Planning Noise Assessment Report

Temple Park

South Shields

HRS Services Ltd.

HRS Ref: 126930 – AC – 1v2

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I. Revision History

Revision	Description	Date	Approved
1v2	First Issue	28.09.2017	TC
1v2	Updated site layout	24.10.2017	TC

II. Executive Summary

HRS has been appointed by Tolent Living Ltd (the Client), to undertake a baseline noise survey of the existing vacant site, in support of an application for Development.

The proposals are for the construction of a new sports club, incorporating a new club house and bar with external terraces, internal sports areas (squash courts etc) with changing rooms, external sports pitches for uses such as rugby, tennis and cricket, with associated parking and landscaping. A tea room and function room will also be included.

Noise levels at and around the Site have been measured over a 24 hour period to inform the review of potential noise impacts. The prevailing noise climate was found to be dominated by road traffic noise from the surrounding road network, with contributions from human activities and local wildlife (predominantly seagulls).

Typical operational noise impact considerations for management of the club house have been identified to help minimise the risk of adverse impact on the neighbouring area. Such measures, which are designed to control noise breakout from the clubhouse bar would be expected to reduce noise levels from the bar such that the potential impact at nearby sensitive receptors would be insignificant.

HRS has proposed building services noise limits at identified noise sensitive receptors (NSRs) most exposed to the proposed scheme in order to achieve a low noise impact in line with BS 4142:2014 *'Methods for rating and assessing industrial and commercial sound*'. These are considered to be applicable at the nearest identified dwellings on Whistler Gardens during both daytime and night time periods.

Noise from external sports activities is considered not to have a significant noise impact when considered in comparison to the prevailing noise climate, having regard to the existing sports activity uses.

In summary, the Development is not expected to result in significant adverse noise effects at the nearest noise sensitive receptors surrounding the development.

III. Contents

1. Introduction

1.1 HRS has been appointed by Tolent Living Ltd (the Client), to undertake a baseline noise survey of the existing vacant site, in support of an application for Development.

1.2 The proposals are for the construction of a new sports club, incorporating a new club house and bar with external terraces, internal sports areas (squash courts etc) with changing rooms, external sports pitches for uses such as rugby, tennis and cricket, with associated parking and landscaping. A tea room and function room will also be included. A proposed Site Layout plan is included as Appendix II.

1.3 This report shall consider noise impact from the proposed development upon the local area and adjacent residential dwellings, and also propose suitable noise limits for new sources of building services plant associated with the scheme.

1.4 This document has been prepared for the sole use, benefit and information of the Client for the purposes set out, or instructions commissioning the works. The liability of HRS in respect of the information contained herein will not extend to any third party.

1.5 This report is limited to addressing the specific issues described and is based on information and drawings provided. Whilst every effort has been made to ensure that this report is easy to understand, it is technical in nature; to provide assistance, a glossary of terminology is included in Appendix I.

2. Relevant Acoustic Standards

Planning Guidance

National Planning Policy Framework

2.1 The current planning guidance for the assessment of the potential environmental noise impact is outlined in the National Planning Policy Framework (NPPF). Whilst the NPPF does not set criteria that must be achieved, the NPPF states the following in relation to the appropriate control of potential noise impacts (paragraph 109)

2.2 *"The planning system should contribute to and enhance the natural and local environment by preventing both new and existing development from contributing to or being put at unacceptable risk from, or being adversely affected by unacceptable levels of soil, air, water or noise pollution or land instability…"*

2.3 Therefore the policy requires that new developments are not affected to an unacceptable degree by environmental noise.

Noise Policy Statement for England

2.4 The Noise Policy Statement for England (NPSE) provides further guidance on the Government's policy with regard to the potential impacts of noise. The NPSE states the aims of Government policy relating to noise are:

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

- *avoid significant adverse impacts on health and quality of life;*
- *mitigate and minimise adverse impacts on health and quality of life; and*
- *where possible, contribute to the improvement of health and quality of life"*

IEMA Guidelines for Environmental Noise Assessment, 2014

2.5 The IEMA Guidelines for Environmental Noise Assessment[1] addresses the key principles of assessing noise effects and are applicable to all development proposals where noise effects may occur.

2.6 The guidance provides advice with regards to the collection of baseline noise data, prediction of noise levels and how noise should be assessed. The guidance recognises that the effect associated with a particular noise source will be dependent on a number of factors including but not limited to the sensitivity of the receptor, frequency and duration of the noise source and time of day. However, it stops short of providing specific assessment criteria which developments should achieve but instead

[1] Institute of Environmental Management & Assessment (2014): Guidelines for Environmental Noise Impact Assessment, IEMA

suggests that the methodology adopted should be selected on a site by site basis with reference to relevant national and local standards.

2.7 The guidelines do provide guidance on assessing the impact due to a change in environmental noise level, as outlined in Table 1.

Table 1: Change in prevailing noise level impacts

Noise Change (dB)	Impact Category
0	No Impact
0 – 3	Slight Impact
3 – 5	Moderate Impact
5 – 10	Substantial Impact
>10	Severe Impact

British Standard 4142: 2014 'Methods for Rating and Assessing Industrial and Commercial Sound'

2.8 Guidance in determining the significance of sound of an industrial and/or commercial nature on residential receptors is provided in BS 4142: 2014[2] '*Methods for rating and assessing industrial and commercial sound*'. BS 4142 describes a method for assessing the likelihood of complaints from noise sources that are of an industrial nature (e.g. fixed plant such as chillers or AHUs, or mobile plant such as fork lifts.).

2.9 The assessment methodology is based upon determining a 'rating level' for the equipment being assessed, which is the level of noise from the item or items of plant being assessed (measured as an L_{Aeq}) corrected for background noise levels where necessary. The rating level is then compared with the underlying background noise level (measured as an L_{A90}) in the absence of noise from the item or items of plant being assessed.

