

“In general, for steady external noise sources, it is desirable that the internal ambient noise level does not exceed the guideline values in Table 4.

Table 4: Indoor ambient noise levels for dwellings

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35 LAeq,16hr	--
Dining	Dining Room/Area	40 LAeq,16hr	--
Sleeping (daytime resting)	Bedroom	35 LAeq,16hr	30 LAeq,8hr

The footnotes to this table make it clear that the guidance is based on the current WHO recommendations and that the above internal levels can be relaxed by 5dB to achieve “reasonable” internal conditions. The footnotes

also make it clear that planning consent can be granted when external levels exceed the WHO guidance targets provided that appropriate internal noise levels are achieved.

With regard to external levels, BS8233:2014 states:

“7.7.3.2 Design criteria for external noise

For traditional external areas that are used for amenity space, such as gardens and patios, it is desirable that the external noise level does not exceed 50 dB LAeq,T, with an upper guideline value of 55 dB LAeq,T which would be acceptable in noisier environments. However, it is also recognized that these guideline values are not achievable in all circumstances where development might be desirable. In higher noise areas, such as city centres or urban areas adjoining the strategic transport network, a compromise between elevated noise levels and other factors, such as the convenience of living in these locations or making efficient use of land resources to ensure development needs can be met, might be warranted. In such a situation, development should be designed to achieve the lowest practicable levels in these external amenity spaces, but should not be prohibited.

Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small

balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels. Achieving levels of 55 dB LAeq,T or less might not be possible at the outer edge of these areas, but should be achievable in some areas of the space."

From the wording, it is clear that there is no intention for the guideline noise levels to be applied to the general spaces external to apartment blocks and that the limits are only intended to apply to more private amenity spaces such as gardens and patios and larger balconies where residents would be expected to spend some time relaxing.

The wording of BS8233 also makes it clear that the guideline noise levels for gardens, patios, larger balconies etc, are not overriding planning considerations in any event.

3.3 BS4142:2014 – Rating Industrial Noise Affecting Mixed Residential and Industrial Areas

BS4142:2014 states, *"Response to sound can be subjective and is affected by many factors, both acoustic and non-acoustic. The significance of its impact, for example, can depend on such factors as the margin by which a*

sound exceeds the background sound level, its absolute level, time of day and change in the acoustic environment, as well as local attitudes to the source of the sound and the character of the neighbourhood...This British Standard describes methods for rating and assessing sound of an industrial and/or commercial nature”.

This British Standard describes a method for assessing whether a specific sound may have an adverse impact.

The Standard requires that the ambient noise (***totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far***) including the “specific” sound from the source in question is measured in terms of the equivalent continuous sound level LAeq [see Appendix 1 for acoustic terms], which is then corrected for the residual sound (total LAeq excluding the “specific” sound).

A correction for character is made if ***“a tone, impulse or other characteristic occurs”***. For tonality a correction of between +2dB and 6dB is considered acceptable and for impulsivity between 3 and 9dB. See table below.

Character	Just Perceptible	Clearly Perceptible	Highly Perceptible
Tonality	+2dB	+4dB	+6dB
Impulsivity	+3dB	+6dB	+9dB

Where the specific sound features characteristics that are neither tonal nor

impulsive, though otherwise are readily distinctive against the residual acoustic environment, a penalty of 3 dB can be applied.

Where tonal and impulsive characteristics are present in the specific sound within the same reference period then these two corrections can both be taken into account. If one feature is dominant then it might be appropriate to apply a single correction. Where both features are likely to affect perception and response, the corrections ought normally to be added in a linear fashion.

The final figure, including any character correction is known as the Rating level.

This Rating Level is then compared with the measured background [LA90] level. The greater this difference the greater the likelihood of “adverse impact” (See Notes 1 & 2 from BS4142:2014 below).

"NOTE 1

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.

NOTE 2

Adverse impacts include, but are not limited to, annoyance and sleep disturbance. Not all adverse impacts will lead to complaints and not every complaint is proof of an adverse impact."

3.3.1 Nighttime Noise

BS4142:2014 recognises that at night residents will be inside their properties [BS4142 A.6.1 and A.6.3] and that consequently *"Other guidance, such as BS 8233, might be applicable in this instance."* Also BS4142 is directed primarily to the circumstances of a proposed or existing noise affecting existing property, i.e. circumstances where insulating the property is impracticable. Therefore, BS4142 can't take into account circumstances where the properties have not yet been built and where noise control, such as acoustic glazing and ventilation, can be incorporated such to alleviate *"...the primary concern is the potential for disturbance of residents who could be sleeping with open bedroom windows."*

It can be seen from Section 3.3 above that the conclusions to a BS4142 assessment also depend on the context and Section 11 of the British Standard states:

" Where the initial estimate of the impact needs to be modified due to the context, take all pertinent factors into consideration, including the following..."

3) The sensitivity of the receptor and whether dwellings or other premises used for residential purposes will already incorporate design measures that secure good internal and/or outdoor acoustic conditions, such as:

- i. facade insulation treatment;*
- ii. ventilation and/or cooling that will reduce the need to have windows open so as to provide rapid or purge ventilation; and*
- iii. acoustic screening."*

Consequently where noise control can be incorporated into the properties Martec uses BS 8233 to assess nighttime noise.

4.0 NOISE MEASUREMENTS

The site was visited on the afternoon of Monday 2nd November 2015 and noise monitoring equipment was installed at two positions [Appendix 5] and left gathering data for a week until the following Monday afternoon:

- (1) at a position some 10m from the western boundary (and some 25m from the approximate centre of the loading/unloading area) in line with the loading/unloading area just to the north of the storage warehouse; this was towards the southern end of the boundary.
- (2) at a position some 10m from the western boundary in line with two fuel tanks towards the northern end of the boundary.

There was some building works activities on the adjacent site that were occasionally audible.

The weather conditions during the monitoring period were generally overcast and dry with some brief periods of rain; temperatures varied between 8-15 degrees Celsius. Wind speeds were low, generally 0-2 Beaufort Scale and were checked when onsite with a Kestrel 2000 hand held anemometer (s/n 1633850) to check that wind speed did not exceed 5m/s.

(Weather information was from observations made at the time of the site visits and also sourced from the Met Office website using the data for Coningsby monitoring station, some 15 miles from site.)

The sound level meters was a Svan type 949 (s/n 8520) and a Svan 957 (s/n 12308); mounted on tripods at a height of 1.2m and fitted with RION WSO2 “all-weather” wind muffs. The meter calibrated correctly before and after the measurements using a Castle calibrator type GA607 (s/n 039893).

Both meters and calibrator had been laboratory calibrated within the preceding 2 years.

5.0 RESULTS

5.1 Period Results - For Use in BS8233 Assessment

5.1.1 Measurement Results – South Position 1

The derived daytime and night time results appear below in Figure 2, and the arithmetically averaged results are shown in Figure 3 below.

The [exceptional] highest level in Graph 1 occurred between 19 and 20:00hrs on Saturday 7th November; the results for the Northern position also exhibited a similar, but louder, exceptional level at the same time [Graph 2]. Given the date and the timing of the event, it seems likely that there was a fireworks party closer to Position 2 [north] and the results below for this period have been excluded from the analysis for both locations.

