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**All-Weather Sports Pitch,
The Queen's C of E Primary School, Kew**

Noise Assessment Report

Doc Ref: 02889-100201

28/09/2017

**On behalf of
The Governing Body of the Queen's School**

**Prepared by
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1.0 INTRODUCTION

1.1 Blue Tree Acoustics was commissioned by The Governing Body of the Queen's School to carry out environmental noise measurements relating to a new all-weather sports pitch (AWP) at The Queen's C of E Primary School on Cumberland Road in Kew, Richmond.

1.2 The school has recently undergone redevelopment works, with a new school building constructed in the northwest section of the site and the former buildings demolished. The consented development (planning permission ref 15/0073/FUL 19/06/2015) includes a new hard games court in the northern site section, landscaped grassed area in eastern site corner, and sports pitch in the southern site section.

1.3 A previous report by Blue Tree Acoustics (ref 02889-100100 dated 20/10/2016) addressed the proposal to seek a variation to the existing consent to increase the overall size of the permitted all-weather surface from 30m x 40m to 35m x 50m, incorporating 2.5m high perimeter rebound fencing. We understand that the variation has been granted with the following Condition U20464:

"Within 28 days of the commencement of use on the 3G pitch, a commissioning acoustic test and report shall be undertaken and submitted to the Local Planning Authority for approval in writing. The report shall demonstrate that the noise limits detailed in Table 5 of 'Additional submission in support of planning application 16/4201/VRC dated 13/01/2017) have been achieved. If the noise limits are exceeded, suitable mitigation shall be outlined. The 3G pitch shall thereafter only be used in accordance with the approved report. REASON: To protect the amenities of nearby residents."

1.4 The noise monitoring and reporting has been undertaken to address the requirements of Condition U20464.

1.5 In order to evaluate noise impact in quantitative terms, a comparative assessment is appropriate. This involves undertaking measurements to facilitate comparison of measured sound levels during AWP use with those in the absence of AWP use. As the current permission for the pitch is only for school use during school hours, noise measurements were necessarily undertaken within these limiting factors. This proposed methodology was submitted to the Planning Authority for consideration, and it has made recommendation to proceed on this basis. Measurements were therefore taken at the noise-sensitive receptor locations identified in our previous report during a typical school day, including use of the AWP for a sports session typical of that expected from a junior sports club.

- 1.6 The sports pitch is provided primarily to improve the school's sports facilities and range of activities that can be provided. Future use by external community groups or sports clubs outside school hours is envisaged, such as Saturday mornings. Potential future use during evenings will be limited to a 6pm finish at the latest during the lighter months, and there is no proposal for flood-lighting.

2.0 DESCRIPTION OF SITE & PREVAILING NOISE CLIMATE

2.1 The area surrounding the Queen's School site is predominantly residential in character. Another school, Kew College, which caters for children up to Year 6, is situated opposite the Queen's School on Cumberland Road.

Road

2.2 The site is situated off Cumberland Road, which is a one-way street, and experiences intermittent passing vehicles.

2.3 Mortlake Road passes the northeastern boundary of the school site. This road is busy with traffic, forming part of the south-circular route.

2.4 Distant, as well as local, road traffic noise is clearly discernible in the vicinity of the site.

Aircraft

2.5 The site and surrounding area experience prominent noise from frequent overhead aircraft, mostly associated with Heathrow Airport.

Schools

2.6 The Queen's School is an established school site incorporating outdoor playgrounds and games areas, and therefore sound from children playing and partaking in outdoor games and sports activity has long been part of the prevailing noise climate in the vicinity. Kew College is situated directly opposite the Queen's School, also on Cumberland Road. External play areas are situated to the rear of the Kew College building, and more distant from the nearest properties to the Queen's School, nonetheless some noise from children around this building will, at times, also be audible in the area.