- *A difference of around +10 dB or more is likely to be an indication of a significant adverse impact, depending on the context.*
- *A difference of around +5 dB is likely to be an indication of an adverse impact, depending on the context.*
- *The lower the rating level is relative to the measured background sound level, the less likely it is that the specific sound source will have an adverse impact or a significant adverse impact. Where the rating level does not exceed the background. Sound level, depending on context, this is an indication of the specific sound source having a low impact.*

2 British Standards Institute (2014): 'Methods for rating and assessing industrial and commercial sound', (BSI).

- *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.*

2.10 BS 4142 states that a penalty should be added for any plant which gives rise to noise features that may increase disturbance such as tonal, impulsive or intermittent characteristics. With respect to the acoustic feature correction, BS 4142 states:

"*Certain acoustic features can increase the significance of impact over that expected from a basic comparison between the specific sound level and the background sound level. Where such features are present at the assessment location, add a character correction to the specific sound level to obtain the rating level.*"

2.11 BS 4142 also notes that in instances where more than one acoustic character is present, the individual corrections should be summed. BS 4142 has been used in assessing the significance of sound from the proposed Development.

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

2.12 BS 8233:2014 provides guidance for the control of noise in and around buildings. The guidelines recommend internal ambient noise criteria for a range of spaces.

2.13 In consideration of external amenity spaces such as gardens balconies and terraces, the guidance provided in BS 8233 states:

"For traditional external areas that are used for amenity space, such as gardens or patios it is desirable that the external noise level does not exceed 50 dB $L_{Aeq,T}$, with an upper guideline value of 55 dB $L_{Aeq,T}$ which would be acceptable in noisier environments. However, it is also recognised 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".

3. Baseline Noise Survey

3.1 An ambient noise survey has been undertaken at various locations around the Site to assess prevailing noise levels to inform the appropriate design advice. The monitoring scheme comprised of long term monitoring at approximately 1.5m above ground level. The long term monitoring has been supplemented with a series of short term attended measurements taken on and around the proposed development Site. Long term noise measurements included an audio recording function to allow for the identification of noise sources. Long term monitoring was undertaken continuously between Sunday 17th of September and Monday 18th September, with short term measurements undertaken concurrently on the 17th September.

3.2 All short term measurements were undertaken at 1.5m above ground level, in free field conditions (except where otherwise noted) using Class 1 sound level meters. Weather conditions throughout the attended monitoring periods were predominantly fine and dry, with wind speeds of <5ms^{-1}. Periods of rain are excluded from the calculated noise levels from the long term measurement positions (heavy showers between 15:00-17:00).

3.3 Figure 1 below illustrates the approximate site location and measurement positions, as well as the location of identified noise sensitive receptors (NSRs). The NSR locations are based on observations made during the site visits, and represent those most likely to be affected by noise from the Development.

3.4 Table 2 presents the identified noise sensitive receptors, along with approximate distances from the Site boundary indicated in Figure 1.

3.5 Existing sports pitches were noted to be present at the western extent of the proposed Development Site, where one full size and one 9-A Side football pitches were observed. A 9-A Side pitch was also noted within the grounds of the adjacent Temple Park Junior School. Although this school appears to be disused, the pitches were recently mowed indicating that they are in use although it is not clear if this is during school hours only.

3.6 Rugby pitches were observed to be in use at the western extent of the Site during the afternoon of the 18th of September, with up to 13 junior players training.

3.7 During the attended short term measurements, as well as during the commissioning of the long term noise monitoring, the prevailing noise levels across the Site were found to be predominantly influenced by local and distant road traffic noise and birdsong (seagulls and crows in particular), with occasional contributions from human activities.

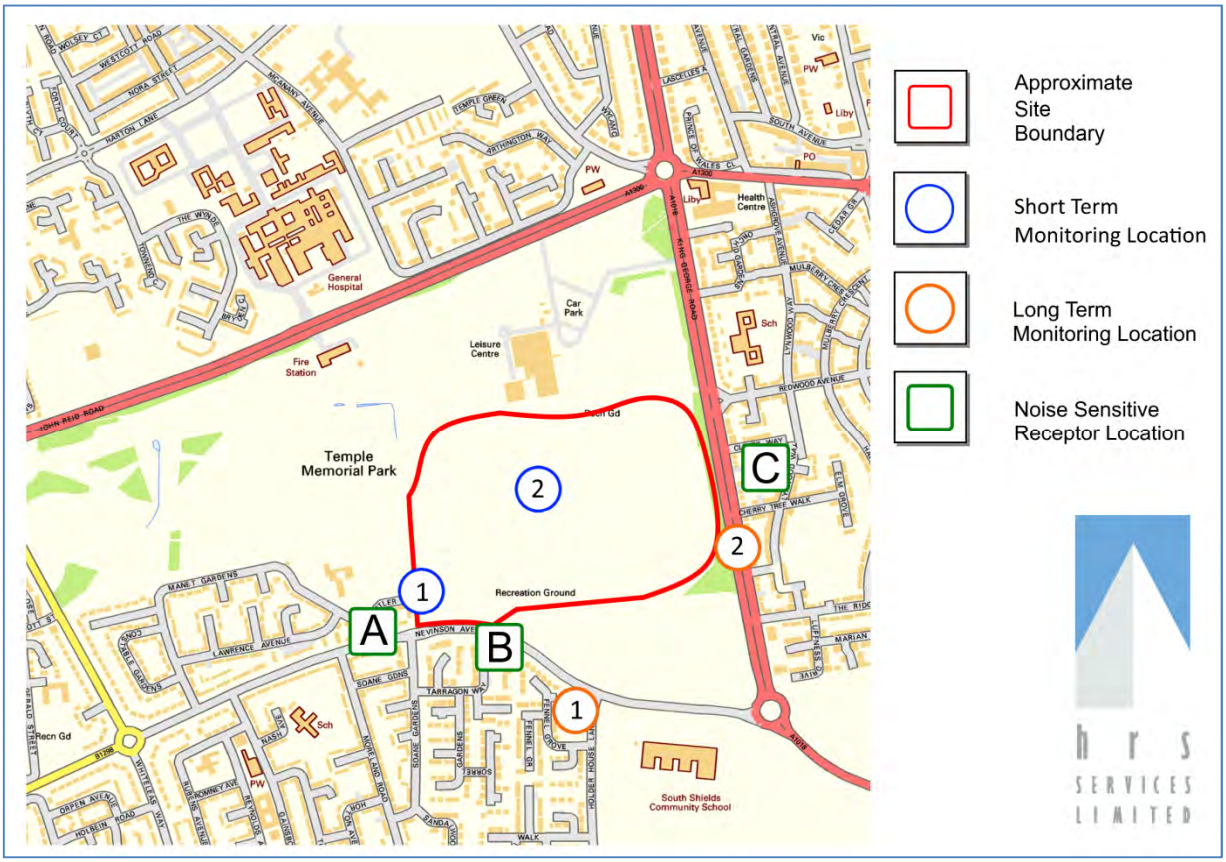


Figure 1: Site layout plan indicating noise monitoring and sensitive receptor locations

