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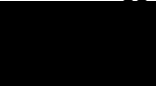
Acoustic Impact Assessment

Prepared for Comptons Tennis club
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May Walters Acoustic Consultants specialise in delivering noise impact assessments and research for padel and sporting facilities.



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1 EXECUTIVE SUMMARY

Further to a proposed planning application by Comptons Tennis Club, a noise impact assessment was requested to assess the noise implications of constructing 2 x outdoor padel courts on club grounds. The proposals were studied and measurements were taken to understand the ambient noise levels at the club. Padel noise levels at the facade of a nearby residence were then predicted, using existing research which comprised extensive monitoring of a similar alternative padel and tennis site. It was concluded that continuous and impact noise levels at the façade of the only nearby residential property were within guideline criteria and would create only a slight impact which is generally regarded as acceptable in planning situations and the proposal was recommended for acceptance due to noise.

2 INTRODUCTION

2.1 May Walters Acoustic Consultants Statement of Experience

May Walters Acoustic Consultants (MWA) specialise in delivering noise assessments and peer reviews for padel developments, the Director and Consultant Martin Higgins is a qualified acoustic consultant and an Associate member of the IOA (Institute of Acoustics).

In 2024 we published one of the most detailed research papers into the noise created by outdoor padel courts, which was conducted independently, (without supporting any interests for those either supporting or opposing padel developments) and under the technical supervision of the IOA. This research has subsequently been presented to the members of the Chartered Institute of Environmental Health (CIEH) at conference, formed content into their training resource and presented at the National IOA Conference for peer review.

The research comprised just under 50 hours of on-site assessment and can quantify not only the composition of the noise, but the frequency of the different types of impact noise created, the variability of this noise over playing time and even indicates how the noise created by padel is linked to player skill levels. Similar studies were also performed on tennis for comparison and a more accurate and relatable benchmark when entering into discussions of the applicability of a proposed site.

A noise model has been created from this research to accurately describe noise and predict its propagation from the courts to any local residences so that the impact of construction of padel facilities can be fully understood.

2.2 Project Circumstances

MWA were instructed by Comptons Tennis Club, 'the Client' to prepare a Noise Impact Assessment to provide guidance on a planning application for a development of 2 x padel courts to be constructed at their tennis club; Leechpond Hill, Lower Beeding, Horsham RH13 6NR, which will be referred to as 'the Site'.

The report aims to profile and quantify the sensitivity of the adjacent residential properties to the Site which may be affected by noise from the proposed development, understand the impact of the noise produced by the proposed padel court development on these and other local residences and the wider area in line with current UK guidance and provide advice on mitigative measures should they be required.

The layout of the Site is shown in fig 2.1 below

All acronyms used within this report are defined in the Glossary presented in the Glossary of Terms at the end of this document.

2.3 Proposed Development

The Site is a village tennis club located to the south of Lower Beeding, a village near Horsham in West Sussex. Set in a rural location, access to the club is gained via the B2110 which runs adjacent to the East side of the club and is one of the main roads serving the village. The club has 7 x tennis courts and a clubhouse facility.

Two padel courts are proposed, situated in the north corner of the club ground, adjacent to the clubhouse and the edge of the club which borders a private residential property. The proposed court positions are outlined in red, an image of which is shown in fig 2.3.



Fig 2.3 shows the location of planned padel courts at the Site.

2.4 Limitations

The limitations of this report are presented in Appendix 1.

2.5 Confidentiality

This document has been prepared for sole use of our client identified on the title page of this report (the “Client”) in accordance with generally accepted consultancy principles, the budget for fees and the terms of reference agreed by MWA and the Client.

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3 PADEL NOISE RESEARCH

3.1 Research Introduction

A detailed noise assessment for padel was researched in 2024 and published in 2025. This research was independently funded and performed within the academic framework of one of the qualifications delivered by the Institute of Acoustics (IOA), who had technical oversight of the project.

3.2 Project Scope & Objectives

Nearly 50 hours of continuous measurements were taken via 3 Class 1 Sound Level Meters, on external, uncovered padel and equivalent tennis courts. A schematic for the courts and measurement positions is detailed below in *fig 3.1*. The project was designed to achieve the following;

- Describe the noise created by a padel court and benchmark it to tennis for comparison
- Quantify and qualify the major noise sources produced by padel
- Investigate way noise propagates from a padel court
- Build a noise model to predict padel noise propagation

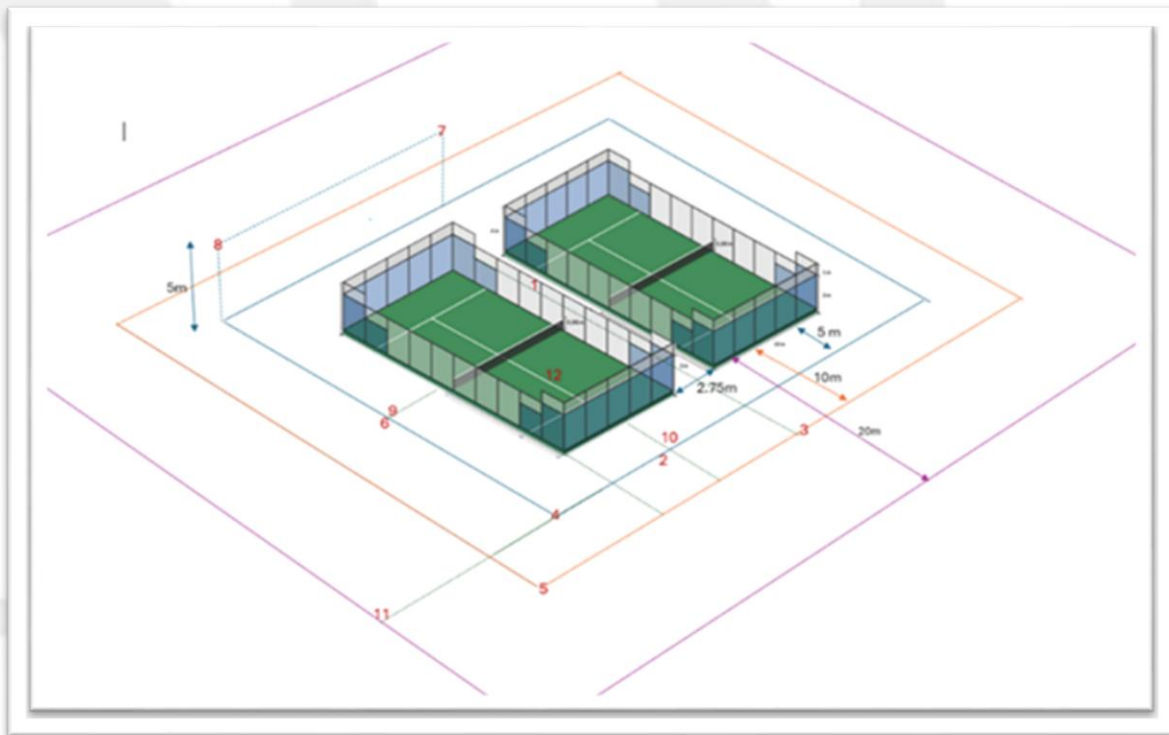


Fig 3.1 shows a schematic of the padel courts research area, detailing measurement points in relation to the court.