Start Day	LAeq,16hr	LAeq,8hr
Monday	57.5	46.1
Tuesday	55.6	50.8
Wednesday	56.0	46.1
Thursday	56.3	46.2
Friday	56.2	49.1
Saturday	54.1	46.1
Sunday	55.4	46.8
Average	55.9	47.3
Highest	57.5	50.8

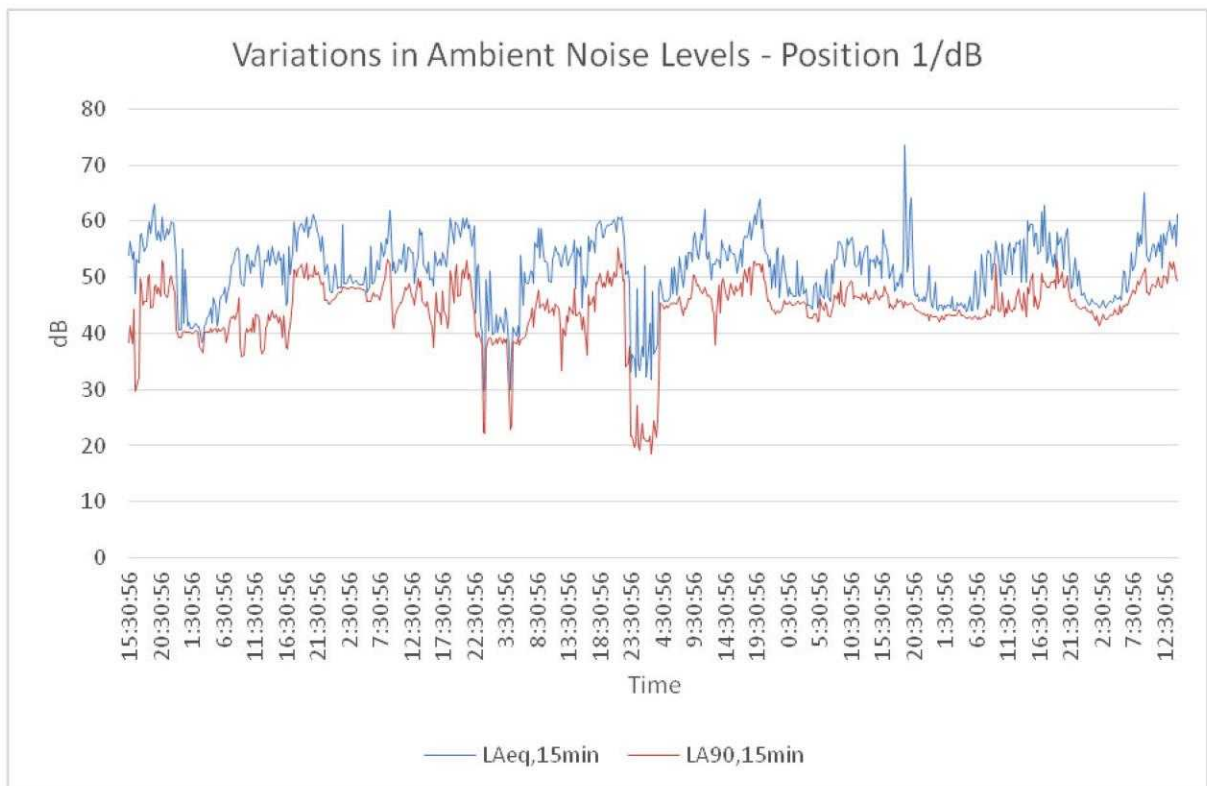
Figure 2 – Derived Results – South Position 1 [dB]

Daytime results from both Mondays have been combined to derive the “Monday” LAeq,16hr above.

Octave Band Centre Frequency [Hz]							
63	125	250	500	1000	2000	4000	8000
62.3	50.2	46.6	46.4	47.5	43.5	39.4	31.9

Figure 3 – Averaged Frequency Results – South Position 1 [dBLin]

Graph 1 below shows the variation in LAeq,15min and LA90,15min throughout the week long monitoring period. The pattern of noise exposure is consistent with the haulage yard being the main noise source affecting the development site.



Graph 1 – Variation in Ambient Noise Levels – South Position 1 [dB]

5.1.2 Measurement Results – North Position 2

The derived daytime and night time results below in Figure 4 and the arithmetically averaged results are shown in Figure 5 below. As above the period of the "fireworks" has been excluded from the results.

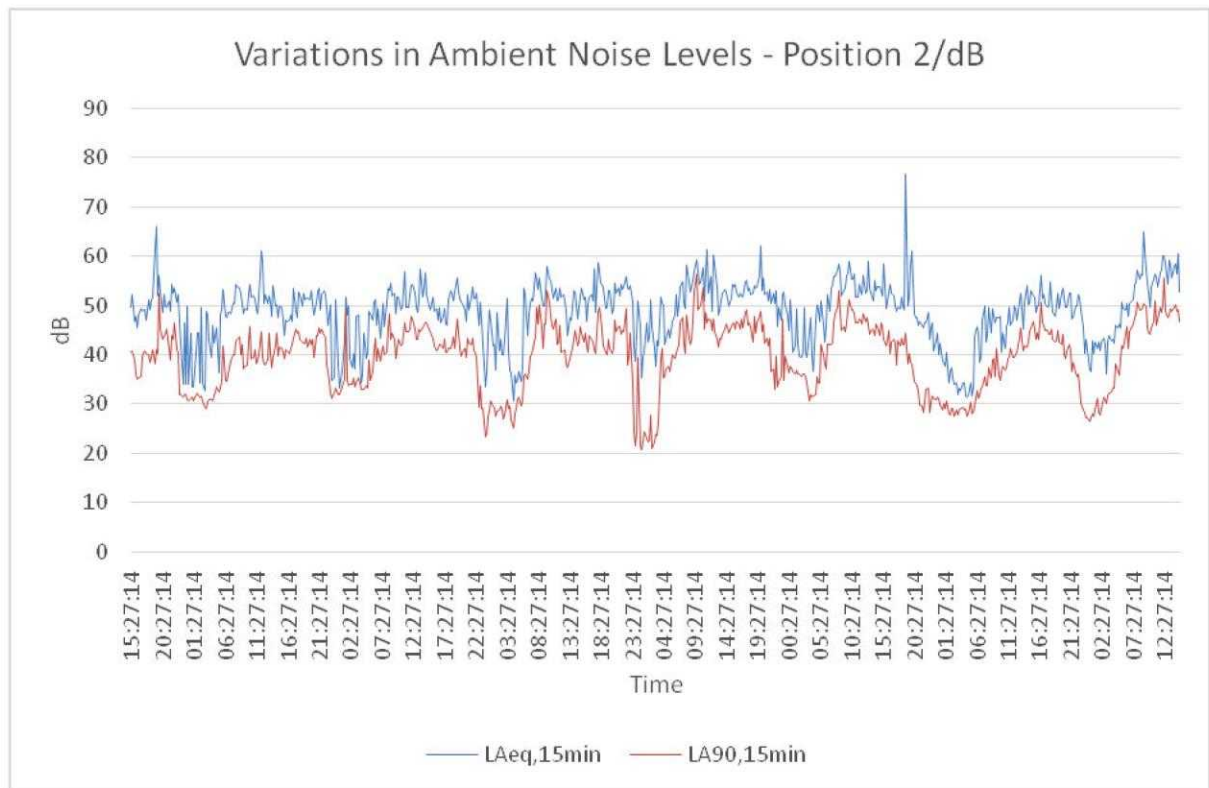
Start Day	LAeq,16hr	LAeq,8hr
Monday	56.2	45.9
Tuesday	51.8	46.3
Wednesday	51.7	45.7
Thursday	53.0	47.6
Friday	54.7	47.8
Saturday	54.0	40.2
Sunday	50.1	45.5
Average	53.1	45.6
Highest	56.2	47.8

Figure 4 – Derived Results – North Position 2 [dB]

Octave Band Centre Frequency [Hz]							
63	125	250	500	1000	2000	4000	8000
56.1	43.2	42.1	44.3	45.6	40.0	34.9	29.1

Figure 5 – Averaged Frequency Results – North Position 2 [dBLin]

Graph 2 below shows the variation in LAeq,15min and LA90,15min. Again the pattern of noise exposure is consistent with the haulage yard being the main noise source affecting the development site.