Table 2: Identified Noise Sensitive Receptors

NSR	Description	*Distance from Site Boundary*
A	Single storey dwellings at Whistler Gardens	18m west
B	Dwellings along Nevinson Avenue	35m south
C	Dwellings fronting on to King George Road	60m east

3.8 Table 3 presents a summary of the measured noise levels, with time history graphs for the long term positions presented as Appendix III. Full details of the noise survey methodology and data are available on request.

Table 3: Summary of short term noise measurements

Position	Period	$L_{Aeq,T}$[1]	$L_{Af,max}$[2]	$L_{A10,T}$[3]	$L_{A90,T}$[3]
Long Term 1	07:00 to 23:00	56	74	58	45
	23:00 to 07:00	47	68	44	36
Long Term 2	07:15 to 23:00	68	84	73	51
	23:00 to 07:00	59	82	55	36
Short Term 1	07:35 to 10:00	44	66	46	41
	20:00 to 22:00	43	69	44	40

Notes:
[1] Logarithmic average presented
[2] Maximum value for period stated
[3] Arithmetic average reported

3.9 Table 4 presents a summary of the average measured noise levels at short term position 2, whilst one of the existing rugby pitches was in use for junior rugby training. Measurements were recorded at approximately 30m with 13 players and three coaching staff. Measurements were logged at 1 minute intervals over approximately half an hour of training.

Table 4: Measured activity noise levels at ST 2

Position	Period	$L_{Aeq,T}$[1]	$L_{Af,max}$[2]	$L_{A10,T}$[3]	$L_{A90,T}$[3]
Short Term 2	11:05 to 11:38	49	71	49	44
	Range (1min)	45 to 59	48 to 71	45 to 63	43 to 47

Notes:
[1] Logarithmic average presented
[2] Maximum value for period stated
[3] Arithmetic average reported

3.10 A comparison of the measured concurrent noise levels at Long term measurement location 1 (LT1) to the short term measurements at Short Term position 1 (ST1) indicates that prevailing noise levels are on average approximately 9 dB $L_{Aeq,15min}$ lower at the short term position. Background noise levels were typically 2 to 4 dB $L_{A90,15min}$ lower than those measured at LT1.

3.11 The highest noise levels were measured at LT 2, where several emergency vehicle sirens were noted during the measured period. At this location, local road traffic flows are higher, with a commensurate increase in prevailing noise levels.

4. Noise Impact Assessment

4.1 Operational noise impacts from the proposed clubhouse would largely be divided between noise from the use of the club house, bar and function room, and that which would arise as a result of external sports activities. It is understood that the operational times of the proposed clubhouse would be 07:00 to 23:00 Monday to Sunday. Floodlighting is proposed for the First XV rugby pitch and tennis courts, so it is possible that these areas may be in use during the late evening periods.

Club House Noise Impact

4.2 An assessment of potential noise breakout from the bar area and the external terraces has been undertaken using a Cadna-A noise model. The Cadna-A noise model has been developed based on ordnance survey mapping and from drawings supplied by the client (drawing ref: 17-006 (ST)SK02 K). Local topographical features which are present on the existing site have not been incorporated into the model, as at this stage in the development it is not clear if these will be retained in situ or modified in any way. As such, the model is based on propagation across flat ground, which is considered the worst case scenario. Should the existing earth bunds be retained, it is likely that noise levels at receptors B and C would reduce slightly.

4.3 Breakout noise from doors opening out on to the terraces from the bar area have been modelled based on an internal noise level of up to 85 dB $L_{Aeq,T}$ which is typical of a venue providing amplified music. In addition, up to twenty point sources representing adult speech have been modelled across the first floor external terraces, equally divided between normal and loud voices. Point sources are modelled at a height of 1.5m above the first floor terraces.

4.4 Typical noise levels for a human voice used in the Cadna-A model are derived from '*ANSI 3.5-1997 American National Standard – Methods for Calculation of the Speech Intelligibility Index (1997)*', summarised in Table 5 below.

Table 5: ANSI 3.5-1997 sound power level for one speaker

	Octave Band Sound Power Level Hz, dB								dB(A)
	63Hz	125Hz	250Hz	500Hz	1kHz	2kHz	4kHz	8kHz	
Normal voice	45.0	55.0	65.3	69.0	63.0	55.8	49.8	44.5	68.4
Loud voice	52.0	63.0	72.1	79.6	80.2	72.9	65.9	54.8	82.6

4.5 Assessment of the predicted noise level resulting from club house use has been made against the measured ambient noise levels during the Sunday evening (19:00-23:00) period, which is considered the most sensitive evening period due to generally lower traffic flows on the surrounding roads and the commensurate reduction in ambient noise levels at all receptors.

4.6 The assessment of the potential noise impacts has been made by determining the potential change in prevailing noise level at each NSR against the noise level in the absence of the noise for the evening period.

4.7 The results of the assessment are presented as Table 6 below. A Cadna-A noise contour plot illustrating the propagation of noise across the Site is presented as Figure 2.

