Margarita Romanovich - Planning Officer.

PLANNING APPLICATION NO 2023/0866

ST GEORGES HILL LAWN TENNIS CLUB WARRENEERS LANE WEYBRIGE SURREY KT13 0LL

APPLICATION FOR 3 SEMI ENCLOSED PADEL COURTS

MEETING DATE 17 OCTOBER 2023 7PM

EAST ROAD OBJECTORS' SUMMARY AND EXPERT REPORTS

East Road Residents' Objections to SGHLT Club's Proposal for 3 New Padel Courts

We have commissioned two sound consultant companies to assess the St George's Hill Lawn Tennis Club's proposal for three new padel courts. Their reports are attached and form an important part of our submission. We've outlined some key findings below:

1. Noise caused by padel activity is significantly louder than noise caused by tennis activity

An increase of 10 dB is mentioned in the tennis club's own report. Generally a 10dB increase means a doubling of the perceived loudness. This was proved by SGHLT Club itself via the trialling of a padel court in 2021. On attending a neighbour's property (East Warreners) the Tennis Club's representatives agreed the noise was unacceptable.

2. The number of hits per minute in a padel game is significantly higher than in a tennis game, causing even more nuisance

Padel is typically played in doubles and on smaller courts, with balls also bouncing off the walls (similar to squash) which adds up to a much higher number of hits per minute, thereby further increasing the nuisance. The Clarke-Saunders White Paper examines the differences between padel and tennis and identified average hit rates of every 2 seconds for padel versus 3.3 seconds for tennis at the amateur level.

3. The 'shot gun' sound character of a padel ball being hit further increases the disturbance

Acoustically, a padel game hit causes a much sharper peak than a tennis game hit (a steeper rise and fall in intensity). Sounds having this profile are very impulsive and are considered to be significantly more intrusive. In other settings, an impulsive sound typically gets a 'penalty' of an added 6dB to take this particular intrusiveness into account.

4. The effectiveness of acoustic fences is unproven.

No studies have established the effectiveness of acoustic panels around padel courts. Further there is no fence at all on the western side. (One has to question why one side has been left open?) Finally, putting a second wall does not necessarily reduce sound emissions (The glass walls being the first one, the acoustic panels, the second one).

5. The sound report provided by the tennis club is flawed

The report commissioned by the tennis club is based on unsupported and theoretical assumptions, uses data incorrectly and glosses over the differences between padel and tennis sound.

Accordingly, we are in no doubt that the occupants of a number of properties in East Road will suffer substantial and unreasonable interference with their use and enjoyment of their properties, particularly so if the courts are in use by up to 12 players from 7am to 10pm (potentially up to fifteen hours a day!) every day of the year. We also know that the increase in noise will be further exacerbated by the rowdy nature of the game of padel plus potential spectator participation. The Tennis Club has a solid history of hosting tournaments and we have no reason to believe that this tradition would not be continued if the 3 proposed padel courts are constructed. We have nothing against padel itself. We just believe that in the proposed location, it should be completely enclosed in a soundproofed building with roof.

This summary has been reviewed and approved by Clarke-Saunders Acoustics and JSP Noise Consultants.

On behalf of the owners of Kingswood, Dorin Court and Longmoor, East Road and East Warreners, Warreners Lane, St George's Hill.

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ENVIRONMENTAL NOISE ASSESSMENT FOR PROPOSED PADEL TENNIS COURTS AT ST GEORGE'S HILL LAWN TENNIS CLUB, WEYBRIDGE

Prepared for

Date: 27 August 2023

1. INTRODUCTION

An environmental noise survey has been conducted to assess the effect of the proposed new padel tennis courts at the St George's Hill Lawn Tennis Club, Weybridge, Surrey on the nearby residential properties.

The survey was conducted on the 13th July 2023 and the results are presented in this report, together with a review of two reports prepared by other acoustic consultancy firms (Hepworth Acoustics on behalf of the Club and Bureau Veritas on behalf of some of the local residents).

The assessment was conducted on behalf of the residents in the East Road area of St George's Hills, and provides comparisons of the padel tennis noise with the existing background noise levels, including padel tennis data measured by the Author of this report at a padel tennis court in Bournemouth and at another padel tennis court in Roehampton.

The Bournemouth measurements were conducted in 2020 during 2 site visits on behalf of local residents objecting to proposals for additional padel courts. The Roehampton measurements were conducted on the same day as the site visit to Weybridge.

Padel tennis has become very popular in England over the last few years, with many normal tennis courts being converted to padel tennis courts. This process, however, has led to many objections from local residents, complaining about increased noise levels in their gardens relative to the previous normal tennis environment.

2. DESCRIPTION OF FACILITIES AND BACKGROUND INFORMATION

Padel tennis is essentially a cross between tennis and squash using hard bats and softer balls with the balls bouncing off glass walls. The St Georges Hill Lawn Tennis Club has a number of tennis courts, and the club is proposing to convert one of the existing tennis courts into 3 all-weather padel tennis courts as shown in figure 1. The 3 new courts will be located at the

eastern end of the complex, which is surrounded on all sides by residential properties. The properties to the south are partly shielded by the club house, and the properties to the west have several normal tennis courts on route.

The residential areas are accessed by Warreners Lane to the west and East Road to the north and east. There is also a pond to the south known as Warren Pond, plus a smaller pond further south.

Each padel court has a size of 20m by 10m (see figure 2) and is marked out like a standard tennis court. There is a 3m high transparent glass wall at each end of the court and partly along the sides. The glass wall extends 4m along each side, leaving a gap of 6m either side of the net location The central part of the sides is normally covered by wire mesh fence, and in the case of the Weybridge courts there will be some form of roof canopy, which presumably allows the courts to be described as all-weather use. The 3 padel courts will be constructed side by side, rather than end on to each other (see figure 1).

As part of the planning assessment process for the 3 new padel courts, a 6 month trial run was conducted, whereby padel tennis took place on one of the tennis courts near the north western end of East Road, opposite the garden of the East Warreners property. The trial court was fitted with glass walls etc, but no PVC roof canopy. The local residents described the noise output as 'exceptionally noisy' and unbearable, hence a later proposal by the club to revisit the situation and partially enclose the future padel courts by means of acoustic fencing.
Noise measurements were conducted by consultancy firm Cole Jarman during the trial run, on behalf of the tennis club, but the report's conclusions did not support the residents' subjective comments.

Assuming that the proposed Weybridge canopy is the same other court designs, such as one in Dundee at Fonthill Community Sports Club, then the canopy is described as an aluminium structure with curved ridge, together with a width of span of 12m, a length of structure of 21m and a height at eaves of 6.7m. The Dundee canopy is further described as a roof and 2 half moon end panels and side protection, plus a

cover of white translucent PVC. The gap between the 3m high glass wall and the start of the roof canopy is about 4m, so regardless of where the glass walls start or end, there is always a height gap of 4m all around the court above the glass walls. It is assumed that the aluminium structure provides a framework for the PVC cover, in which case the acoustic attenuation characteristics of the canopy are likely to be negligible.

The Hepworth Acoustics report (reference 1) based its assessment on background noise measurements at the Weybridge facility, and measurements of padel tennis noise at the Roehampton Lane tennis club. The Roehampton club has 2 padel courts, one partially enclosed as per the Dundee court, and the other court without any enclosure. In view of the importance of the Roehampton court data to the Hepworth Acoustics assessment process, the Author of this report also visited the Roehampton club to obtain some independent noise data.

As part of its assessment process, the Hepworth Acoustics consultant also referred to general guidance and policy from Government planning documents such as the National Planning Policy Framework 2021 and the Noise Policy Statement for England 2010, but neither of these documents are intended to be applicable to sport and games activities, and the main assessment concentrated on the padel tennis noise versus existing background noise levels.

The Hepworth Acoustics report also makes reference to British Standard BS4142 for assessing industrial and commercial noise (reference 2), but then dismisses this document as not being applicable to rating and assessing recreational noise. Whilst this statement is true, there are aspects of the BS4142 rating correction procedure which might warrant inclusion for padel tennis impacts.

The Hepworth Acoustics report lacks detail in a number of areas and makes questionable assumptions, leading to possible errors in the assessment process. In particular the report contains several pages and tables describing and presenting the background noise measurements, whilst the

description of the padel tennis measurements at Roehampton is severely limited to 2 short paragraphs. Similar comments apply to the prediction model, with just one paragraph explaining the source noise levels. These various issues are discussed further in section 3.

In view of the need to comment on the content of the report and the accuracy of its predictions, as they are paramount to the site conclusions, both the Bournemouth data and the Roehampton data have been used to assess the Hepworth Acoustics predictions, for comparison with the existing background noise measurements at Weybridge.

Some brief comments have also been given on the Bureau Veritas report (reference 3) in section 4.

The 2 padel tennis courts were given planning permission by Wandsworth Borough Council, and an online search of planning applications at Wandsworth BC shows that the proposed Roehampton padel tennis courts were assessed by another consultancy firm, Sustainable Acoustics, on behalf of the Roehampton tennis club. Whilst it is not intended to review the Sustainable Acoustics report in great detail, sections of the report have been studied to see if the report provides further insight into the levels and frequency content of padel tennis noise, and provides more information on the Roehampton facilities. Sustainable Acoustics visited another padel tennis club at Hurlingham, near Roehampton for its measurement data.

3. REVIEW OF HEPWORTH ACOUSTICS REPORT

3.1 Measurement Procedure

The Hepworth Acoustics consultant conducted background noise measurements at the St George's Hill site, over a period of several days. Two freefield measurement positions were chosen at the boundaries of the existing tennis courts (see figure 3), but no attempt appears to have been made to seek access to any of the rear gardens of the residents in East Road.

Position A was located close to the rear garden of

Markinch and position B was located close to the rear garden of Beaumont Lodge. No further details are given in the report, except to note that position A was representative of the background noise environment to the north and north east of the proposed padel courts, and position B was representative of the background noise environment to the south of the courts.

Data was obtained over several 24 hour periods including weekends, and included periods with and without the existing tennis courts in use. Automated equipment was used, which suggests that the equipment was left unmanned, since there is no comment on the composition of the background noise environment, bearing in mind that the site lies under the take off flight path for Heathrow Airport.

Based on the graphical presentation of the results in Appendix II of the Hepworth Acoustics report, the data has been acquired over 15 minute averaging periods, which seems fair enough, but has then been converted to long term average periods of 12 hours daytime and 4 hours evening time, albeit with the range of values also shown in the summary tables. The background Leq, Lmax and L90 values have all been measured, but the consultant then concentrates on the Leq values for the subsequent comparison with the padel tennis noise levels and does not comment further on the background L90 values or the padel tennis Lmax values.

As far as the measurements of padel tennis noise are concerned, the Hepworth Acoustics consultant has visited the Roehampton Club and conducted measurements at 2 locations around a padel court, but there is a distinct lack of information on the exact locations and which court was in use. The Roehampton Club in Roehampton Lane has 2 padel tennis courts separated by a mini tennis court. One padel court is semi enclosed with the roof canopy design, similar to the ones proposed for Weybridge, whilst the second padel court is uncovered. It is assumed that the Hepworth Acoustics measurements were conducted around the semi enclosed roof court, since this court appears to be the favoured court for serious games. It should be noted, however, that this court is surrounded on 2 sides by high brick walls and

the club house on the third side.