3.3 Results Overview

Noise generated by both padel and tennis courts can be divided into vocal and also impulse (created by impacts) noise. In the case of tennis, the majority of intrusive impulse noise is generated by ball striking the racquet (the strings of which have a dampening effect). In padel, impact noise of ball on; bat, glass boundary and metal grille tend to be the most intrusive impulse noises. All of these impacts have different frequency of occurrence and create a different sound.

The metal grille on the side is typically acoustically transparent, unless it is struck by a ball. The glass boundaries on the padel court act as reflecting barriers, inhibiting the noise propagation from the ends of the court, but also reflecting noise back into the court, creating a reverberant environment and increasing the noise levels inside the court by approximately 10dB, which would be perceived by most people as doubling in loudness.

3.4 Overall Noise levels (L_{AEQ})

Like most sports, the noise emitted from continuous play on both padel and tennis courts was found to be intermittent in nature. The overall noise levels measured in L_{AEQ} (continuous average sound energy levels over a period) were measured at various points around the court, as detailed in *fig 3.1*. These measurements were taken over 5-minute intervals during continuous play on the courts containing mixed club level players.

It was found that measurements taken at 5m from the baseline with each sport, the average L_{AEQ} levels were both around 70dB. Readings were taken at 5m from the net line for each sport, it was found that padel was on average 6dB more than tennis (approximately 50% louder).

In padel, the average noise levels were taken from 5m behind the baseline and 5m from the net line (both external from the court). It was found that the point at the net line was 12dB L_{AEQ} greater than the base, which would be perceived by most as just over twice as loud). This is due to the barrier effect of the boundary, and it confirms the theory that noise egress from the side of the courts is greater than from the end.

3.5 Impulse / impact noise (L_{MAX})

Each of the major impact noises were studied, which included the ball striking the tennis racquet / padel bat. In padel the additional impact noises of ball striking glass boundary and metal grille were also analysed. Similar ball speeds were used in order to gain comparison results and readings were taken to determine 'average' and 'worst case scenario' impact noise levels and the noise propagation of these sounds from the court were studied. A spectral analysis of each impact noise is shown in *Fig 3.5a* and an example of the impact noise propagation from a metal grille strike is detailed in *fig 3.5b*

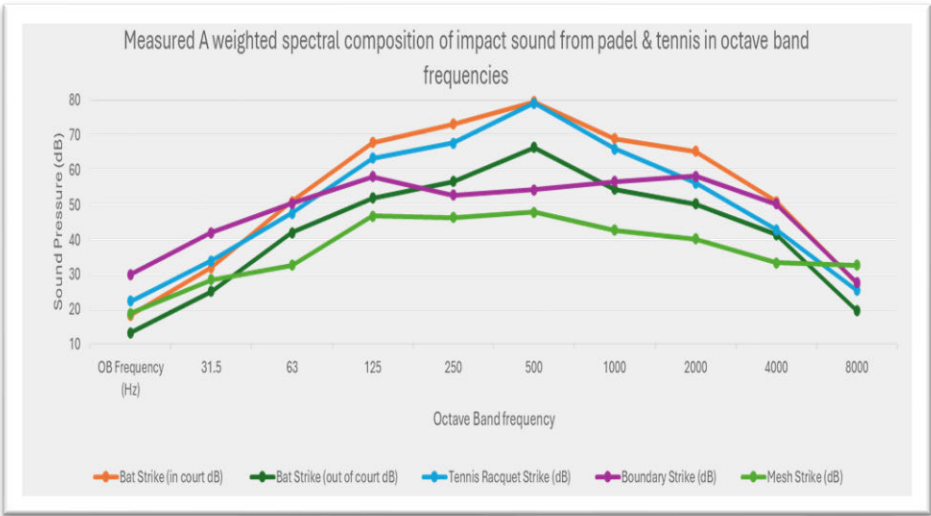


Fig 3.5a shows a spectral analysis of the major impact noises emanating from a padel court

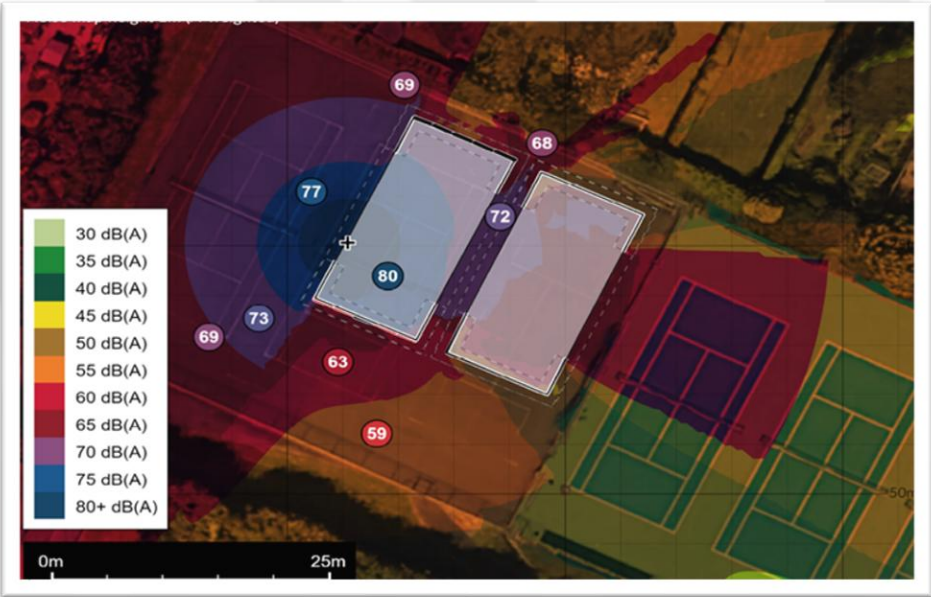


Fig 3.5b shows an impact measurement from a ball strike on the metal grille (side of the court) and shows the propagation of the subsequent sound

3.6 Impulse Noise Frequency

As the noise from padel and tennis is dominated by impulse noise created by ball impacts, a number of assessments were performed to quantify these individual sounds. Impact noises were counted during 5 minutes of continuous play for club level and elite players.