Graph 2 – Variation in Ambient Noise Levels – North Position 2 [dB]

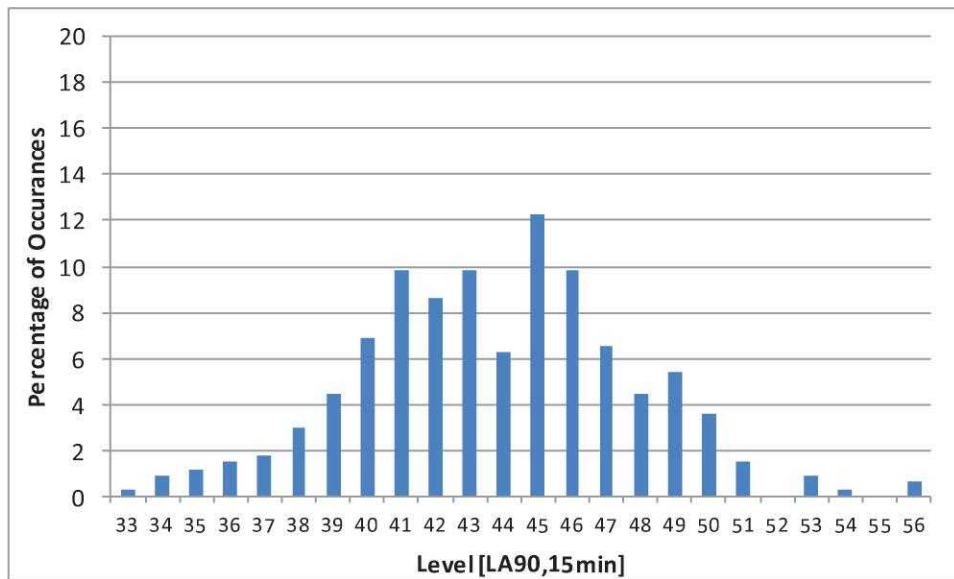
5.2 BS4142 Results

5.2.1 Background Noise Levels - For Use in BS4142 Assessment

It can be seen from Graph 1 above and Graph 8 Appendix 4, that there was a constant low level noise source [or sources] which affected the LA90 readings at the Southern Position [No.1]; it seems unlikely that there was a "real" source of background noise acting in this manner, it is more likely that the cause was equipment at the haulage yard such refrigeration units on HGVs. By contrast the results at the northern monitoring position [Graph 2 above & Graph 9 Appendix 4] appear unaffected by such sources and have been used to represent background noise levels across the site.

BS4142 provides guidance on analysing the recorded levels when a range of results is available.

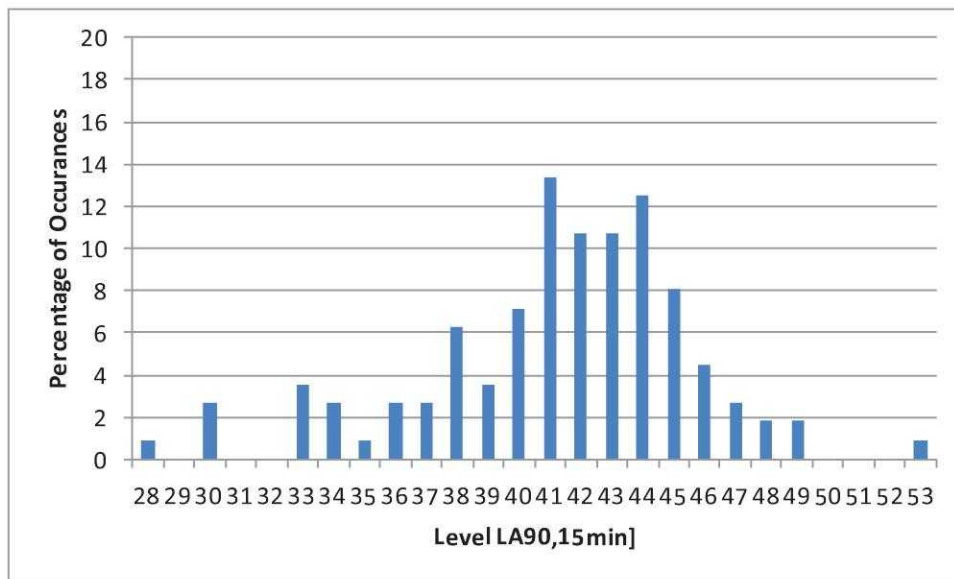
The average of all the daytime [7am to 7pm] readings was 43.7 dB LA90; the spread of results can be plotted as follows:



Graph 3: Variation in Daytime Background Noise – North Position 2 [dB]

From the above a figure of 45 dB LA90 has been taken as reasonably representative of daytime [7am to 7pm] background noise levels.

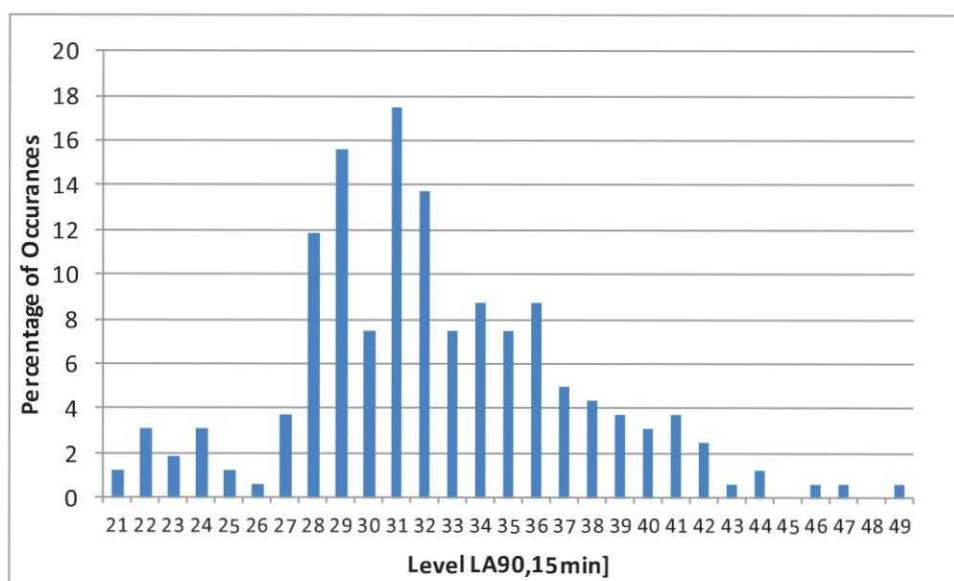
If we consider evening [7pm to 11pm] separately, the average of the readings was 41.3 LA90 and the graph appears as follows:



Graph 4: Variation in Evening Background Noise – North Position 2 [dB]

From the above, a figure of 42 dB LA90 has been taken as reasonably representative of evening [7pm to 11pm] background noise levels.

Finally for nighttime [11pm to 7am] the average was 32.3 dB LA90 and the results can be plotted as follows:

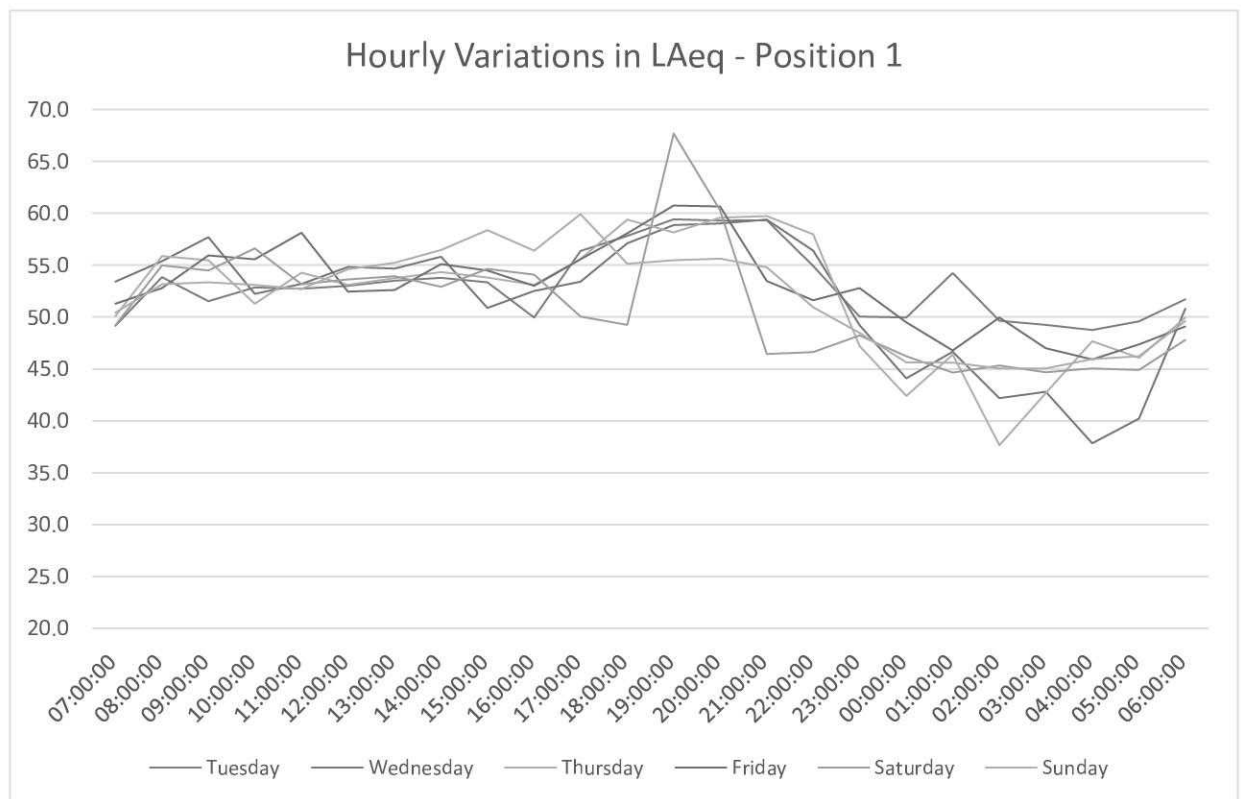


Graph 5: Variation in Nighttime Background Noise – North Position 2 [dB]

From the above, a figure of 32 dB LA90 has been taken as being reasonably representative of nighttime [11pm to 7am] background noise levels.