3.0 NOISE SURVEY

- 3.1 Noise monitoring was undertaken by Blue Tree Acoustics in order to assess ambient noise levels around the new sports pitch when in use.
- 3.2 Attended external noise measurements were taken between 1100-1530 hours on Friday 22/09/2017. The measurements were taken at accessible locations along the southeastern site boundary with nearby residential properties, and also at a position close to the AWP perimeter, as indicated in Figure 1. Locations 1 and 2 along the site boundary correspond with those used for our previous assessment report (as referenced in 1.3 above).
- 3.3 The instrumentation used during the surveys was 1no Rion NA28, 1no Rion NL32, 1no Svan 958A, and 1no Svan 971 unit, each of which is a Type 1/Class 1 Integrating Sound Level Meter. Each meter was within a valid period of laboratory calibration. Calibration checks of each meter were carried out both before and after the measurements, with no variance observed. A proprietary environmental windshield was fitted to the microphones in each case. Measurements were made with each microphone mounted on a tripod at approximately 1.5m from local ground level.
- 3.4 Weather conditions throughout the survey periods were dry and calm.
- 3.5 As there are a variety of uncontrolled noise sources that can influence the measurements, the meters were set to log contiguous measurements of 1-minute duration in an attempt to obtain sample data, from which meaningful conclusions can be drawn.
- 3.6 The dominant noise sources at the measurement locations were found to be overhead aircraft and road traffic. Noise from schoolchildren in outdoor play areas within Queens Primary School, including use of the AWP for PE lessons, is audible when occurring.
- 3.7 The example AWP sports session involved upper year pupils led by a teacher, and took place between 1253-1325 hours. There was an initial gathering/discussion period between 1253-1300 hours, and then from 1300-1325 hours there was a session of tag rugby involving 14 children and one teacher, with raised voices, whistle blows, and ball throwing and kicking. Following this, the AWP was in use for PE lessons for the rest of the school afternoon session and generally involving around 25-30 children with two teachers. During the AWP use, there was also some influence on the noise climate from parents collecting children from the main building.

- 3.8 The measurement results are detailed in Appendix II and summarised in Tables 1 and 2 below for the periods with and without AWP sports sessions taking place. As can be seen, in terms of general overall noise levels, there is no significant difference in measured sound levels with and without the AWP sports session activity. As would be expected, noise levels at Location 3 are slightly greater, being closer to the AWP, outdoor play areas, and road traffic than the other locations. At Location 1 and Location 2 on the boundary, it can be seen that noise levels are very similar, i.e. typically no more than 1dB difference, although it should be noted that Location 1 is more influenced by reflected sound from the boundary wall, and so the comparative 'free-field' sound levels are around 2-3dB lower.
- 3.9 Subjectively, noise generated by the AWP sports session was found to be audible at the assessment locations, but was not particularly discernible against the prevailing ambient noise climate, and was fully masked by aircraft noise when passing overhead.

Table 1: Summary of measured noise levels excluding AWP sports session, dB(A)

Measurement Location	Friday 22/09/2017 (1100-1252 hours and 1326-1530 hours)		
	L _{Aeq,1min}	L _{AFmax,1min}	L _{A90,1min}
Location 1	50 – 69 (Avg=62)	53 – 80 (Avg=70)	45 – 60 (Avg=52)
Location 2	49 – 70 (Avg=63)	56 – 85 (Avg=71)	44 – 59 (Avg=51)
Location 3	49 – 73 (Avg=65)	56 – 94 (Avg=73)	45 – 61 (Avg=52)

Table 2: Summary of measured noise levels during AWP sports session, dB(A)

Measurement Location	Friday 22/09/2017 (1253-1325 hours)		
	L _{Aeq,1min}	L _{AFmax,1min}	L _{A90,1min}
Location 1	54 – 66 (Avg=62)	59 – 77 (Avg=71)	51 – 58 (Avg=54)
Location 2	53 – 68 (Avg=62)	63 – 80 (Avg=71)	50 – 58 (Avg=53)
Location 3	55 – 69 (Avg=65)	65 – 85 (Avg=76)	51 – 59 (Avg=54)

4.0 NOISE ASSESSMENT

Criteria

- 4.1 Planning Condition U20464 requires demonstration that the noise levels detailed in Table 5 of 'Additional submission in support of planning application 16/4201/VRC' dated 13/01/2017 have been achieved. This document was submitted in support of the planning application by The Governing Body of The Queen's Church of England Primary School, and Table 5 summarises the predicted daytime AWP noise impact at the nearest residential property as given in our original noise assessment report. This Table 5 is reproduced below for reference. The values in red relate to the adjusted source sound data, which is for an 11-a-side adult team, to 5- or 7-a-side, i.e. source levels around 3dB less, this is explained in detail in our previous assessment report and the above referenced additional submission document:

Description	dB L _{Aeq}	dB L _{AMax}
Sports Pitch Source Noise Level @ 4m from sideline	59 56	85 *
Distance correction from centre of Sports Pitch to nearest dwelling [20xLog (19/38)]	-6	-6
Noise level at nearest dwelling due to Sports Pitch	53 50	79
Prevailing noise levels measured at the southwestern site boundary (Location 1)	49-60 (Avg=56)	70-88 (Avg=77)

Assessment of Measured Noise Levels

- 4.2 As the site is an active school in a busy urban area, there are many extraneous noise sources that influence measured sound levels. It can be seen from the measurement data that noise from passing aircraft was particularly prominent during the survey, with measured sound levels typically around 60-65dB L_{Aeq,1min}, which is indicated by the dense distribution of 'spikes' in the data presented in the charts in Appendix II. In addition, the various outdoor areas within the school are in use during classes and at break-times, so there is frequent fluctuating noise from children's voices and activity experienced at the boundary locations.
- 4.3 Traffic flow on nearby roads was relatively constant, and this formed the general background sound level that was prevalent in the area. From measurements during periods of little influence from aircraft or schoolchildren, it was found that measured traffic noise was 55dB L_{Aeq} at Location 1, and 53dB L_{Aeq} at Location 2. These values compare closely, i.e. no more than 1dB

variation, with those measured during our previous ambient noise level survey, which was undertaken on a Saturday.