Key observations include;

Bat/ball strike was by far the most frequent in both sports, occurring once every 4.5 seconds in padel and once every 6 seconds in tennis. This type of impact was the major contributor to the overall L_{Aeq} , and when completing an on-time calculation, the other impacts contributed negligibly to the overall result. In practice, noise generated by padel would include, on average, boundary impacts (occurring every 30 seconds at club level) and grille strike impacts (occurring every 100 seconds at club level), this is summarized in *fig 3.6*. This difference in sound created for each strike and the intermittency would create a subjective impact on the local area, which is not fully described by the L_{Aeq} .

When the frequency of impact noise from elite players were compared, in padel the bat frequency of mesh grille strikes decreased, and the frequency of boundary strikes increased substantially. Further the speed of the impacts appeared to decrease, which would make the L_{Amax} (measure of total sound energy) levels of each boundary impact decrease. This is consistent with the players controlling and positioning the ball at the corners of the boundary to reduce bounce back, a similar tactic which is seen in squash. This supports the theory that as a padel court becomes established and the skill level of players using it increases over time, the noise profile of the court will change to provide a greater number of impulse noises, but with lower L_{Amax} values with boundary and grille impact sounds.

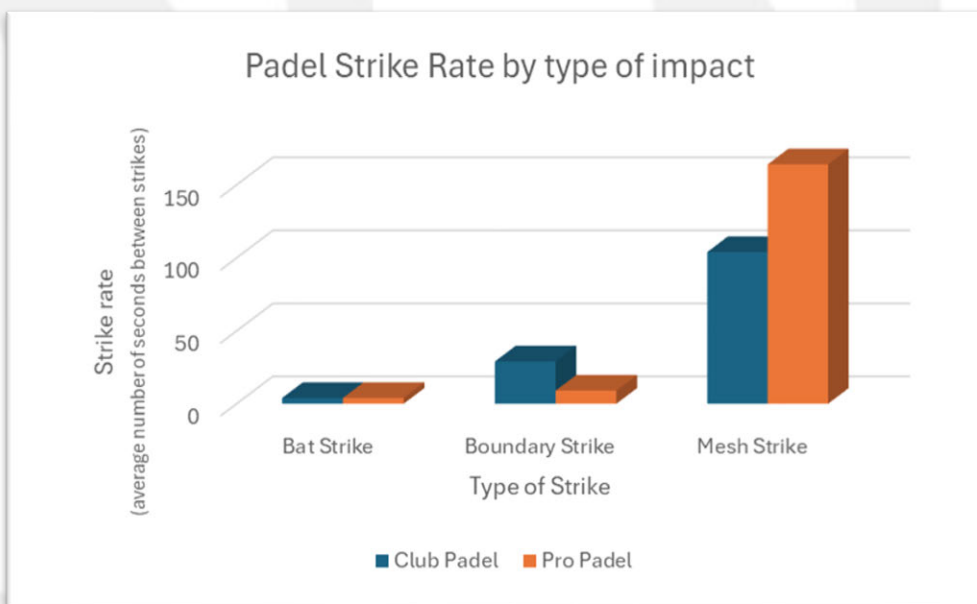


Fig 3.6 summarises the frequency of ball impact strikes on the padel court of different surfaces. The results are presented in the form of number of seconds between strikes and it also indicates the difference in skill level with strike frequency

4 RELATED POLICY & GUIDANCE

4.1 National Planning Policy Framework & National Planning Practice Guidance

The Government updated the National Planning Policy Framework (NPPF) on 7th February 2025 and its associated National Planning Practice Guidance (NPPG) on 14th February 2024. Together, the NPPF and NPPG set out what the Government expects of local authorities. The overall aim is to ensure the planning system allows land to be used for new homes and jobs, while protecting valuable natural and historic environments.

Noise needs to be considered when development may create additional noise or would be sensitive to the prevailing acoustic environment. When preparing plans or taking decisions about new developments, there may also be opportunities to make improvements to the acoustic environment. Good acoustic design needs to be considered early in the planning process to ensure that the most appropriate and cost-effective solutions are identified from the outset.

Decision making needs to take account of the acoustic environment and in doing so consider:

- whether or not a significant adverse effect is occurring or likely to occur;
- whether or not an adverse effect is occurring or likely to occur; and
- whether or not a good standard of amenity can be achieved.

In line with the Explanatory note of the noise policy statement for England, this would include identifying whether the overall effect of the noise exposure (including the impact during the construction phase wherever applicable) is, or would be, above or below the significant observed adverse effect level and the lowest observed adverse effect level for the given situation. As noise is a complex technical issue, it may be appropriate to seek experienced specialist assistance when applying this policy.

The Observed Effect Levels are detailed in Table 4.1 below and the likely averaged responses;

The subjective nature of noise means that there is not a simple relationship between noise levels and the impact on those affected. This will depend on how various factors combine in any particular situation.

These factors include:

- the source and absolute level of the noise together with the time of day it occurs. Some types and levels of noise will cause a greater adverse effect at night than if they occur during the day
- the character of the introduced noise and how it relates to the existing sound environment – greater similarities there between the source and ambient noise tends towards less intrusion
- the qualities of non-continuous sources of noise, e.g. frequency of noise, pattern of intermittency etc. Introduction of non-continuous or intermittent noise can increase intrusion.
- the local arrangement of the environment, i.e. buildings, surfaces and green infrastructure, which may reflect or absorb sound and therefore will change the propagation path of the noise.

And consideration should also be given to;

- the cumulative impacts of the introduction of the source as it acts with other existing sources of noise.
- the effect of noise on wildlife. Noise can adversely affect wildlife and ecosystems.

Perception	Examples of Outcomes	Increasing Effect Level	Action
No Observed Effect Level			
Not present	No Effect	No Observed Effect	No specific measures required
No Observed Adverse Effect Level			
Present & not intrusive	Noise can be heard but does not cause any change in behaviour or attitude. Can slightly affect the acoustic character of the area but not such that there is a perceived change in the quality of life.	No Observed Adverse Effect	No specific measures required
Lowest Observed Adverse Effect Level			
Present & Intrusive	Noise can be heard and causes small changes in behaviour and/or attitude, e.g. turning up volume of television; speaking more loudly; where there is no alternative ventilation, having to close windows for some of the time because of the noise. Potential for some reported sleep disturbance. Affects the acoustic character of the area such that there is a perceived change in the quality of life.	Observed Adverse Effect	Mitigate and reduce to a minimum
Significant Observed Adverse Effect Level			
Present & disruptive	The noise causes a material change in behaviour and/or attitude, e.g. avoiding certain activities during periods of intrusion; where there is no alternative ventilation, having to keep windows closed most of the time because of the noise. Potential for sleep disturbance resulting in difficulty in getting to sleep, premature awakening and difficulty in getting back to sleep. Quality of life diminished due to change in acoustic character of the area.	Significant Observed Effect	Avoid
Present & very disruptive	Extensive and regular changes in behaviour and/or an inability to mitigate effect of noise leading to psychological stress or physiological effects, e.g. regular sleep deprivation/awakening; loss of appetite, significant, medically definable harm, e.g. auditory and non-auditory	Unacceptable Adverse Effect	Prevent

Table 4.1 Noise Exposure Hierarchy

4.2 BS8233:2014 'Guidance on sound insulation and noise reduction for buildings'

Provides guidance and noise criteria for the control of noise in and around buildings. It suggests appropriate criteria and limits for different situations, which are primarily intended to guide the design of new buildings or refurbished buildings undergoing a change of use, rather than to assess the effect of changes in the external noise climate.