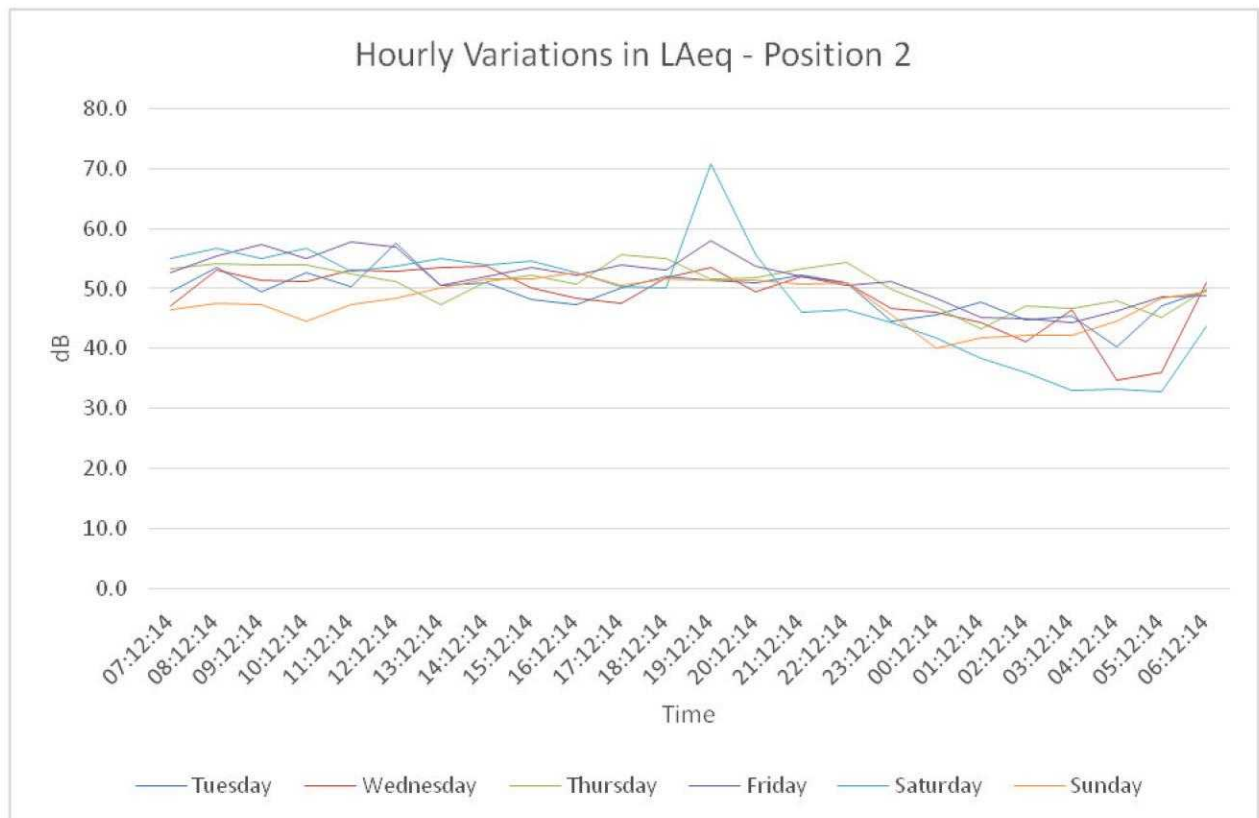
5.2.2 Source Noise Levels - For Use in BS4142 Assessment

From the LAeq traces in Graphs 1 and 2, it can be seen that noise levels affecting the site are very variable. If we plot the hourly LAeq results as follows [Graph 6] for the Southern Position [No.1] it can be seen that Monday to Friday noise levels tend to increase into the evening period [7pm to 11pm] which is when the haulage yard is understood to be at its busiest. The hour affected by "fireworks" can also be seen on Saturday..



Graph 6: Variation Hourly Noise Levels – South Position 1 [dB LAeq,1hr]

From the above, if we take 59 and 61 LAeq,1hr as being representative of the daytime and evening source noise levels respectively and similarly 55 LAeq,15min as being representative of nighttime levels at the Southern Position 1.



Graph 7: Variation Hourly Noise Levels – North Position 2 [dB LAeq,1hr]

For the northern location [Position 2], if from Graph 7 we take 59 and 58 LAeq,1hr as being representative of the daytime and evening source noise levels respectively and similarly 54 LAeq,15min as being representative of nighttime levels at the Northern Position 2.

5.3 Subjective Observations

At the time of the site visits, it was noted that noises from the haulage operation that were present on the site included fork lift truck movement with tonal reversing alarms and lorry movements with both tonal and "white noise" reversing alarms from the haulage facility; fork lift truck

hydraulic noise; container doors opening and closing and impact noises as pallets are handled; there was also passing railway traffic and distant road traffic from the A52 to the north and Malting Lane to the east.

Occasional building site activities at the adjacent site were audible. It is likely that building site activities would typically begin at about 07:00 until about 16:30 on weekdays and may have influenced noise levels during these periods. Night time (23:00-07:00) noise levels are less likely to have been affected as no night time construction works were being undertaken.

Occasional trains were audible, but the dominant noise source affecting the development site was the haulage yard.

6.0 ASSESSMENT OF RESULTS

6.1 LAeq - External Noise Levels – Position 1 [South]

As detailed above, the daytime and night time periods are given in terms of $L_{Aeq,16hr}$ for day (07.00 - 23.00) and $L_{Aeq,8hr}$ for night (23.00 – 07.00).

The individual Daytime and Night time LAeqs are shown in Figure 2 above, together with the arithmetic average and highest derived level for both the daytime and night time periods.

Daytime **LAeq,16hr = 58dB** to nearest whole number.

Night time **LAeq,8hr = 51 dB** to nearest whole number.

The above noise levels were for a position some 10m from the site boundary, and some 25m from the nominal centre of the loading/unloading area; whereas the illustrative layout [See Appendix 6] shows the façade of the nearest dwelling at a distance some 42m from the site boundary (57m from the nominal centre of the loading/unloading area) and so a distance correction is required; using the provisions of Reference 8 yields the following prediction for the monitoring location:

BS5228 SWL Method				Octave Band Centre Frequency [Hz]					dBA
Version	1.1	SWL Spectrum		125	250	500	1000	2000	
© 2015 Martec Environmental Consultants Ltd		Shape (dBLin)		50.2	46.6	46.4	47.5	43.5	50.6
BS5228-1:2009 Predictions		Adt to							97.0
Element	Height	Dist from Source							
Sound Power Level	2.0		96.6	93.0	92.8	93.9	89.9	97.0	
Attenuations									Attenuati
Receiver [distance correction]	1.5	25.0	36.0	36.0	36.0	36.0	36.0	36.0	
Proportion of Soft Ground [soft ground attn]	1.0		0.0	0.0	0.0	0.0	0.0	0.0	
Barrier Attenuation	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0	
Traverse Length	0.0		0.0	0.0	0.0	0.0	0.0	0.0	
Percentage on Time	100.0		0.0	0.0	0.0	0.0	0.0	0.0	
Percentage in Use	100.0		0.0	0.0	0.0	0.0	0.0	0.0	
Façade Reflection	0.0		0.0	0.0	0.0	0.0	0.0		
Predicted Level at Reciever		External SPL/dBLin	60.6	57.0	56.8	57.9	53.9	61.0	

Figure 6 – Predicted level at Southern [1] Monitoring Position

Using the same provisions and increasing the separation distance, produces a predicted level of 52 LAeq at the front facades of the nearest dwellings [61-52=9 dBA lower - not shown here]; if we now predict levels in the nearest rear gardens assuming a 2.5m acoustic barrier around the gardens:

BS5228 SWL Method		Octave Band Centre Frequency [Hz]					dBA
Version	1.1	SWL Spectrum	125	250	500	1000	2000
© 2015 Martec Environmental Consultants Ltd		Shape (dBLin)	50.2	46.6	46.4	47.5	43.5
BS5228-1:2009 Predictions		Adt to					
		Height					
		Dist from Source					
Element							
Sound Power Level	2.0		96.6	93.0	92.8	93.9	89.9
Attenuations							
Receiver [distance correction]	3.0	75.0	45.5	45.5	45.5	45.5	45.5
Proportion of Soft Ground [soft ground attn]	1.0		2.4	2.4	2.4	2.4	2.4
Barrier Attenuation	4.0	70.0	6.8	8.3	10.4	12.4	14.7
Traverse Length	0.0		0.0	0.0	0.0	0.0	0.0
Percentage on Time	100.0		0.0	0.0	0.0	0.0	0.0
Percentage in Use	100.0		0.0	0.0	0.0	0.0	0.0
Façade Reflection	0.0		0.0	0.0	0.0	0.0	0.0
Predicted Level at Reciever	External SPL/dBLin		44.3	39.2	36.9	35.9	29.7

Figure 7 – Predicted level at Nearest Rear Garden

It can be seen that noise levels are some 21 dB lower in rear gardens than at the monitoring position [61-40=21].

Daytime **L_{Aeq,16hr} = 49dB** to nearest whole number.

Night time **L_{Aeq,8hr} = 42 dB** to nearest whole number.

6.2 Maximum Noise Levels – Position 1 - South

From Graph 8 at Appendix 4, which shows night time L_{A,1s} for Fast time weighting for the Tuesday, Friday and Saturday night time periods, the typical maximum noise level was 72dBA[F] at the monitoring position which equates to **63dBA[F]** at the nearest façade (72-9).

6.3 LAeq - External Noise Levels – Position 2 - North

Similarly as for position 1 above, the individual Daytime and Night time LAeqs are shown in Figure 4 above, together with the arithmetic average and highest derived level for both the daytime and night time periods at the monitoring location are:-

Daytime **LAeq,16hr = 56dB** to nearest whole number.

Night time **LAeq,8hr = 48 dB** to nearest whole number.

Using the same correction factors as above, the predicted levels at the nearest facade:

The LAeq,1hr = **47dB** to nearest whole number.

The LAeq,1hr = **39 dB** to nearest whole number.

6.4 Maximum Noise Levels – Position 2

From Graph 6 at Appendix 4, which shows night time LA,1s for Fast time weighting for the Tuesday, Friday and Saturday night time periods, the typical maximum noise level was 68dBA[F] at the monitoring position which equates to **59dBA[F]** at the nearest facade position including the distance correction factor.

7.0 DISCUSSION OF PROPERTY NOISE LEVELS

7.1 Internal Noise Levels - BS8233

7.1.1 General Operations

If we carry out indicative predictions as per Ref 7, for the more affected (southern) end of the site, and assume a small bedroom [18m³] with a large window [2m²], assuming a reverberation time of 0.3 seconds, the daytime results would be as follows:

BS EN 12354-Calcs		Use	Volume	Volume					18.0		
Version	3.6	length								dBA Diff	31
© 2014 Martec Environmental Consultants Ltd & Acute Acoustics Ltd		width		RT					0.3		
		height		Octave Band Centre Frequency [Hz]						dBA	
				125	250	500	1k	2k			
External Spectrum Leq (Free Field & Linear)				50.2	46.6	46.4	47.5	43.5	50.6		
Adjustment if required									-1.6		
External Spectrum Adjusted for Level				48.6	45.0	44.8	45.9	41.9	49.0		
		Area m2		Element Sound Reduction Index [SRI]					Contrib		
Wall	Brick/block/cavity	12.5		41	45	45	54	58	3.7		
Window	6/12/6_double_glazing	2.0		20	19	29	38	34	16.4		
Window	None	0.0		0	0	0	0	0	0.0		
Door	None	0.0		0	0	0	0	0	0.0		
Roof	None	0.0		0	0	0	0	0	0.0		
		# Vents									
Vent Dn,e	Passivent TVALdB 450 Window Frame vent	1.0		45	42	36	40	43	12.5		
									dBA		
		Internal SPL/dBLin		25.0	22.3	15.2	10.3	6.4	18.0		

Figure 8: Daytime [LAeq,16hr] Predictions for Nearest Property

From the above, it can be seen that the predicted internal daytime noise level of **18 dB LAeq,16hr** for 6/12/6 standard thermal glazing together with a Passivent TVALdB 450 Vent meets the BS8233 daytime design target of 35 LAeq,16hr.

The dBA difference between inside and out is 31 dB ["dBA Diff"]; therefore, the internal nighttime level would be **11 LAeq,8hr** [42-31 "dBA Diff" =11] which again meets the BS8233 nighttime design target of 30 LAeq,16hr, by a margin of 19 dBA.

The previous [1999] version of BS8233 indicated that regular nighttime events should not exceed 45 dBA,F L_{Amax}. Here the bedroom building envelope reduces traffic noise by 31 dBA, if the typical external L_{Amax} level is 63 dBAF [see Section 6.2], then typical internal L_{Amax} levels would not exceed 45 dBA,F L_{Amax} [63-31=32].

Given that the other rooms are likely to have a lower proportion of glazing to room volume it is considered that the glazing and ventilation proposals above would also be appropriate to those rooms.

The acoustic vents should be combined with a Mechanical Extract Ventilation (MEV) or a Passive Input Ventilation (PIV) system which extracts/supplies air from the habitable rooms, but which does not allow significant noise to enter from the outside, either because of the system's attenuation or because it vents to a quiet façade.

7.1.2 Christmas Period Operations

It is understood that particularly during the Christmas period, the "evening" period of operation can extend into the night. In Section 6.1 the evening noise level of 61 LAeq,1hr at the Southern monitoring position was

calculated as equating to 52 LAeq,1hr at the position of the nearest proposed facades. If we assume that this evening noise level occurs all night the internal levels can be predicted on the same basis as above:

BS EN 12354-Calcs		Use	Volume	Volume					dBA Diff	
Version	3.6	length		18.0					28	
© 2014 Martec Environmental Consultants Ltd & Acute Acoustics Ltd		width		RT					0.3	
		height		Octave Band Centre Frequency [Hz]					dBA	
				125	250	500	1k	2k		
External Spectrum Leq (Free Field & Linear)				50.2	46.6	46.4	47.5	43.5	50.6	
Adjustment if required									1.4	
External Spectrum Adjusted for Level				51.6	48.0	47.8	48.9	44.9	49.0	
		Area m2		Element Sound Reduction Index [SRI]					Contrib	
Wall	Brick/block/cavity	12.5		41	45	45	54	58	6.8	
Window	6/12/6_double_glazing	2.0		20	19	29	38	34	19.4	
Window	None	0.0		0	0	0	0	0	0.0	
Door	None	0.0		0	0	0	0	0	0.0	
Roof	None	0.0		0	0	0	0	0	0.0	
		# Vents								
Vent Dn,e	Passivent TVALdB 450 Window Frame vent	1.0		45	42	36	40	43	15.6	
									dBA	
		Internal SPL/dB Lin		28.0	25.3	18.2	13.3	9.4	21.1	

Figure 9: "Christmas" Nighttime [LAeq,8hr] Predictions for Nearest Property

From the above, it can be seen that the predicted internal nighttime noise level of **21 dB LAeq,8hr** for 6/12/6 standard thermal glazing together with a Passivent TVALdB 450 Vent meets the BS8233 nighttime design target of 30 LAeq,16hr.

The maximum levels would remain the same and conform with the recommendations of BS8233:1999.

7.2 External Levels - BS8233

Firstly it should be pointed out neither the latest government guidance nor BS8233:2014 consider that garden noise levels should be overriding planning considerations.

With regard to private [rear] gardens, at the near [southern] monitoring position daytime noise levels were 58 LAeq,16hr; consequently the levels in the rear gardens would be at least 21 dBA lower [see 6.1] and would achieve the daytime levels of 55 LAeq,16hr [58-21=37] from BS8233:2014.