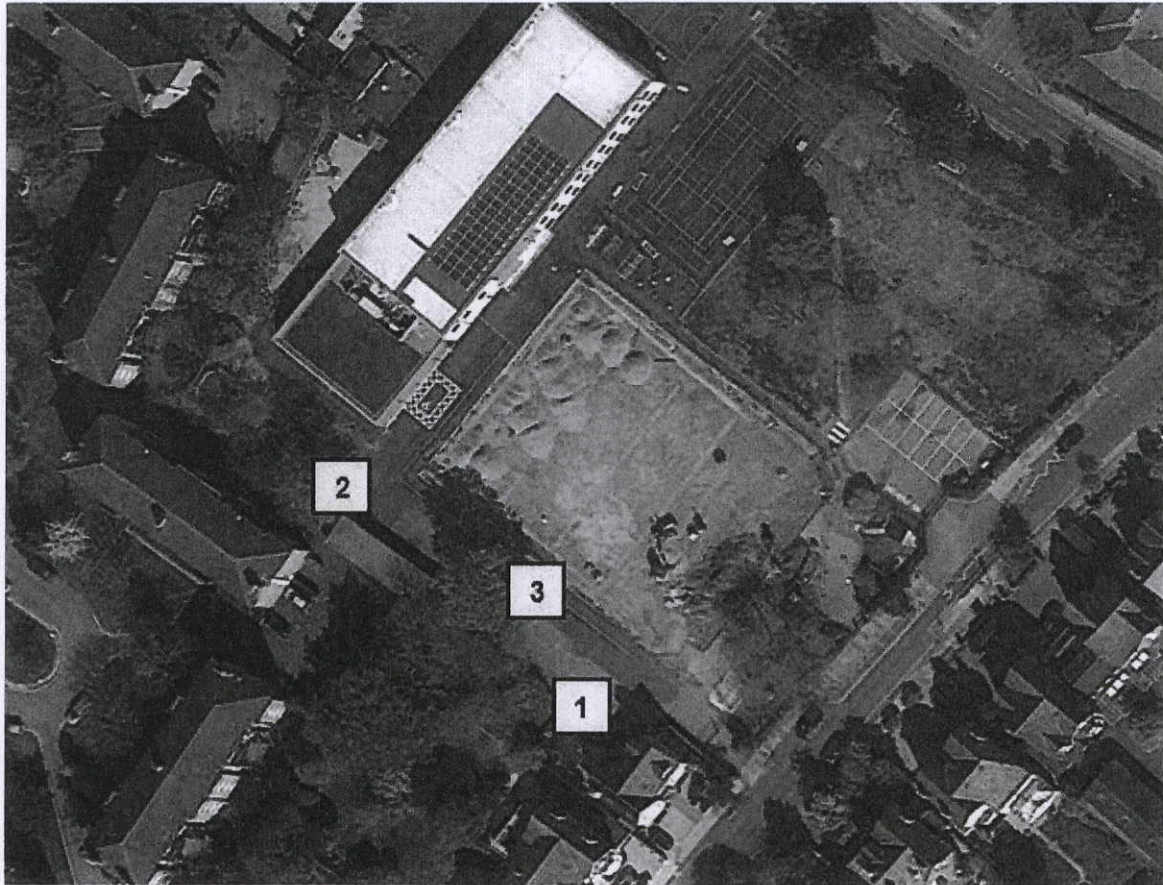
- 4.4 It can be seen from the measurement data that there is no significant influence from the AWP sports session activity upon the magnitude of measured noise levels at Location 1 and Location 2, representative of nearby residential receptors.
- 4.5 As the sound levels from the AWP sports session are low in relation to the general ambient noise level, it is not possible to derive a precise value to determine comparative impact at the nearby residential properties. There is one measurement period during the AWP sports use when there was little influence from aircraft noise, where levels of 54dB $L_{Aeq,1min}$ and 53dB $L_{Aeq,1min}$ were recorded at Location 1 and Location 2, respectively. Given that these values are representative of the general road traffic noise experienced at these locations, and that noise from lunchbreak playground use was also occurring at that time, it can reasonably be concluded that the measured AWP sports noise is below the 50dB level defined in Table 5, and more likely around 10dB (or more) below the prevailing L_{Aeq} sound levels. It is acknowledged that other sports activities may have potential to generate greater source noise levels, but given this margin of tolerance, it is unlikely that activity noise will exceed the predicted noise impact given in Table 5. This accords with the original noise assessment, from which Table 5 is derived, which was intentionally pessimistic by basing the assessment on source noise data for adult sports activity on full-sized sports pitches, and therefore the low magnitude of noise impact from junior sports activity is in line with expectations.
- 4.6 In addition, as road traffic noise of similar magnitude was measured on a Saturday, it can reasonably be expected that noise impact at these times would be similar to that described above, and therefore potential use of the AWP for similar sports activities outside of normal school hours is not expected to result in unacceptable noise impact.

5.0 SUMMARY AND CONCLUSIONS

- 5.1 A noise assessment has been carried out on behalf of The Governing Body of the Queen's School relating to the new all-weather sports pitch at The Queen's C of E Primary School, Kew.
- 5.2 The assessment has included measurement of noise levels at the site on a weekday to ascertain prevailing ambient sound levels and sound levels during a representative AWP sports session.
- 5.3 The measurement results demonstrate that noise impact during the AWP sports use was negligible, and had no discernible effect on measured sound levels at the nearby residential receptors.
- 5.4 The magnitude of noise impact is in accordance with that predicted in our previous noise assessment, and achieves the noise limits defined by Planning Condition U20464, thereby satisfying this condition.
- 5.5 Based on the survey data collected during weekday and weekend site visits, the use of the AWP for the proposed additional hours outside of normal school use is also expected to satisfy the noise limits defined by Planning Condition U20464, and therefore will not have detrimental effect on residential amenity by way of noise.

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FIGURE 1 – SITE AERIAL VIEW AND APPROXIMATE MEASUREMENT LOCATIONS



APPENDIX I – NOISE UNITS AND INDICES

a) Sound Pressure Level and the decibel (dB)

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

b) Frequency and Hertz (Hz)

Frequency is a measure of the rate of fluctuation of a sound wave. The unit used is cycles per second, or Hertz (Hz). Sometimes large frequencies are often written as kilohertz (kHz), where 1kHz = 1000Hz. Young people with normal hearing can hear frequencies in the range 20Hz to 20kHz. However, the upper frequency limit gradually reduces as a person gets older.