Table 6: Assessment of club house noise

NSR	Prevailing Noise Level (dB $L_{Aeq,T}$)	Predicted Club Noise Level (dB $L_{Aeq,T}$)	Cumulative Noise Level (dB $L_{Aeq,T}$)	Change in prevailing Noise Level (dB $L_{Aeq,T}$)	Predicted Noise Impact
A[1]	43	37	44	+1	Slight Impact
B	53	41	53	0	No Impact
C	64	32	64	0	No Impact

Note:

[1] Presented prevailing noise level at NSR A is the average for the period 20:00 to 22:00, measured at ST1

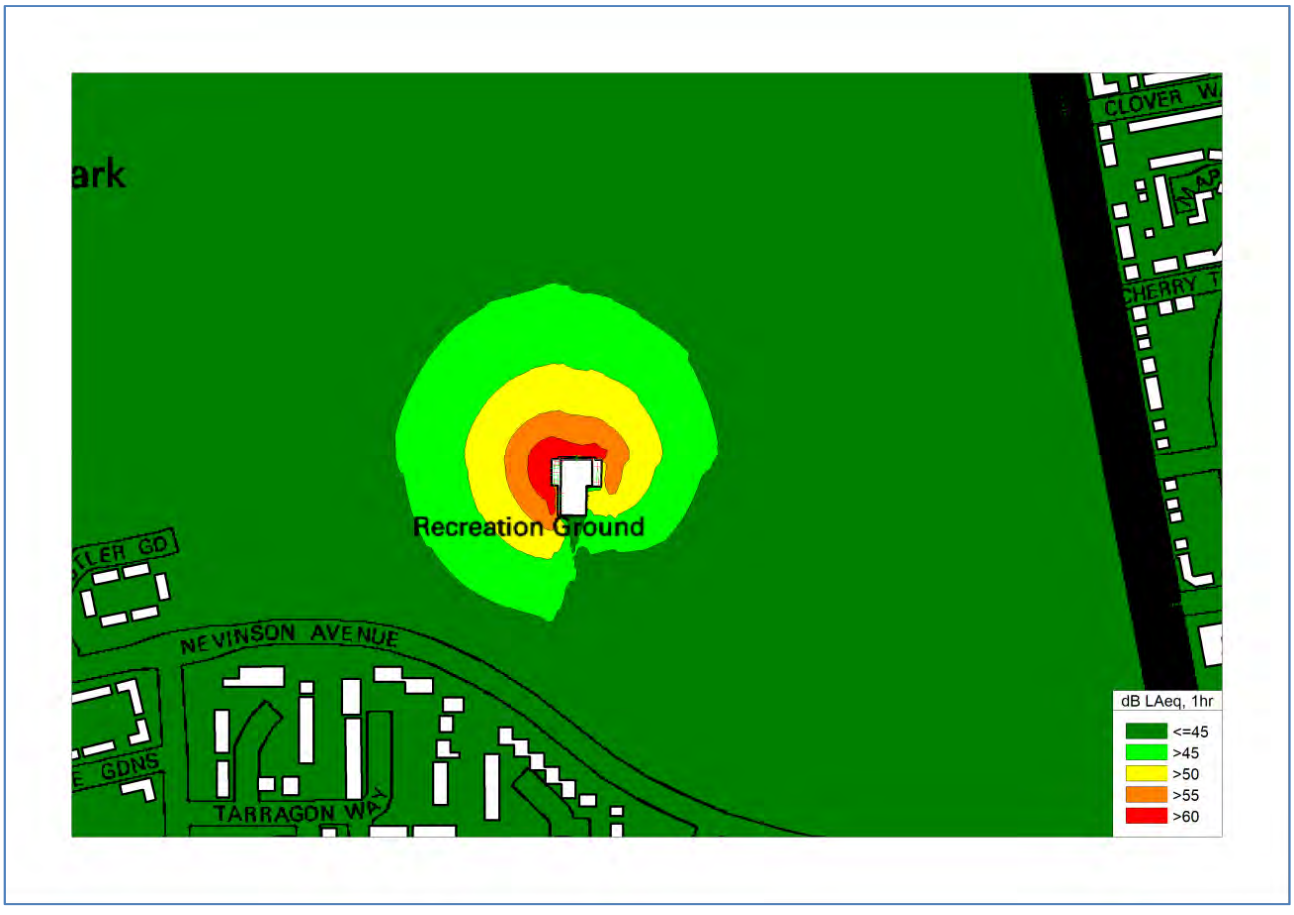


Figure 2: Evening noise contour plot for Clubhouse noise

4.8 With reference to the change of level guidance presented as Table 1, the results presented as Table 6 indicate that unmitigated noise from the proposed club house would be insignificant at NSRs B and C. Noise levels at NSR A are predicted to be slight to insignificant. Predictions indicate that the dominant noise source at NSR A was breakout from the bar area doors. Noise levels at NSR A could be reduced by up to 10 dB by ensuring that the bar doors ordinarily remain closed except for access/egress to the bar. Assuming such controls are in place, the impact from bar noise on nearby NSRs is predicted to be insignificant.

Noise from external sports activities

4.9 Noise levels at the nearest NSR from the use of the external sports pitches has been predicted using a Cadna-A noise model. Source noise levels for each activity are based on historic noise measurements for similar activities to the proposed.

4.10 Noise levels have been modelled based on the assumption that the cricket pitch would not operate concurrently with the Rugby pitch, but that the Tennis courts may be operating concurrently with either. Rugby noise levels are compared against the prevailing noise level for the evening period, as per the assessment of noise from the club house as this is considered the most noise sensitive period during which external sports areas may be in use. As the cricket pitch is not floodlit, the assessment has compared the predicted noise level with the prevailing daytime levels at each NSR.

4.11 The results of the assessment are presented as Table 7. A comparison of the predicted noise contours for the Cricket and Rugby pitches is presented as Figure 3.

Table 7: Assessment of external sports noise

NSR	Prevailing Noise Level (dB $L_{Aeq,T}$)	Activity Noise Source	Predicted Activity Noise Level (dB $L_{Aeq,T}$)	Cumulative Noise Level (dB $L_{Aeq,T}$)	Change in prevailing Noise Level (dB $L_{Aeq,T}$)	Predicted Noise Impact
A[1]	44	Rugby	46	48	+4	Moderate Impact
	47	Cricket	45	49	+2	Slight Impact
B	53	Rugby	52	56	+3	Moderate Impact
	56	Cricket	46	56	0	No Impact
C	64	Rugby	48	64	0	No Impact
	68	Cricket	36	68	0	No Impact

Note:

[1] Presented prevailing noise level at NSR A is interpolated from measurements at LT1.