7.3 External Levels - BS4142

In Section 5.2.1 above the representative backgrounds were established as 44, 41 and 39 LA90 for daytime, evening and night respectively; similarly in Section 5.2.2 the representative source noise [specific noise] levels were established as 59, 58 and 54 LAeq [north monitoring position] and 59, 61 and 55 [southern monitoring position] for daytime, evening and night respectively. From Figure 7 it can be seen that noise levels in the nearest rear gardens are some 21 dBA lower than at the monitoring position.

An indicative evening BS4142 assessment would be as per the Table below, which assumes that there are "Clearly perceptible" tonal elements to the noise [reversing beepers], and some impulsive characteristics; this means that the "other" character correction is not applicable; there is no

correction for intermittency because the measurement periods [1 hour by day and 15 minutes by night are the same as the reference periods].

It is understood that in the run up to Christmas, that there is a limited period of time when the operation of the haulage yard could run into the nighttime period. An assessment for this period has also been conducted.

Condition	Day		Evening	
	North	South	North	South
At Monitoring Posn	59	59	58	61
Correction for Dist & Barrier	-21	-21	-21	-21
Specific Noise Level	38	38	37	40
Tonal Character	4	4	4	4
Impulsive Character	3	3	3	3
Other Characteristic	0	0	0	0
Intermittency	0	0	0	0
Rating Level	45	45	44	47
Background Noise Level	44	44	42	42
Excess over Background	1	1	2	5

Figure 10: Indicative BS4142:2014 Assessments for Rear Gardens

For the predicted daytime and evening haulage yard rating levels, there is less than an indication of significant adverse impact depending on the context.

Given that facade insulation treatment is being proposed for the new properties along with appropriate ventilation, and acoustic screening, nighttime noise has been assessed as per BS8233 above.

7.3.1 Commentary on BS4142 Assessment

The reliability of the assessment is as follows:

1. The above assessment is based on a very variable noise source; however, the representative level of "haulage yard noise" was selected by ignoring the hour affected by "fireworks" and then to use the second loudest time period measured; in many instances the figure used was the same as the loudest time period, e.g. for the southern position in the evening, both the loudest and second loudest hours rounded to 61 LAeq,1hr, i.e. the figures used are not typical levels but are more representative of worst case conditions.
2. The monitoring was conducted over the course of a week, which provides greater certainty.
3. The monitoring positions were close [10m] to the boundary with the haulage yard meaning that the influence of weather conditions was minimised.
4. The prediction methodology is a well established one [BS5228] which should help minimise uncertainty. In addition the calculations assume that only the acoustic fence 2.5m high acts as a barrier; should the noise source happen to be behind the house [7m] a significantly greater attenuation would result, i.e. the predictions will tend to underestimate the benefits of the layout.
5. For most locations, evening and nighttime background noise levels caused by road traffic are likely to be relatively low in months such as

November, i.e. tending to underestimate background noise levels, and hence overestimate the general noise impact.

6. Overall the assessment is considered sufficiently robust, and demonstrates that appropriate noise limits can be met; however, as with all such assessment they cannot demonstrate that the limits will be met under any and all circumstances.

8.0 ADDITIONAL NOISE CONTROL

As shown in the assessment above, it is considered that acceptable noise levels can be achieved on the development site by providing the mitigation of building orientation, standard glazing, acoustic ventilation and 2.5m fences etc.

It is noted that the South East Lincolnshire Strategic Housing Land Availability Assessment (SHLAA January 2016) recognises the existence of the haulage yard adjacent to this site, which is referred to as a distribution site, and considers that this site is suitable for residential development; the SHLAA states that the boundary of the site adjacent to the Haulage Yard would need to be protected in some way, such as by an earth bund [See Appendix 7].

Given the layout of the site, and the proposed methods of mitigation it is considered that the construction of an earth bund would not be necessary;

however, should a 4m high [above local ground height] earth mound, or mound/fence combination, be constructed along the length of the south western boundary, using the same calculations procedures as previously [Ref 8], it is predicted that the external noise levels would change as follows:

Location	Change over "Martec Proposals" with Additional 4m barrier [dB]
Front Facade Ground Floor	-9.1
Front Facade First Floor	-4.2
Rear Gardens	0

It can be seen that for the rear gardens, the additional 4m high barrier along the SW boundary makes no additional improvement over the "Martec" noise control proposals, but for the front facade of the properties noise levels are reduced, particularly at ground floor level.

Whilst it is considered that the provision of the bund would not be necessary to ensure that acceptable noise levels are achieved on site, the 4m barrier would have the additional "vicarious" benefit of reducing noise levels at the properties to the north and east of the development site. Particularly because they are understood to be less well protected from haulage yard noise.

Finally it is considered that a 4m high mound would have the additional benefit of reducing light spill from floodlights and headlights onto the development, and adjacent, sites.

9.0 CONCLUSIONS

- 9.1** A noise assessment for the site off Malting Lane is presented above.
- 9.2** The results show that haulage yard activities result in periods of higher noise levels, particularly during late afternoons, and evenings which could potentially cause complaints from nearby residents.
- 9.3** In order to reduce the impact, a proposed layout would face the nearest properties towards the noise with their external amenity areas [rear gardens] on the "blind" side of the properties, further from the haulage yard and screened by the houses themselves.
- 9.4** It is recommended that a 2.5m high acoustic fences be built around the rear gardens of the properties and linking the "front line" of properties [shown as a blue line in Appendix 6].
- 9.5** Habitable rooms in the "front line" of properties with any view of the haulage yard should be fitted with standard thermal glazing and acoustic vents such as Passivent TVALdB 450 or similar and approved [Shown as red stars in Appendix 6].

-
- 9.6** Any rooms fitted with acoustic vents, should also be fitted with a Mechanical Extract Ventilation (MEV) or a Passive Input Ventilation (PIV) system which extracts/supplies air from the habitable rooms, but which does not allow significant noise to enter from the outside, either because of the system's attenuation or because it vents to a quiet façade. Residents could then occupy the properties without the need to open windows.
- 9.7** The above assessment indicates that with the above package of noise control measures, internal and external levels would comply with the recommended design criteria from BS8233. Furthermore, even during times where there are periods of higher activity at the Haulage Yard (such as Christmas), when the haulage yard daytime/evening operations could occur at night, the internal and external levels would comply with the recommended design criteria from BS8233.
- 9.8** Predictions based on the measured levels of existing noise indicate that for daytime and evening noise levels there is no indication of significant adverse impact on the proposed development as defined by BS4142:2014.
- 9.9** The South East Lincolnshire Strategic Housing Land Availability Assessment (SHLAA January 2016) considers that the site is suitable for residential development, albeit that a noise barrier such as an earth bund would be required along the southwestern boundary. However, as this Noise Assessment has demonstrated, should the above package of measures be adopted, a boundary bund/barrier would not be necessary.
-

Notwithstanding this, calculations have been performed assuming a 4m high mound. These show that a bund/barrier would only have the effect of reducing noise levels at residential facades facing the haulage site and not the external amenity areas. Albeit, the bund/barrier would help to protect existing dwellings adjacent to the proposed development site.

APPENDIX 1

EXPLANATION OF ACOUSTIC TERMS

The dB or the decibel, is the unit of noise. The number of decibels or the level, is measured using a sound level meter. It is common for the sound level meter to filter or 'weight' the incoming sound so as to mimic the frequency response of the human ear. Such measurements are designated **dB(A)**.

A doubling of the sound is perceived, by most people, when the level has increased by 10 dB(A). The least discernible difference is 2 dB(A). Thus most people cannot distinguish between, say 30 and 31 dB(A).

If a noise varies over time then the **equivalent continuous level, or LAeq**, is the notional constant level of noise which would contain the same amount of acoustic energy as the time varying noise.

The following table gives an indication of the comparative loudness of various noises expressed in terms of the A weighted scale:

Source of noise	dB(A)	Nature of Noise
Inside Quiet bedroom at night	30	Very Quiet
Quiet office	40	
Rural background noise	45	
Normal conversational level	60	
Busy restaurant	65	
Typewriter @ 1m	73	
Inside suburban electric train	76	
Alarm clock ringing @ .5m	80	
Hand clap @ 1m	80	
HGV accelerating @ 6m	92	Very Loud

APPENDIX 2

QUALIFICATIONS AND EXPERIENCE OF M.A. KENYON

My full name is Melville Alexander Kenyon. I am the principal of the firm of Martec Environmental Consultants Ltd, a consultancy company that specialises in environmental noise assessment and control. I hold a Bachelor's degree in Engineering and a Master's degree in Environmental Acoustics. I am a member of the professional body for noise and vibration specialists, the Institute of Acoustics and have sat on the British Standards Committee dealing with noise in buildings [BS.8233:1999].