As the ear hears some frequencies better than others, the A-weighting scale is used to mimic human hearing. A-weighting applies a correction to the sound level at a given frequency depending on how well the ear hears that frequency.

c) Glossary of Terms

In order to describe noise where the level is continuously varying, a number of other indices, including statistical parameters, are used. The indices used in this report are described below.

L_{Aeq} This is the A-weighted equivalent continuous sound level which is an average of the total sound energy measured over a specified time period. In other words, L_{Aeq} is the level of a continuous noise which has the same total (A-weighted) energy as the real fluctuating noise, measured over the same time period.

L_{Amax} This is the maximum A-weighted sound level that was recorded during the monitoring period.

L_{A90} This is the A-weighted sound level exceeded for 90% of the time period. L_{A90} is used as a measure of background noise.

L_{A10} This is the A-weighted sound level exceeded for 10% of the time period and is often used in the assessment of road traffic noise.

L_{A1} This is the A-weighted sound level exceeded for 1% of the time period.

SEL This is the Single Event Level which is used to calculate the resultant L_{Aeq} which would be generated by a number of events with a given SEL. The SEL is the total energy measured over the event, compressed into 1 second. $SEL = L_{Aeq} + 10\log(t)$ where t is time in seconds. Also $L_{Aeq} = SEL - 10\log(t) + 10\log(n)$ where t is time in seconds and n is the number of events in the time period. SELs are often used for Train noise calculations and other specific events.

APPENDIX II – NOISE SURVEY DATA

Friday 22/09/2017

All values dB(A), logging contiguous measurements of 1-minute duration.

Location 1 is adjacent to the southern site boundary with the rear garden of the neighbouring house on Cumberland Road. The instrument used was 1no Rion NA28 Type 1/Class 1 Integrating Sound Level Meter.

Location 2 is near the western site boundary with nearby flats at Gloucester Court. The instrument used was 1no Svan 971 Type 1/Class 1 Integrating Sound Level Meter.

Location 3 is approximately 4m from the AWP pitch sideline. The instrument used was 1no Svan 958A Type 1/Class 1 Integrating Sound Level Meter.

Measurement Location 2 and Location 3 were not in close proximity to reflective surfaces (other than ground) and were >3.5m from any walls or similar vertical surfaces; however, the area is built-up, and therefore not fully 'free-field'. Location 1 was at 1m from the boundary brick wall (approximately 2m high), therefore considered 'façade' conditions, i.e. the measured values include a contribution from sound reflected from the wall.