The standard suggests suitable internal noise levels within different types of buildings, including dwellings, as shown in Table 4.2.

Criterion	Typical Situation	Design $L_{Aeq,T}$ (dB)
Suitable resting / sleeping conditions	Living Room	35
	Bedroom*	30
*For a Reasonable standard in bedrooms at night, individual noise events (measured with fast time weighting) should not exceed 45dB L_{max}		

Table 4.2 BS8233:2014 Internal Target Noise Levels

BS8233 goes on to recommend noise levels for gardens as follows:

"It is desirable that the external noise level does not exceed 50dB $L_{Aeq,T}$, with an upper guideline value of 55dB $L_{Aeq,T}$ 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 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".

With regards to external noise within balcony areas, BS8233: 2014 provides the following advice:

"Other locations, such as balconies, roof gardens and terraces, are also important in residential buildings where normal external amenity space might be limited or not available, i.e. in flats, apartment blocks, etc. In these locations, specification of noise limits is not necessarily appropriate. Small balconies may be included for uses such as drying washing or growing pot plants, and noise limits should not be necessary for these uses. However, the general guidance on noise in amenity space is still appropriate for larger balconies, roof gardens and terraces, which might be intended to be used for relaxation. In high-noise areas, consideration should be given to protecting these areas by screening or building design to achieve the lowest practicable levels"

4.3 Lawn Tennis Association – Planning Guidance

Regarding noise, the LTA guidance states;

"Installation of Padel Tennis courts. If applying for planning permission for a Padel court and there is a neighbouring property within 30m of the court, then sound attenuation could be required."

4.4 Sports England Artificial Grass Pitch (AGP) Noise Guidance 2015

The guidance produced by Sports England provides guidance for sports facilities in the form of AGP or multi-use games area (MUGA) and has relevance to padel courts. It recognizes the benefits of recreational and sports facilities to the community and encourages a positive approach to the planning process for these and encouragement to consider the context of the site for its appropriateness. Noise criteria are provided as a single figure L_{Aeq} 1 hour of 58dB, taken at 10m from the centre line of the pitch to use as a benchmark for propagation to the façade of the nearest noise sensitive receptor and suggests the following criteria;

'The determining noise criteria for AGPs proximity to residential properties to avoid moderate annoyance in daytime and evenings, as set by The World Health Organisation's 'Guidelines for community Noise': = 50dB $L_{Aeq(1hour)}$ upper noise limit external to residential properties and within external living areas"

Where the site has an existing level ambient level which exceeds this, "A 'slight' impact is considered for an increase less than 3 decibels" on sites where a new noise source is introduced.

It also recognizes the issue of impact noise from hockey in particular and provides details of mitigative process for this.

4.5 Institute of Environmental Management & Assessment 'Guideline for Environmental Noise Impact Assessment', October 2014

The guidelines address the key principles of noise impact assessment and are applicable to all development proposals where noise effects are likely to occur. The guidelines provide specific support on how noise impact assessment fits within the Environmental Impact Assessment (EIA) process. They cover:

- How to scope a Noise Assessment;
- Issues to be considered when defining the baseline noise environment;
- Prediction of changes in noise levels as a result of implementing development proposals; and
- Definition and evaluation of the significance of the effect of changes in noise levels (for use only where the assessment is undertaken within an EIA).
- Although the guidance states that it is only applicable for use in an Environmental Impact Assessment (EIA), in the absence of any other specific guidance for assessing changes in ambient noise levels, it provides a useful benchmark for establishing the significance of the effect of introduced noise levels.

Table 4.5 categorises the change in noise level for a noise sensitive receptor such as a residential dwelling.

Effect	Change in Ambient Noise Level (dB)
Very substantial	≥ 10.0
Substantial	5.0 – 9.9
Moderate	3.0 – 4.9
None / not significant	≤ 2.9

Table 4.5 Effect Descriptors for Residential Dwellings

4.6 Local Authority Guidance and Criteria

Research was conducted into finding any local guidance published by the local authority. There is no policy or procedure found which specifically addresses padel developments.

5 NOISE IMPACT ASSESSMENT

5.1 Methodology

Although UK planning guidance encourages a positive stance on proposed sporting facilities, due to their positive effect on health & wellbeing in the community, it is essential to ensure that this is not at the expense of excessive noise for those living in immediate area. As all sites will maintain their own unique identity due to existing noise sources from various types of infrastructure but also spatial and cultural differences, we are encouraged to look at the context of both site and proposal so that an appropriate decision can be made.

For the introduction of any new noise source into an area of this nature, the amount of sound energy and also the character of the noise would be key in influencing the scale of impact. For example, as the difference between the ambient and proposed noise levels increases, and the difference in character of the new noise and the existing soundscape increases, the potential impact would increase.

Padel produces intermittent noise which is dominated by verbal, but also impulsive sounds created by the ball striking bats and other surfaces. When considering the impact of the new noise source, it would be beneficial therefore to consider both the overall sound levels (L_{AEQ}) and also the level on impulse/impact noise (L_{AMAX}) and this project has considered both elements within the scope of the report. Therefore, it will compare the overall impact by comparison of existing (ambient) and predicted levels of overall noise and impulse noise at the site.

To understand what may constitute an acceptable difference in levels we must initially look towards guidance, however there are currently no specific UK noise criteria for padel courts. However, inference can be taken from guidance addressing other related areas which may be used to help steer decision on what would be reasonable levels, so it links in with the larger planning strategy.

Noise Impact Assessment Guidance from IEMA (2014) suggest a scale of overall noise levels and the associated significance of intrusive effect. An increase up to 2.9dB would have an impact which is 'not significant' rising to a 'moderate' impact up to 4.9dB (as summarised in Table 4.5), although it should be stressed that this project does not form part of an impact assessment under this guidance.

