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Oakwell Community Assets

Assessment of noise at the
land at Oakwell Stadium for
proposed residential development

Prepared for :-

Planning and Law
The Old Office
Grange Farm
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1.0 SUMMARY

A daytime PPG 24 NEC assessment shows that the site falls into NEC A by both day and by night. Even an evening match with a home win is likely to take levels just into NEC B at the very worst.

Assessment under BS8233 criteria suggest that at least reasonable conditions will be achieved with normal opening windows.



A R Raymond P J Durell

2.0 INTRODUCTION

ADC was asked to carry out an independent assessment of the above site with regards to its suitability for residential development from a noise perspective.

This report begins by summarising assessment standards and, where appropriate, discusses alternative interpretations.

After a brief statement of survey details we discuss basic results and the resulting assessment, along with any mitigation which might be implied. We sum-up and conclude at the end, along with brief recommendations.

3.0 ASSESSM ENT STANDARDS

3.1 PPG24

PPG 24 : Planning and Noise refers to four Noise Exposure Categories (NECs). These are as follows:-

NEC	
A	Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection against noise.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example because there are no alternative quieter sites available, conditions should be imposed to ensure a commensurate level of protection against noise.
D	Planning permission should normally be refused.

Thresholds for these NECs are as follows:-

	NOISE EXPOSURE CATEGORY			
NOISE SOURCE	A	B	C	D
road traffic				
07.00 – 23.00	<55	55 – 63	63 – 72	> 72
23.00 – 07.00[1]	<45	45 – 57	57 – 66	> 66
rail traffic				
07.00 – 23.00	<55	55 – 66	66 – 74	> 74
23.00 – 07.00[1]	<45	45 – 59	59 – 66	> 66
air traffic[2]				
07.00 – 23.00	<57	57 – 66	66 – 72	> 72
23.00 – 07.00 [1]	<48	48 – 57	57 – 66	> 66
mixed sources[3]				
07.00 – 23.00	<55	55 – 63	63 – 72	> 72
23.00 – 07.00[1]	<45	45 – 57	57 – 66	> 66

3.2 BS8233

BS8233 is a wide-ranging document which covers many aspects of noise in buildings but includes recommended “Reasonable” and “Good” noise climates in its Table 5. Of most significance to environmental noise assessments are the levels given for living rooms and bedrooms.

The significant aspects are summarised below:

Environment Experiencing the Noise	Criterion	Implied Limits		
		L_{Aeq} (0700-2300)	L_{Aeq} (2300-0700)	L_{Amax} (2300-0700)
Living Rooms	Good Conditions	30dB	n/a	n/a
	Reasonable Conditions	40dB	n/a	n/a
Bedrooms	Good Conditions	n/a	30dB	45dB
	Reasonable Conditions	n/a	35dB	45dB

Note that the standard accepts the widely used rule of thumb that, for a partly open window, the levels just outside will be 15dB higher than those just inside. This brings us to an external equivalent of the above table, as follows:-

Environment Experiencing the Noise	Criterion	Implied Limits		
		L_{Aeq} (0700-2300)	L_{Aeq} (2300-0700)	L_{Amax} (2300-0700)
Living Rooms	Good Conditions	45dB	n/a	n/a
	Reasonable Conditions	55dB	n/a	n/a
Bedrooms	Good Conditions	n/a	45dB	60dB
	Reasonable Conditions	n/a	50dB	60dB

Note also that the standard is aimed at general anonymous noise and not necessarily specific and identifiable sources. In a rural situation this might be distant traffic interspersed with infrequent local traffic. In a suburban situation this might be local and middle distance traffic. In a city centre, this might be crowds of people and busy traffic, and perhaps some faint music. We would also argue that the noise associated with a football stadium, (large crowds of pedestrians, cars, and atmospheric music, infrequently and for short periods), should be regarded as normal for the immediate area and community. It is unimaginable that residents would move into the new development without fully realising this, and indeed we would suggest that they are likely to see such an atmosphere as a positive aspect of the environment.

