ATKINS

Sully Sports and Social Club

Noise Impact Assessment of Land for Residential Development

St Modwen Homes Ltd

June 2015

Notice

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This document has 36 pages including the cover.

Document history

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Rev 1.1	Minor revisions to include latest masterplan	PH	LH	IE	IE	26/06/15

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1. Introduction

Atkins Acoustics, Noise and Vibration have been commissioned to undertake a baseline noise survey and an impact assessment in relation to the release of land associated with the proposed development at the site of the existing Sully Sports and Social Club.

1.1. Site Location

The site is located between Sully and Swanbridge in Glamorgan, at approximate postcode CF64 5SP.

Nearby noise sensitive receptors include residential properties on Clevedon Avenue located immediately to the west of the site; nearby residential properties on Winsford Road, Highbridge Close, and Swanbridge Grove located on the opposite side of South Road, which is immediately to the north of the site; a small number of isolated residential properties located on Beach Road immediately to the east of the site; and an existing caravan park located on Beach Road immediately to the south east of the site.

The south of the site is flanked by Sully Bay.

1.2. Description of Existing Facilities

The site currently includes a bowling green with pavilion and the existing Sully Sports and Social Club facilities including an outdoor fenced and floodlit sports pitch.

1.3. Description of Proposed Facilities

The proposals are to build a new set of facilities for the club and release land located on the west of the site for a residential development of around 200 homes whilst retaining the existing bowling green and its clubhouse. New club facilities are proposed on the east of the site, and a new touring caravan park on the south east of the site.

The new club facilities will include:

- New Single Storey Retail Building
- New Sports and Social Club Facility incorporating the retained indoor bowls, extended changing facilities and club house, possible additional community facilities.
- Grass Rugby Pitch
- All Weather Floodlit Pitch with Fencing and Floodlights
- Two Senior Football/Rugby Pitches

This report focuses on the noise impacts on the proposed residential development, including those from the redeveloped Sports and Social Club, and the impacts of the residential development on neighbouring sensitive receptors. The report does not consider wider impacts from the Sports and Social Club as this is considered likely to have a neutral impact (i.e. it is replacement of existing facilities, rather than new development).

2. Standards and Guidance

2.1. BS 4142:2014: Methods for Rating and Assessing Industrial and Commercial Noise (BS4142)

This standard is the main source of guidance used in the rating of noise of an industrial nature as it affects residential receptors.

It is based upon the margin by which noise produced by such a source, after being adjusted for any tonal characteristics, impulsiveness, irregularity and other acoustic features, exceeds the background noise level. The standard may be used, within limits, to indicate the likelihood of adverse impacts on local residents in response to noise of an industrial nature.

- A difference of around +10dB or more above measured background noise levels is likely to be an indication of a significant adverse noise impact, depending on context.
- A difference of around +5dB is likely to be an indication of an adverse noise impact, depending on context.
- Where the rating level does not exceed the background sound level this is judged to be an indication of having a low impact.

2.2. CRTN/Road Traffic Noise Level Prediction

The Department for Transport document Calculation of Road Traffic Noise,1988 (CRTN), details a methodology by which the basic noise level from a given road, or section of road, may be predicted based upon knowledge of the traffic flow, %HGV, and speed in kph on that section of road.

However, it should be noted that the CRTN methodology cannot be reliably used to calculate noise levels on roads where flows are below 1000 vehicles/18-hour day. In this instance the methodology described in '*A Guide to Measurement and Prediction of the Equivalent Continuous Sound Level* L_{eq}', dated 1980, can be used to calculate the expected noise levels arising from road traffic activity at such locations.

2.3. DMRB

The Highways Agency document Design Manual for Roads and Bridges (DMRB) details a methodology by which the magnitude of impact of a change in road traffic noise level may be classified. A change in road traffic noise of 1 dB $L_{A10,18h}$ in the short term (e.g. when a project is opened) is the smallest that is considered perceptible. In the long term (typically 15 years after project opening), a 3 dB $L_{A10,18h}$ change is considered perceptible. The magnitude of impact should, therefore, be considered different in the short term and long term. The classification of magnitude of impacts to be used for traffic noise is given in Tables 2-1 and 2-2 below.

Table 2-1 DMRB Classification of magnitude of noise impacts in the short term

Change in Noise Level, $L_{A10,18Hr}$	Magnitude of Impact
0	No Change
0.1 – 0.9	Negligible
1 – 2.9	Minor
3 – 4.9	Moderate
5+	Major

Table 2-2 DMRB Classification of magnitude of noise impacts in the long term

Change in Noise Level, $L_{A10,18Hr}$	Magnitude of Impact
0	No Change
0.1 – 2.9	Negligible
3 – 4.9	Minor
5 – 9.9	Moderate
10+	Major

2.4. BS5228-1:2009+A1:2014 Code of practice for noise and vibration control on construction and open sites – Noise (BS5228)

There are no statutory limits regarding construction noise. BS5228-1:2009+A1:2014 '*Code of practice for noise and vibration control on construction and open site – Part 1: Noise'*, provides guidance on assessing the potential significance of noise effects from construction activities in Annex E, and two approaches are described for threshold limits and noise level changes. For the purpose of this assessment, the noise level change approach detailed in Annex E.3.2 of BS5228-1:2009+A1:2014 has been used to determine the potential significance of possible impacts from construction noise at the nearby residential receivers.

Table 2-3 below has been reproduced from table E.1 in BS5228-1:2009+A1:2014, and shows the 'ABC criteria' thresholds for potential significant effect.

The ambient noise level is determined through baseline noise survey at, or within the vicinity of, the nearest residential properties and then rounded to the nearest 5dB to determine the appropriate category (A, B or C) and subsequent threshold value. This is compared with the noise level predicted from construction activity. A potential significant effect is indicated if the construction noise level exceeds the appropriate category threshold value. If the existing ambient level exceeds the threshold category threshold values, then a potential significant impact is indicated if the total noise level, including both the ambient noise and the various contributions of construction noise, is greater than the ambient noise level by more than 3dB.

Table 2-3 Construction Activity Noise Levels: Example Threshold of Potential Significant Effect at Dwellings (BS5228-1:2009+A1:2014)

Assessment Category and Threshold Value Period	Threshold Value in decibels (dB) ($L_{Aeq, T}$)		
	Category A A)	**Category B B)**	**Category C C)**
Night-Time (23:00 – 07:00)	45	50	55
Evenings and Weekends D)	55	60	65
Daytime (07:00 – 19:00) and Saturdays (07:00 – 13:00)	65	70	75
NOTE 1: A potential significant effect is indicated if the total $L_{Aeq,T}$ noise level arising from the site exceeds the threshold level for the Category appropriate to the ambient noise level.			
NOTE 2: If the ambient noise level exceeds the threshold values given in the table (i.e. the ambient noise level is higher than the above values), then a potential significant effect is indicated if the total $L_{Aeq,T}$ noise level for the period increases by more than 3dB due to site noise.			
NOTE 3: Applied to residential receptors only.			
A) Category A: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are less than these values.			
B) Category B: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are the same as category A values.			
C) Category C: threshold values to use when ambient noise levels (when rounded to the nearest 5dB) are higher than category A values.			
D) 19:00 – 23:00 Weekdays, 13:00 – 23:00 Saturdays and 07:00 – 23:00 Sundays.			

2.5. Control of Pollution Act 1974

Section 60 of the Control of Pollution Act 1974 (COPA) gives local authorities the power to serve notices imposing requirements which could dictate methods of construction.

Under Section 61 of COPA, the person intending to carry out works (typically the developer or contractor) may apply in advance to the local authority to agree the methods and timetabling of works to be carried out.

2.6. BS 8233:2014 "Guidance on sound insulation and noise reduction for buildings"

British Standard Code of Practice BS8233: 2014 provides information and guidance on sound insulation and noise reduction for buildings. It deals with the control of external noise and outlines criteria for various criteria for different rooms.

Included within this document is guideline values for indoor ambient noise levels for dwellings (presented within Table 4 of BS8233:2014) presented below in table 2-4.

Table 2-4 Indoor Ambient Noise Levels for Dwellings (BS8233:2014)

Activity	Location	07:00 to 23:00	23:00 to 07:00
Resting	Living Room	35dB $L_{Aeq,16Hr}$	-
Dining	Dining Room/Area	40dB $L_{Aeq,16Hr}$	-
Sleeping	Bedroom	35dB $L_{Aeq,16Hr}$	30dB $L_{Aeq,8Hr}$

From Table 4 - BS8233:2014

The noise levels presented are based on existing WHO guideline values and assume a normal diurnal variation in external noise. It should be noted that regular individual noise events can cause sleep disturbance. An additional guideline value may be set in terms of SEL or $L_{Amax,F}$, depending on the character and number of events per night. Sporadic noise events could require separate values.