A closer inspection of the planning application details on the Wandsworth Borough Council in 2019, prior to the construction of the courts, shows that the then existing tennis courts were enclosed by 'a 6.6m high building to the north, a 2.8m high building to the east and a boundary treatment between 6.4m and 3.2m high to the south'. It is not clear what took place during the subsequent padel tennis court construction process, but at the time of the July 2023 site visit by the Author of this report, there were 4m high brick walls to the east and south, as well as the tall building to the north. The implications of this layout are discussed further in section 6.2.

The Hepworth Acoustics report is extremely vague about the locations of the 2 measurement positions, merely describing them as being located at 'a reference distance to the side of the court' and 'a reference distance to the end of the court'. Since the gap between the side of the court and the adjacent brick wall is only about 2m, it is assumed that the reference distance in this case is 1m. Similarly, the gap between the end of the court and the adjacent brick wall is only about 3m, so it is assumed that this reference distance is also 1m.

Having measured the padel tennis court noise levels over a 57 minute period, the Hepworth Acoustics consultant then proceeds to correct the data to a 15m 'common reference' distance from the centre of the court, without describing how this distance (d) correction was carried out (e.g 20 log d1/d2 or some other relationship). Since the padel tennis court has dimensions 20m by 10m, it means that the common reference distance is 5m from the end of the court, in the case of data acquired at the end of the court, and 10m from the side of the court, in the case of data acquired at the side of the court. These distances are important when comparing the Hepworth Acoustics data with the data collected by the Author of this report at the same Roehampton club.
The Hepworth Acoustics report notes that padel court match noise levels were 10 dBA higher than normal tennis match noise levels, but there is no comment on the different impacts obtained by the harder padel tennis racket on a softer ball, compared with normal

tennis impacts. The consultant states that 'the character of padel tennis match noise is not significantly different to a tennis match', but such a statement is not correct (as noted in the Bureau Veritas report- see section 4), and without any Lmax comparisons, no evidence has been provided for such a statement.

3.2 Prediction Approach

The Hepworth Acoustics consultant has used the measured source noise data at the Roehampton Club, to set up a 3D noise mapping model using CadnaA software. This approach takes the data at known distances to the padel court (15m from the centre of the court in this case) to predict the noise levels at greater distances, associated with the residential locations. The predicted results can then be compared with existing background noise levels, but there are no recognised procedures for assessing padel tenis noise. As already noted in section 2, the Hepworth Acoustics report refers to the National Planning Policy Framework 2021 and the Noise Policy Statement for England 2010, but both these documents only make generalised statements about avoiding adverse noise impacts on health and quality of life, and do not specifically cover sport and games activities. Instead, the Hepworth Acoustics report mainly restricts the assessment process to comparisons of the predicted padel tennis noise with existing background noise levels, whilst making brief reference to the Government documents.

Full details of the model inputs are not given, but a point noise source approach has been adopted, since the report refers to the use of 4 point noise sources on each proposed padel tennis court. A distance relationship will be required, but it is not clear whether a 20 log d1/d2 relationship, or a 10 log d1/d2 relationship has been used, where d1 is the source noise distance and d2 is the reception point distance. Since point noise sources have been used, it is assumed that Hepworth Acoustics are using a 20log d1/d2 relationship. The predictions have been conducted with 3 padel courts in use at the same time and match play activity in progress. The fabric roof canopy has been assumed to provide zero noise attenuation, which is a reasonable assumption.

Any prediction model needs to be calibrated, and this has been conducted by comparing the predicted levels with the measured levels from the Roehampton survey, and then adjusting the model accordingly, but no information has been given on the correction factors.

3.3 Prediction Results

Noise contour plots have been produced for the ground floor and first floor levels and these have been used to derive the predicted noise levels for 13 different residential properties around the proposed padel courts (as shown in table 3 of the Hepworth Acoustics report). The report singles out 2 properties having the highest predicted noise levels at the property boundaries. These are 51 dBA Leq (1 hour) at Beaumont Lodge to the east and 44 dBA Leq (1 hour) at Tintern Cottage/Tudor Cottage, also to the east. The next highest levels are 43 dBA Leq (1 hour) at The Tiled House and 42 dBA Leq (1 hour) at Kingswood. The predicted levels at the ground floor and first floor locations are generally lower owing to their greater distance from the padel courts, although it is unclear from the Hepworth Acoustics report whether the 3 dBA difference between façade and freefield locations has been taken into account in the predictions, bearing in mind that the background noise levels (due to the existing tennis courts etc) would have been freefield levels.

The predicted values are averaged over a period of 1 hour, which makes them comparable with the background noise levels measured over 57 minutes. The predictions have assumed 3 padel courts in operation, but there is no indication in the report as to the likely increase in noise levels from one padel court to 3 padel courts, bearing in mind that the 3 courts will be spaced out from each other and some of the residential reception points will be primarily affected by the nearest court.

The first set of results presented in the Hepworth Acoustics report apply to the prediction model with no screening from acoustic fences etc. The second set of results presented in the Hepworth Acoustics report apply to the prediction model with screening from

acoustic fences intended for the southern, eastern and northern edges of the courts. The height of the acoustic fence is 4.2m, but there is no clear description of exactly where these screens would be located and why there is no screen on the western side of the courts.

The effect of the acoustic screens is to reduce the predicted noise levels at both the Beaumont Lodge boundary and the Tintern Cottage/ Tudor Cottage by 16 dBA, but there is no reduction for The Tiled House and Kingswood, because there are no acoustic screens intended for properties to the west.

It is not obvious that an acoustic fence, is going to be effective, since each court already has 3m glass sides around most of the court. Also is not clear how much of the total noise emission is due to impact of the balls with the glass walls, rather than impact between racquet and ball, observations by the Author of this report at Bournemouth tend to confirm the racquet/ball impact dominates. If as seems likely this is the case, then the glass screen is already acting as an acoustic fence, bearing in mind its 3m height and its location around most of the court, except for openings on each side of the court adjacent to the net.

It should be noted that two acoustic fences do not combine to give a total attenuation much greater than the attenuation of the higher fence, so an acoustic fence may only be effective where there are gaps in the glass sides. Since the gaps only occur near the court net and much of the ball/racquet impact noise during a match will occur in areas of the court away from the net, the attenuation benefits from any acoustic fence have not been proven.

3.4 Assessment Conclusions

Having obtained the predicted noise levels at the 2 worst case residential locations of Beaumont Lodge and Tintern Cottage/ Tudor Cottage for all 3 new padel courts, the Hepworth Acoustics consultant compares the resulting noise levels with the existing background noise levels.

Unfortunately, having measured the L90 background

noise levels, the consultant then proceeds to ignore them, and instead compares the predicted padel tennis noise levels with the higher Leq background noise levels. The Author of this report strongly belives that the predicted Leq noise level should be compared with the existing background L90 level, because of the distinctive and variable nature of padel tennis noise, and because many environmental noise assessments involve comparing the measured or predicted Leq noise levels with the background L90 noise levels.

Leq is essentially the average noise level of a time varying signal. It is used to assess and compare different noise sources, and involves specifying the time period over which the signal was measured. In contrast L 90 is the noise level occu rring for 90% of the time and represents the troughs of the time varying signal, so the L90 level is usually much lower than the Leq level. Lmax level is the highest noise level in the measurement time period.

If the L90 level is adopted for the background noise, then the Hepworth Acoustics conclusions need to be revisited, as discussed below.

In the case of the unmitigated situation, the predicted level of 51 dBA Leq (1 hour) at Beaumont Lodge compares with a background noise level of 37-42 dBA L90 (1 hour), from the Hepworth Acoustics measurements (position B) during weekday evenings. Similarly, the predicted Leq noise level of 44 dBA Leq (1 hour) at Tintern Cottage compares with a background level of 34-43 dBA L90 (1 hour) during weekday evenings (position A). Thus the predicted padel tennis Leq noise levels at both locations without mitigation exceed the background noise levels in the evening period by a wide margin.

In the case of mitigation with the proposed 4.2m high acoustic fence on the southern, eastern and northern sides of the padel courts, the predicted level of 35 dBA Leq (1 hour) at Beaumont Lodge compares with the evening background level of 37-42 dBA L90 (1 hour), according to the Hepworth Acoustics report. Thus the predicted padel tennis noise is only marginally below the background noise at this location (position B). On the other hand, the predicted padel

tennis noise level of 28 dBA Leq (1 hour) at Tintern Cottage is well below the evening background level of 34-43 dBA L90 (1 hour), assuming that the acoustic fence is being effective.

A problem arises, however, with the residential properties to the west of the padel tennis courts such as East Warreners, Dorin Court etc. Here there is no acoustic fence and predicted levels of 34 dBA Leq (1 hour) for East Warreners and 38 dBA Leq (1 hour) for Dorin Court compare with evening background levels of around 34-43 dBA L90 (1 hour) for position A, although Hepworth Acoustics did not measure the background noise near these properties. Thus the predicted padel tennis noise levels are of a similar magnitude to the existing background L90 noise levels at these locations.

4. REVIEW OF BUREAU VERITAS REPORT

The Bureau Veritas report was requested by some of the residents, following the need to have a peer review of the Hepworth Acoustics report. In particular Bureau Veritas was required to determine whether the assessment, and the conclusions therein, were fully justified and reasonable. The Bureau Veritas report is very brief, however, and limits itself to stating that all the correct procedures, normally used for assessing noise impact, have been followed. The report does not include checking any of the predictions and neither does it provide any evidence of similar padel tennis noise levels from the company's own measurements.

The report does, however, point out that there is no presentation of Lmax levels and, most importantly, disagrees with the Hepworth Acoustics statement that padel tennis noise is only slightly different to normal tennis noise. Instead the Bureau Veritas report states that 'padel tennis noise is quite distinctive in terms of both acoustic character and rate of ball/racquet interaction'. This view is the same as the one shared by the Author of this report, as discussed in section 9.

5. REVIEW OF COLE JARMAN REPORT

The Cole Jarman report (reference 5) on the padel

tennis court trial run has been prepared as a short memorandum document, which suggests that it might be a summary of another report, although one has not been provided by the tenns club.

As previously noted, a temporary padel court was installed on an existing tennis court directly opposite the East Warreners rear garden and a noise recording system was set up on the rear garden patio. This system was left unattended for a period of 24 hours in April 2021 measuring normal tennis noise and general background noise, and a later (approximate) 2 day period when measuring padel tennis and general background noise. Some attended spot measurements were also made in the adjacent garden.

The results are difficult to comprehend, since the time history traces provided by the unattended system do not indicate the periods when padel tennis was actually being played, and the spot check measurements are presented as single number Leq values without any associated time period. Also the Leq values for the padel tennis activity are considerably lower than the Leq values for normal tennis activity. This result does not make any sense, since most consultants would agree that padel tennis is noisier than normal tennis, even if there is no agreement on the extent of exceedance.

Furthermore, there is no description of what sort of padel game was in progress in terms of players ability etc, and why the measurement programme was so short relative to the 6 month trial period, particularly when the residents were complaining about the high noise levels.

The report does imply, however, that the lower L90 background unit should be used for the background noise comparison and not the higher value Leq unit.

6. MEASUREMENT PROCEDURE AT WEYBRIDGE

6.1 Background Measurements

The background noise measurements at St George's Hill (conducted by the Author of this report) involved 4 freefield measurement positions at various garden

locations around the residential gardens, as shown in figure 4.