Most acoustics professionals have some difficulties with BS8233. Firstly, it is design guidance. It is not a set of rigid criteria, below which a development “passes” and above which a development “fails”. For instance, with windows open, there can be very few developments outside the quietest of areas where the internal levels do not exceed at least some of the various “good” criteria.

3.3 Planning Conditions

As far as we are aware no noise related planning conditions have been suggested.

4.0 SURVEY DETAILS

4.1 Site Times and Personnel

The measurements were carried out by Andrew Raymond of ADC Acoustics.

Non matchday assessments were carried out on 22nd November 2011 between about 16:00 hours and 18:00 hours to represent rush hour, and between about 23:00 and 01:00 the following night, representing what is likely to be the noisier end of the night. A match was also assessed between about 18:00 and 22:30 on 6th December 2011.

4.2 Instrumentation

Instrumentation used was a Larson Davis 824. This is a precision grade sound level meter which holds a current calibration certificate and which was field-calibrated as necessary. The meter was set up to measure 10 to 20 minute samples in terms of dB L_{eq}, dB L_{Amax} and dB L_{A90} in overall A-weighted terms, and in octave bands across the frequency range. See Definition of Acoustic Terms in Appendix 1.

4.3 Measurement Positions

The measurement positions are shown on the following plan.



Positions 1a and 1b are the main one used for this assessment. Position 1a was used on non match days, just inside or just outside the boundary, depending on whether the ground was open at the time. Position 1b was used on Matchdays. The microphone was 1.5 m above ground and well away from other reflecting surfaces.

4.4 Survey Conditions

We have no reason to believe that the conditions we found on the surveys were anything other than representative of normal conditions. The match was on a chilly but pleasant evening, with an average attendance and a 2:1 home win.

Weather conditions had negligible impact on the measurements. Details are as follows :-

Rain	:	none, dry roads
Cloud	:	0 to 100% high
Temperature	:	5 to 10 Celsius
Wind	:	less than 5m/s from an indeterminable direction

5.0 RES ULTS AND DISCUSSIONS

Nearly all the time, noise was dominated by the A628 to the South and the A61 to the west. During the match, there were swells in the noise from the stadium and activity in the car park, but general traffic was still dominant most of the time. The crows were well controlled and arrived and dispersed well.

5.1 Basic Results

Full details are given in Appendix 2. A summary is as follows:-

Measurement	*Position*	*Index*	***dB(A)***
Rush Hour	1a	Leq	**55**
		Lmax	**69**
Night Time	1a	Leq	**44**
		Lmax	**57**
Match	1b	Leq	**57**
		Lmax	**71**

5.2 Assessments

The above results give the following assessments.

PPG24 NEC Criteria

For a PPG 24 assessment we are mostly concerned with the dB(A) L_{eq} levels, or the dB L_{Aeq} levels. See definition of Acoustic terms in Appendix 1. At 55 dB L_{Aeq} for rush hour and 44 dB L_{Aeq} for midnight, the sites appear to fall into NEC category A. Note also, that the PPG 24 NEC categories are for noise levels “averaged” from 0700 to 2300 and for daytime and 2300 to 0700 for night time. It is almost certain, therefore that the levels presented err on the pessimistic side. A match, including build-up and the time it takes to die-down, is a little noisier but only for about 4 hours at most. It may possibly be enough put the daytime just into NEC B.

BS8233

In terms of BS8233, again we are mainly concerned with the dB(A) L_{eq} values, or the dB L_{Aeq} levels. See Definition of Acoustic terms in Appendix 1. For night time, however, we are also concerned with the dB(A) L_{max} values, or the dB L_{Amax} levels. The measured levels appear to suggest that sound insulation will need to be designed to reduce external noise by up to 15 dB for "Reasonable" daytime levels, and up to 12 dB for "Reasonable" night time levels. A reduction of up to 14 dB would be required for "Good" night time levels. Note, of course, that these assertions are based upon the assumption that night-time noise levels are represented by measurements around midnight and that daytime noise levels are represented by measurements around afternoon at rush hour. In other words, they should represent a worst case. On matchdays, the levels were about 2dB higher than rush hour for the duration of the build-up, match, and die-down.