BS8233 notes that if relying on closed windows to meet the guideline values, there needs to be appropriate alternative ventilation that does not compromise the facade insulation or resulting noise level.

BS8233 also notes 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 5dB and reasonable internal conditions still achieved.

Regarding outdoor spaces, such as gardens and balconies, it is desirable that the steady noise levels do not exceed 50 dB $L_{Aeq,T}$ with an upper limit of 55 dB $L_{Aeq,T}$. BS8233 recognises that these guideline values are not achievable in all circumstances where development may 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 might be warranted. In such a situation the development should not be prohibited, but should be designed to achieve the lowest noise levels practicable in external amenity spaces.

2.7. WHO Guidelines

2.7.1. WHO Guidelines for Community Noise

Published by the World Health Organization (WHO) in 2000, this document was prepared as a response to a need for action together with a generic need for improvements in legislation at a national level.

In the document are guideline noise levels in specific human environments. There is also information on the likely 'critical health effects' associated with noise levels exceeding the guideline values. The guideline levels which are relevant in this case are set out in Table 2-5.

Table 2–5 WHO Guideline Noise Values

Specific Environment	Critical health effect(s)	L_{Aeq} (dB)	Time base (hours)	$L_{AF,max}$, (dB)
Outdoor Living Area	Serious annoyance, daytime and evening	55	16	-
	Moderate annoyance, daytime and evening	50	16	-
Dwelling, indoors	Speech intelligibility and moderate annoyance, daytime and evening	35	16	-
Inside bedrooms	Sleep disturbance, night-time	30	8	45*
Outside bedrooms	Sleep disturbance, window open (outdoor values)	45	8	60*

* With regard to the assessment of maximum noise levels, it is suggested in Section 3.4 of the WHO Guidelines that the levels as shown in Table 2-5 should not be exceeded more than 10- 15 times per night.

2.7.2. WHO Night Noise Guidelines for Europe

Published in 2009, these guidelines may be considered as an extension to, as well as an update of the 2000 WHO Guidelines for Community Noise. The document presents the conclusions of the WHO working group responsible for preparing guidelines for exposure to noise during sleep to protect the public from adverse health effects.

Within the document it recommends the following night noise guideline values for the protection of public health from night noise:

Table 2–6 WHO recommended night noise guidelines values

Target	**$L_{night,outside}$ dB [1]**
Interim target (IT)	55
Night noise guideline (NNG)	40
1) The A-weighted long-term average sound level as defined in ISO 1996-2:1987, determined over all the night periods of a year; in which: the night is eight hours (usually 2300 – 0700 hours).	

The $L_{night,outside}$ parameter is set at a level which takes into account temporal variations in noise and the typical external to internal noise reduction allowing for a partially open window.

Above 40 dB $L_{night,outside}$ it is stated that adverse health effects are observed among the exposed population and that many people have to adapt their lives to cope with the noise at night. The NNG of 40 dB $L_{night,outside}$ is therefore judged to be equivalent to the LOAEL for night noise.

Above 55 dB $L_{night,outside}$, the situation is considered to be increasingly dangerous for public health; adverse health effects occur frequently and a sizeable proportion of the population is highly annoyed and sleep disturbed. It is, however, clearly stated within the document that the IT is not a health based limit value by itself and vulnerable groups such as children, the chronically ill and the elderly, cannot be protected at this level. It should only be considered as a feasibility-based intermediate target which can be temporarily considered by policy-makers for exceptional local situations.

2.8. Local Policy and Guidance

2.8.1. TAN 11

Technical Advice Note 11 provides guidance on the suitability of a site for a proposed residential development based on the noise exposure of the site. The level of noise exposure on a given site is measured then categorised. These categories give clear guidance for developers and planners as to the suitability for development and identifies the potential need for noise mitigation and/or building envelope sound insulation measures (including specialist ventilation recommendations). TAN 11 annex A table 1 details Noise Exposure Categories (NECs) and appropriate advice for consideration by local planning authorities. TAN 11 Annex A table 2 details the recommended range of noise levels for the establishment of the appropriate NEC. Both TAN 11 Annex A Tables 1 and 2 are reproduced below in tables 2-7 and 2-8 respectively.

Table 2–7 Noise Exposure Categories (as per TAN 11 Annex A Table 1)

Noise Exposure Categories	
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 desirable.
B	Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection.
C	Planning permission should not normally be granted. Where it is considered that permission should be given, for example, because there is 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.

Table 2–8 Recommended Noise Exposure Categories for New Dwellings Near Existing Noise Sources (as per TAN 11 Annex A Table 2)

Recommended Noise Exposure Categories for New Dwellings near Existing Noise Sources					
Noise Levels(1) corresponding to the Noise Exposure Categories for New Dwellings $L_{Aeq,T}$ dB					
Noise Source		**Noise Exposure Categories**			
		A	**B**	**C**	**D**
Road traffic	0700 – 2300 2300 – 0700(2)	<55 <45	55 – 63 45 – 57	63 – 72 57 – 66	>72 >66
Rail Traffic	0700 – 2300 2300 – 0700(2)	<55 <45	55 – 66 45 – 59	66 – 74 59 – 66	>74 >66
Air Traffic(3)	0700 – 2300 2300 – 0700(2)	<57 <48	57 – 66 48 – 57	66 – 72 57 – 66	>72 >66
Mixed Sources(4)	0700 – 2300 2300 – 0700(2)	<55 <45	55 – 63 45 – 57	63 – 72 57 – 66	>72 >66

Notes

(1) **Noise levels:** The noise level(s) ($L_{Aeq,T}$) used when deciding the NEC of a site should be representative of typical conditions.

(2) **Night-time noise levels (2300 – 0700):** Sites where individual noise events regularly exceed 82dBL_{Amax}(S time weighting) several times in any hour should be treated as being in NEC C, regardless of the $L_{Aeq,8hr}$ (except where the $L_{Aeq,8hr}$ already puts the site in NEC D)

(3) **Aircraft noise:** Daytime values accord with the contour values adopted by the Department of Transport which relate to levels measured 1.2m above open ground. For the same amount of noise energy, contour values can be up to 2dB(A) higher than those of other sources because of ground reflection effects.

(4) **Mixed sources**: this refers to any combination of road, rail, air and industrial noise sources. The "mixed source" values are based on the lowest numerical values of the single source limits in the table. The "Mixed Source" NECs should only be used where no individual source is dominant.

To check if any individual noise source is dominant (for the purposes of this assessment) the noise level from the individual sources should be determined and then combined by decibel addition (remembering to subtract 2dB(A) from any aircraft noise contour values). If the level of any one source then lies within 2dB(A) of the calculated combined value, that source should be taken as the dominant one and the site assessed against the appropriste NEC for that source, rather than using the "missed sources" NECS. If the dominant source is industrial noise see paragrapgh B17 of Annex B.

If the contribution of the individual noise sources to the overall noise level cannot be determined by measurement and/or calculation, then the overall measured level should be used and the site assessed against the NECs for "Mixed Sources".

TAN 11 acknowledges that in some cases it may be appropriate for local planning authorities to determine the range of noise levels they wish to attribute to the various NECs and therefore where there is a clear need for new residential development in an already noisy area some or all NECs might be increased by up to 3dB(A) above the recommended levels. TAN 11 also acknowledges that in other cases, a reduction of up to 3dB(A) may be justified.

TAN 11 Annex B, paragraph B21 provides the following advice regarding noise from recreational and sporting activities:

> *"For these activities the local planning authority will have to take account of how frequently the noise will be generated and how disturbing it will be, and balance the enjoyment of the participants against nuisance to other people. Partially open buildings such as stadia may not be in frequent use. Depending on local circumstances and public opinion, local planning authorities may consider it reasonable to permit higher noise emission levels than they would from industrial development, subject to a limit on the hours of use, and the control of noise emissions (including public address systems) during unsocial hours. A number of sports activities are the subject of Codes of Practice. Some noise generating activities enjoy permitted development rights granted by Part 4 of Schedule 2 to the Town and Country Planning (General Permitted Development) Order 1995, and so may not require specific planning permission provided that they occur on a temporary basis. However, this permission may be withdrawn by making a direction under Article 4 of the Order."*

3. Baseline Noise Survey

3.1. Introduction

Baseline noise surveying was undertaken in the vicinity of Sully Sports and Social Club on Thursday 19th March 2015 and Friday 20th March 2015.