Positions 1 and 2 were located in the rear garden of East Warreners, whilst positions 3 and 4 were located in the rear garden of Kingswood. All 4 positions were directly opposite the existing tennis courts, with positions 3 and 4 directly north of the proposed 3 padel courts.

Unfortunately, it had been intended to visit other gardens during the site visit on 13.7.23, but many of the owners were not at home, and the tight security cover around the St Georges Hill estate with locked gates and security staff on patrol, meant that access was not possible to gardens such as Markinch and Beaumont Lodge, without prior permission.

The background noise data was acquired in the form of the Leq, L10, L50, L90 and Lmax levels over 10 minute measurement periods for the afternoon period of 14.20 hours to 16.00 hours. The daytime weather conditions were cloudy with a slight breeze. A further site visit took place the same evening between 21.00 hours and 21.45 hours. The late evening weather conditions were clear skies with no wind. The measurement equipment consisted of a CEL 593C Precision Computing Sound Level Meter.

During both afternoon and evening sessions there was some normal tennis activity on the courts, but it was difficult to see through the boundary hedges etc whether one or two courts were in use.

6.2 Padel Tennis Measurements at Roehampton

As already indicated in section 1, the Author of this report visited Roehampton to obtain some independent padel tennis noise data for comparison with the Hepworth Acoustics data. The site visit took place during the early evening period of 13.7.23. Access permission was kindly given by the padel test manager, but only for the early evening session as a corporate event was taking place earlier in the day and there were no court bookings until 6pm. Data was acquired at 2 locations around the semi enclosed padel court with the canvas roof canopy.

Since the court was surrounded on 2 sides by the 4m high brick walls and the club house on a third side, the choice of measurement positions was limited. Position X was located 1.4m from the glass screen at the end of the court, and position Y was located 1m from the side of the court in line with court net (see figure 5). Whilst position X was 2.3m from the adjacent brick wall and hence was a freefied location, position Y was only 0.8m from the adjacent brick wall and hence was effectively a façade position. Both positions, however, are likely to be affected by acoustic reflections off the brick walls and the clubhouse walls.

There was only minor activity at the other padel court, so the measurements had to be conducted at semi enclosed padel court with its reflection complications.

Data was obtained in the form of consecutive 1 minute Leq and Lmax levels over short periods at each position. The padel tennis activity consisted of 4 male players on court, with hard fought games involving much ball lobbing and smashing. Several sets of data were obtained over periods of 3-10 minutes with the first 3 minute period being a game warm up session.

Weather conditions were cloudy with a slight breeze initially, but then rain arrived and the measurement session had to be terminated around 6.45pm. There was no interference from aircraft noise movements related to nearby Heathrow Airport, but owing to the weather problems, site attendance was limited to an approximate 30 minute period.

6.3 Padel Tennis Measurements at Bournemouth

The first site visit to the Bournemouth tennis club took place in January 2020, when measurements took place alongside an existing padel tennis court and in neighbouring residential gardens. A friendly game was taking place between 4 players.

The second site visit to the Bournemouth club took place September 2020 during a padel tennis tournament for experienced players. Similar measurement positions were used for both site visits and, since the measured Leq and Lmax values were

similar to the first visit, only the second site visit data is presented in this report. The first site visit, however, included some frequency content measurements in the form of 1/1 octave band Leq levels at one position, and this data is reproduced in this report. The Bournemouth tennis club had one padel tennis club, but was seeking to build some more padel courts, hence the need to assess the situation on behalf of the local residents.

Several measurement positions were selected at Bournemouth site, in order to cover the gardens of concern, but the most important one was a road pavement position to the side of the padel court, at a mid court location near to the net (see figure 6). Unfortunately, a 1.7m high non acoustic timber fence was located between the padel court and the pavement, which complicated the assessment situation, but it was not possible to choose a location on the other side of the padel court, owing to normal tennis use. Similarly it was not possible to conduct meaningful measurements at either end of the court, owing to access problems and traffic noise interference.

On the other hand the boundary fence was useful, because it enabled data to be obtained without the problem of being observed by the players. The pavement location was about 7m from the court side glass panel, or 12m from the centre of the court.

The measurement equipment again consisted of a CEL 593C Precision Computing Sound Level meter, set to record data in the form of consecutive 1 minute Leq and Lmax levels over long periods. This approach was adopted partly to see how the padel tennis varied, and partly to see the effect of passing vehicles. Weather conditions were cloudy with a slight breeze.

7. RESULTS

7.1 Background Measurements at Weybridge

Table 1 provides the background noise levels at St George's Hill (taken by the Author of this report) for the 10 minute measurement periods, together with on site observations. Apart from any tennis games in

progress, the afternoon background noise environment consisted mainly of aircraft noise, with up to 1 or 2 take off movements per 10 minute period from Heathrow Airport. Other noise sources consisted initially of the occasional distant hedge trimmer and lawn mower, and a low level air handling plant type hum, which may have been coming from the clubhouse. Levels of 46-56 dBA Leq (10 minutes) and 40-42 dBA L90 (10 minutes) were obtained at positions 1-4 during the afternoon session.

For the late evening session, aircraft noise was again present, but the air handling plant hum had disappeared by then. Levels of 50-51 dBA Leq (10 minutes) and 37-39 dBA L90 were obtained for the evening period.

As previously noted, the Hepworth Acoustics report does not comment on the composition of the background noise for the April 2022 visit, with no mention of the aircraft movements. This may be because the equipment was left unmanned with no on site observations of typical site activities.

Background levels of 44-60 dBA Leq (1 hour) and 38-52 dBA L90 (1 hour) were obtained by Hepworth Acoustics for the weekday daytime session at position A, although it is not clear why the L90 range was so large. For the weekday evening session, background levels of 38-56 dBA Leq (1 hour) and 33-43 dBA L90 (1 hour) were obtained by Hepworth Acoustics for position A. Position A at the Markinch residential garden is similar to position 3 for the Author's measurements, and both sets of data show approximately similar L90 values. Thus there is no reason to change the padel tennis noise comparisons with the background noise L90 levels of section 3.4.

7.2 Padel Tennis Measurements at Roehampton

Tables 2-6 provide the raw data in the form of consecutive 1 minute Leq and Lmax values (measured by the Author of this report) at each of the 2 Roehampton measurement positions. Tables 2-4 apply to position X, with table 2 for the warm up session, and tables 5-6 apply to position Y. Leq gives the average level in the 1 minute period, whilst Lmax gives the highest noise level in that 1 minute period.

The padel tennis activity was very audible and measurable and consisted mainly of the bat thumping the ball and the players shouting to each other. There were several occasions when the ball thumped the glass walls of the court, particularly during the overhead smash impact.

For measurement position X at the end of the court, the Leq levels generally varied between 65 and 70 dBA Leq (1 minute). For position Y at the side of the court, the Leq levels were slightly higher at 70-75 dBA (1 minute). The corresponding Lmax levels were 80-92 dBA Leq (1 minute) for position X and 89-93 dBA Leq (1 minute) for position Y, with the side of the court location giving slightly higher levels than the end of the court location.

Whilst the position X and Y data were measured in 1 minute intervals, and hence contains all the rise and fall in noise levels during the monitoring period, the sound level meter also provides the cumulative Leq value over the total measurement period. The cumulative Leq values are shown in table 7 for positions X and Y, with separate values whenever the meter was reset. The table entries show the cumulative noise level alongside each total measurement period in minutes. As shown position X had cumulative values of 69.2 dBA Leq for a 3 minute period, 68.3 dBA Leq for a 4 minute period and 67.2 dBA Leq for the next 10 minute period. All 3 values are similar, giving an average value of about 68.2 dBA Leq. Similarly position Y had a cumulative value of 72.0 dBA Leq for 4 minutes and 71.7 dBA Leq for another 4 minutes (see table 7), giving an average value of 71.9 dBA Leq.

Summarising these results, position X was 1.5m from the end of the court, with the court length being 20m, thus the average value of 68 dBA Leq at the end of the court applied to a distance of 11.5m from the centre of the court. Similarly position Y was 1m from the side of the court with the court width being 10m. Thus the average value of 72 dBA Leq applied to a distance of 6m from the centre of the court when measured at the side of the court.

If the noise versus distant relationship is 20log d1/d2

then the corresponding 15m values become 65.9 dBA Leq when measured at the end of the court and 63.9 dBA Leq when measured at the side of the court, where 15m distance has been chosen for comparison with the Hepworth Acoustics data.

Unfortunately, the Hepworth Acoustics report does not provide any individual tables of the April 2022 padel tennis measurements at Roehampton. Instead the report merely summarises the data in the form of a level of 52 dBA Leq (1 hour) at 15m from the centre of the court, when measured at the end of the court, and 57 dBA Leq (1 hour) at 15m from the centre of the court, when measured at the side of the court. The corresponding Lmax values are also not provided.

Assuming that the correct distance relationship is 20 log d1/d2, then the Hepworth Acoustic padel tennis levels become 55 dBA Leq (57 minutes) at a distance of 1m from the court end and 65 dBA Leq (57 minutes) at a distance of 1m from the court side. Thus the Hepworth Acoustics padel tennis data is 13 dBA below the Author's data for measurements at the side of the court, and 15 dBA below the Author's data for measurements at the end of the court.

It is unclear why the Author's data is considerably higher than the Hepworth Acoustics data, although it is appreciated that the Author's data was obtained over short periods of time, owing to impending rain. In contrast the Hepworth Acoustics data was measured over a 57 minute, which means that it may have included breaks between games etc, which would have lowered the average level.

The presence of the brick walls etc will clearly lead to an increase in noise level from acoustic reflections, which in the case of a façade location next to one wall would be expected to produce a 3dBA increase. With 3 walls and the glass sides of the court, there are likely to be multiple reflections, however, which could mean a 6 dBA difference maybe. Unfortunately, without any proper detail on the Hepworth Acoustics choice of court, the measurement locations and no proper tabulated measurement data, it is difficult to analyse the situation further. Possible reasons for the differences are given in section 8.

As mentioned in section 2, the Roehampton padel tennis court proposals were originally assessed by consultancy company Sustainable Acoustics. The company report produced in 2020 (reference 4), includes descriptions of the proposed padel tennis court layout at Roehampton, background noise measurements in the adjacent residential areas, and measurements of padel tennis noise at the nearby Hurlingham club.

In terms of court layout, the report shows the proposed conversion of the existing tennis courts at Roehampton into 2 padel courts either side of a mini tennis court, and confirms the presence of high walls on 3 sides of the existing tennis court to the east and a high wall on 1 side of the existing tennis court to the west. In terms of the background noise environment at Roehampton, the report particularly mentions relatively high noise levels from aircraft noise due to Heathrow Airport movements, although no such interference was reported by Hepworth Acoustics during the measurements of padel tennis at Roehampton.

In terms of padel tennis measurements at Hurlingham, the Sustainable Acoustics report is rather disappointing in its description of the measurement positions and its presentation of results. Several positions were chosen for the padel tennis measurements, with positions AP1 to AP5 at various locations and distances around the padel tennis court, measuring over very short periods of time between passing aircraft, and a further position MP3 near to the court, measuring over a whole match period. Also the measured data shows similar noise levels regardless of whether the measurements were conducted at 1m or 5m distance from the court edge.