5.3 Mitigation

The above assessments show than noise will need to reduced by the following amounts on the worst affected facades:-

Outdoor living areas	: None required for non-matchdays. Up to 2 dB for matchdays.
Living Rooms	: Up to 15 dB for reasonable conditions on non-matchdays, ie. the majority of the time. We have never known a local authority request good conditions for living rooms as defined by BS 8233. Up to 2 dB for matchdays.
Bedrooms	: Up to 14 dB to achieve good conditions as defined by BS8233.

A partly open window can be expected to provide about 15 dB reduction. This is adequate for all conditions other than (possibly) matchday periods where the ideal reduction required for the houses facades and gardens facing the car park at Position 1b is an extra 2 dB.

However, this does not account for the 1.8m high fence which is proposed along the North and East boundaries. Such a fence will easily provide at least 5 dB reduction[1] to the gardens and to ground floor rooms.

Of course, these assessments are very robust as they use what are likely to be the noisier times of day and night, assume all facades have an unrestricted lines of site to the main sources and that the development itself will not provide any screening to its own properties.

[1]An acoustic barrier which just breaks the line of sight will provide around 5 dB reduction. As the required reductions from this fence are so tiny, any construction will be fine as long as there are no gaps – eg, feather edge.

6.0 CONCLUS IONS/RECOMMENDATIONS

Nearly all of the proposed dwellings will be exposed to acceptable noise levels, even under match conditions.

Some rear gardens and ground floor facades could possibly experience levels which are higher than ideal during the build-up, match, and die-down periods on a matchday, but simple garden fencing will be more than adequate to reduce levels acceptably.

Appendix 1

Definition of Acoustic Terms

The Decibel

The decibel is the basic unit of noise measurement and is denoted dB. Technically, it is a means of expressing the difference in noise level between the measured noise and a standard level of noise. Most often the threshold of human hearing is used as the standard reference but is really should be stated. The threshold of human hearing is a sound pressure of 20μPa or a sound power of 1pW.

A sound pressure level or SPL should be expressed in dB(re. 20μPa). A sound power level or SWL should be expressed in dB(re. 1pW). If the reference levels are omitted, it will often (but not always) be safe to assume that they are referenced to the threshold of human hearing.

A-Weighting and dB(A)

The human hearing system responds differently to different frequencies. The A-weighting system takes account of this by emphasising mid and high frequencies more than low frequencies to given an overall level. An A-Weighted noise level, therefore, reflects the way normal, healthy hearing would perceive the overall level of the noise. The basic unit is dB(A), although other systems of expressing an A-weighted level are discussed below.

Other weighting systems, such as C-Weighting, denoted dB(C), reflect the human hearing system's response at higher noise levels.

Equivalent Continuous Sound Level, L_{eq}

This is a kind of mean noise level.

The unit is dB L_{eq}. For A-weighted levels the unit is dB(A) L_{eq} or, in more modern units, dB L_{Aeq}. The Noise at Work Regulations use $L_{eq(s)}$ which refers to a sample level.

Maximum Level, L_{max}

This is the maximum level reached (usually for a fraction of a second) in the measurement period.

The unit is dB L_{max}. For A-weighted levels the unit is dB(A) L_{max} or, in more modern units, dB L_{Amax}.

Statistical (Percentile) Levels, L_n

During a measurement of fluctuating noise, it is often useful to establish the levels exceed for a percentage of the time. L_n is the index representing the level exceeded for n% of the measurement period.

The unit is dB L_n. For A-weighted levels, the unit is dB(A) L_n or, in more modern units, dB L_{An}.

Common examples are as follows :-

dB L_{A90} is the A-weighted level exceeded for 90% of the time and is often used to describe the underlying background noise.

dB L_{A50} is the A-weighted level exceed for 50% of the time. Mathematically, it is the median, another kind of average.

dB L_{A10} is the A-weighted level exceeded for 10% of the time and has traditionally been used to describe the intermittent highs in the noise climate such as passing cars or aircraft.

Frequency Analysis

Here the audible frequency range is divided up into bands and the noise level is expressed in each frequency band form low pitches to high pitches.