The weather throughout the survey was dry and clear, with wind speeds generally between 0.5ms^{-1} and 1.5ms^{-1}, and gusts up to 2.7ms^{-1}.

3.2. Survey Equipment

The equipment used for the survey is shown in table 4.1 below:

The sound level meter was calibrated before and after both the day time and night-time sets of noise level measurements. No drift in calibration was observed.

Table 3-1 Equipment used during noise survey

Equipment	Serial Number	Last Calibration Date
Manned Sample Measurements (Atkins Set 37)		
Sound Level Meter: Norsonic 118	30668	July 2014
Microphone: Norsonic 1225	28663	July 2014
Preamplifier: Norsonic 1206	18476	July 2014
Calibrator: Brüel & Kjær 4230	830348	July 2014
Logging Sound Level Meter (ANV Hire Kit)		
Sound Level Meter: Rion NL-52	00320643	March 2015
Microphone: Rion UC-59	03392	March 2015
Preamplifier: Rion NH-25	10651	March 2015
Calibrator: Rion NC-54	34536131	October 2014

3.3. Measurement Procedure

A suitable location for the installation of a logging sound level meter was identified (see section 3.4 below), and a number of locations suitable for handheld sample measurements were identified.

All logging sound level meter measurements and manned sample measurements were 15mins in duration.

Field calibration of the sound level meters was undertaken both before and after the measurement sets, no significant drift in calibration was observed.

3.4. Measurement Locations

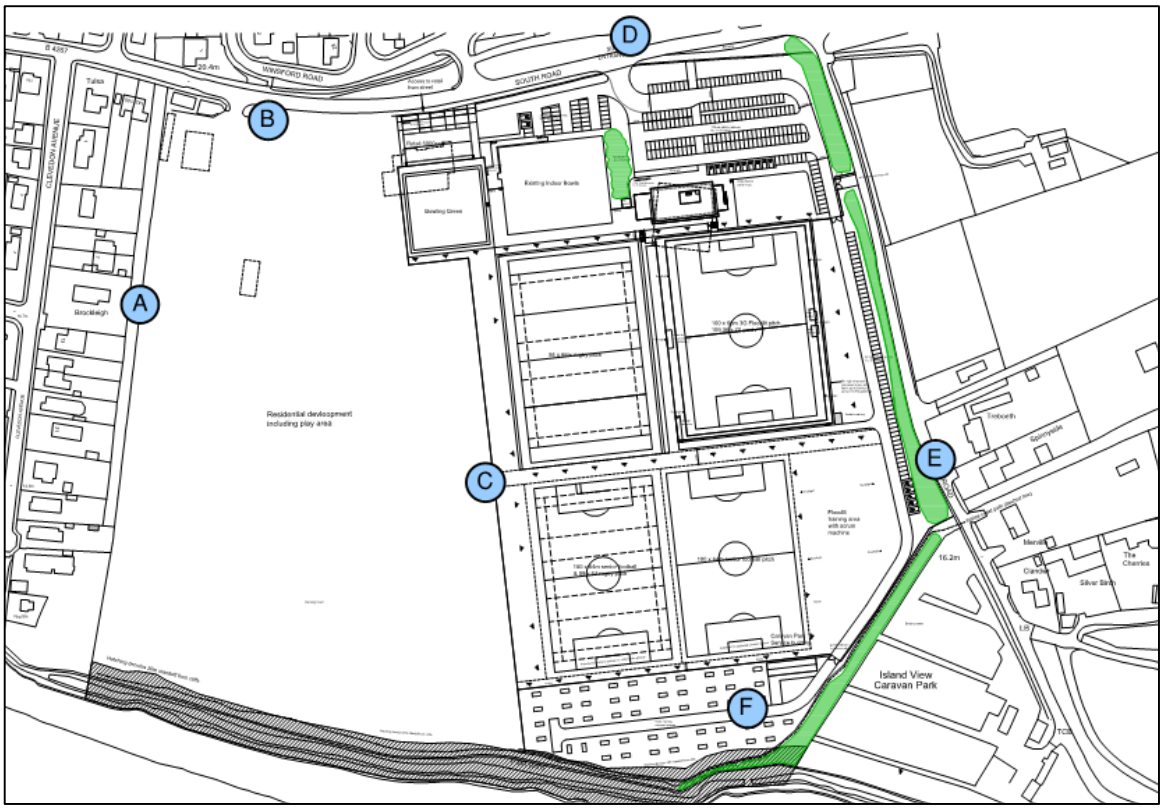
A total of 6 measurement locations were initially identified for surveying prior to visiting site, these were:

- Location A – Western side of proposed residential development area. Near rear of Brockleigh, Clevedon Avenue.
- Location B – Northern side of proposed residential development area. Near South Road.

- Location C – Eastern side of proposed residential development area.
- Location D – Northern side of proposed sports area. Near South Road
- Location E – Eastern side of proposed sports area. Near Treboeth on Beach Road.
- Location F – Southern side of proposed sports area/new touring caravan park. Near existing caravan park on Beach Road.

These are shown in Figure 3-1 below.

Figure 3-1 Noise Survey Measurement Locations (shown on an approximate proposed layout plan)



On the days of the site visit and noise survey local light roadworks activity on South Road meant that location B was determined to be not suitable for the undertaking of noise level measurements. This local light roadwork activity is not considered to have adversely impacted upon the measurements as undertaken at the remaining locations.

3.5. Results of Noise Survey

3.5.1. Location A – Western side of proposed residential development area. Near rear of Brockleigh, Clevedon Avenue.

The noise climate at Location A predominantly consisted of road traffic noise from South Road.

Table 3-2 below presents the results of the sample noise level measurements undertaken at Location A.

Table 3-2 Summary of Sample Noise Level Measurements at Location A

Date	Time	L_{eq}, dB(A)	L_{10}, dB(A)	L_{90}, dB(A)	L_{Max}, dB(A)
19/03/2015	13:07	51.5	52	43.4	67
19/03/2015	15:11	46.5	48.8	43.3	60.1
19/03/2015	16:58	52.7	55.2	44.3	70.8
20/03/2015	09:41	43.2	42.8	38.9	62.2
Average		**49.9**	**49.7**	**42.5**	
Max					**70.8**

3.5.2. Location B – Northern side of proposed residential development area. Near South Road.

Not sample noise level measurements undertaken at Location B due to interference from local roadwork activity.

3.5.3. Location C – Eastern side of proposed residential development area.

The noise climate at Location C predominantly consisted of road traffic noise from South Road.

Table 3-3 below presents a summary of results of the logging noise level measurements undertaken at Location C. The complete measurements are presented within Appendix A.

Table 3-3 Summary of Sample Noise Level Measurements at Location C

Period	L_{eq}, dB(A)	L_{10}, dB(A)	L_{90}, dB(A)	L_{Max}, dB(A)
***TAN 11, BS4142, BS8233*, WHO Measurement Period Classification**				
Daytime (07:00 – 23:00)				
Average	49.1	50.0	42.4	
Max				81.2
Night-Time (23:00 – 07:00)				
Average	41.1	40.1	30.4	
Max				77.2
***BS5228* Measurement Period Classification**				
Daytime (07:00 – 19:00)				
Average	49.9	50.5	43.6	
Max				81.2
Evening (19:00 – 23:00)				
Average	46.1	48.4	39.1	
Max				65.3
Night-Time (23:00 – 07:00)				
Average	41.1	40.1	30.4	
Max				77.2

3.5.4. Location D – Northern side of proposed sports area. Near South Road

The noise climate at Location D predominantly consisted of road traffic noise from South Road.

Table 3-4 below presents the results of the sample noise level measurements undertaken at Location D.

Table 3-4 Summary of Sample Noise Level Measurements at Location D

Date	Time	L_{eq}, dB(A)	L_{10}, dB(A)	L_{90}, dB(A)	L_{Max}, dB(A)
19/03/2015	13:35	60.6	64.1	50.9	73.7
19/03/2015	15:41	60.6	63.9	51.0	70.1
20/03/2015	09:17	59.9	63.7	47.4	70.9
Average		**60.4**	**63.9**	**49.8**	
Max					**73.7**

3.5.5. Location E – Eastern side of proposed sports area. Near Treboeth on Beach Road.

The noise climate at Location F predominantly consisted of road traffic noise from local traffic on Beach Road, with road traffic noise from South Road audible in the distance.