The exact location of position MP3 is described as the 'same distance as position MP2' for the background noise measurements at Roehampton, but MP2 is not fully described in terms of distance from the Roehampton court. Instead MP2 is merely described as 'at the perimeter wall of the club'. Since the wall at Roehampton is about 3.8m from the court glass side, it is assumed that position MP3 is about 3.8m from

the Hurlingham padel court at a court end location.

Table 4 of the report shows levels of 60-63 dBA Leq and 73-85 dBA Lmax for 15 minute periods at position MP3 during a padel tennis match, but then dismisses these as unrepresentative owing to the inclusion of regular aircraft landings. Table 4 of the report provides the results for positions AP1-AP5, with levels of 53-66 dBA Leq and 62-79 dBA Lmax and aircraft noise excluded. The measurement periods, however, vary between 8 and 40 seconds only, so it is difficult to see how such data can be totally relied upon.

The text of the report then states that the padel tennis noise at the end of the court, next to the glass wall, varies from 53-56 dBA Leq and 63-67 dBA Lmax. According to table 4 of the report these levels apply to position AP1, which is 1m from the glass side of the court (according to figure 5 of the report. These levels only apply to measurement periods of 8-20 seconds. Similarly
the report text refers to levels of 58-66 dBA Leq and 69-79 dBA Lmax next to the net at the side of the court. According to table 4 of the report, these levels apply to position AP4, which is 1m from the side of the court, and applies to measurement periods of only 21-40 seconds. So once again, it is difficult to see how such data can be totally relied upon. Nevertheless, the data was used by Sustainable Acoustics to predict the noise levels at the nearest residential property using a 20 log d1/d2 distance relationship.

Whilst the Sustainable Acoustics assessment process is applicable to the Roehampton club and not the Weybridge club, the report does consider the Lmax levels (as well as the Leq levels), unlike the Hepworth Acoustics report for Weybridge. The Sustainable Acoustics report compares the predicted padel tennis Leq noise levels (from Hurlingham) with the measured Leq background noise levels from Roehampton, but there is also a comparison of the predicted Lmax levels with the measured Lmax background levels. There is no comparison, however, of the predicted padel tennis Leq levels with the L90 background noise level, as recommended by the Author of this report.

Table 8 provides the 1 minute Leq and Lmax levels, together with on site observations, for the pavement location at Bournemouth measured over an approximate 1 hour period.

The padel tennis activity was clearly audible and measurable and consisted mainly of the bat thumping the ball and the players shouting to each other. There were very few occasions when the ball thumped the glass walls of the court, although ball lobbying/overhead smashing was not part of the game process, unlike the Roehampton visit.

The Leq levels varied between 50 and 65 dBA (1 minute), but this included passing cars in the adjacent road, and when these are removed, the values vary between 50 and 59 dBA Leq (1 minute). The corresponding Lmax levels were 60 to 79 dBA, without the passing cars. The cumulative effect of 34 minutes of padel tennis noise with the data for the passing cars removed was 55 dBA Leq on a log average basis.

During the measurements at Bournemouth, the opportunity was taken to listen to the impacts from the court for a short period of time. It was noted that, out of approximately 105 impacts, 90 impacts were due to the racket hitting the ball, 12 impacts were due to the ball hitting the glass screen and 3 impacts were from the ball hitting the court wire fence. Whilst it was not possible to see the impacts and confirm the numbers (owing to the timber fence), the listening tests were sufficient to indicate that most of the noise at Bournemouth was caused by the racket hitting the ball. This is important because it suggests that mitigation measures such as an acoustic fence around the outside of the court may not be effective, because the glass screen could already be acting as an acoustic fence

Obviously, the acoustic attenuation of the glass screen will depend on its mass/unit area and height, and the fact that the screen has gaps and does not go all the way round the court. It is worth noting, however, that approximately 11% of shots rebound from the glass walls and so would not be attenuated by the walls themselves.

Table 9 shows the frequency content of the padel tennis measured over several minutes at Bournemouth in the form of unweighted 1/1 octave band Leq value between 31.5 Hz and 8000 Hz for the pavement position. The frequency content tends to peak in the low to mid frequency bands, showing that low/mid frequency noise is an important characteristic of padel tennis noise.

8. DISCUSSION OF RESULTS

Four sets of padel tennis measurements have been presented in this report, consisting of two sets of data from Roehampton by the Author and Hepworth Acoustics, one set of data by Sustainable Acoustics from Hurlingham and one set of data by the Author from Bournemouth. Unfortunately, the Cole Jarman data for the Weybridge trial run is not in a suitable format for inclusion in any comparison process.

The Roehampton data by the Author produced levels of 68 dBA Leq (17 minutes) and 80-92 dBA Lmax at a distance of approximately 1m from the end of the court, and levels of 72 dBA Leq (8 minutes) and 89-93 dBA Lmax at a distance of 1m from the side of the court. As previously noted, however, there was the potential for multiple reflections owing to the presence of the glass sides and the high brick walls on 3 sides of the court.

The Roehampton data by Hepworth Acoustics produced levels of 52 dBA Leq (57 minutes) at the side of the court at 15m from the court centre, and 57 dBA Leq (57 minutes) at 15m from the court centre at the side of the court. There were no corresponding Lmax values. When the Leq levels are corrected for distance, assuming the 20 log d1/d2 relationship, the levels become 55 dBA Leq (57 minutes) at a distance of 1m from the court end and 65 dBA Leq (57 minutes) at a distance of 1m from the side of the court.

The Hurlingham data by Sustainable Acoustics produced of 53-56 dBA Leq (8-20 secs) and 63-67 dBA Lmax (with aircraft noise excluded) at a distance of 1m from the end of the court, and levels of 58-66 dBA Leq (21-40 secs) and 69-79 dBA Lmax (with

aircraft noise excluded) at a distance of 1m from the side of the court.

The Bournemouth data by the Author produced levels of 50-59 dBA Leq (1 minute), or 55 dBA Leq when averaged over 34 minutes, and Lmax levels of 60 to 79 dBA, at a distance of 7m to the side of the court. Using the 20 log d1/d2 relationship from the centre of the court, this level becomes 61 dBA Leq (34 minutes) for a distance of 1m from the side of the court. The corresponding Lmax levels become 66-85 dBA. There were no measurements at the end of the court.

Comparing all 4 sets of data, table 10 shows the various values for the 2 locations of 1m from the end of the court and 1m from the side of the court, with a 6 dBA reduction being applied to the Author's Roehampton data to account for the multiple acoustic reflection issue. Clearly the Author's data from Roehampton is much higher than the other sets of data at comparable distances from the padel court.

Table 11 compares the Lmax values from the 4 sets of data and again the Author's data (including the 6 dBA reduction for reflection) from Roehampton is higher than the other sets of data. There are various possible reasons for these differences.

Firstly the Bournemouth data included acoustic screening from the standard timber fence between the court complex and the pavement. This might be expected to give some attenuation (maybe 3-5 dBA), particularly near the centre of the court where there are no glass sides, although standard timber fences are not as effective as acoustic fences. Secondly the Hepworth Acoustics Roehampton data was measured over a relatively long period of 57 minutes and could well have included some breaks between games, whereas the Author's Roehampton data was measured over relatively short periods and only covered individual games.

Thirdly the Author's Roehampton data was subject to multiple reflections off the surrounding walls, whereas acoustic reflections were not mentioned in the Hepworth Acoustics report, and it is not even clear which padel court was measured by Hepworth Acoustics at Roehampton. Also the Hepworth

Acoustics data has been corrected from an unknown 'reference distance' to a common reference distance of 15m, but a 20 log d1/d2 distance relationship may not have been applied, in which case the Hepworth Acoustics 1m values of table 10 may have been higher than shown.

Fourthly the Sustainable Acoustics measurements at Hurlingham were considerably affected by aircraft movements and separating out padel tennis noise from aircraft noise would have been difficult during the measurement and analysis process, bearing in mind the very short measurement periods.

Fifthly and most importantly, the padel tennis games measured by the Author at Roehampton included much ball lobbing and ball overhead smashing, plus rebounds of the end glass walls sometimes resulting in the ball reaching the other side of the court without touching the ground.

It is of interest to note that a search of the internet produced a report by Resound Acoustics (reference 6), who conducted some padel tennis measurements at another Weybridge site over 5-15 minute periods for a position 1m from the edge of the court near the net. Levels of 63-65 dBA Leq and 77-86 dBA Lmax were obtained, which is in line with the Author's data at Roehampton in tables 10 and 11.

It is not just the absolute level of padel tennis noise or the increase in level relative to background, however, since the impulsive and frequency characteristics of the racket/ ball impact are also important. As noted earlier the frequency content tends to peak in the low/mid frequency region, and low frequency noise is attenuated less with distance than high frequency noise.

The Hepworth Acoustics report provided a graph of the frequency content of padel tennis versus normal tennis, and commented on higher levels for padel tennis mainly in the 630 and 800 Hz 1/3 octave bands, before stating that the frequency spectrum is not significantly different from normal tennis. As already noted, the Bureau Veritas report disputed such findings, by commenting that padel tennis noise is quite distinctive in terms of both acoustic character

and rate of ball/racquet interaction. The Sustainable Acoustics report for the Hurlingham measurements provides some frequency content information in the form of 1/1 octave frequency bands, and this data tends to confirm high levels of low/mid frequency content, particularly in the 63Hz to 500Hz bands. The report also notes that the character of padel tennis noise is different to normal tennis noise due to the impact of the ball on the glass walls, particularly if the players are using the back wall on their own side to project the ball over to the other side of the court.

9. CONCLUDING REMARKS

According to the Cole Jarman report, the St George's Hill Residents Association agreed to a temporary padel tennis court being installed on an existing tennis court at the Lawn Tennis Club in May 2021, so that a 6 months trial run could take place. Despite only measuring for approximately 2 days over the 6 month period, the Cole Jarman consultant concluded that 'whilst the padel court is expected too be audible, it is not significantly different in character or louder in level to tennis noise', and not to a level that would cause annoyance.

This conclusion is in sharp contrast to the residents living close to the padel court, who considered that the noise was unbearable and unacceptable. In addition, other residents and Club representatives, invited to listen to the noise from East Warrener's garden, considered the noise to be a nuisance.

In May 2022 Hepworth Acoustics conducted an assessment on behalf of the Tennis Club, which concluded that noise levels from the use of 3 padel courts at the eastern end of the tennis complex 'will be within suitably low levels within the context of the prevailing noise climate and no adverse noise impact is expected', providing that acoustic screens are installed on 3 sides.

The Hepworth Acoustics report, however, lacks considerable detail on the modelling approach and the measurement procedure, both of which are required to provide accurate noise predictions and comparisons with existing background noise levels. Consequently, it has been difficult to confirm the

predicted acoustic impact at the residential properties in East Road and Warreners Lane.

In particular the Hepworth Acoustics report relies on measured padel tennis data from another padel court at Roehampton, without providing a clear description of the measurement positions and without providing detailed measurement data in Leq and Lmax levels.

In addition, the Hepworth Acoustics report compares predicted Leq noise levels at the various locations with background noise in Leq units, instead of the lower L90 noise units, thereby leading to a nearly acceptable noise environment for the unfenced situation.

In September 2022, Bureau Veritas conducted an independent review of the Hepworth Acoustics assessment, but apart from noting that the Hepworth Acoustics data at Roehampton fell into the expected range of measurement data for padel tennis, the report did not check any of the predictions. Instead the Burea Veritas report concluded that all the correct procedures had been followed, although the report did highlight the fact that padel tennis noise is quite distinctive in terms of acoustic character and rate of ball/racquet interaction, and that Lmax levels need to be considered as well.