Sports England AGP Noise Guidance (2015) suggests that any development would be acceptable if it produces an overall noise of less than 50dB L_{AEQ} at the façade of the nearest noise sensitive receptor, or if the existing noise levels currently exceed that, an increase of 3dB L_{AEQ} would be considered a 'slight impact'.

All of the guidance noted above uses overall noise levels (L_{AEQ}) for criteria, but for impact noise there is no specific noise criteria for padel as to what would be an acceptable impact noise level. Again, inference can be drawn from related guidance to provide a benchmark.

The World Health Organisation (WHO) 'Guidelines for Community Noise' published in 1999 does not provide noise criteria during the day for impact noise, however, does set a nighttime only threshold of 60dB. This criterion was brought in to protect health & wellbeing and to help prevent disturbed sleep. The nighttime ambient noise levels in most areas are significantly lower than during other times of the day, therefore these impact criteria could be justified as a lower end benchmark for daytime criteria.

Chartered Institute of Environmental Health (CIEH) Shooting Guidance published in 2003 refers to the sport of clay pigeon shooting which produces impulsive noise. The guidance suggests that as the level of L_{AMAX} for impulse noise reaches 65 dB, it starts to encourage annoyance in the community. It is noted however, that this is subjective measure which would be influenced by a number of factors, including the local environment and the listeners perception of the source, both of which would be different in sites containing padel courts.

5.1.1 Measurement Points and Results

The purpose of the on-site measurements is to study the ambient noise levels, particularly at the façade of the nearest houses so that an impact can be calculated. In this instance, the adjacent residential property is considered to be most at risk due to its proximity to the courts at a distance of 30m. In order to gain accurate measurements, noise measurements were taken during the course of 2 days so that noise levels could be assessed around the site, during various levels of activity on the tennis courts;

Measurement Point 1 (MP1) Northern corner of tennis court enclosure adjacent to residential boundary

Measurement Point 2 (MP2) Southern corner of tennis court enclosure adjacent to residential boundary

These locations are depicted below in fig 5.1 which shows an aerial view of the site and MP locations.

Fig 5.1 shows the location of measuring points at the Site



Measurement Position (MP) 1:

This measurement point was located externally at the corner of the fencing surrounding the tennis court. This position would monitor the noise generated on the court by tennis activity but when there is no activity present, due to its distance from the road, which is the major noise source, it would be representative of the ambient noise levels at the façade. Measurements were taken in free field conditions at 1.5m in height

Attended ambient sound measurements were taken in free-field conditions on 25/06/26 from 1600 hours to 27/06/26 to 1000 hours.

Measurement Position (MP) 2:

This measurement point was located externally at the corner of the fencing surrounding the tennis court. This position would monitor the noise generated on the court by tennis activity but when there is no activity present, due to its distance from the road, which is the major noise source, it would be representative of the ambient noise levels at the façade. Measurements were taken in free field conditions at 1.5m in height

Attended ambient sound measurements were taken in free-field conditions on 25/06/26 from 1600 hours to 27/06/26 to 1000 hours.

5.2 Subjective Assessment & Environmental Conditions

Environmental conditions during the monitoring are summarised;

Temperature during daytime was 35°C, with no wind, 0% cloud coverage and no precipitation throughout monitoring. During the course of monitoring the cloud increased periodically to 100% and the temperature decreased to 25 °C. There was negligible wind during monitoring.

When there was no activity at the club, the major ambient noise sources at the site come from the B2110 Leechpond Hill road, and due to its rural nature, the noise from bird calls and rustling of trees also was present a major source.

The results of the ambient readings are summarised in Table 5.2 below

The following analysis was completed.

$L_{AEQ1 \text{ hour}}$ (continuous average noise levels over a one-hour period) measured in dB

L_{AMAX} hourly average impulse noise levels measured in dB

$L_{A90 \text{ 1 hour}}$ average levels (the amount of sound energy measured which is exceeded for 90% of the measurement period)

Ambient summary	Readings	MP1	MP2	Mean Average
Average daytime ambient façade levels (LAEQ) dB		46	43	44.5
Average daytime total ambient façade levels (LA90) dB		38	37	37.5
Average daytime total ambient impulse levels (LAmax) dB		65	65	65

Table 5.2 summarises the ambient readings taken on site

5.3 Results

5.3.1 Method of Calculation of Predicted L_{AEQ} & L_{AMAX}

The research conducted into padel have benchmarked the average L_{AEQ} levels from a padel court. These are summarised in Table 5.3a. This data may be used to calculate the attenuation of the sound over distance so that the levels of noise from padel can be predicted at the façade of the nearby properties.

The results in Tables 5.3 represent noise levels generated during doubles play on a fully 100% utilised court and includes noise generated by congregating players. The results are therefore considered to be a worst-case scenario in assessing padel play. Measurements have been calculated at a point of 1.5m in height, which is consistent with the average height of noise generation on the court and the average noise receiver height. The ground conditions between the proposed court and facades are noted to be soft, consistent with earth and grassed areas.

LAEQ Predicted Measurements	Sound Power of source, court centralised (dB)	Distance to façade from nearest court centre (m)	Estimation of attenuation due to border and soft ground (dB)	Level of predicted sound compliment at façade (dB)	Predicted total level of sound at façade (dB)	Increase in LAEQ at façade (dB)
Padel - 5m from end of the court, 20m from the side of the court (position 11 in research)	86	35	3	44	47.5	2.5
Tennis - 5m from net line (position 14 in research)	84	25	3	45	48	3
LAMAX Predicted Measurements	Sound Power of source, court centralised (dB)	Distance to façade from nearest court centre (m)	Estimation of attenuation due to border and soft ground (dB)	Level of predicted sound compliment at façade (dB)	Average Ambient LAMAX (dB)	Difference between predicted and ambient LAMAX (dB)
Padel - 5m from end of the court, 20m from the side of the court (position 11 in research)	108.5	35	3	66.5	65	+1.5
Tennis - 5m from net line (position 14 in research)	105.5	25	3	66.5	65	+1.5

Table 5.3a shows the average sound levels emanating from a padel and tennis court and their predicted levels at the façade of the local residence, during 100% utilisation of the court with mixed doubles play.

5.3.2 Calculation of Predicted levels

The calculations have accounted for adjustments due to the presence of a border which is approximately 3-5m in width of dense foliage and continuous soft ground. Mitigation due to borders can vary from 3-8dB on average, and soft ground can further mitigate sound by up to 3dB. In order to account for this a conservative weighting of 3dB has been added to the prediction of sound levels at the façade. It should also be noted that due to the hot weather during monitoring, most of the monitoring period does not reflect any tennis play occurring on the courts, therefore the ambient readings are considered to be vanilla ambient readings without tennis noise.