Table 3-5 below presents the results of the sample noise level measurements undertaken at Location E

Table 3-5 Summary of Sample Noise Level Measurements at Location E.

Date	Time	L_{eq}, dB(A)	L_{10}, dB(A)	L_{90}, dB(A)	L_{Max}, dB(A)
19/03/2015	14:26	58.9	62.1	38.3	78.5
19/03/2015	16:10	60.8	58.8	38.7	92.4
20/03/2015	10:26	52.5	52.5	36.9	75.6
Average		**58.6**	**57.8**	**38.0**	
Max					**92.4**

3.5.6. Location F – Southern side of proposed sports area/new touring caravan park. Near existing caravan park on Beach Road.

The noise climate at Location F predominantly consisted of distant road traffic noise from South Road.

Table 3-6 below presents the results of the sample noise level measurements undertaken at Location F.

Table 3-6 Summary of Sample Noise Level Measurements at Location F.

Date	Time	L_{eq}, dB(A)	L_{10}, dB(A)	L_{90}, dB(A)	L_{Max}, dB(A)
19/03/2015	12:22	47.0	49.0	43.8	61.5
19/03/2015	14:48	42.5	44.3	39.8	54.8
19/03/2015	16:33	50.4	54.0	42.5	67.5
20/03/2015	10:03	39.1	40.3	38.0	53.4
Average		**46.7**	**46.9**	**41.0**	
Max					**67.5**

4. Impact Assessment for Residential Dwellings

4.1. TAN 11 (Based on Current Site Conditions)

In order to establish site suitability for residential development, comparison is made of the measured ambient noise levels in proximity to the residential site area against the TAN 11 Noise Exposure Category Levels as presented within Table 2–8, and the appropriate category planning advice as presented within Table 2-7.

Measurements undertaken at locations A and C are taken as representative of the western and eastern boundaries of the residential site area respectively. Measurement locations D and F are considered as representative of the northern and southern boundaries of the residential site area, given their respective similar distances to South Road and the coastline.

The diurnal variation at measurement locations A, D, F is extrapolated from the diurnal variation as measured by the logging sound level meter at measurement location C, which demonstrated diurnal variation of 8dB between the average daytime L_{Aeq} and the average night-time L_{Aeq}.

The TAN 11 categories of the various boundaries of the residential site are then presented in Table 4-1 below.

Table 4-1 TAN 11 Categories at the extents of the Residential Site

Equivalent Measurement Location	Period	L_{eq}, dB(A)	TAN 11 Category
Northern Boundary of Residential Area			
D	Day	60.4	B
	Night*	52.4	B
Eastern Boundary of Residential Area			
C	Day	49.1	A
	Night	41.1	A
Southern Boundary of Residential Area			
F	Day	46.7	A
	Night*	38.7	A
Western Boundary of Residential Area			
A	Day	49.9	A
	Night*	41.9	A

*Extrapolated in accordance with the diurnal variation as measured by the logging sound level meter at location C.

On the basis of the noise levels as measured at present, and in accordance with the TAN 11 road noise threshold levels, then the bulk of the site would be deemed as TAN 11 category 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 desirable*" with the exception of the northern extent of the site, nearest South Road, which would be deemed as TAN 11 category B "*Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection*". It is likely that this category B classification would be applicable to the front row of housing, which is directly exposed to road traffic noise from South Road; whereas housing further back would benefit from screening by this front row of housing. Such screening could be reasonably assumed to achieve approximately 10 dB of attenuation, thus it is expected that subsequent rows of housing would be deemed to be TAN 11 category 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 desirable*".

In order to ensure that the amenity of the front row of housing is maintained, and that WHO guideline and BS8233 threshold criteria values for living rooms and bedrooms are achieved (as presented within Table 2-4, Table 2–5, and Table 2–6), it is recommended that the internal layout of any front row housing locates non-critical areas such as kitchens, bathrooms and corridors facing toward the road (on the northern façade of the buildings), and all living areas and bedroom areas are planned so as to be facing inwards to the site (on the southern façade of the buildings), thus exploiting the inherent self-screening of the buildings to enable the internal ambient noise level threshold criteria values to be achieved.

It should be noted however that the BS8233:2014 and WHO guideline external ambient noise level targets would still be exceeded in any proposed external spaces on the northern façade. This may or may not be applicable depending on the internal layout and if garden or balcony spaces were planned for the northern façade of these buildings.

If such orientation of the internal layouts are not possible, or if garden or balcony spaces were intended for the northern façade, then additional mitigation should be utilised in order to ensure that target WHO guideline and BS8233 threshold criteria values were met. This could be in the form of an acoustic barrier between the front row of housing and South Road, however this would require careful design once the residential site plan is at an appropriately advance stage of design, to ensure any such proposed barrier was of adequate height and length for the specifics of the final design of the site. Such a barrier should be designed so as to achieve approximately 10dB of attenuation to ensure all target threshold criteria values can be met.

Additionally it is important to note that the noise level measurements presented above have been undertaken with the sporting facilities in the presently existing conditions. Changes to the sporting activities undertaken have the potential to impact upon the ambient noise levels at the proposed residential site, and therefore site suitability should also be determined with regard to potential sporting noise levels.

4.2. Sporting Noise

The sporting facilities proposed in the latest Masterplan (dated 03/06/15) at Sully Sports Ground include:

- Grass Rugby Pitch
- All Weather Floodlit Pitch with Fencing and Floodlights
- Two Senior Football/Rugby Pitches

These facilities will have the potential to impact upon nearby noise sensitive receptors, including the proposed residential developments to the west of the Sully Sports and Social development area.

It is understood that these sporting facilities will be in place prior to the residential developments, and therefore in ascertaining the sites suitability for the residential development the potential impact arising from these sporting facilities must also be considered.

As presented within section 2, TAN 11 Annex B, paragraph B21 provides the following advice regarding noise from recreational and sporting activities:

> *"For these activities the local planning authority will have to take account of how frequently the noise will be generated and how disturbing it will be, and balance the enjoyment of the participants against nuisance to other people. Partially open buildings such as stadia may not be in frequent use. Depending on local circumstances and public opinion, local planning authorities may consider it reasonable to permit higher noise emission levels than they would from industrial development, subject to a limit on the hours of use, and the control of noise emissions (including public address systems) during unsocial hours. A number of sports activities are the subject of Codes of Practice. Some noise generating activities enjoy permitted development rights granted by Part 4 of Schedule 2 to the Town and Country Planning (General Permitted Development) Order 1995, and so may not require specific planning permission provided that they occur on a temporary basis. However, this permission may be withdrawn by making a direction under Article 4 of the Order."*

There is however currently no recognised criteria from which a judgement of the significance of the noise impact from a sporting event can be made.

For residential dwellings the World Health Organisation “Guidelines for Community Noise” (2000) defines the critical effects of noise on sleep, resting conditions within living spaces and annoyance, and BS8233:2014 also presents guideline noise values for critical residential spaces.

Therefore, in the absence of specific criteria, the propagation of noise from the outdoor sporting facilities has been assessed in accordance with information contained within WHO and BS8233:2014.

As the outdoor sporting activities are not anticipated to take place during night-time hours, defined within TAN 11 as being 23:00-07:00, sleep disturbance due to sporting activity will not occur, therefore levels within bedrooms during the night-time period have not been assessed.

BS8233 defines limits for intrusive external noise within living environments. For daytime hours, indoor ambient noise levels should not exceed 35 dB L_{Aeq} for continuous noise for bedrooms or living rooms (during daytime hours) to allow for appropriate resting conditions. Regarding outdoor spaces, such as gardens and balconies, it is desirable that the steady noise levels do not exceed 50 dB $L_{Aeq,T}$ with an upper limit of 55 dB $L_{Aeq,T}$. BS8233 recognises that these guideline values are not achievable in all circumstances where development may 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 might be warranted. In such a situation the development should not be prohibited, but should be designed to achieve the lowest noise levels practicable in external amenity spaces. These limits are to be used to assess the impacts from the outdoor sporting facilities.

To protect the majority of people from being seriously annoyed during the daytime, WHO guidelines recommend that 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, WHO guidelines recommend that the outdoor sound pressure level should not exceed 50 dB L_{Aeq}.

The BS8233:2014 and WHO guideline limits are to be used to assess the impacts from the outdoor sporting facilities.