Measurement of padel tennis noise levels at Roehampton by the Author of this report produced much higher noise Leq values than the Hepworth Acoustics visit to the Roehampton Court. The reasons for this are not clear, and appear to depend on which Roehampton court was being measured by Hepworth Acoustics, the effects of multiple acoustic reflections off the surrounding walls, the corrections required to convert levels from one distance to another distance, and the intensity of the actual games in progress.

Measurement of padel tennis noise levels by the Author of this report in Bournemouth produced lower levels, but the measurements included the effect of a boundary timber fence. Measurements by Sustainable Acoustics on a padel court at Hurlingham (as part of the original assessment for the Roehampton courts) have proved unhelpful, because of the very short term nature of the data and considerable interference from

passing aircraft.

It is clear, however, that padel tennis noise varies considerably in level depending on the number of players, the type of game, the intensity of the game, and the extent to which the glass sides are used during the game etc. To some extent padel tennis is a cross between tennis and squash, so it is not surprising that residents find padel tennis noisier than normal tennis. Hence the comments by residents about unacceptable noise levels from padel tennis courts at Weybridge and other padel courts around the country.

As a result of the Hepworth Acoustics report findings, the club is considering installing 4.2m high acoustic fences around the northern, eastern and southern sides of the 3 padel court complex. The benefit of acoustic fences is not proven, however, as it is not clear what attenuation benefit is already being provided by the glass sides, particular where play does not involve the ball regularly hitting the glass sides. Since the proposed 4.2m high acoustic fence is taller than the 3m high glass sides and the glass sides do not cover all the court, there is likely to be some benefit from parts of the acoustic fence.

There is no acoustic fence intended for the western sides of the padel courts, which means that the very residents that were complaining about the trial padel court, will not receive whatever benefit might accrue from an acoustic fence.

The other major omission in the Hepworth Acoustics report is the complete lack of comment on the characteristics of padel tennis noise and frequency content. Padel tennis noise has a more perceptible acoustic character (repetitive thuds), resulting in an under estimate of the potential disturbance impacts. According to the Author's measurements of padel courts at Bournemouth and Roehampton, Lmax levels can be 10-15 dBA higher than the Leq levels. Similarly, the low frequency content of padel tennis impacts needs to be part of the assessment process.

There are no specific criteria in British Standards or technical literature for assessing Lmax levels, but some related guidance on impulsive content of noise

is given in British Standard BS4142 (reference 2). BS4142 provides a means of rating industrial noise and commercial noise affecting mixed residential and industrial areas. It rates industrial noise by comparing the predicted or measured Leq noise level from the industrial activity with existing background L90 noise levels.

If the industrial noise, after correcting for special characteristics of the noise source, exceeds the background noise by 10 dBA or higher, a significant adverse impact is likely to occur, with an 'adverse impact' for +5 dB difference, down to a 'low impact' where the rating level does not exceed the background level. The special characteristics have different corrections (or rating penalties) for tonal content, impulsive content, distinctive content and intermittency content which are added to the source noise Leq level before comparison with the L90 background level. In the case of impulsive content there is a 9 dBA correction for a highly impulsive noise or 6 dBA correction for clearly perceptible impulsive content.

Whilst BS4142 is not applicable to non industrial/commercial operations, and specifically states that it is not intended for rating and assessing 'recreational activities', it clearly confirms that impulsive noise is more intrusive than non impulsive noise. Even if the lower 6 dBA impulsive content correction was applied, it would increase the Leq rating level over background L90 noise considerably and could cancel out any acoustic mitigation measures that the St George's Hill Lawn Tennis Club might wish to apply on site.

10. REFERENCES

1 *Assessment of Noise Impact from Proposed New Padel Courts at St George's Hill Lawn Tennis Club.*
Hepworth Acoustics Report No P22-158-RO3v1 dated June 2022

2. *Methods for Rating & Assessing Industrial & Commercial Sound*
BS4142:2014

3. *St George's Hill Residents Association. Independent Technical Review (Noise)- St George's Hill Lawn Tennis Club (Padel Tennis) Bureau Veritas Project No UK. 16088652-01 dated September 2022*

4. *Proposed Padel Courts Acoustic Assessment Sustainable Acoustics Report No 19-0215-0 R01 dated January 2020*

5. *St George's Lawn Tennis Club- Padel Court. Noise Monitoring With & Without Trial Court Cole Jarman Report 206/0157/M1 dated May 2021*

6. *A Noise Assessment for Proposed Padel Tennis Courts Solihull Arden Tennis Club Resound Acoustics Report RA00407 dated March 2016*

Statement of Disclaimer

The Consultant cannot guarantee that the objectives of the investigation have been achieved, but every reasonable effort has been made to provide expert advice and measurement assistance during the investigation and preparation of the report, based on information made available by the client and the agent.

TABLE 1 – MEASURED BACKGROUND NOISE LEVELS (dBA) AT WEYBRIDGE

Position	Period	Leq	L10	L50	L90	Lmax	Observations
1	14.28-14.38	50.3	51.0	45.5	41.0	67.6	Tennis game, bleeper, distant hedge
							trimmer &. lawn mower
1	14.50-15.00	49.0	58.5	45.0	42.0	65.1	Tennis game, air plant hum, one
							aircraft movement
2	15.01-15.11	45.8	48.5	45.0	42.5	60.9	Tennis game, air plant hum, one
							aircraft movement
2	15.12-15.22	56.3	54.5	45.0	42.0	75.8	Tennis game, air plant hum, bleeper
							2 aircraft movements
3	15.34-15.44	49.7	50.0	42.5	40.5	66.0	Tennis game, intermittent hedge
							trimmer, 2 aircraft movements
4	15.44-15.54	47.5	51.5	44.5	41.5	63.3	Tennis game, distant aircraft
							15.53 loud bang
1	21.00-21.10	49.6	46.0	40.0	37.0	67.0	Tennis game, distant aircraft

2	21.12-21.22	50.0	52.5	41.0	38.5	67.0	Tennis game, children playing,
							2 aircraft movements
3	21.35-21.45	50.6	53.5	39.5	37.5	67.8	Tennis game, 2 aircraft
							movements, distant train

TABLE 2 – MEASURED 1 MINUTE LEQ AND LMAX LEVELS AT POSITION X FOR PERIOD 18.08-18.10 DURING WARM UP ACTIVITY AT ROEHAMPTON

Time	Leq Level	Lmax Level	Observations
18.08	67.4	79.9	
18.09	70.1	85.4	
18.10	70.3	91.8	

TABLE 3 – MEASURED 1 MINUTE LEQ AND LMAX LEVELS AT POSITION X FOR PERIOD 18.12-18.15 DURING MATCH PLAY ACTIVITY AT ROEHAMPTON

Time	Leq Level	Lmax Level	Observations
18.12	69.9	86.7	
18.13	65.2	81.5	
18.14	69.6	89.7	
18.15	68.9	86.8	

TABLE 4 – MEASURED 1 MINUTE LEQ AND LMAX LEVELS AT POSITION X FOR PERIOD 18.16-18.25 DURING MATCH PLAY ACTIVITY AT ROEHAMPTON

Time	Leq Level	Lmax Level	Observations
18.16	67.7	86.3	
18.17	67.1	82.8	
18.18	64.6	83.8	
18.19	70.0	90.4	
18.20	54.4	68.3	Short break
18.21	67.5	84.9	
18.22	64.6	82.9	
18.23	67.8	83.8	
18.24	67.1	88.7	
18.25	68.9	85.7	

TABLE 5 – MEASURED 1 MINUTE LEQ AND LMAX LEVELS AT POSITION Y FOR PERIOD 18.29-18.32 DURING MATCH PLAY ACTIVITY AT ROEHAMPTON

Time	Leq Level	Lmax Level	Observations
18.29	69.7	89.2	
18.30	72.9	90.9	
18.31	74.5	90.8	
18.32	70.6	91.7	

TABLE 6 – MEASURED 1 MINUTE LEQ AND LMAX LEVELS AT POSITION Y FOR PERIOD 18.40-18.43 DURING MATCH PLAY ACTIVITY AT ROEHAMPTON

Time	Leq Level	Lmax Level	Observations
18.40	72.0	92.6	
18.41	70.6	88.8	
18.42	71.5	89.7	
18.43	72.9	91.5	

TABLE 7 – CUMULATIVE LEQ LEVELS (dBA) FOR POSITIONS X AND Y AT ROEHAMPTON

	Position X	Position Y
	Leq/minutes	Leq/minutes
1st reset	69.2/3	72.0/4
2nd reset	68.3/4	71.7/4
3rd reset	67.2/10	

TABLE 8 – MEASURED 1 MINUTE LEQ AND LMAX LEVELS AT PAVEMENT POSITION 15.31-16.24 AT BOURNEMOUTH

Time	Leq Level	Lmax Level	Observations	TIME	Leq Level	Lmax Level	Observations
15.31	51.5	68.5		15.58	59.9	73.5	
15.32	51.1	67.8		15.59	62.7	74.1	2 passing cars
15.33	55.6	72.9	Roller skater	16.00	62.6	78.4	1 passing car
15.34	57.6	69.6	1 passing car	16.01	53.6	69.4	
15.35	55.4	72.5		16.02	55.7	76.5	
15.36	55.7	70.3		16.03	55.3	73.6	
15.37	59.0	71.0	Siren & 1 car	16.04	52.4	70.5	
15.38	49.7	60.4		16.05	58.9	79.0	
15.39	51.9	67.4		16.06	62.3	78.7	1 passing car
15.40	63.2	77.4	2 passing cars	16.07	57.9	71.7	Helicopter
15.41	60.7	75.4	2 passing cars	16.08	62.4	78.0	2 passing cars
15.42	54.8	72.7		16.09	60.6	75.0	1 passing car
15.43	62.2	76.4	1 passing car	16.10	52.5	66.2	

15.44	56.0	74.6		16.11	52.4	66.0	
15.45	52.0	67.8		16.12	61.8	76.3	2 passing cars
15.46	50.2	65.3		16.13	54.3	69.6	
15.47	52.7	65.8		16.14	58.7	72.4	1 passing car
15.48	52.4	75.7		16.15	53.9	72.9	
15.49	65.1	81.9	1 passing car	16.16	54.0	71.2	
15.50	61.9	75.7	2 passing cars	16.17	51.3	70.6	
15.51	56.8	70.8		16.18	57.0	70.5	1 passing car
15.52	55.3	75.0		16.19	57.9	70.9	1 passing car
15.53	57.1	76.3		16.20	54.4	73.1	
15.54	54.3	72.7		16.21	54.8	70.1	
15.55	62.8	77.2	1 passing car	16.22	57.5	71.8	
15.56	54.3	68.1		16.23	56.7	69.3	
15.57	63.6	79.8	1 passing car	16.24	57.3	73.3	

TABLE 9 MEASURED UNWEIGHTED 1/1 OCTAVE BAND LEQ LEVELS FOR BOURNEMOUTH PADEL TENNIS

Freguency	Position
c/s	B
31.5	61.0
63	58.3
125	53.2
250	53.5
500	51.8
1000	50.9
2000	45.7
4000	40.1
8000	33.8
dBA	54.5

TABLE 10 COMPARISON OF PADEL TENNIS LEQ NOISE LEQ LEVELS (dBA)