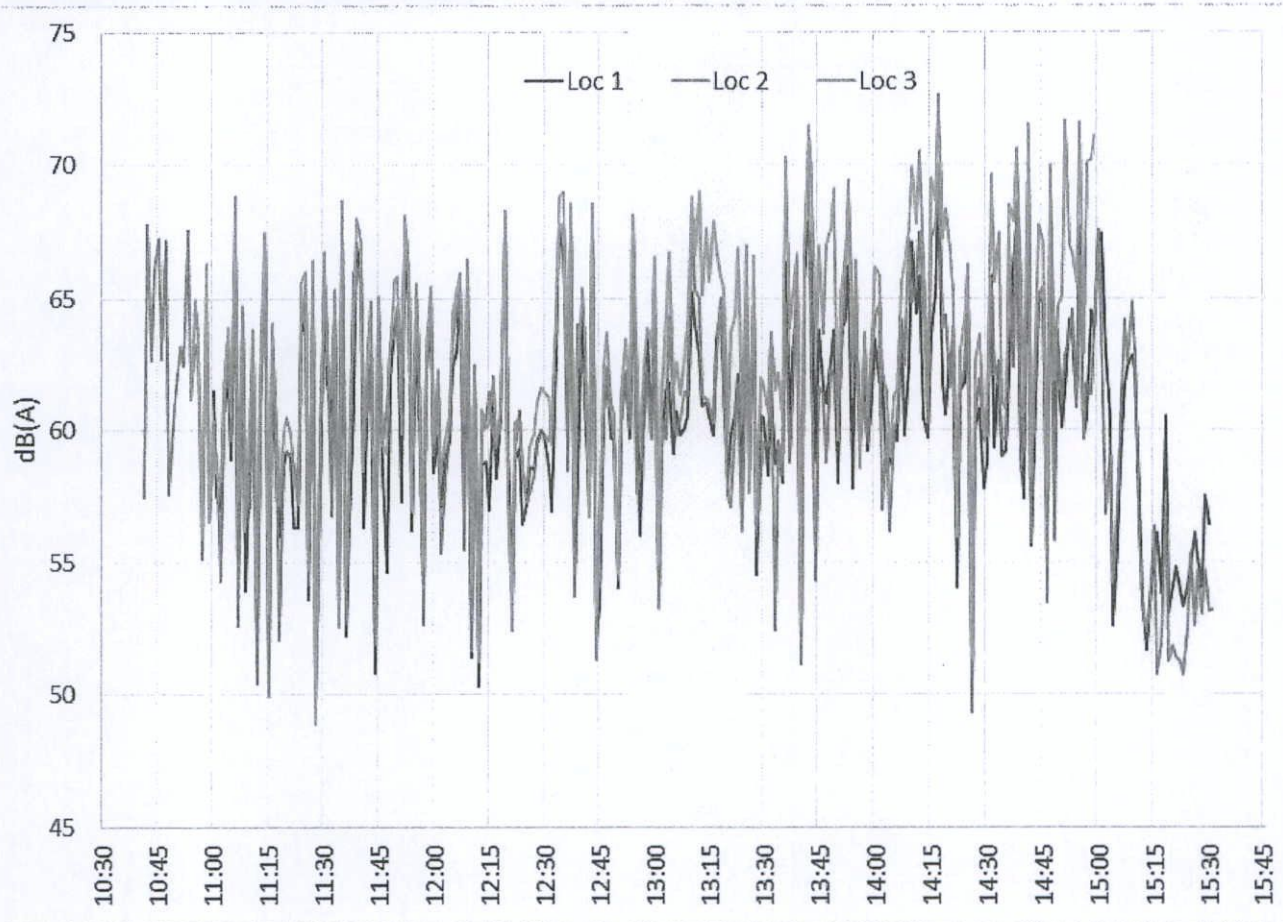
The charts below plot and compare the measured L_{Aeq} , L_{AFmax} , and L_{A90} parameters for each location.

The grey shaded area indicates the period when the example AWP sports session occurred.