Atkins have previously undertaken impact assessments for sporting noise from Multi Use Sporting Areas (MUGAs), and source noise level data collected from the use of two side by side pitches. Source noise levels were undertaken at a distance of approximately 30m from the nearest of the two MUGAs, and these results are presented in Table 4-2 below.

Table 4-2 MUGA Sporting Noise Level Data (Atkins)

MUGA Utilisation	Noise Level (dB) (@30m from nearest MUGA)		
	$L_{Aeq, 15min}$	$L_{A1, 15min}$	$L_{A90, 15min}$
1 pitch	53	61	48
1 pitch	54	63	46
1 pitch	55	64	46
1 pitch	51	59	44
2 pitches	51	59	43
2 pitches	53	62	43
2 pitches	54	62	44
2 pitches	55	64	44
Mean	**53**	**62**	**45**

Table 4-3 below presents estimated MUGA sporting noise levels at varying distances from the pitches, on the basis of the measured noise levels as detailed in Table 4-2 above, and assumes a point source type propagation in the absence of more detailed and specific noise level data for such sporting facilities.

Table 4-3 Estimated MUGA Sporting Noise Level Data with Varying Distance (based on Atkins Source Noise Level Data at 30m)

Distance from Sporting Facilities	Sporting Noise Level		
	$L_{Aeq, 15min}$	$L_{A1, 15min}$	$L_{A90, 15min}$
5	69	78	61
10	63	72	55
15	59	68	51
20	57	66	49
25	55	64	47
30	53	62	45
35	52	61	44
40	51	60	43
45	49	58	41
50	49	58	41
55	48	57	40
60	47	56	39
65	46	55	38
70	46	55	38
75	45	54	37
80	44	53	36
85	44	53	36
90	43	52	35
95	43	52	35
100	43	52	35

Table 4-4 below presents the distances between the proposed Sully outdoor sporting facilities, based on current site layout plans, and the nearest point on the proposed residential site boundary.

Table 4-4 Sully Outdoor Sporting Facilities and Distances to the Residential Site Boundary

Sporting Facility	Approximate Distance to Residential Site Boundary, m
100 x 64m senior football / 89 x 64m rugby pitch	16
100 x 66m senior pitch	90
94 x 66m rugby pitch	16
100 x 66m 3G Fenced and Floodlit pitch	101

On the basis the data presented within Table 4-2, Table 4-3 and Table 4-4 above, it is then possible to undertake an approximate calculation of a worst case scenario which assumes activity on all sporting pitches at any given time.

Assuming concurrent activity on all sporting pitches, the individual noise level from each sports pitch at the nearest point on the residential boundary, and the theoretical construct that is the cumulative noise level of these individual noise levels ('theoretical' because in practice the spatial separation distance to the individual sports pitches would vary for a given point on the residential site boundary, whereas the calculation assumes the nearest point on the residential site boundary), is presented below.

Table 4-5 Sully Outdoor Sporting Facilities Noise Levels at Residential Site Boundary

Sporting Pitch Facility	Approximate Distance to Nearest Point on Residential Site Boundary, m	Sporting Noise Level, $L_{Aeq, 15mins}$, dB
100 x 64m senior football / 89 x 64m rugby pitch	16	59
100 x 66m senior pitch	90	44
94 x 66m rugby pitch	16	59
100 x 66m 3G Fenced and Floodlit pitch	101	43
Cumulative Noise Level at Residential Site Boundary		**62**

Table 4-5 above shows that based upon current site layout plans, that a worst case sporting noise level arising from use of the proposed outdoor sports pitches is expected to be approximately 62dB $L_{Aeq, 15mins}$, with the nearest pitches (the 100 x 64m senior football and the 94m x 66m rugby pitch) having the greatest potential for adverse impact on the amenity of the proposed residential development.

In order to ensure that the TAN 11 category A threshold value of an ambient L_{Aeq} not greater than 55dB is met irrespective of which combination of sports pitches are used at any given time, attenuation in the form of an acoustic barrier should be designed so as to achieve approximately 10dB of attenuation. Such a threshold would also accord with the BS 8233:2014 recommended upper limit for outdoor spaces, and the WHO guideline threshold to protect the majority of people from being seriously annoyed).

The details of the appropriate acoustic mitigation will require careful consideration once the residential site plan is at an appropriately advance stage of design, to ensure any such a proposed barrier was of adequate height and length representative of the final site layout. Such a barrier should be designed so as to achieve approximately 10 dB of attenuation to ensure all target threshold criteria values can be met. Section 6 of this report includes recommendations regarding the specification of acoustic barriers.

4.3. Functions at Club House

Typical use of the club house is expected to be hospitality for members and visiting guests, and may on occasion hold functions or events such as private parties and celebrations, with potential for very occasional live music. The club house may also open for daytime community use such as meetings, activity classes, business events etc.

It is anticipated that typical frequency for such events may be as follows:

- 2-3 daytime community groups/activity sessions per week
- 2-3 private parties or events per month
- Members bar/Clubhouse open daily until 11pm, possibly 1am on Friday and Saturdays (possibly later), and 10.30pm on Sundays

Although no standards exist to place limits on noise from the functions at the club house, care should be taken to ensure that noise from Club House functions and entertainment within the members bar does not adversely impact on the amenity of the nearby residential noise sensitive receptors located approximately 88m to the east of the club house.

The Institute of Acoustics document '*Good Practice Guide on the Control of Noise from Pubs and Clubs*' (2003) provides guidance regarding such situations.

The guidance document states that it is recommended that local authorities and others should devise and apply policies having regard to the guide, and taking into account local circumstances and existing licensing and planning policies.

The aim should be to ensure that:

- For premises where entertainment takes place on a regular basis, music and associated sources should not be audible inside the noise sensitive property at any time. In the absence of objective criteria, what is 'regular' should be determined on a local basis to reflect local expectations and should be incorporated by local authorities in the planning and enforcement policies; and
- For premises where entertainment takes place less frequently, music and associated sources should not be audible inside noise-sensitive property between 23:00 – 07:00. For other time, appropriate criteria need to be developed which balance the rights of those seeking and providing entertainment, with those who may be disturbed by the noise.

The document notes that for the purpose of such appraisal, noise may be considered as not audible or inaudible when it is at a low enough level such that it is not recognizable as emanating from the source in questions, and it does not alter the perception of the ambient noise environment that would prevail in the absence of the source in question.

The document also notes however that the determination of "nuisance" is not within the scope of the guide, although the guide may be useful in forming a view on the likelihood that a "nuisance" has occurred, is occurring, or could occur.

Recommendations to assist in minimizing adverse impact on nearby noise sensitive receptors include:

- The construction of cavity walls, or the addition of sound insulating, independent wall linings to enhance the containment and attenuation of sound.
- The provision of lobbies with automatic door-closers for building entrances and exits. Where possible the distance between the inner and outer doors should be sufficient to ensure that one door set is normally closed as people pass through the lobby. It will also be necessary to ensure that wheelchair access is not hindered.
- The provision of well-sealed acoustic doors on emergency exits
- The provision of mechanical ventilation or air conditioning systems that will enable windows and doors to be kept closed, hence reducing noise breakout.
- The installation of visual or audible alarms to alert staff that doors or windows that should be kept closed, are open. Alternatively a manual checking system may be adopted.
- The control of music noise at source, either by reducing the overall sound level of the music, or by reducing the sound level at individual frequencies which are causing, or have the potential to cause, disturbance.
- The installation of sound level regulatory devices (noise limiters), connected to all permanent music and public address equipment and all available mains power sockets within the area around a stage, performance area, or near to a control desk.
- Alterations to the number, location and mounting of loudspeakers so that internal music levels can be kept as low as possible and the transmission of structure-borne noise is minimized.

Entertainment and function noise emission should then be controlled as part of the licensing agreement, and with the consultation of the local planning authority and local environmental health services.

4.4. Potential Plant Noise from Club House

The proposed club house design layout includes a plant room on the ground floor of the building. This room is located within the building structure, surrounded by other rooms and a corridor, and is not located adjacent to the building facade. No further details regarding plant to be installed at the club house is available at the time of assessment.

Since the specifics of plant to be installed at the club house are yet to be established (plant items, number of plant, noise spectral data of plant etc), plant noise limits can only be set in accordance with the noise levels as measured at the nearby residential noise sensitive receptors. The acceptable level of plant noise will also depend on the hours of operation of the plant. Since it is proposed that the club house will operate into night-time hours, the plant noise limit should be based on typical night-time background noise levels, as per BS4142.