	1 m from end of court	1m from side of court
	Leq/minutes	Leq/minutes
Roehampton Author data	62dBA / 17 min	66 dBA / 8min
Roehampton HP data	55 dBA/ 57 min	65 dBA/ 57 min
Hurlingham SA data	53-56 dBA/ 8-20 sec	58-62 dBA/ 21-40 sec
Bournemouth Author data	No data	61dBA/ 34 min

TABLE 11 COMPARISON OF PADEL TENNIS LMAX NOISE LEVELS (dBA)

	1 m from end of court	1m from side of court
	Lmax/minutes	Lmax/minutes
Roehampton Author data	74-86 dBA / 17 min	83-87 dBA / 8min
Roehampton HP data	No data	No data
Hurlingham SA data	63-67 dBA/ 8-20 sec	69-79 dBA/ 21-40 sec
Bournemouth Author data	No data	66-85 dBA/ 34 min

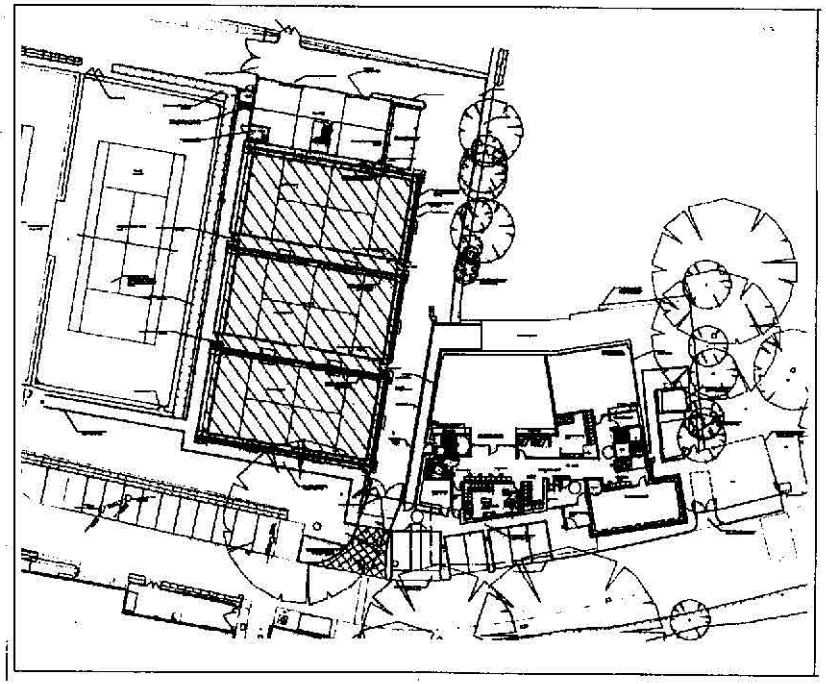

Figure 1 Proposed Location of 3 Padel Courts at St George's Hill, Weybridge

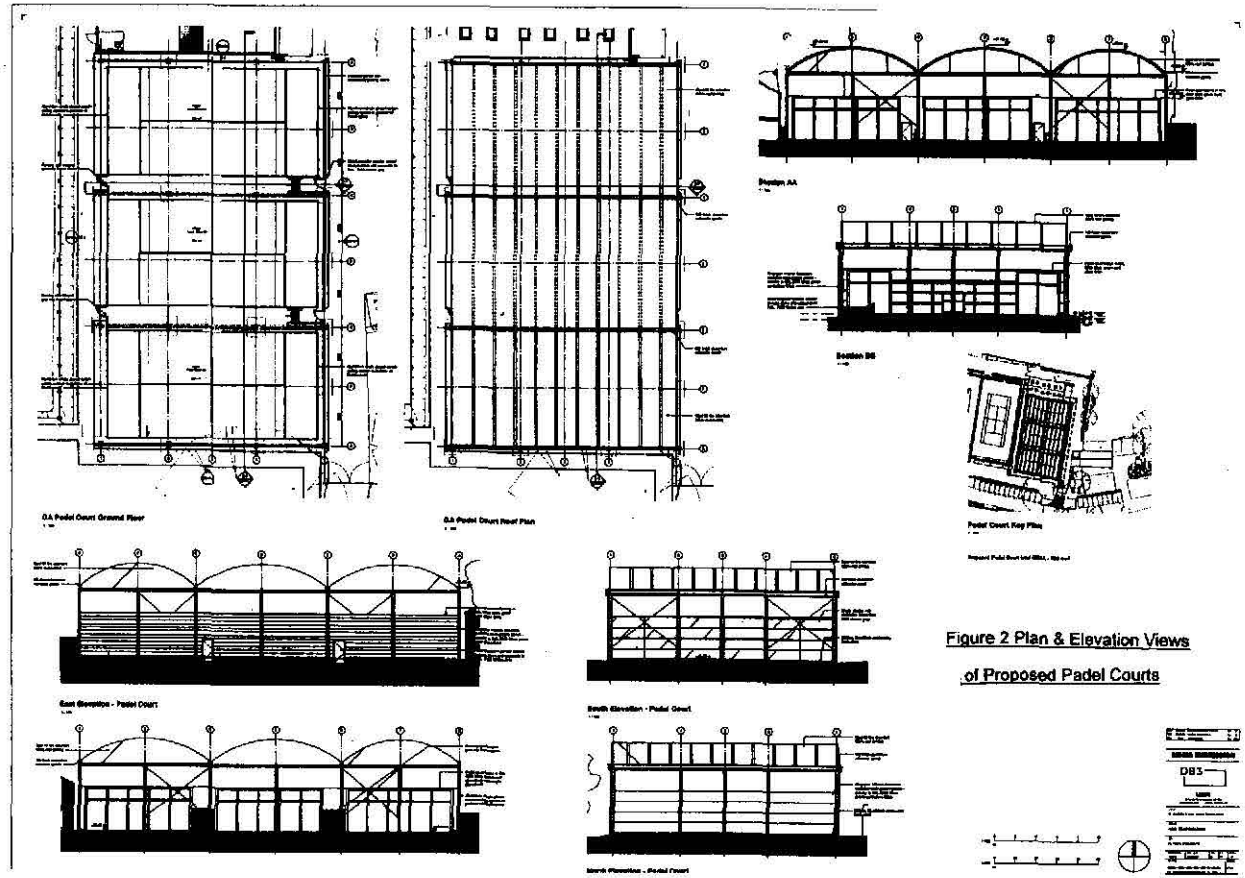

Figure 2 Plan & Elevation Views of Proposed Padel Courts

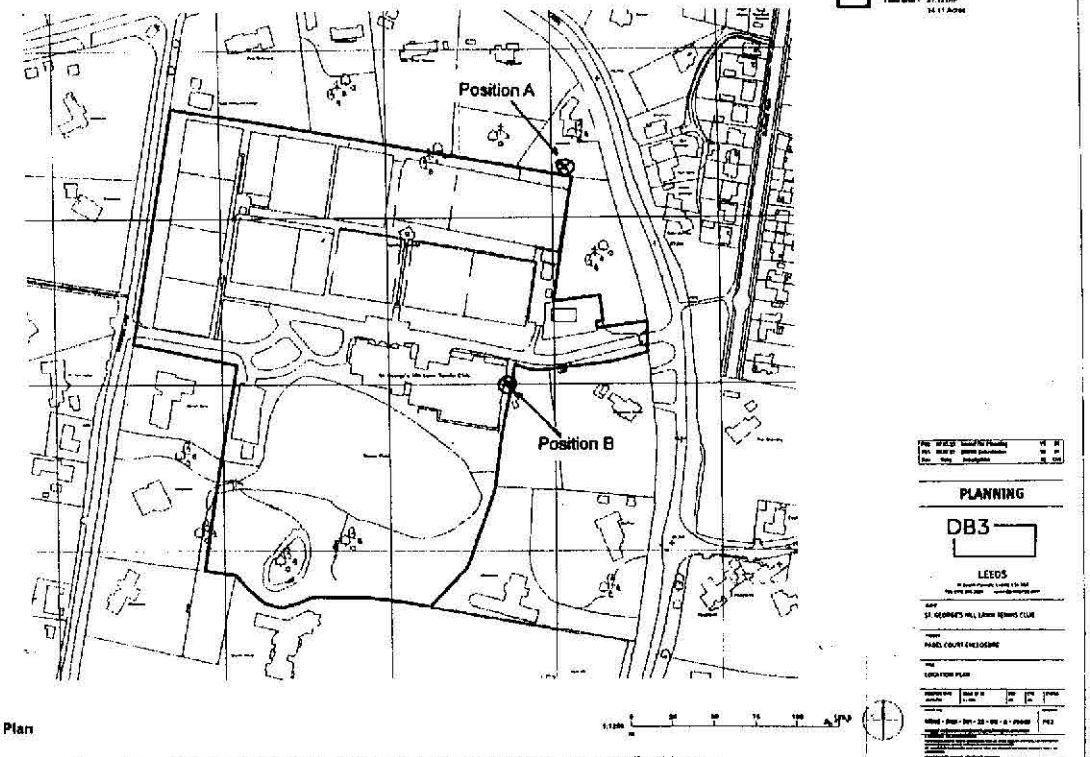

Figure 3 Location of Hepworth Acoustics Background Noise Measurement Positions at Weybridge

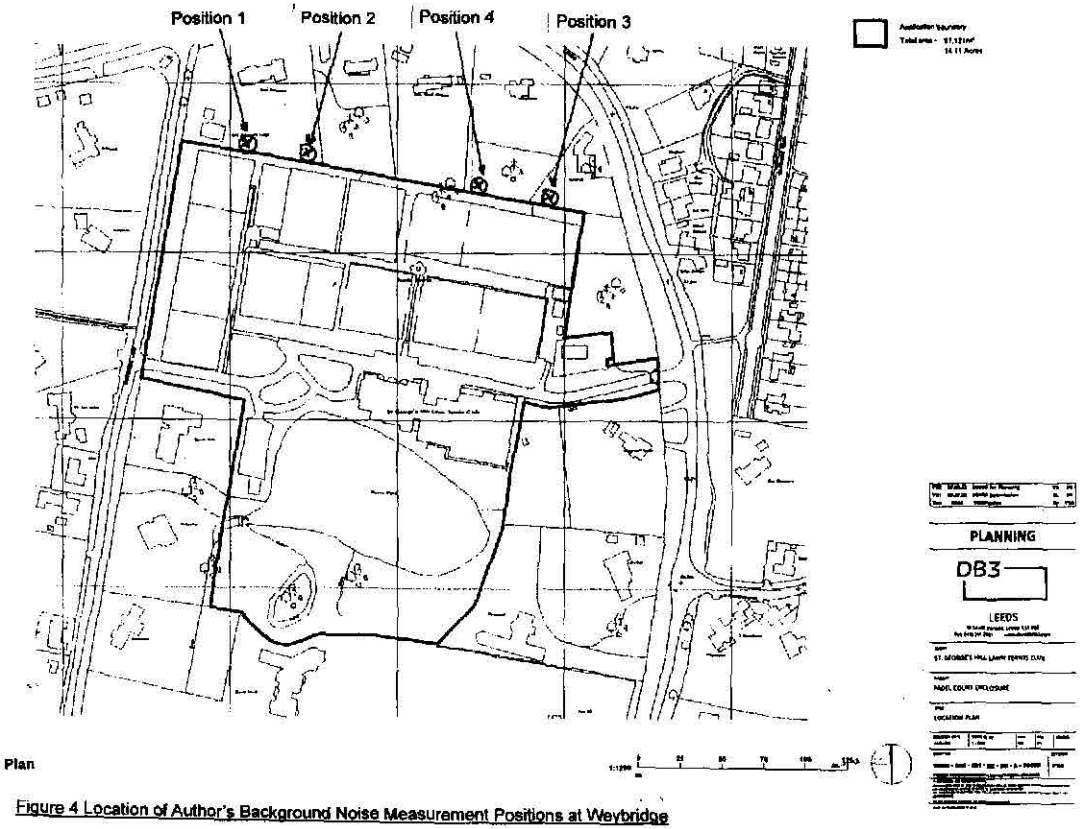

Figure 4 Location of Author's Background Noise Measurement Positions at Weybridge