My company is on the panel of noise advisers the Clay Pigeon Shooting Association and is a member of The Association of Noise Consultants. I have lectured at Liverpool John Moores University on the Diploma of Acoustics course and at Manchester Metropolitan University on their Environmental Health degree course.

I graduated in 1982 and since that time have experience of dealing with problems caused by noise and vibration, both regarding noise and vibration in the environment, the workplace and the home. The firm of Martec Environmental Engineering was formed in the 1970's. Since that time we have advised many groups of both residents and developers about the problems of noise and vibration in the environment.

QUALIFICATIONS OF P. M. DYSON

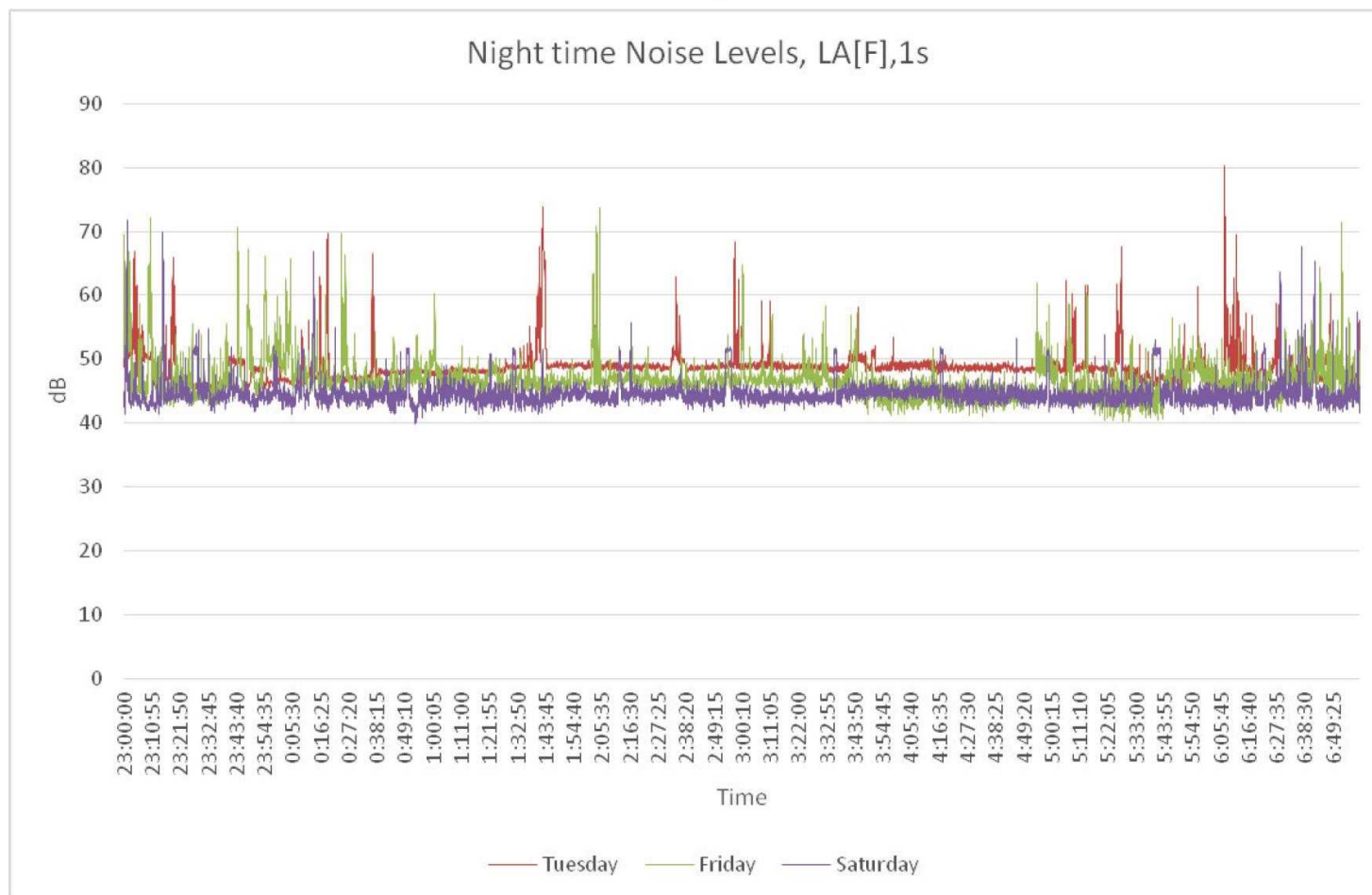
Peter Dyson holds the Institute of Acoustics Diploma in Acoustics and Noise Control, a Bachelor's degree in Mechanical Engineering, The Institute of Acoustics Certificates of Competence in Environmental Noise Assessment and in Workplace Noise Measurement. He is a Member of the Institute of Acoustics.