In this case plant to be installed at the club house should be specified as such that the cumulative plant rating noise level from all plant associated with the club house should not exceed 30dB(A) (as measured during night-time period at location C) at the nearest residential properties. Detailed calculations should be undertaken to ensure these conditions are met once the plant to be installed at the clubhouse is confirmed.

4.5. Construction Noise from Sporting Facilities Upgrade

It is understood that the development at the sporting facilities is to be undertaken prior to the proposed residential housing being built, and construction noise from the upgrade to the sporting facilities will therefore not adversely impact upon the proposed residential development at the site. Should variation to this occur then a construction noise impact assessment should be undertaken in accordance with BS5228, as previously described within Section 2 of this report.

4.6. Traffic Noise

Traffic figures associated with the proposed development at Sully Sports and Social are not available at this stage of assessment. Depending on the magnitude of traffic on existing nearby roads, and the magnitude of traffic expected to be generated in association with the proposed development at Sully Sports and Social Club, the noise levels within the vicinity of the development may be subject to variation. It should be noted that in order to experience a perceptible change in noise, an increase of 25% in traffic flow magnitude, or a decrease of 20% in traffic flow magnitude, would result in a 1 dB noise change.

Should detailed existing and proposed traffic figures become available at a later design stage then the potential impact predicted to be experienced may be confirmed in accordance with the CRTN and DMRB methodologies as previously described within Section 2 of this report.

5. Construction Noise Impact Assessment at Nearby Existing Residential Dwellings

Since construction plant and activity data will be confirmed and finalised at a later development stage within the project, assumptions are made herein to permit an indicative construction noise impact assessment to be undertaken for the purpose of the planning application assessment. The plant used for noise impact calculations has been based on previous experience of similar projects, and includes the use of plant items such as excavators, cranes and dump trucks, dozers etc.

Noise levels from the construction works have been calculated allowing for distance attenuation between the works and the relevant nearest noise sensitive receivers (NSR). The levels of construction noise associated with the development will depend on factors such as the actual plant used, the operations being performed, and the condition of the plant. The $L_{Aeq,T}$ noise levels produced from the activities will also depend on the fraction of time the equipment is operated for during the works.

The calculations presented within this report represent a 'worst case' scenario as they:

- Assume that the identified NSR will have a direct view of the works;
- Assume no form of acoustic protection such as screening;
- At each identified NSR, the calculations assume that all plant for each activity is sited at the closest location where that activity could be undertaken.

The calculations assume that various plant items will be running in combination with other plant items, at a given location and at the same time.

The operating 'on–times' of the plant over a particular working period have been estimated on the following basis:

- 100% for activities likely to occur continuously;
- 75% for activities likely to stop and start during their operation but are likely to be operating most of the time;
- 50% for activities likely to stop and start during operation;
- 25% for activities considered to play a minor part in the overall process.

In the absence of defined construction plant itineraries and schedules, empirical data from other projects has been used to provide indicative construction noise levels. The predicted noise level at 10m from the works for typical construction stages, using plant based on similar project experience, is shown in Table 5-1 below.

Table 5-1 Typical Construction Stage Noise Levels at 10m

Construction Stage	Construction Noise Level $L_{Aeq, 1Hour}$ dB(A) at 10m
Soft Ground Excavation/Topsoil Striping	81
Bulk Fill	82
Infra-structure (ground drainage)	77
Road Based Excavation and Fill Works	82
Site Clearance Works	82
Erection of Formwork, Building Construction	77
Hardstanding Construction	80

Table 5-1 above shows that differing construction stages typically result in noise levels ranging from 77 – 82 dB $L_{Aeq,1Hr}$ at 10m. For the purpose of this assessment all calculations will be based on a construction noise level of 82dB $L_{Aeq,1Hr}$ at 10m, to account for a likely worst case scenario.

This assessment assumes all construction activity is to be undertaken during the daytime period (as defined within BS5228).

Inspection of Table 2-8 (BS5228 thresholds) and Tables 3-2 to 3-6 (summary of noise level measurements at all locations), shows that all nearby noise sensitive receptors (NSRs) such as those located on Clevedon Avenue, South Road and Beach Road, would be subject to BS5228 “Category A” threshold values. Therefore all there is a potential for significant effect when the construction noise levels at the existing NSR locations is predicted to exceed 65dB $L_{Aeq,T}$.

Calculations undertaken in accordance with the methodology outlined in BS5228 annex F indicate that in order for the construction activity noise level to exceed 65dB $L_{Aeq,T}$. at a given NSR, construction activity would have to occur within 58m of the NSR (assuming soft ground attenuation). This is demonstrated in Table 5-2 below, which shows that for distances closer than 58m, then the 65dB $L_{Aeq,T}$ threshold value would be exceeded.

Table 5-2 Demonstration of Critical Distance for Exceeding Threshold Value at NSRs

BS5228 Calculation Step	value
Construction Noise Level at 10m, dB $L_{Aeq,1Hr}$	82
Distance to demonstration calculation point, m	58
Distance Attenuation (assuming ground attenuation as per BS5228 annex F eqns F1 and F.2), dB	-17.1
Resulting noise level at calculation point dB $L_{Aeq,1Hr}$	64.9

Construction activity associated with the proposed residential development occurs at distances significantly greater than 58m from the nearby residential receivers on Beach Road, and therefore the potential for a significant effect arising from construction activity associated with the proposed residential development is not expected for NSRs located on Beach Road.

Construction activity associated with the proposed residential development has the potential to present a potential significant effect for noise sensitive receptors within the vicinity of Clevedon Avenue and South Road. This will in part depend on the precise location of the construction activity within the proposed residential development area at any given time. In order to minimize the potential for significant effect, and in order to minimize the magnitude of construction activity noise experienced at the nearby NSRs, mitigation measures and best practicable means should be utilized at all times (as described in section 6 of this report).

Table 5-3 below presents calculations demonstrating that if the construction noise level of 82dB $L_{Aeq,1Hr}$ at 10m were to be reduced by 10dB to 72dB $L_{Aeq,1Hr}$ at 10m, (potentially achieved through mitigation measures such as an appropriately sized noise barrier(s) – see section 6 of this report) then the critical distance within which a potential significant effect would be predicted to occur would be reduced to 23m.

Table 5-3 Demonstration of reduction in Critical Distance for Exceeding Threshold Value at NSRs through use of Mitigation Measures

BS5228 Calculation Step	value
Construction Noise Level at 10m, dB $L_{Aeq,1Hr}$	82
Attenuation due to noise barrier/mitigation measures/full screening, dB	-10
Construction Noise Level at 10m after mitigation measure, dB $L_{Aeq,1Hr}$	72
Distance to demonstration calculation point, m	23
Distance Attenuation (assuming ground attenuation as per BS5228 annex F eqns F1 and F.2), dB	7.2
Resulting noise level at calculation point dB $L_{Aeq,1Hr}$	64.8

Table 5-3 above shows that provided adequate mitigation measures and best practice techniques are employed (see section 6 of this report), then the potential for significant construction activity noise effects at properties in the vicinity of Clevedon Avenue and South Road should be avoidable for all but the very nearest of construction activity locations within the proposed residential development area.

More detailed construction activity calculations may be undertaken once a schedule of construction plant and activities is available and a program of works is prepared. This would permit a more in depth assessment of the likely magnitude and duration of the potential significant effects, and could be used to inform the preparation of a section 61 notice by the contractor if necessary.

6. Mitigation, Best Practice Measures and Recommendations

6.1. Acoustic Screening for Mitigating Sporting Noise and Construction Noise

Where impacts are predicted at noise sensitive receivers mitigation should be considered. Depending on the proximity of noise sensitive receivers to the site it is possible that mitigation could be achieved by the use of effective temporary acoustic screening. Use of acoustic screening could provide approximately 5 - 10dB(A) attenuation depending on the proximity of the noise sensitive receivers.