Fig 5.3a shows an example calculation of the average predicted L_{AMAX} level at the façade. Table 5.3b shows the average number of impact noises predicted from research at club level play occurring from both padel and nearby tennis courts.

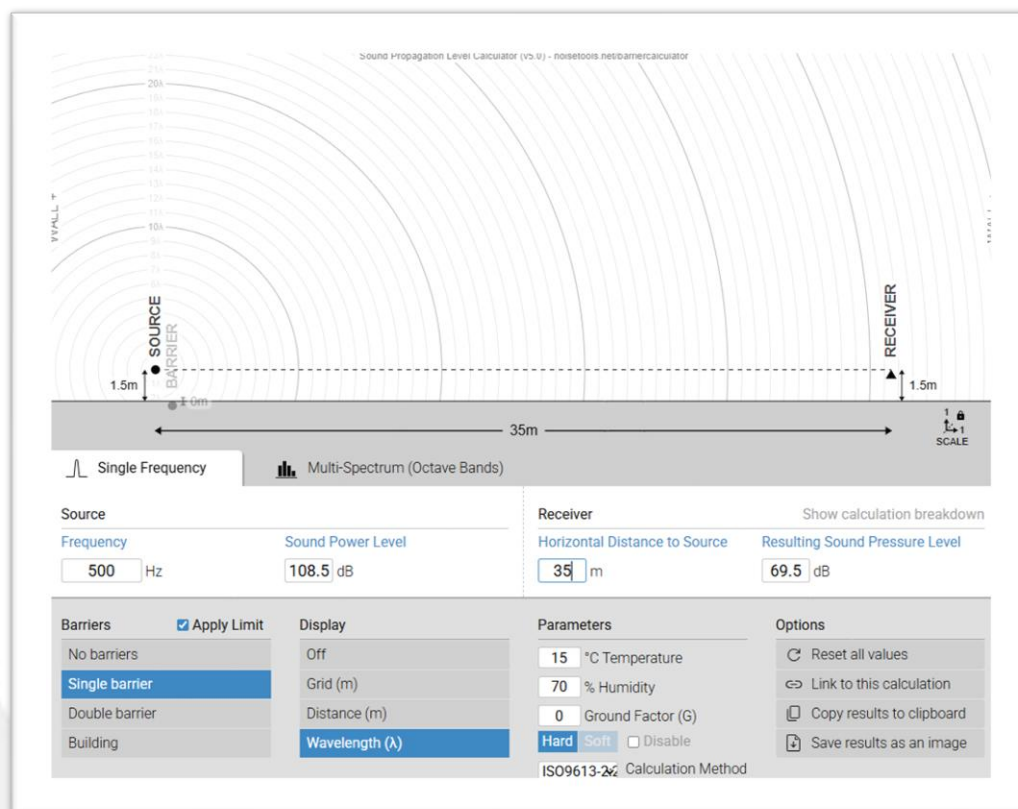


Fig 5.3a shows an example calculation of average impact noise levels (LAMAX) at the façade of the adjacent residence

Type of impact noise created	Mean frequency of padel ball strikes for 2 x courts (measured in strikes per minute)	Mean frequency of tennis ball strikes for 3 courts (measured in strikes per minute)
Bat strike	30	10
Boundary (wall) strike	2	-
Wire mesh (grille) strike	2	-
Total	34	30

Table 5.3b summarises the average frequency (propensity) of ball strikes emanating from a padel courts during continuous padel play (doubles random selection of men/women), compared to tennis courts at club level. The rate is expressed as the number of ball strikes per minute and is inclusive of natural breaks in play (which includes change of ends, players and breaks in between points and games)

6 INTERPRETATION

The adjacent residence to the tennis club has been identified as a potentially sensitive noise receptor to the proposed padel noise due to its location and this residence has been the focus of the calculations.

Measurements were taken during the day at the Site in order to estimate the ambient noise levels at the façade of this property, which is necessary to assess the nature of the soundscape and therefore understand the level of impact of proposed noise source.

The environment at Comptons Tennis Club is rural and has a subjective feel of a quiet country area, and this in the ambient readings. The ambient daytime L_{Aeq} readings average 44.5dB. The L_{Aeq} measurement represents the average noise level over a period of time, therefore it can provide information regarding the level of sound energy in the area. This measurement is less effective in describing noise, as most noise in the environment comprises a series of impulse noise (short duration noise, such as passing traffic, bangs, bird calls, etc), therefore the soundscape is not constant, but has natural highs and lows.

The average daytime ambient L_{A90} readings are 37.5dB. L_{A90} measurements are the level at which sound pressure is exceeded 90% of the time during the measuring period. This value is generally accepted as the average level of sound during the quiet moments in the soundscape.

In order to assess the impact of padel noise in the area, research data used, this was from an independent and published research project, comprising nearly 50 hours of measurements from padel and tennis courts.

Predicted noise levels from the proposed padel courts have been based on courts with 100% utilised with doubles play and has included noise generated by congregating players. The prediction has been demonstrated to be a worst-case scenario in this regard. It does not include vehicle activity, car parks or noise emitted from any associated clubhouses.

Predicted noise levels from padel are summarised in Tables 5.3a and 5.3b. As there is no specific guidance for padel development in the UK as yet, the most common guidance used is Sports England AGP Guidance which adopts noise criteria from BS 8233. In simple terms Sports England guidance states that it would be desirable to keep the façade L_{Aeq} levels below 50dB and any increases in the noise level below this should ideally be restricted to below 3dB.

Although it uses L_{Aeq} criteria, the guidance also talks at some length about impact noise generated by hockey and methods of reducing this. As the noise from padel courts is almost exclusively impulse (short duration noise events from vocal noise) and impact noise, it is inferred that this should be investigated to measure the intrusive nature of the new noise source. Unfortunately, there is also no UK noise guidance for impulse noise during the day, therefore we must gauge the intrusiveness of the proposed noise by looking at the site and using judgement. The peak sound level of impulse and impact noise is measured by the L_{Amax} value.

When performing calculations, L_{Aeq} values (average continuous noise) and L_{Amax} (impulse/impact) values are predicted at the nearest facade of the nearby residence. The results in Table 5.3a shows that the proposed padel input to L_{Aeq} increases the façade level by 2.5dB. A similar prediction for tennis shows an increase in level to 3dB. Clearly tennis is not under consideration for planning consent as the courts already exist, however the comparison is representative of the current ambient levels when tennis courts are in play. When the two nearest tennis courts are in play, the padel courts will increase the façade levels by 1.5dB. To understand the relevance of these numbers, 3dB would be just about audible, 1.5dB is unlikely to be audible as an increase. Both of these increases fulfil guidance noise criteria to an acceptable level and suggest there would only be a slight impact.