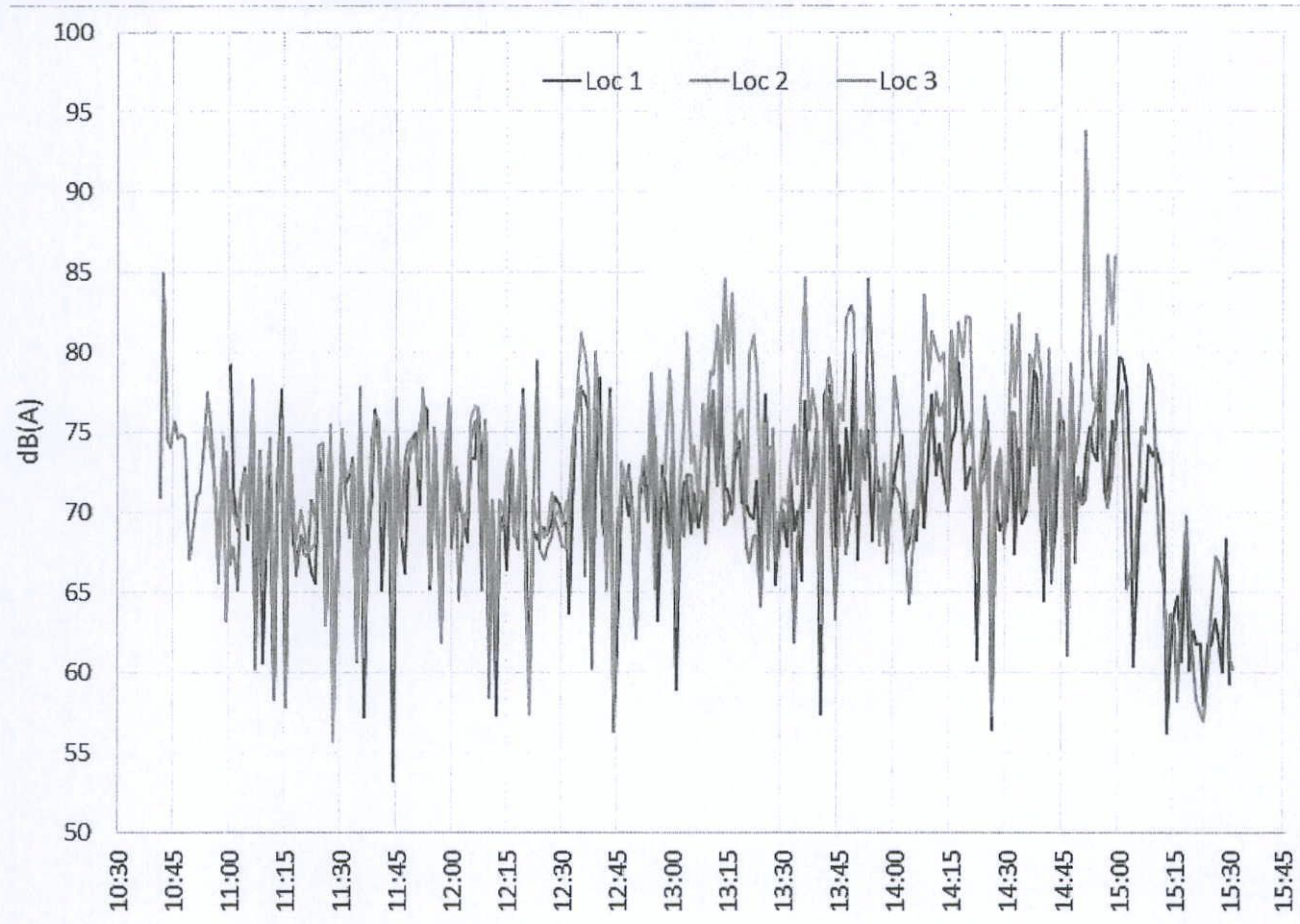
The light orange shaded area indicates the period near the end of the school day when there was no use of external areas. In addition, there was no significant contribution from passing aircraft during that time.

Measurement results are shown into chart form for ease of presentation. Tabulated data can be provided on request.