BS5228 gives the following advice about temporary acoustic screens (BS5228 Part 1, 2009, Section B4) for mitigating construction noise impacts. The advice contained therein is equally applicable to any proposed permanent acoustic barriers for mitigation associated with sporting noise from the sports pitches:

> "B.4 Acoustic screens
>
> Care is needed in the design, siting and construction of a barrier for screening purposes if it is to be effective. It should be noted also that a barrier may, by reflecting sound, simply transfer a problem from one receiving position to another. On level sites, for maximum effectiveness, a barrier should be brought as close as possible to either the noise source or the receiving positions. In addition, there should be no gaps or openings at joints in the barrier material.
>
> In design it may be necessary for sound transmitted both through and around the barrier to be considered. However, in most practical situations the overall attenuation will be limited by transmission over and around the barrier, provided that the barrier material has a mass per unit of surface area in excess of about 7 kg/m^2 and there are no gaps at the joints. When equipment is to be screened for many months, sand bags can be useful as they are durable, easy to erect and easy to remove. Ordinary building materials normally stored on site (e.g. bricks, aggregate, timber or top soil) can, if carefully sited, provide noise screening without additional cost. Plywood sheets can be fixed to a scaffold support frame and if constructed in sections provide a portable barrier.
>
> Some sound will pass round the ends of short straight barriers. As a rough guide, the length of a barrier should be at least five times greater than its height. A shorter barrier should be bent round the noise source. The minimum height of barriers should be such that no part of the noise source will be visible from the receiving point."

Any temporary acoustic screens should be fabricated out of impervious boards which have a surface mass of not less than 7 kg/m^2 minimum. A 15mm plywood would meet this requirement.

All screens should extend to a height so that the "line of sight" between noise source and receiver is fully obstructed, but should be of at least 2m.

Subject to safety and access considerations, all screens should be positioned as close to the works as possible. The contractor should ensure that the screen obstructs the direct line of sight between the works and the nearest properties.

Subject to safety considerations, the screens may be mounted on wheels to facilitate on-site relocation. Any gaps between the ground and the bottom of the panel should be less than 100mm.

6.2. Construction Works - Current Legislation

Construction works will be of a relatively limited duration and the potential of any nuisance caused should be minimised by the application of Best Practicable Means (BPM) in working practices, as defined in section 72 of the Control of Pollution Act 1974 (COPA) or Part III of the Environmental Protection Act1990 and BS 5228-1:2009.

Additionally, the contractor's attention should be drawn to Sections 60 and 61 of COPA: Section 60 empowers local authorities to impose conditions on noise levels, methods of working (including machinery to be used) and permissible working hours for construction operations. Section 61 of the Act allows contractors or other responsible persons to apply for consent to local authorities for construction works. Within this application they must detail hours of operation, methods of working and the plant and equipment that will be used to undertake the works. The local authority may grant such a Section 61 application with or without conditions. Any agreement formed would then become binding on both parties.

6.3. Construction Works – Further Recommendations

The impact of the construction works would usually be discussed with the Local Authority before commencement of the project. The Local Authority may require detailed construction noise level predictions once final selection of plant, equipment, processes and dates has been made. These predictions may then be used to agree a set of noise criteria for the project, which could either be set against absolute noise level limits, increases above existing noise levels, or a combination of both.

It is recommended that a construction method statement be prepared for agreement with the Local Authority Environmental Health Department. This should provide an indication of the methods to be employed to minimise the noise impact of the operations, and show that the assessment of that impact is ongoing through the construction process.

The method statement should indicate the range of plant and equipment to be used in construction, together with the phasing of the works and the monitoring methodology and frequency to be employed to ensure that the impact of the works is being minimised as far as is reasonably practicable.

An important element of the proactive approach to limiting the potential impact of such works is to ensure that the public are kept fully informed over the scale and nature of the works, when they are to take place, and who to contact if they are disturbed. It is therefore suggested that a letter be sent to all the potentially affected residents to ensure that they know of the construction works and why they are required.

6.4. General Advice on Best Practicable Means for Construction Works

The noise impact of construction activities can be minimised by the use of noise control measures, as suggested by BS5228. General principles for the control of noise and vibration during the construction works could include:

- The use of Best Practicable Means during construction works.
- Switching off plant, equipment and vehicles when they are not in use.
- Establishment of agreed site working hours for "normal" construction activities.
- Establishment of agreed criteria whilst undertaking significantly noisy or vibration-causing operations near to sensitive locations.

- Programming works such that the requirement for working outside of normal working hours is minimised.
- Ensuring that all staff and operatives are briefed on the requirement to minimise nuisance from site activities.
- Use of temporary noise screens or partial enclosures around particularly noisy activities, for example pneumatic breakers used in close proximity to dwellings.
- Use of silenced compressors, generators and fans at site locations.
- Regular plant maintenance.

6.5. General Advice on Best Practicable Means for General Operation

The noise impact of plant and activities arising from the general operation of the site can be minimised by the use of best practical means. General principles for the control of noise could include:

- Selection of quiet plant and equipment where appropriate.
- Use of silenced compressors, generators and fans at site locations where appropriate.
- Switching off plant and equipment when they are not in use.
- Regular plant maintenance.
- Ensuring that all staff and operatives are briefed on the requirement to minimise nuisance from site activities.
- Advice regarding minimising the potential for impact from functions held at the club house in accordance with that described within Section 4.3 of this report.

7. Conclusions

7.1. Planning Permission Considerations

The majority of the area proposed for residential development is predicted to fall within TAN 11 category 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 desirable*" with the exception of the northern extent of the site, nearest South Road, which is predicted to fall within TAN 11 category B "*Noise should be taken into account when determining planning applications and, where appropriate, conditions imposed to ensure an adequate level of protection*".

It is likely that this category B classification would be applicable to the front row of housing, which is directly exposed to road traffic noise from South Road; whereas housing further back would benefit from screening by this front row of housing. Such screening could be reasonably assumed to achieve approximately 10 dB of attenuation, thus it is expected that subsequent rows of housing would be deemed to be TAN 11 category 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 desirable*".

Depending on the exact internal layout of the proposed residential developments, and also the location of any proposed external spaces, acoustic mitigation may be required to ensure all guideline values are met at the northern extent of the site. This is discussed in detail in section 4.1 of this report.

7.2. Sporting Noise

Calculations based upon current site layout plans indicate that a worst case sporting noise level arising from use of the proposed outdoor sports pitches is expected to be approximately 62dB $L_{Aeq, 15mins}$, with the nearest pitches (the 100 x 64m senior football and the 94m x 66m rugby pitch) having the greatest potential for adverse impact on the amenity of the proposed residential development.

Appropriate acoustic mitigation would enable the upper limits of TAN 11 category A, and WHO and BS 8233:2014 daytime outdoor threshold values to be met.

The details of the appropriate acoustic mitigation will require careful consideration once the residential site plan is at an appropriately advance stage of design, to ensure any such a proposed barrier was of adequate height and length representative of the final site layout. Such a barrier should be designed so as to achieve approximately 10 dB of attenuation to ensure all target threshold criteria values can be met. This is discussed in detail in section 4.2 of this report. Section 6 of this report includes recommendations regarding the specification of acoustic barriers.

7.3. Club House Noise

Functions held at the club house have the potential to impact on the amenity of the proposed nearby residential receivers. Entertainment and function noise emission should be controlled as part of the licensing agreement, and with the consultation of the local planning authority and local environmental health services. Details of how such impacts may be minimized are in detail in section 4.3 of this report.

Plant to be installed at the club house should be specified as such that the cumulative plant rating noise level from all plant associated with the club house should not exceed 30.4dB (as measured during night-time period at location C) at the nearest residential properties. Detailed calculations should be undertaken to ensure these conditions are met once the plant to be installed at the clubhouse is confirmed.

7.4. Construction Noise

It is understood that the development at the sporting facilities is to be undertaken prior to the proposed residential housing being built, and construction noise from the upgrade to the sporting facilities will therefore

not adversely impact upon the proposed residential development at the site. Should variation to this occur then a construction noise impact assessment should be undertaken in accordance with BS5228, as previously described within Section 2 of this report.

In the absence of acoustic mitigation, then the potential significant effect arising from construction activity associated with the proposed residential development occurs at distances less than 58m, and the potential for significant effect exists at existing noise sensitive receptors within the vicinity of Clevedon Avenue and South Road, whilst the potential for a significant effect arising from construction activity associated with the proposed residential development is not expected for noise sensitive receptors located on Beach Road.

Such potential for significant effect will in part depend on the precise location of the construction activity within the proposed residential development area at any given time.

Calculations demonstrating that if the construction noise level were to be reduced by 10dB, (potentially achieved through mitigation measures such as an appropriately sized noise barrier(s) – see section 6 of this report) then the critical distance within which a potential significant effect would be predicted to occur would be reduced to 23m.

In this case, provided adequate mitigation measures and best practice techniques are employed (see section 6 of this report), then the potential for significant construction activity noise effects at properties in the vicinity of Clevedon Avenue and South Road should be avoidable for all but the very nearest of construction activity locations within the proposed residential development area.