Table 5.3a also shows the predicted impact noise levels from padel and tennis at the façade of the local residence. In terms of noise level, both sources create a sound level of 65dB. When this is compared to the average ambient impulse noise level (with no tennis activity) it is only slightly higher, albeit it should be noted that number of impulses/impacts from both sports would be significantly higher and also the nature of the sound created is likely to be more intrusive.

Comparing the number of impact noise instances created, when the three nearest tarmac tennis courts are in play, the predicted number of impact noises created between tennis and padel would be similar to the total number of padel impact noises.

7 CONCLUSION

There were concerns from the Club regards the noise impact of the proposed padel courts on the neighbouring residence, so when conducting the calculations for predicting the noise levels, a worst-case scenario was adopted wherever possible.

Despite this, when fully utilised, the predicted L_{AEQ} noise levels are within criteria guidance, affecting an increase of 2.5dB at the neighbouring façade, in contrast to when tennis is played on the nearest two courts to the boundary when the increase would be 3dB. When the nearest tennis courts are active and the two padel courts are in play, the increase would be 1.5dB at the façade and would likely be indistinguishable. Both the predictions of L_{AEQ} (2.5dB and 1.5dB) are defined as only causing an 'low or insignificant level of impact' and are generally considered to be acceptable levels, and this is also the recommendation with Sports England AGP guidance. However, as previously stated, as padel and tennis is comprised almost entirely of impulse and impact noise, it is also advisable to investigate this to inform a recommendation.

The impact noise levels at the façade are predicted to be 65dB from both sports. In terms of the number of instances of impact, the nearest 3 tennis courts in play would create a similar number of noise events than 2 active padel courts – padel would be predicted to be 34 per minute, as compared to 30 with tennis. It should also be considered that tennis impact noise is generally limited to racquet/ball impacts, whereas there are 3 main types of impact noise created from a padel court, so the padel compliment, whilst being the same noise level are likely to be slightly more noticeable. However, the level of impact noise from both sports at the nearby façade is 65dB which is largely due to the favourable orientation of the padel courts. For context, this is in line with the Chartered Institute of Environmental Health (CIEH) Clay Pigeon Shooting criteria which (in simple terms) states that 65dB is the acceptable façade level, after which it is likely to create annoyance. It should be noted that this is a subjective comparison on a different situation, and it is only mentioned to provide a benchmark of what level is looked on as acceptable in other similar circumstances.

The introduction of padel, like any new sport will produce a new noise source in the environment, however the impulsive character of padel noise has similarities to tennis, as is the propensity and the level of impact noise in this instance. It is also noted that the Club has an existing restriction on the use of floodlighting for tennis outside of the hours of 0800-2100 hrs (Monday to Thursday) and 0800-2200 hrs (Friday to Saturday) and it is fully expected that this condition will be carried through to the proposed padel courts, which will affect hours of utilisation of the proposed courts to that of the existing courts.

Like tennis, it may be heard on occasion in the garden area of the adjacent residence, but given that the site is an established and frequently used tennis club which has been running without causing any previous noise issues, I would suggest that the predicted padel noise would not generally be noticeable to any greater degree and therefore would be in acceptable limits.

I have considered mitigation, which would reduce the padel noise compliment, but in this instance, I consider that mitigation would not be necessary to endorse this application from a noise perspective and recommend that permission should be granted.

8 APPENDIX

8.1 Measurement Limitations & Uncertainty

Measurements have been taken in accordance with guidelines which minimises, where possible any uncertainty in results, however, it would be impossible to eliminate uncertainty and therefore good practice to quantify where possible.

Limitations exist with the measurement equipment;

The devices used for measurement were class 1 sound level meters. These are calibrated to an uncertainty level of +/- 0.7 dB @1KHz and are recalibrated every 2 years under laboratory conditions.

Prior to and post measurement, calibration of the sound level meter is performed by a field calibrator, which in turn is calibrated under laboratory conditions every 12 months. The pre and post project calibration variance in this instance was 0.3 dB and 0.4 dB respectively.

Uncertainty in environment;

Although assessments were made with regards to the environment, it cannot be guaranteed that the conditions were during the assessment remained, as variation of these assessments would lead to uncertainty, including;

Meteorological fluctuations, wind, temperature, humidity, rain

External polluting noise; in this instance road traffic and urban noise from the surrounding area being the major contributors

Subjective factors, assessment of the source being subject to varying opinion

8.2 Noise Survey Equipment

The following equipment was used for the noise survey;

Table 8.1 Noise Measurement Equipment

Measurement Position	Equipment Description	Manufacturer & Type No	Serial No.	Calibration Due Date	Calibration Drift (dB)
MP1	Sound Level Meter	Svante SV971A	159458	11/12/27	-0.1
	Calibrator	Svante	175227	13/01/27	
MP2	Sound Level Meter	Svante SV971A	159480	11/12/27	0.1
	Calibrator	Svante	175227	13/01/27	

8.3 Images of the padel site



Fig 8.3a shows an image of the site scheduled for the padel courts



Fig 8.3b shows an image of the tennis courts adjacent to the residents border and also the site scheduled for padel courts.

9 GLOSSARY OF TERMS

Sound – an acoustic effect perceived by an individual. Sound is perceived differently by individuals and is highly subjective. Acoustically for sound to be perceived it has to be above the threshold of hearing (typically taken to be 0dB) but this threshold varies between individuals.

Noise – noise is defined as unwanted sound. The level at which noise is present will indicate the potential impact. In order for a sound to become noise, it has to be perceivable by the individual. Technically noise can be described in terms of its acoustic profile, typically though noise at or below the ambient levels is rarely loud enough to be considered significant.

Acoustic environment sound from all sound sources as modified by the environment [BS ISO 12913-1:2013]

'A' Weighting – This function modifies the linear frequency response of the meter sound profile to attempts to simulate the characteristics of human hearing. Hence a dB(A) reading is a subjective evaluation of what we actually hear whereas dB(LIN) (now written dBZ), is an objective reading of what is actually present. A weightings are normally used in environmental and occupational measurements

Ambient – This is the general level of sound in an area. It is usually composed of sound from many sources near and far, that together make the 'average' noise for an area. Ambient noise is normally described using a long term average sound level (typically L_{Aeq}).

Ambient sound – totally encompassing sound in a given situation at a given time, usually composed of sound from many sources near and far. *NOTE The ambient sound comprises the residual sound and the specific sound when present.*

Ambient Sound Level, $L_{Aeq,T}$ – equivalent continuous A-weighted sound pressure level of the totally encompassing sound in a given situation at a given time, usually from many sources near and far, at the assessment location over a given time interval, T . *NOTE The ambient sound level is a measure of the residual sound and the specific sound when present.*

Attenuation – The loss in energy level of the sound usually used in relation to the loss due to sound passing through a structure or enclosure.