Octave Band analysis is where the frequency range is divided into 8 bands from 63 Hz to 8kHz, or sometimes into 10 bands from 31.5 Hz to 16kHz.

1/3 Octave Band analysis provides more detailed subdivision into 24 bands from 50 Hz to 10kHz, or sometimes into 30 bands from 20Hz to 20kHz.

Narrow Band analysis takes this further with the possibility of many thousands of bands, possibly only 1Hz wide, or even less.

In all types of frequency analysis, the level in each band can be expressed in terms of L_{eq}, L_{max}, L_n, etc. as defined above.

Appendix 2

Measurement Details

Non Matchday - Rush Hour

Position 1a	*Index*	***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
16:35	Leq	**54**	65	54	52	49	50	47	37	28
	Lmax	**66**	67	68	68	65	60	54	40	29
	L90	**50**	55	48	46	45	46	42	31	24
17:30	Leq	**55**	66	59	55	51	51	48	39	29
	Lmax	**71**	81	77	71	69	67	60	52	44
	L90	**50**	55	48	45	45	47	43	32	24

Non Matchday - Night Time

Position 1a	*Index*	***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
23:10	Leq	**46**	54	47	44	41	42	39	30	20
	Lmax	**59**	59	60	52	46	56	53	41	33
	L90	**39**	44	37	34	34	36	32	21	14
00:05	Leq	**43**	55	42	39	37	39	36	27	18
	Lmax	**52**	58	52	56	53	43	35	36	32
	L90	**37**	53	41	38	32	29	26	28	28

Matchday - Buid-Up, Match, Die Down, Match

Relevant Statistics (derived from www.barnsletfc.co.uk)

Attendance	9,524
Average for season to 10/12/11	9,534
Home Goals	2
Average for season to 10/12/11	1.4
Away Goals	1
Average for season to 10/12/11	1.4

Position 1b	*Index*	***dB(A)***	*63*	*125*	*250*	*500*	*1k*	*2k*	*4k*	*8k*
18:20	Leq	**55**	63	56	52	52	52	46	38	31
Car Park quiet	Lmax	**66**	71	68	61	60	64	57	49	41
Noise from main road	L90	**52**	57	51	47	49	49	42	33	25
19:00	Leq	**55**	63	56	52	52	52	46	38	31
Car park much busier, but not noisy	Lmax	**67**	74	67	62	61	64	58	49	39
Noise from main road	L90	**52**	58	52	49	50	49	41	33	26
19:40	Leq	**63**	65	58	52	53	59	58	50	37
KO at 19:45	Lmax	**78**	71	63	57	63	75	74	65	50
Home goal in 1st few seconds	L90	**51**	59	53	49	48	47	42	35	27
19:50	Leq	**55**	64	56	51	51	52	48	42	35
Away goal missed but no subjective	Lmax	**70**	64	56	54	56	66	65	58	43
impact	L90	**50**	57	51	47	47	46	40	31	25
20:30	Leq	**54**	69	61	52	49	48	46	41	34
	Lmax	**63**	72	63	59	55	57	58	48	42
	L90	**49**	62	55	48	45	44	39	33	27
20:40	Leq	**53**	68	64	51	47	46	42	37	30
Home goal missed. Audible impact,	Lmax	**60**	78	73	56	53	51	47	40	32
but short lived. Similar to first goal	L90	**48**	62	55	47	44	43	38	33	27
21:20	Leq	**51**	68	58	50	46	46	43	36	31
	Lmax	**67**	75	65	57	50	62	63	49	41
	L90	**47**	61	53	46	44	43	37	31	27
21:30	Leq	**54**	69	59	52	49	49	45	40	38
Match ended	Lmax	**64**	84	76	64	57	55	51	47	41
	L90	**49**	62	53	47	45	45	40	34	28
22:10	Leq	**49**	60	49	43	43	45	42	36	30
	Lmax	**60**	62	53	48	48	55	54	52	37
	L90	**44**	54	44	40	40	41	36	28	25
22:20	Leq	**50**	58	49	43	43	46	44	36	31
	Lmax	**61**	67	57	45	46	55	58	48	40
	L90	**44**	53	44	40	41	41	35	25	24