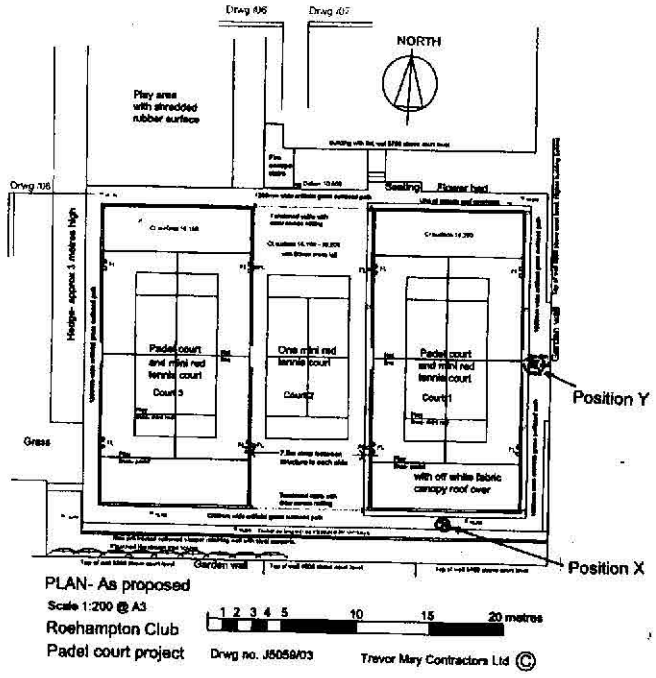

Figure 5 Location of Author's Measurement Positions at Roehampton Padel Tennis Courts

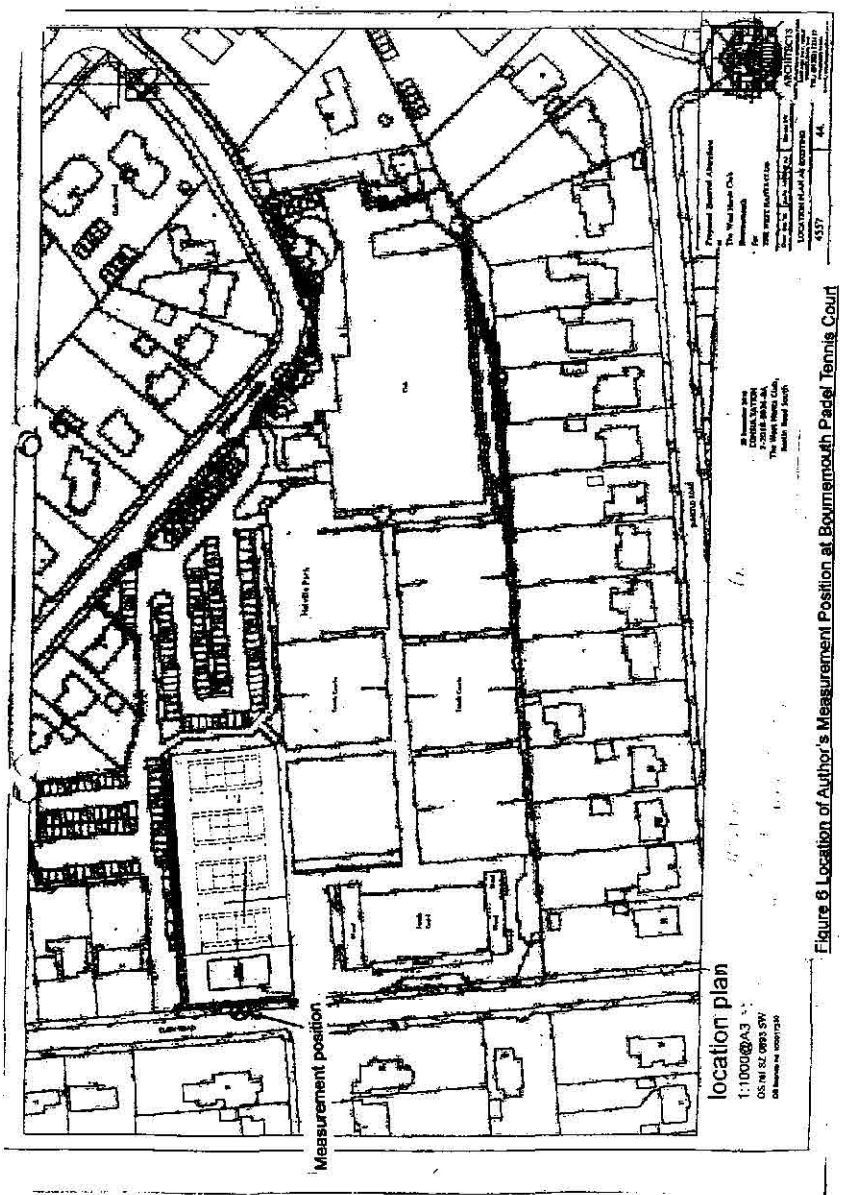

Figure 8 Location of Author's Measurement Position at Bournemouth Padel Tennis Court

clarke saunders
acoustics

DIFFERENCES IN SOUND CHARACTERISTICS OF PADEL AND TENNIS

CLARKE SAUNDERS ACOUSTICS WHITE PAPER

Ed Clarke
Ian MacArthur
Barney Whiffin

Introduction

Padel, also called Padel Tennis, has been popularised in Spanish speaking countries following its invention in Mexico in 1969. It is a relatively new and fast-growing sport in the UK, it having gained popularity in Europe over the last decade.

Proponents of the game describe it as easier to pick up and reach a reasonable level of competence than tennis, with players of differing abilities more easily able to play together. As a result it is said to be more sociable and accessible, and is therefore an attractive proposition for tennis clubs to add to their offering.

Consequently a number of tennis clubs in the UK have built, and many more are considering construction of Padel courts which, due to the nature of the enclosing screen structure, require a planning application.

Meanwhile, local authority environmental health practitioners are starting to express concerns over whether the sound generated by this activity is more disturbing to the residential amenity of neighbours than 'normal' tennis, and to what extent this ought to be catered for in the planning process.

At CSA we have been instructed to assess the noise impact of a number of Padel court planning applications, variously on behalf of the applicant, concerned neighbouring residents and the local planning authority.

This white paper presents the results of a non-project specific 'deep dive' into the matter, which we intend to use as the starting point for broader discussions with other acousticians, the Padel industry, and local planning officials.

Scope

Our study is intended to address the knowledge gap at the heart of the potential planning issue around construction of Padel courts;

Is Padel demonstrably more disturbing than Tennis?

Human response to sound is very complex and subject specific. Metrics we use to assess other noise sources, such as aircraft noise for example, are based on averages of large social survey responses, rather than any individual's specific reactions. To answer this type of question comprehensively, therefore, requires extensive dose-response relationship studies which are beyond the scope of this exercise.

Our slightly modified aim, therefore, is to identify objective aspects of sound generated by Padel play which quantify the differences in technical characteristics between the sports perceived by the listener.

Follow up studies might then be able to go on to consider the significance of these differences and work towards providing guidance on to what extent and in what circumstances mitigation is warranted, and if so what form this might take.

Functional Differences between Tennis and Padel

On a fundamental level the sports are very similar. The court layout, scoring and gameplay of Padel is almost identical to tennis, the primary differences being a physically smaller court with enclosing walls to the rear (extending partially to the

sides) which allow rebounds, and shorter solid rackets, originally referred to as 'paddles'.

Our review included observing both Padel and tennis matches in progress at a local tennis club[1], reviewing footage of elite level competitions online and conducting controlled noise survey measurements while also experimenting with playing both games at a novice level.

It is clear that Padel features longer, more frequent extended rallies involving exchanges of volleys. Serving is always underarm in Padel, requiring less preparation and the contained court reduces time spent retrieving balls.

Tennis features more forceful hitting and more powerful serves, but less frequent impact sounds. Singles tennis features less frequent rallies of volleys than doubles. Padel is always played as a doubles sport by default.

Padel allows rebounds from the glass walls, and occasionally the ball is struck directly against the wall to rebound into play.

Literature Review

We reviewed readily accessible public domain information from planning applications across the London Boroughs and other UK metropolitan authorities. This search identified 18 noise impact assessments undertaken by a range of other consultancy firms (we excluded our own CSA reports).

Of these assessments, 15 relied on information gathered from noise surveys at other Padel courts, two used the generic guidance given in Sport England's Design Guidance Note[2], and one was based on typical data provided by the client. Some companies used the same source survey data for multiple assessments, such that we have a range of noise data from seven individual Padel court surveys, in additional to those we have conducted at CSA.

The surveys ranged from single courts to multi-court regional Padel centres. Some contain information on the skill level of the players involved and the nature of the games – from novice instruction to social and competitive.

Most surveys differentiated between noise emissions to the side, where the Padel court is open, and to the ends which are enclosed by the glass walls. A number of them then went on to helpfully quantify noise levels at increasing distance from the court, which is helpful in understanding the nature of the transition from near to far field propagation characteristics.

In assessing the significance of the Padel noise, most reports provided a comparison with otherwise prevailing ambient conditions in the absence of Padel activity to set the impact in the context of the surrounding soundscape. In most instances, the context being at a facility where tennis was already being played, this involved a comparison between Padel and tennis.

In a number of instances, the differences between the two sports were based on conjecture only, assuming for example that the slightly lower pressure and slower hitting speeds involved in Padel would make the individual noise events slightly

[1] Winchester Racquets and Fitness – with thanks for their assistance
[2] Sport England Design Guidance Note – Artificial Grass Pitch (AGP) Acoustics (2015)

lower in level and therefore the noise emissions overall slightly quieter. This does not seem to be consistent with the findings of assessments which involved comparative survey measurements.

In some of the reports there was inconsistency in the direct comparisons due to the different sizes of the courts and the resultant ambiguity over the location of the source in each case with respect to the measurement location.

Little differentiation is provided in the character of the hitting sounds of tennis racket versus Padel racket on ball, the majority of reports stressing the similarities rather than identifying any differences.

Head-to-head Comparisons

Informed by previous assessments of our own, and the review described above, we undertook specific tests to better understand the differences between the sports we were starting to identify.

These tests have provided us with objective data on the following aspects, which helps us to quantify the sounds associated with Padel, to present the extent to which it can be differentiated from tennis in particular.