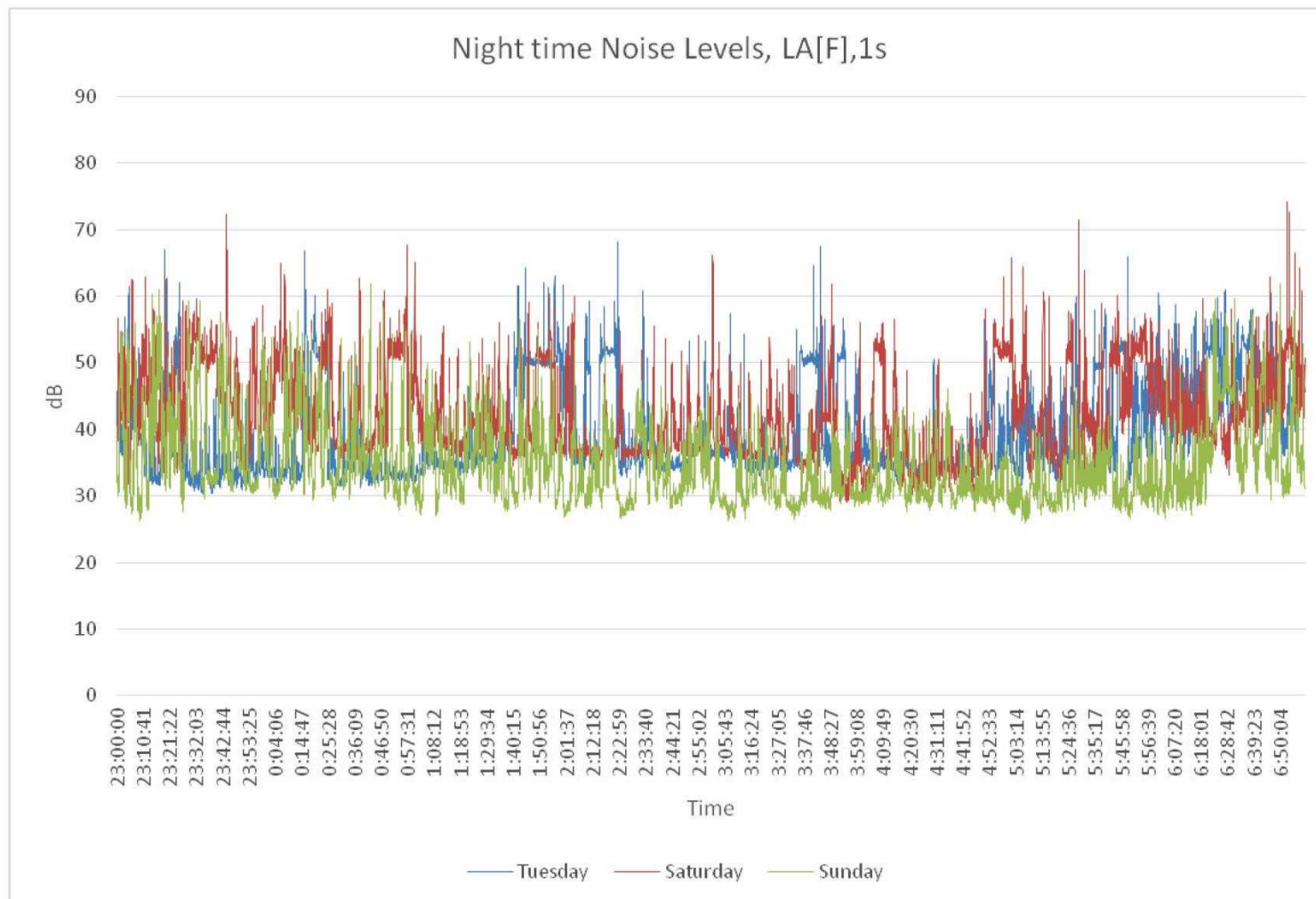
APPENDIX 3

REFERENCES

- 1 National Planning Policy Guidance – Noise -
<http://planningguidance.planningportal.gov.uk/blog/guidance/noise/noise-guidance/>
- 2 BS4142:2114 “Methods for Rating and Assessing Industrial and Commercial Sound”.
- 3 Planning Policy Guidance 24: Planning and Noise. –
<http://www.communities.gov.uk/publications/planningandbuilding/ppg24>
- 4 BS.8233:1999: “Sound Insulation and noise reduction for buildings – Code of practice.”
- 5 Calculation of Road Traffic Noise (CRTN) – Department of Transport and the Welsh Office, HMSO,1988, ISBN 0-11-550847-3
- 6 Method for Converting the UK Road Traffic Noise Index $L_{A10,18h}$ to the EU Noise Indices for Road Noise Mapping – TRL/Casella Stanger
<http://www.defra.gov.uk/environment/quality/noise/research/crtn/documents/noise-crtn-update2006.pdf>
- 7 BS EN 12354-3:2000 *Building Acoustics-Estimation of Acoustic Performance in buildings from the performance of elements. Part 3 Airborne sound Insulation against outdoor sound.*
- 8 BS.5228-1:2009 "Code of Practice for noise and vibration control on construction and Open Sites"

APPENDIX 4

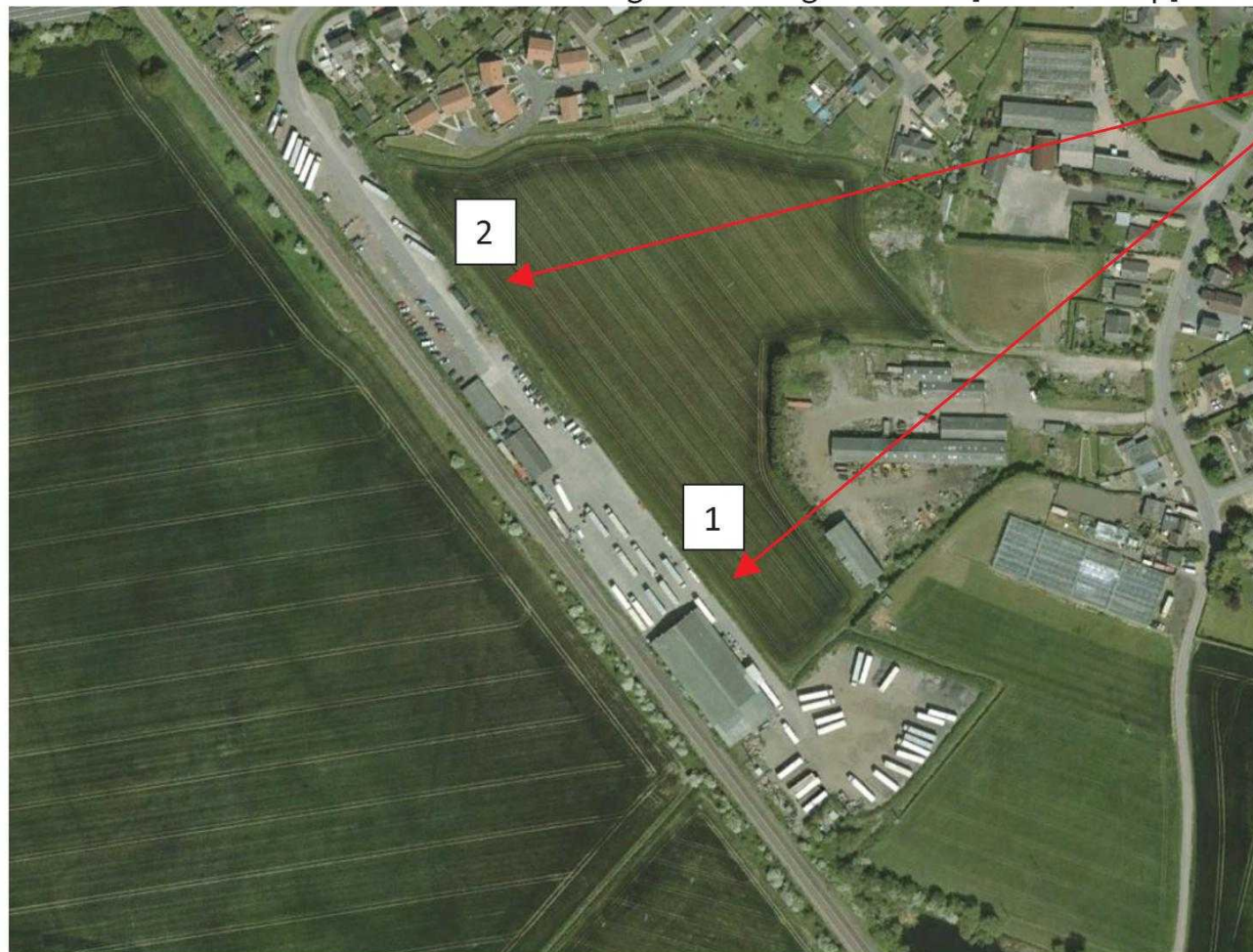
**Graph 8: Night Time Noise Levels, LA[F],1s – South Position 1**



Graph 9: Night Time Noise Levels, LA[F],1s – North Position 2

APPENDIX 5

Aerial View of Site showing Monitoring Positions [North at Top]



Monitoring Positions

APPENDIX 6

Illustrative Masterplan [2.5m Acoustic Fence ➡ & Acoustic Ventilation ★]



APPENDIX 7

Extract from SHLAA 2016-Donington

Reference	Don008	Settlement:	Donington
Address	Land to the west of Maltings Lane, Donington		
Site area (Hectares)	3.61	Site capacity at 30 dph:	108
		Site capacity at 25 dph:	90
		Site capacity at 20 dph:	72
		Site capacity from planning permissions:	
Availability	Is the site available? ☒ Yes		
Explanation	Although there is no planning permission or allocation, there is no known legal or ownership problems.		
Achievability	Is the site achievable? ☒ Yes		
Explanation	Moderate achievability. Values are moderate, and opening-up infrastructure costs are likely to be relatively low. However, a suitable noise barrier, such as an earth bund, will reduce the site area and raise development costs. If it is allocated, there is a reasonable prospect that it would be developed (assumed to begin in year 9, and be completed before year 15).		
Assumed delivery rate	Delivered in yrs 1-5: Delivered in yrs 6-10: 50 Delivered in yrs 11-15: 22 Delivered in yrs 16-20 Delivered in yrs 21-25:		
Suitability	Is the site suitable? ☒ Yes		
Explanation	The site is in scale with the 380 dwellings which the emerging Local Plan seeks to be developed in Donington. ENVIRONMENTAL IMPACTS - it will not have adverse impacts on natural, built or historic assets. It will not change the built up character and appearance of the area. INFRASTRUCTURE - It will not lead to the loss of, nor place undue burdens on, existing infrastructure, such as open space, green infrastructure or community facilities. LOCATION - It is accessible to Donington's existing services and facilities and is located adjacent to the existing built-up area (defined settlement limit); SITE CHARACTERISTICS - The site is close to a distribution site which will impact on the residential amenities of this site. Although some of the site will be no more impacted than the E & S Forklifts site, which has planning permission, the boundary would need to be protected in some way, such as an earth bund. The E & S Forklifts site is also shown on the SHDC contaminated land register. TRANSPORT - services and facilities are potentially accessible on foot and bicycle. The access would be close to the junction for the E & S Forklifts site, but this is acceptable in this situation Consequently, the site is considered suitable.		
Classification	Developable (11-15)		
Flood risk	Zone 1 Zone 2 Zone 3a Zone 3b	No hazard Low hazard Danger for some Danger for most Danger for all	No Hazard 0m to 0.25m 0.25m to 0.50m 0.50m to 1.0m 1.0m to 2.0m >2.0m