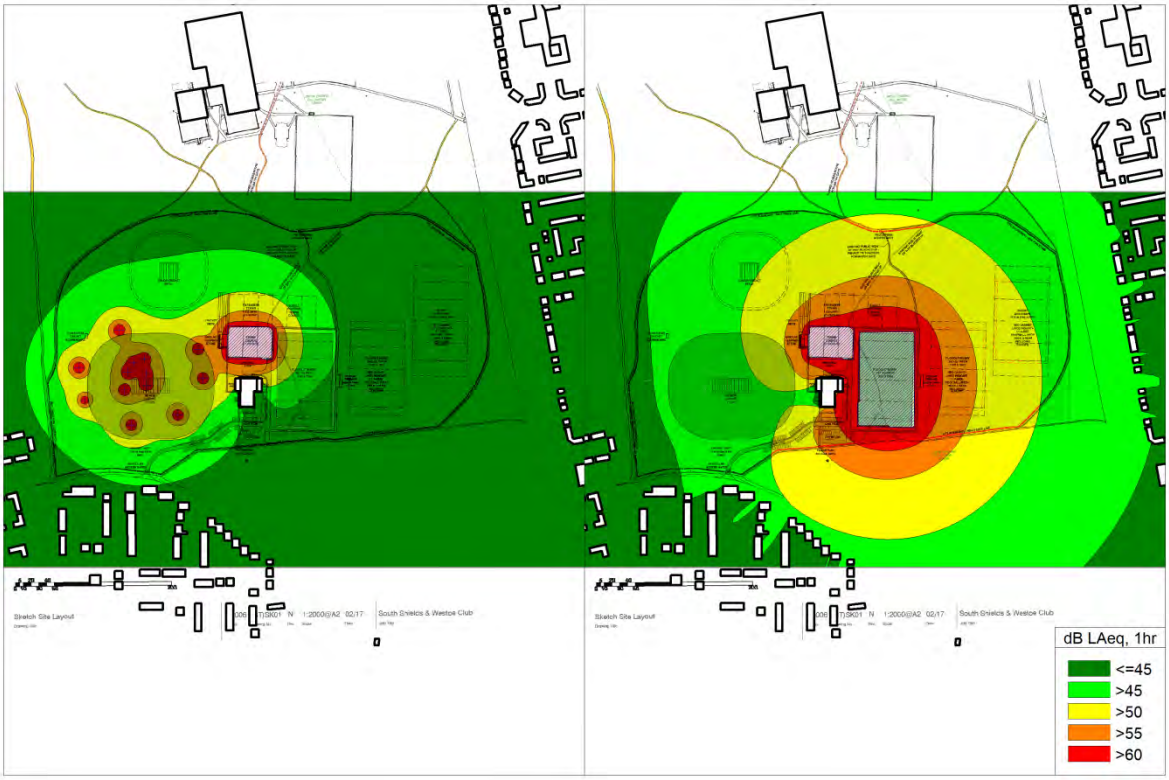


Figure 3: Noise contour plot comparison for Cricket and Rugby pitches

4.12 With reference to the change of noise level guidance presented as Table 1, the results presented as Table 7 indicate that unmitigated noise from the proposed club house would be insignificant at NSR C.

4.13 Noise levels at NSR A and NSR B are likely to increase by up to 4 dB over the measured prevailing noise level in the absence of sports activities. Such an increase would typically be considered a moderate impact according to the scale of significance presented as Table 1. However, as the proposed location of the cricket pitch is currently in use as a football pitch and with further sports activities surrounding the site, it is considered that the change in noise level would be no greater than would occur with the pitches in use in their present form. With reference to Table 4, noise levels of up to 49 dB $L_{Aeq,T}$ would be expected at NSR A assuming similar activity levels on the existing pitches.

4.14 Further, in terms of the absolute noise level the predicted level at NSR A is below the lower limit of 50 dB $L_{Aeq,16hr}$ recommended by BS 8233: 2014 for noise in outdoor amenity areas, and would be considered satisfactory without further mitigation.

4.15 Based on the above, it is considered that the noise impact from the proposed cricket and rugby pitches on nearby noise sensitive receptors would not be significant in the context of the existing noise climate and when considering present uses.

5. Fixed Plant Noise Limits

5.1 At this stage in the Development, the exact location and type of fixed plant (if any) which may be associated with the Development has yet to be confirmed. Therefore, plant noise limits have been proposed, which would apply to the cumulative noise level from all items of fixed plant which may operate throughout the assessment period.

5.2 Based on HRS' measured background noise levels presented in Section 3, noise limits for fixed plant noise emissions at the nearest sensitive receptors have been proposed. Fixed plant noise limits are based on the measured levels and the guidance in BS 4142 to achieve a level difference of less than or equal to the representative background ($L_{A90,\ 15min}$) level for the relevant period. The proposed plant noise limit should be confirmed following consultation with the local authority, taking account of any local policy or noise criteria.

5.3 It is understood that the club house and sports facilities may be operational seven days a week, therefore fixed plant noise limits have been proposed based on the measured background levels at each NSR on Sunday 17th of September, with Sunday generally being considered the most sensitive period for external noise intrusion.

5.4 Plant noise limits for NSRs B and C have been determined from long term measured data, whilst the limits at NSR A has been inferred based on the typical level difference between LT1 and ST1 outlined in section 3. Background levels at the long term position were typically up to 3 dB higher than those measured adjacent to the NSR on Whistler Drive, therefore plant noise limits have been adjusted accordingly.

5.5 HRS understands that the hours of operation of the club house are expected to be between 07:00 and 23:00 Monday to Sunday. However, as fixed plant associated with the development may operate outside these hours, for example to provide cold storage etc, plant noise limits for the night time period have been proposed based.

5.6 Table 8 presents the proposed fixed plant noise limits. Note that the reference interval for noise limits is 1 hour for the daytime, and 15 minutes for the night time. The Rating Level described above should be assessed in accordance with BS 4142:2014, including appropriate consideration of any tonal or impulsive characteristics of the proposed building services plant.