(a) Impact Sound Character

Padel rackets are not strung like tennis rackets[3], they comprise a solid EVA rubber core and a fibreglass or carbon face. The racket face is perforated with holes to allow it to be moved through the air more easily. The resultant impact sound differs audibly from a tennis ball strike, which is slightly more resonant. In onomatopoeic terms, we have used the words 'thunk' and 'bop' to characterise tennis and Padel impacts respectively. Although clearly audible, some of the analyses reviewed from other practitioners did not show the difference clearly using an octave band spectrum comparison, although it can be identified in our own data and through more sophisticated analyses.

(b) Impact Sound Level

As noted above, differences in court size, and therefore variations in noise source to measurement location distances, plus the influence of the glass end walls acting both as acoustic barriers and reflectors, make the direct comparison of the noise output level from the tennis and Padel a non-trivial exercise. These factors need to be considered very carefully when making comparisons between different racket sports. In the context of the configuration and alignments of the courts we at CSA have studied, depending on the assessment metric used and the nature of the comparison, Padel tends to give rise to slightly higher levels of sound than tennis.

(c) Wall Impacts

Although mentioned in a number of the other assessments reviewed, our experience is that the ball-wall impact sound is much less significant than ball strikes. The ball hits the glass walls most frequently after first bouncing on the floor, so is traveling relatively slowly. Shots involving a ball strike

[3] 'Racket' is preferred to according to the OED, but racquet is an accepted alternative spelling.

directly against the wall are relatively infrequent in gameplay, and tend to be finesse shots, rather than the kind of power strike that squash players may be accustomed to – this is an ineffective strategy that a player is only likely to ever attempt once.

(d) Strike Frequency

The increased strike frequency of Padel over tennis is more marked at elite competition level. At world tour major finals events a tennis ball is struck typically every 8 seconds on average during a men's singles match, during which there are significant pauses between points, reducing only slightly to 7.5 seconds in doubles, whereas the comparable figure in elite Padel world tour finals is one hit every 2.8 seconds.

This differentiation is much less marked at the amateur level. From our own tests we saw a hit rate of once per 3.3 seconds for doubles tennis and 2.0 seconds for Padel. Differences in strike frequency become significant when considering the merits of comparing event noise maxima or energy average noise levels over time.

Conclusions

It is clear that there are both differences and similarities between Padel and tennis. We have studied the differences in more detail and developed some technical descriptions of the key aspects identified, while also recognising areas in which the sports are similar.

We can only answer the question set at the outset of this paper in an equivocal sense, however. We have identified, and to some extent quantified some of the differences in the sports, but the extent to which these differences can be established to illicit a different response in terms of neighbour disturbance cannot be determined without studying the experiential aspects of these differences from the perspective of neighbouring residents.

As numbers of applications continue to rise for Padel courts, it may be useful for the Padel industry to engage more widely with acoustics practitioners. This would increase the knowledge base and help define guidelines in terms of assessing noise impacts, both as absolute levels and when considered in comparison to existing tennis courts and/or other sports and recreation facilities.

Clarke Saunders Acoustics is an independent consultancy practice specialising in applying both rigor and pragmatism to real world challenges. We are actively engaged in development of best practice guidance and standards across the acoustics industry, collaborating with colleagues, stakeholders and decision makers. To continue this discussion on Padel noise, or any of the other multitude of areas in which acoustics touches all our lives please reach out to us at mail@clarkesaunders.com | LinkedIn.

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REF: AS13140.230818.L1

23 August 2023

Len Busch
Via email [redacted]

Dear Len,

AS13140 ST GEORGE'S HILL PADEL, WEYBRIDGE
Expert Opinion

I have been instructed to review and comment on three reports on the noise impact of Padel courts proposed at the St George's Hill Lawn Tennis Club will have on the amenity of residential neighbours.

These references and revision number of the reports I have been asked to review are:

Report A	206/0157/M1 revision 0: Noise monitoring with and without trial court
Report B	P22-158-R03v1 June2022: Assessment of Noise Impact from...
Report C	UK.16088652-01 DRAFT: Independent Technical Review (Noise)

My practice, Clarke Saunders Acoustics (or CSA), is well known to London Boroughs and Home Counties planning authorities, with whom we have a good working relationship. Details of the qualifications and experience of myself and my team are available if this information would be helpful.

In recent years I have been instructed on numerous cases which involve the review and appraisal of work conducted by other acousticians and have built a reputation for providing pragmatic and balanced opinions, rather than dwelling on unnecessary or confusing technical pedantry. In a number of instances, these reviews have been commissioned by the local planning authority themselves to assist in navigating more complex issues involving apparent conflicts between experts.

Case Summary

Along with numerous other rackets clubs, St George's Hill Lawn Tennis Club is keen to engage with the current surge of interest in the sport of Padel, a short form tennis variant, by constructing a facility in which their members can play.

A temporary trial court was installed in 2021 to test the concept and to enable the potential for neighbour disturbance to be evaluated. Report A was commissioned by the club at that time to assist in quantifying the potential for disturbance from the trial court.

The club's plans were then refined, and a planning application was submitted for three Padel courts and an associated two storey outbuilding in summer 2022, with which Report B was submitted as supporting evidence.

Due to the apparent complexity of the issues at hand, concerned residents from St George's Hill Residents Association then commissioned a technical review, Report C, to assess the merits of the application as described in Report B.

Considerable technical content within all three reports has served to muddy the waters somewhat, and I have been appointed to provide high level explanation and set out the implications of the proposals in a readily digestible format to assist the decision making process.

Temporary Padel Court Trial – Report A

A number of shortcomings concern me about this report. It may be that a more comprehensive report was issued to the client, and that this 'memorandum' presents only a summary of a more comprehensive piece of work. Even if that were the case, however, some aspects are problematic.

Data is presented, but not really explained. Time history graphs identify the precise times of other specific activities e.g. 'dog barking' and 'gardener' but do not provide any information on when the trial Padel court was actually in use.

The 'with' and 'without' Padel court activity comparison was made 'without' on 6-7th April (during Easter children's tennis camp) and then the 'with' experiment was conducted three weeks later on 27-29th April, when the children in question would have returned to school.

A much more direct and immediate comparison would have been possible, and more useful. Padel play could have been monitored during and between activity on the temporary court, with play suspended for periods to provide direct 'with' and 'without' comparisons.

The appropriateness of the comparison of average levels shown is questionable, to say the least, seeming to show the use of Padel courts somehow reducing ambient noise levels. Nevertheless, the report concludes that the Padel courts will be audible, and noticeable. It is vague about the extent to which the character of the sound of the sports differs and concludes that sound levels are similar and that the slight differences in characteristics are not significant. No justification or explanation is given for this judgement on significance.

I am told that that the trial court exercise also involved the tennis club management and neighbours listening to and discussing the sound of a Padel game in progress, and concluding that resultant sound of Padel in this context would be disturbing and that the club would go to additional lengths to seek to address this. It appears that the report author was either uninvolved in these experiential observations or considered them to be less relevant than the numerical comparisons.

My conclusion in relation to Report A is that it rather missed the opportunity of the temporary Padel court trial to thoroughly investigate the impact of the proposal, and set an initial expectation for accepting the proposal on the premise that the activity would be broadly equivalent to tennis.

Planning Application Submission – Report B

This report uses Padel noise survey data from another site, the Roehampton Tennis Club, rather than referring to any of the findings from the Padel trial at St George's Hill, either measured or observed.

Once again, the difference between characteristics of noise generated by the two sports appears to be identified, but then dismissed. [ref paras 4.13 and 4.16]. It is becoming clear as increasing numbers of Padel court noise assessments[1] are submitted around the country that these differences do need to be considered, and while it is true that insufficient information is available to quantify how much more disturbing Padel noise is, the resultant uncertainty should be highlighted in a comparative assessment of this nature, rather than dismissed.

I find the assertions that this report presents a robust worst-case assessment to be somewhat overstated. The word 'robust' appears six times and 'worst-case' ten times within the report, referring to the assumption that three high intensity Padel games are running concurrently, and that there will be additional benefit from the proposed fabric canopy over the courts, which has not been included in the modelling.

[1] The attached document "CSA White Paper – Differences in Sound Characteristics of Padel and Tennis" presents our independent findings, including reviews of numerous other planning submissions.

The application is for three courts, presumably based on the premise that there will be sufficient demand for this popular new sport to use these courts. The eventuality that all three are used at once, for a sport that seems to be intrinsically rather high-intensity, would seem to me a likely daily occurrence. The suggestion that a fabric canopy might provide some tangible acoustic benefit is something of a stretch in my view, considering the openness of the structure and the negligible sound insulation properties of such fabric. Indeed, if there were any significant levels of sound reflected down from the canopy, this would seem more likely to increase reflected sound levels at neighbouring dwellings rather than reduce them.

I consider the phrasing of report B to be somewhat misleading. In stating that predicted Padel noise levels will be *"lower than even the lowest measured existing prevailing noise levels at most locations"*, the reader might be forgiven for thinking Padel would be quieter than background sounds; not particularly noticeable, possibly inaudible. The comparison made however is against L_{Aeq} average values however, not the underlying background levels denoted by L_{A90}. This is flagged in report C – see below, which does accurately confirm that Padel noise will clearly be heard by neighbours, a point on which report B is silent.

The following conclusion is the key finding of report B.
4.49 Taking into account the noise mitigation provided by the proposed acoustic screens, the Padel court match noise is not anticipated to result in any adverse noise impact on the local residents and would be within the Lowest Observed Adverse Effect Level (LOAEL).

It is based on the assumption that the different character of Padel noise is not significant, for which no substantiation is provided. It is clear that the sound of the new sport will be heard by neighbours, and with the inherent uncertainty around response to this sound, it is only reasonable to conclude that there could be some impact on amenity. The conclusion is that there is no adverse impact.

The significance of the impact is for the planning authority to judge, and it may be that the resultant loss of amenity could be judged to lie between the LOAEL and the SOAEL (Significant Observed Adverse Effect Level). It may well be that, considered in the appropriate planning balance, it is acceptable to allow this amenity impact, but it is important for the planning authority to appreciate that it is not nil as the Applicant's report suggests, and needs to be considered carefully.

Independent Technical Review – Report C

I find the third report to be particularly disappointing. Having been instructed to provide a peer review to explain and test Report B by the St George's Hill Residents Association, the authors have satisfied themselves on the survey methodology, modelling and other numerical aspects of Report B. They did usefully make the point noted above clarifying the audibility of Padel noise by neighbouring residents, but they repeat the Report B conclusions and seem to accept the fundamental assumptions which I have flagged above.

The bold statement that the character of noise will not be intrusive is not substantiated in any of the reports, and based on the assumption that any difference from tennis is insignificant.

The seemingly definitive assertion that the noise impact is below, or 'within' the LOAEL is the key finding of Report B in planning terms, and this is not questioned or tested at all in Report C.

Conclusions

Uncertain aspects of the noise impact from the proposed use, in particular the different character of Padel noise should have been addressed, rather than dismissed.

The extent to which the sound is likely to be noticed by neighbours has been downplayed, unsubstantiated opinions expressed as to significance and erroneous statements have been made relating to the notional LOAEL threshold.

Successive reports, including a technical review of the Applicants' submission, have continued in the vein of accepting the assumed equivalence of Padel and tennis

My considered expert opinion, therefore, is that the reports cannot be relied upon to provide the reassurance the local planning authority would need to ensure the impact on residential amenity has been established and can be considered in the planning balance in relation to this planning application.

Yours sincerely
for CLARKE SAUNDERS ACOUSTICS

[redacted]

E H Clarke
email: [redacted]