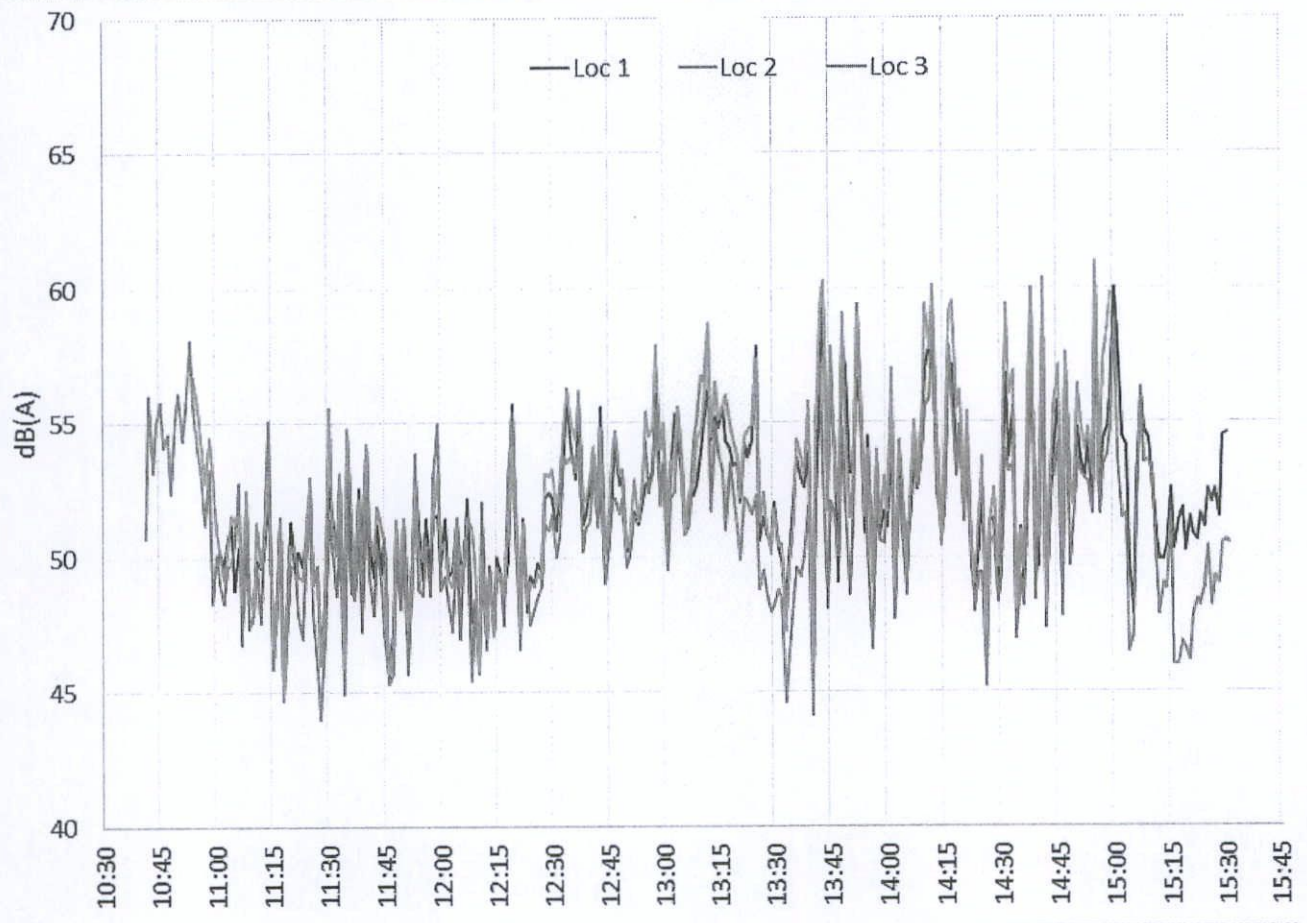
Measured dB $L_{Aeq,1min}$ at Location 1, Location 2, and Location 3



Measured dB L_{AFmax,1min} at Location 1, Location 2, and Location 3



Measured dB L_{A90,1min} at Location 1, Location 2, and Location 3



In addition to the 1-minute logging measurements set out above, logging of contiguous measurements of 15-minute duration was also undertaken at Location 1.

The instrument used was 1no Rion NL32 Type 1/Class 1 Integrating Sound Level Meter.

All values dB(A).

Location 1 – Residential Southern Boundary, Cumberland Road

Date	Time	L _{Aeq}	L _{Amax}	L _{A10}	L _{A90}	Comment
22/09/17	11:15	60.3	74.5	64.7	47.8	Aircraft and road traffic
22/09/17	11:30	63.1	76.6	68.2	49.7	
22/09/17	11:45	62.9	76.8	67.6	49.0	
22/09/17	12:00	61.1	75.7	65.6	48.6	
22/09/17	12:15	60.5	77.2	64.4	49.6	
22/09/17	12:30	63.9	78.2	68.2	52.2	As above, schoolchildren outside for lunchbreak
22/09/17	12:45	61.2	76.2	65.4	51.8	As above, with AWP sports session taking place (14 children, 1 teacher). Parents collecting younger children from main building. Lunchbreak until 1330 hours
22/09/17	13:00	62.0	80.9	65.7	52.9	
22/09/17	13:15	62.1	76.5	66.4	52.4	Aircraft, road traffic, PE lessons on AWP (around 25-30 children, 2 teachers).
22/09/17	13:30	63.5	77.9	67.5	50.8	
22/09/17	13:45	62.9	81.0	67.0	52.1	
22/09/17	14:00	62.9	76.9	66.9	52.3	
22/09/17	14:15	63.4	79.2	67.7	50.4	
22/09/17	14:30	64.0	78.6	68.0	51.2	
22/09/17	14:45	64.1	80.2	68.1	53.0	
22/09/17	15:00	62.0	79.3	65.7	50.5	Schoolchildren all inside, no aircraft
22/09/17	15:15	55.4	69.2	57.7	51.2	