Table 8: Fixed plant noise limits

Location	Period	Representative Background Noise Level (dB $L_{A90,T}$)	Recommended Maximum Fixed Plant Rating Level (dB $L_{Ar,Tr}$)
At 1m from identified NSRs	Daytime (07:00 – 23:00)	39	39
	Night Time (23:00 – 07:00)	33	33

6. Summary

6.1 HRS has been appointed by Tolent Living Ltd (the Client), to undertake a baseline noise survey of the existing vacant site, in support of an application for Development.

6.2 The proposals are for the construction of a new sports club, incorporating a new club house and bar with external terraces, internal sports areas (squash courts etc) with changing rooms, external sports pitches for uses such as rugby, tennis and cricket, with associated parking and landscaping. A tea room and function room will also be included. A proposed Site Layout plan is included as Appendix II.

6.3 Noise levels at and around the Site have been measured over a 24 hour period from Sunday 17th to Monday 18th of September 2017 to inform the review of potential noise impacts. The prevailing noise climate was found to be dominated by road traffic noise from the surrounding road network, with contributions from human activities and local wildlife (predominantly seagulls).

6.4 Typical operational noise impact considerations for management of the club house have been identified to help minimise the risk of adverse impact on the neighbouring area. Such measures, which are designed to control noise breakout from the clubhouse bar would be expected to reduce noise levels from the bar such that the potential impact at nearby sensitive receptors would be insignificant.

6.5 Rating noise limits for fixed plant have been proposed based on HRS' measured noise levels according to relevant guidance.

6.6 Noise from external sports activities is considered not to be significant in comparison to the prevailing noise climate, having regard to the existing sports activity uses.

6.7 In summary, the Development is not expected to result in significant adverse effects at the nearest noise sensitive receptors surrounding the development.

6.8 Where alternative requirements are identified to those outlined or proposed in this report, further assessment may be required.

Appendix I. Acoustic Glossary

Sound pressure level and the decibel, dB

A sound wave is a small fluctuation of atmospheric pressure. The human ear responds to these variations in pressure, producing the sensation of hearing. The ear can detect a very wide range of pressure variations. In order to cope with this wide range of pressure variations, a logarithmic scale is used to convert the values into manageable numbers. The decibel is the logarithmic unit used to describe sound (or noise) levels. The usual range of sound pressure levels is from 0 dB (threshold of hearing) to 120 dB (threshold of pain).

Frequency and hertz, Hz

Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or hertz (Hz). Sometimes large frequency values are written as kilohertz (kHz), where 1 kHz = 1000 Hz. The human range of hearing is commonly accepted to be 20 Hz to 20,000 Hz. Additionally, an octave can be used to describe the interval between a frequency in Hz and either half or double that frequency.

Frequency weighting

Different weighting networks can be applied to a given sound level in each stated octave band by a specified amount, in order to better represent the response of the human ear. The most commonly used weighting network is the 'A' weighting, and the letter 'A' will be included within a descriptor to indicate that the value has been 'A' weighted, e.g. $L_{Aeq,T}$ or L_{A90}. An 'A' weighted noise level may also be written as dB(A). Other weightings less commonly used are 'C' and 'D' weighting.

Noise indices

When a noise level varies with time, the measured 'A' weighted dB level will vary as well. In this case it is therefore not possible to represent the noise climate with a simple 'A' weighted dB value. In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The various indices used are described as below:

$L_{Aeq,T}$	The 'A' weighted 'equivalent continuous noise level' which is an average of the total sound energy measured over a specified time period, T
L_{Amax}	The maximum 'A' weighted noise level that was recorded during the monitoring period.
L_{A10}	The 'A' weighted noise level that was recorded for at least 10% of the monitoring period.
L_{A90}	The 'A' weighted noise level that was recorded for at least 90% of the monitoring period, usually taken as the underlying 'background' noise level.

Sound level difference, *D*

The sound level difference between two internal spaces, or between internal and external spaces. The '*D*' value is used to denote the differences at each third octave or octave band, with a single figure 'weighted' value to describe an overall performance. Note that the '*D*' value will always describe an in-situ or on-site acoustic performance. All values are described using the decibel.

D_w	Single figure weighted sound level difference, simply the measured source noise level minus receiver noise level, not adjusted to reference conditions
$D_{nT,w}$	Weighted normalised sound level difference – a single, weighted sound insulation value, normalised to a reference reverberation time using the measured reverberation time in the receive room
$D_{nT,w} + C_{tr}$	As above, with a spectral adaptation term applied to account for the effects of low frequency noise, and based on urban traffic noise
$D_{nf,w}$	Overall flanking normalised level difference - A parameter that defines the flanking transmission of sound from room to room where a dividing partition or floor construction abuts a flanking building element common to both rooms, such as the building façade or ceiling

Sound reduction index, *R*

This describes the sound transmitted through a material or building element, such as a wall, door or window. It is measured in a laboratory with suppressed flanking transmission. The '*R*' value is used to denote the differences at each third octave or octave band, with a single figure 'weighted' value to describe an overall performance. All values are described using the decibel.

R_w	Weighted single figure sound reduction index
$R_w + C_{tr}$	As above, with a spectral adaptation term applied to account for the effects of low frequency noise, and based on urban traffic noise
R'_w	The 'apparent sound reduction index', a field measurement to obtain the sound reduction index of a material or element, with all effects of site installation accepted.

Standardised impact sound pressure level, $L'_{nT,w}$

$L'_{nT,w}$ is the single figure used to characterise the impact sound pressure level in a receiving room, normalised to a reference reverberation time. Impact noise can be classified as (but is not limited to) the result of footfall impact on a separating floor to a habitable space below. All values are described using the decibel.

Reverberation time, *T* and T_{mf}

The reverberation time of a space is a measure of the rate at which sound decays, measured in seconds. It is defined as the time taken for the sound pressure level to reduce by 60 dB from its original impulse level. Reverberation time is commonly quoted in terms of the mid-frequency reverberation time, T_{mf}, the arithmetic average of the reverberation times in the 500 Hz, 1 kHz and 2 kHz octave bands.