Background Noise Level – The underlying level of sound in the absence of the source is normally measured as an LA90, the level which is exceeded by 90% of sound present. This measurement effectively screens out transient noises. Occasionally LA99 is used which is the level which is exceeded by 99% of the sound present.

Background sound level, $L_{A90,T}$ – A-weighted sound pressure level that is exceeded by the residual sound at the assessment location for 90% of a given time interval, T , measured using time weighting F and quoted to the nearest whole number of decibels

Decibel (dB) – a unit or level, derived from the logarithm of the ratio between the sound pressure measured and a reference value. For sound pressure level the reference quantity is 20μPa, the threshold of normal hearing is in the region of 0 dB and 140 dB is the threshold of pain. A change of 1 dB is only barely perceptible whilst a change of 10dB is considered significant. Sound pressure levels are noted as SPL, sound power can also be measured as a ratio of energy values, and is normally noted as SWL.

dB(A) (See A weighting above) – decibels measured on a sound level meter weighted by a scale which is designed to reflect the perception by the human ear. A noise meter incorporates a frequency weighting device to create this differentiation. Measurements in dB(A) broadly agree with people's assessment of loudness for broadband noise. A change of 3 dB(A) is the minimum perceptible under normal conditions, and a change of 10 dB(A) corresponds roughly to halving or doubling the loudness of a sound. The background noise level in a living room may be about 30 dB(A); normal conversation about 60 dB(A) at 1 metre; a busy factory may have a level around 85dB(A); the level near a pneumatic drill about 100 dB(A).

Equivalent continuous A-weighted sound pressure level, $L_{Aeq,T}$ – value of the A-weighted sound pressure level in decibels of continuous steady sound that, within a specified time interval, $T = t_2 - t_1$, has the same mean-squared sound pressure as a sound that varies with time. *NOTE The equivalent continuous A-weighted sound pressure level is normally quoted to the nearest whole number of decibels.*

Frequency – This is the number wavelengths passing a given point per second. The unit is the hertz (Hz). Frequency is the normal variation in pitch that most sounds have over time. Sound is normally made up of many different frequencies, and they behave differently within the environment. For example, moderate and high frequencies are damped out easily by barriers, screens or enclosures while low frequencies are more difficult to attenuate, which explains why loud music from a neighbour perceived through a wall often only sounds like a dull base thumping noise.

Impulse Noise – Single or repeated sound of short duration such as a bang or crash.

L_{A90} – The A weighted noise level exceeded for 90% of the specified measurement period. It is a statistical measurement. Used in BS 4142:2014 as the baseline for impact assessment and more generally it is used to define background noise level. Example, if a sound measurement carried out each second over 100 seconds the L_{A90} result would be the level representing the quietest 10% of the readings i.e. 10seconds.

L_{Aeq} – The equivalent continuous sound level - the sound level of a notionally steady sound having the same energy as a fluctuating sound over a specified measurement period. L_{Aeq} is used to describe many types of noise and can be measured directly with an integrating sound level meter. It is obtained by continuously integrating ('adding up the energy of') a fluctuating sound signal and dividing by the elapsed time, to give the true mathematical average of any time varying signal. An L_{eq} reading must always be related to a time period, it should not be read as an instantaneous value of sound pressure.

L_{Amax} – The highest A weighted noise level recorded during a noise event. The time weighting used (F or S) should be stated. Almost all environmental measurements are 'Fast' weighted.

Logarithmic – A scale where the exponent indicating the power to which a fixed number, the base, must be raised to produce a given number. The base used in acoustics is 10. Thus, the logarithm of 10 = 1, the logarithm of 100 = 2 and the logarithm of 1000 = 3. Logarithms are used to convert very wide spans of pressure or energy measurements into usable scales.

Loudness – An observer's auditory impression of the strength of a sound. It is a subjective effect which is a function of the way we hear, and psychoacoustic response as well as the amplitude and frequency of the sound.

Masking – The process by which the threshold of hearing of one sound is reduced due to the presence of another which 'masks' the first.

Measurement Periods (T) – is the period over which the measurement is taken, normally varies between 5mins to an hour. More commonly 'real time' analysis and new data storage capabilities has allowed measurement times to be reduced to 1 second

Measurement time interval, T_m – total time over which measurements are taken. *NOTE This may consist of the sum of a number of non-contiguous, short-term measurement time intervals.*

Meter response and time weightings – Sound Level Meters are provided with a sampling reference time weightings dependent on the sounds to be assessed. The variable time response control with settings are:- 'S' Slow; 'F' Fast; 'I' Impulse; 'P' Peak.

'S' Slow – meter response is over damped with a time constant of approximately 1000ms. The setting tends to average out variations in sound levels in the readings.

'F' Fast – meter responses sample over a response of 125ms. i.e. the measurement for variable sound will respond each 1/8th of a second showing a value.

'I' Impulse – uses a special electrical circuit with a time constant of about 35ms (of the same order as the response time of the human ear) to permit a very rapid response for investigating very sudden, short duration - impulsive - sounds. This setting incorporates a detector which in effect stores the signal for sufficient time to allow it to be displayed. Also a slow decay rate is incorporated with time response of approx. 1500ms to allow more easy reading of the maximum value as the indicator moves back relatively slowly.

Peak – Sound Level Meters often incorporate this setting which enables the **absolute peak** (as opposed to the rms) value of an impulsive waveform to be measured. A time constant of the order of 20 - 50 micro seconds is now involved to permit the following of very sharp impulsive events. Evidently electrical signal storage is also required to permit the meter to register the peak of such very fast events.

Rating Level – The specific noise level of a source when measured at receiver location (usually averaged over a time interval) plus any adjustment (penalty or weighting) for the characteristic features of the noise. It is used in BS4142 to rate the likelihood of complaints.

Reference time interval, T_r – specified interval over which the specific sound level is determined. *NOTE This is 1 h during the day from 07:00 h to 23:00 h and a shorter period of 15 min at night from 23:00 h to 07:00 h.*

Residual sound – ambient sound remaining at the assessment location when the specific sound source is suppressed to such a degree that it does not contribute to the ambient sound

Residual sound level, $L_r = L_{Aeq,T}$ – equivalent continuous A-weighted sound pressure level of the residual sound at the assessment location over a given time interval, T

Specific sound level, $L_s = L_{Aeq,T_r}$ – equivalent continuous A-weighted sound pressure level produced by the specific sound source at the assessment location over a given reference time interval, T_r

Specific sound source – sound source being assessed

WHO – World Health Organisation