More detailed construction activity calculations may be undertaken once a schedule of construction plant and activities is available and a program of works is prepared. This would permit a more in depth assessment of the likely magnitude and duration of the potential significant effects, and could be used to inform the preparation of a section 61 notice by the contractor if necessary.

Appendices

Appendix A. Logging Sound Level Meter (Location C) - Noise Level Measurements

A.1. Logging Sound Level Meter Measurements

Date and Time	L_{eq}, dB(A)	L_{10}, dB(A)	L_{90}, dB(A)	L_{Max}, dB(A)	TAN 11, BS8233, BS4142 and WHO Measurement Period Classification	BS5228 Measurement Period Classification
19/03/2015 11:45	49.9	50.9	45.2	80.6	Day	Day
19/03/2015 12:00	48.8	51.4	44.9	61.7	Day	Day
19/03/2015 12:15	49.6	52.2	45.4	64.9	Day	Day
19/03/2015 12:30	50.2	52.4	44.7	68.3	Day	Day
19/03/2015 12:45	48.7	51.1	44.1	63.3	Day	Day
19/03/2015 13:00	52.0	53.4	42.5	69.0	Day	Day
19/03/2015 13:15	46.8	49.3	43.1	59.3	Day	Day
19/03/2015 13:30	56.3	52.5	43.2	76.7	Day	Day
19/03/2015 13:45	47.2	49.9	43.0	64.6	Day	Day
19/03/2015 14:00	45.8	48.3	42.4	55.0	Day	Day
19/03/2015 14:15	47.4	49.9	42.7	59.9	Day	Day
19/03/2015 14:30	44.4	46.6	41.1	52.9	Day	Day
19/03/2015 14:45	47.4	50.1	42.5	62.2	Day	Day
19/03/2015 15:00	47.7	50.4	42.6	63.1	Day	Day
19/03/2015 15:15	48.0	50.1	42.7	64.3	Day	Day
19/03/2015 15:30	51.7	54.9	44.3	67.5	Day	Day
19/03/2015 15:45	48.5	52.1	40.8	66.1	Day	Day
19/03/2015 16:00	50.8	53.2	42.9	70.3	Day	Day
19/03/2015 16:15	52.4	55.3	45.6	71.2	Day	Day
19/03/2015 16:30	52.9	54.6	46.5	72.4	Day	Day
19/03/2015 16:45	50.3	52.3	44.8	72.7	Day	Day
19/03/2015 17:00	52.1	55.0	45.9	68.3	Day	Day
19/03/2015 17:15	52.0	53.3	46.5	81.2	Day	Day
19/03/2015 17:30	50.4	52.3	47.0	67.2	Day	Day
19/03/2015 17:45	50.8	53.2	47.1	66.6	Day	Day
19/03/2015 18:00	52.3	54.7	48.1	70.3	Day	Day
19/03/2015 18:15	52.6	54.9	48.0	68.5	Day	Day
19/03/2015 18:30	53.9	54.9	46.2	73.7	Day	Day
19/03/2015 18:45	49.2	51.8	45.2	62.2	Day	Day
19/03/2015 19:00	48.3	50.6	44.7	61.6	Day	Evening
19/03/2015 19:15	48.8	51.3	43.9	62.7	Day	Evening
19/03/2015 19:30	48.4	50.1	44.2	62.4	Day	Evening
19/03/2015 19:45	46.2	48.8	42.5	58.7	Day	Evening
19/03/2015 20:00	47.4	50.5	42.7	61.1	Day	Evening
19/03/2015 20:15	47.0	49.8	42.7	60.4	Day	Evening
19/03/2015 20:30	46.0	48.7	39.7	65.3	Day	Evening
19/03/2015 20:45	46.9	49.9	41.3	61.5	Day	Evening

19/03/2015 21:00	45.8	49.0	39.2	60.0	Day	Evening
19/03/2015 21:15	45.8	48.6	39.9	61.7	Day	Evening
19/03/2015 21:30	42.4	45.5	34.7	54.5	Day	Evening
19/03/2015 21:45	43.1	46.6	36.0	54.0	Day	Evening
19/03/2015 22:00	45.6	48.7	34.2	60.6	Day	Evening
19/03/2015 22:15	43.5	46.9	34.7	57.7	Day	Evening
19/03/2015 22:30	41.5	44.9	33.3	55.6	Day	Evening
19/03/2015 22:45	40.5	44.2	32.3	53.2	Day	Evening
19/03/2015 23:00	40.7	44.5	32.1	53.2	Night	Night
19/03/2015 23:15	40.4	43.7	32.9	54.1	Night	Night
19/03/2015 23:30	40.5	43.6	27.9	55.7	Night	Night
19/03/2015 23:45	40.1	44.0	28.6	53.4	Night	Night
20/03/2015 00:00	39.1	43.0	28.4	55.2	Night	Night
20/03/2015 00:15	39.8	44.2	25.5	54.5	Night	Night
20/03/2015 00:30	34.0	37.5	26.1	50.1	Night	Night
20/03/2015 00:45	33.1	36.8	24.5	49.7	Night	Night
20/03/2015 01:00	31.7	30.0	26.5	48.6	Night	Night
20/03/2015 01:15	33.6	35.9	28.0	48.1	Night	Night
20/03/2015 01:30	34.1	35.2	25.6	52.0	Night	Night
20/03/2015 01:45	37.2	40.2	26.0	55.7	Night	Night
20/03/2015 02:00	31.6	34.0	26.8	45.5	Night	Night
20/03/2015 02:15	32.3	31.3	25.7	51.9	Night	Night
20/03/2015 02:30	33.7	35.5	27.0	51.2	Night	Night
20/03/2015 02:45	32.3	31.3	27.0	51.5	Night	Night
20/03/2015 03:00	33.0	36.6	26.7	48.1	Night	Night
20/03/2015 03:15	33.0	36.1	27.9	47.0	Night	Night
20/03/2015 03:30	29.2	30.9	26.5	44.3	Night	Night
20/03/2015 03:45	30.8	32.0	26.4	45.9	Night	Night
20/03/2015 04:00	33.4	36.5	27.1	50.8	Night	Night
20/03/2015 04:15	36.9	40.1	28.4	53.6	Night	Night
20/03/2015 04:30	38.8	41.9	31.4	53.0	Night	Night
20/03/2015 04:45	36.5	39.3	31.0	50.6	Night	Night
20/03/2015 05:00	39.3	43.0	32.5	52.2	Night	Night
20/03/2015 05:15	40.6	44.1	33.5	53.1	Night	Night
20/03/2015 05:30	42.8	45.6	39.0	51.2	Night	Night
20/03/2015 05:45	49.2	51.4	41.3	70.9	Night	Night
20/03/2015 06:00	47.7	49.0	38.1	77.2	Night	Night
20/03/2015 06:15	44.0	46.5	39.1	65.9	Night	Night
20/03/2015 06:30	47.1	48.9	41.1	71.9	Night	Night
20/03/2015 06:45	46.8	49.3	43.1	56.3	Night	Night
20/03/2015 07:00	47.7	49.9	44.3	64.7	Day	Day
20/03/2015 07:15	47.3	49.5	44.6	60.9	Day	Day
20/03/2015 07:30	46.8	48.7	44.4	54.2	Day	Day
20/03/2015 07:45	46.5	48.4	44.1	53.4	Day	Day
20/03/2015 08:00	46.7	48.7	43.6	54.8	Day	Day
20/03/2015 08:15	46.3	48.3	43.2	54.8	Day	Day
20/03/2015 08:30	46.8	49.4	42.7	56.2	Day	Day
20/03/2015 08:45	46.7	49.3	42.6	56.2	Day	Day
20/03/2015 09:00	55.0	51.9	42.5	72.2	Day	Day
20/03/2015 09:15	45.2	47.7	41.9	53.9	Day	Day
20/03/2015 09:30	44.0	46.0	40.7	55.3	Day	Day
20/03/2015 09:45	44.9	47.0	41.7	54.9	Day	Day

20/03/2015 10:00	43.7	46.3	39.7	55.9	Day	Day
20/03/2015 10:15	42.2	44.3	39.4	49.6	Day	Day
20/03/2015 10:30	40.8	43.2	37.4	50.0	Day	Day
20/03/2015 10:45	46.3	44.3	38.9	77.5	Day	Day

Atkins
The Axis
10 Holliday Street
Birmingham
B1 1TF