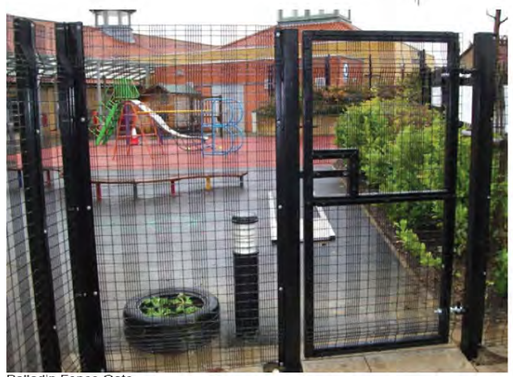
Noise rating, NR

The noise rating or NR system is commonly used in the design of noise emitted by internal building services systems. The system is frequency dependent, and was empirically derived to prevent disturbance to occupants in habitable or working areas from building services noise that exhibits 'tonal' elements, e.g. rumbles, whines, whistles etc. There is no direct relationship between the average 'A' weighted noise level in dB and the NR. However, as a guide, and assuming the absence of strong low frequency content in a given noise, the NR could generally be said to be 6 dB less than the average 'A' weighted dB value.

Privacy

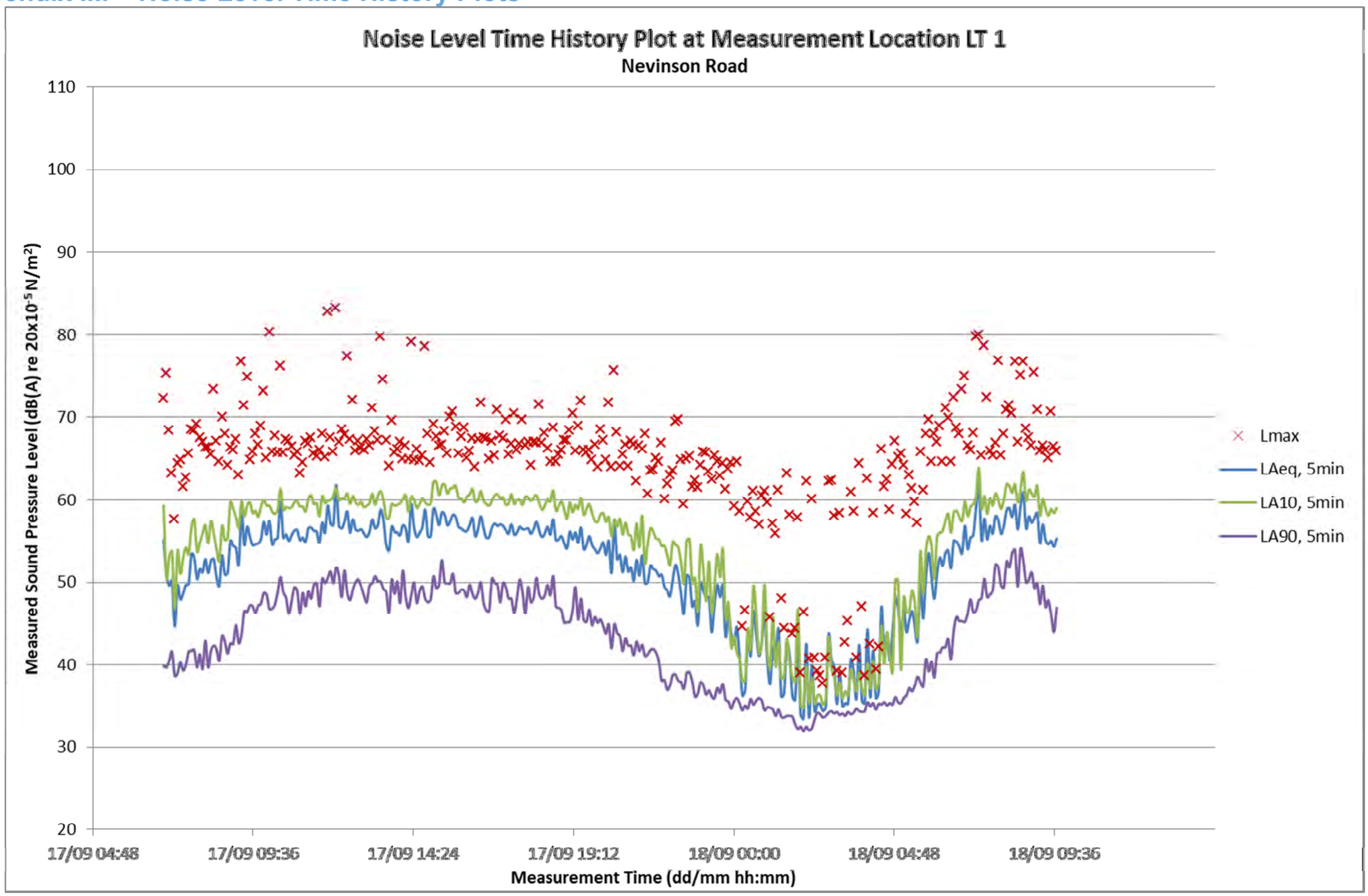
Privacy is the addition of the level of sound insulation between two rooms and the background noise within a receiving room. It can be used to assess the level of privacy afforded in the 'receiving room' for speech from the 'source room'. The 'privacy factor' is a unit-less value that is the combination of the average 'A' weighted background noise level in dB and the weighted sound level difference (D_w) in dB.

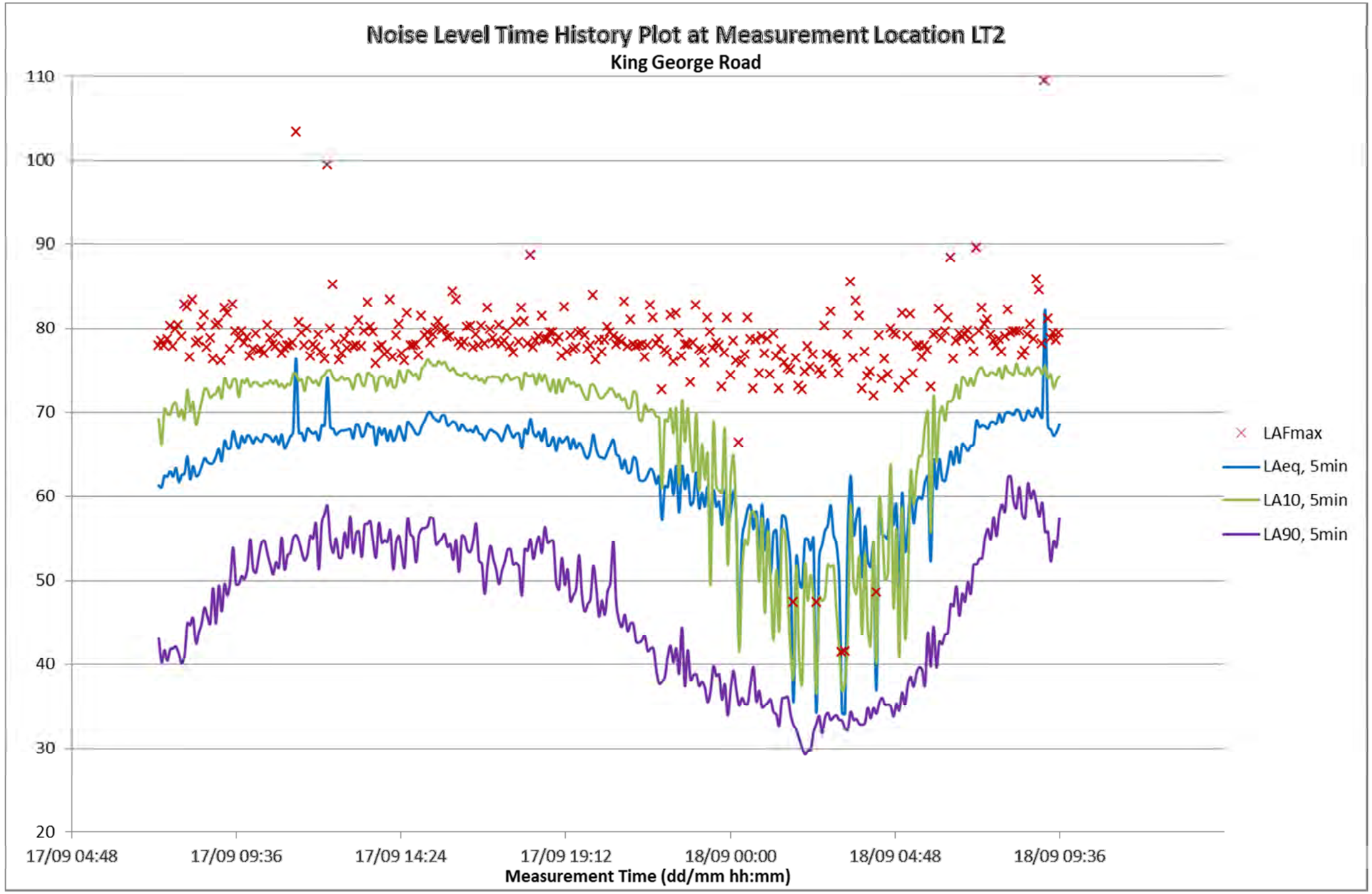
Appendix II. Proposed Site Layout Plan


Palladin Fence Gate


2.4m Palladin Perimiter Fence

Appendix III. Noise Level Time History Plots




Noise Level Time History Plot at Measurement Location LT2
King George Road
110
100
90
80
70
60
50
40
30
20
17/09 04:48
17/09 09:36
17/09 14:24
17/09 19:12
18/09 00:00
18/09 04:48
18/09 09:36
Measurement Time (dd/mm hh:mm)
LAFmax
LAeq, 5min
LA10, 5min
LA90, 5min

Appendix IV. HRS Acoustic Credentials

HRS Services Ltd. (HRS) have specialised in providing the UK Construction Industry with a range of acoustics services since 2006. Specialising in Building Acoustics, all HRS acousticians are members of the Institute of Acoustics.

HRS has been accredited for on-site acoustic testing by United Kingdom Accreditation Service (UKAS) since 2006 (Testing Laboratory Number 2587).
HRS meet the relevant acoustic requirements typically required in the UK, including for sound insulation testing as defined in Approved Document E for the purposes of testing for Part E to the Building Regulations 2010.

This report has been authorised by Tom Chaffer, Senior Acoustic Consultant who meets the BREEAM requirements for a suitably qualified acoustician (SQA) as follows;

1. Holds an MSc degree in Audio Acoustics from the University of Salford
2. Has been an Acoustic Consultant for more than three year's (within the last five years). This experience includes a practical understanding of factors affecting acoustics in relation to construction and the built environment; including, acting in an advisory capacity to provide recommendations for suitable acoustic performance levels and mitigation measures.
3. Holds Corporate Membership of the Institute of Acoustics - MIOA membership.

This report has been read and reviewed by Tom Chaffer and has been found to;

1. Represent sound industry practice
2. Be appropriate given the building being assessed and scope of works proposed
3. Avoid invalid, biased and exaggerated recommendations.

Appendix V. Report Conditions

This document has been prepared for the sole use, benefit and information of the Client. The liability of HRS Services Ltd. in respect of the information contained herein will not extend to any third party unless prior agreement is obtained in writing from HRS Services Ltd.

This report is limited to addressing the specific acoustic issues contained herein. Advice has been provided for acoustic reasons only and it is recommended that appropriate expert advice be sought on all the ramifications, e.g. safety, fire, structural, CDM etc., associated with any proposals contained herein.

The in-situ performance of acoustic measures is influenced to a large extent by the quality of workmanship and compliance with the specifications on-site during construction, as such, HRS Services Ltd. accepts no liability for issues with acoustic performance arising from such factors.

Acoustic survey and testing work carried out for the project is representative of the prevailing conditions at the time of the work. Conditions can vary and no warranty is given as to the possibility of changes in the environment of the site and surrounding area at differing times.

In particular, it should be noted that where calculations are carried out that are based on assumptions regarding certain aspects where information has not been supplied, these are provided for indicative purposes only and should be treated as such.