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Technical Note

Prepared by:	**Matthew Sweet**	Date:	**24 September 2014**
Project	**Swalcliffe Park Equestrian Events**	Ref:	**4214**
For:	**Partway House, Elm Farm, Swalcliffe House Residents**	Page:	**1 of 12**
Subject:	**Noise Levels Observed During Visits on 21 September 2014**		

This Technical Note details the findings of measured noise levels and observations during visits to the area around Swalcliffe Park on Sunday 21 September 2014. Details of noise units are presented in Appendix 1 of this Technical Note.

Summary

WBM was approached in September 2014 and requested by Mrs Vandamme of Partway House to undertake a noise survey on Sunday 21 September 2014 whilst the Swalcliffe Autumn One Day Event was taking place at Swalcliffe Equestrian Centre. The measurement positions used for previous surveys undertaken for Mrs Vandamme were adopted for this most recent survey with one additional location at Swalcliffe House. Details of the previous surveys undertaken are presented in WBM Technical Notes dated 21 October 2013 and 14 August 2014.

A visit was undertaken on Sunday 21 September 2014 between about 11:00 and 14:00 hours and attended sample measurements were undertaken at 6 positions. Five of the measurement positions used were identical or similar to those used for the survey on 1 August 2014. A sixth position (Position 9) was selected to represent the front garden of Swalcliffe House. The weather during the survey period was dry and sunny, 13 to 16°C, with a wind speed of about 3 to 4 m/s at the noise measurement positions, increasing to 5 m/s later in the survey, and estimated to be from the east-north-east.

The overall impression from the attended measurements on Sunday 21 September 2014 was that noise levels due to the activity at Swalcliffe Equestrian Park were evident throughout the survey. In particular, the use of tannoy systems and other activity associated with the equestrian event was clearly audible at Swalcliffe House, which was downwind of the event site.

The observations and comments taken during the event are notably different to those observations made when no event was taking place. With regard to the measured noise levels, by comparing the levels measured when the equestrian event was occurring with those taken without an event occurring, it can be seen that for the majority of the measurements the noise levels during the event were higher. In particular the $L_{Aeq,T}$ levels for every measurement with the equestrian event occurring increased by between 2 and 9 dB(A) and the background ($L_{A90,T}$) for every measurement increased by up to 10 dBA over the measured level when there was no event activity

Sunday 21 September 2014 Measured Noise Levels and Observations

The noise survey details are presented in Appendix 2 and the complete results and comments are presented in Appendix 3. The measurement positions are described and shown on plans in Appendix 4. The noise survey results from Sunday 21 September 2014 are summarised below.

The measurement positions 1, 2a, 3, 5 and 6 used for the survey work in August 2014 were adopted for the survey on 21 September 2014. A sixth measurement position, Position 9, was also used which was in the front garden of Swalcliffe House and overlooked the equestrian event activity.

The observations / comments presented below are the noted activity associated with the Swalcliffe Autumn One Day Event. Shown in brackets in the table are the levels measured at the appropriate positions for the noise survey on Sunday 22 September 2013 when no equestrian event was taking place.

Measurement Position	**Time**	**dB $L_{Aeq,T}$**	**dB $L_{Amax,F}$**	**dB $L_{A10,T}$**	**dB $L_{A90,T}$**	**Observations / Comments Abbreviated from Appendix 3**
Position 1 - Partway House by pool	13:02 – 13:17	46 (37)	66 (54)	49 (40)	40 (32)	Car horn, bell and whistle sounding. Tannoy occasionally just audible. Horse noise.
Position 2a - Partway House in garden	11:37 – 11:52	47	66	49	37	Car door slams, clapping and voices in field with event. Horses neighing. Distant tannoy.
Position 3 - Elm Farm Front Garden	12:39 – 12:54	48 (46)	68 (65)	51 (44)	35 (28)	Occasional banging hoofs from horse boxes.
Position 5 - Swalcliffe House by courts	12:06 – 12:21	46 (44)	72(58)	48 (48)	40 (32)	Tannoy very clearly audible. Jump poles falling. Occasional horsebox and car passing on lane. Shouting, clapping and voices in field.
Position 5 - Swalcliffe House by courts	13:40 – 13:55	51 (44)	67 (58)	53 (48)	44 (32)	Bells and whistles sounding. Horsebox movement. Horse neighing. Noise from event clearly audible with tannoy speech, bells, voices, horses, falling poles and clapping.
Position 6 - Swalcliffe House by patio	11:10 – 11:25	48 (39)	65 (55)	51 (42)	41 (31)	Tannoy announcements. Horses neighing. Jump poles falling. Clapping. Engine noise from vehicle in field. Bell.
Position 9 - Swalcliffe House front lawn	13:22 – 13:37	52	69	55	46	Horse neighs. Tannoy. Horns, bells and whistles sounding. Voices shouting and clapping. Tannoy operating less than previously. Horsebox movement in field.

By comparing the levels measured on 21 September 2014 when the equestrian event was occurring with those taken on 22 September 2013 when no event was occurring, it can be seen that for the majority of the measurements the noise levels during the event were higher. In particular the $L_{Aeq,T}$ levels for every measurement with the equestrian event occurring increased by between 2 and 9 dB(A) and the background ($L_{A90,T}$) for every measurement increased by up to 10 dBA over the measured level when there was no event activity.

The following table is taken from WBM Technical Note dated 21 October 2013 and sets out the observations and comments made during the survey on Sunday 22 September 2013 when no activity was occurring at the Equestrian Park.

Measurement Location	Time	Observations / Comments
Position 1 - Partway House by pool	10:58-11:13	Distant road traffic, birdsong, slight wind movement in trees, distant farm animals, distant aircraft
Position 2 - Partway House by road	11:16-11:31	Few local vehicles, cars on B4035, bird calls / birdsong, slight wind movement in trees
Position 3 - Elm Farm front lawn	11:40-11:55	Few local cars, distant aircraft, slight wind movement in trees
Position 4 - Elm Farm rear of garage	11:59-12:14	Few cars on local road, distant road traffic, slight wind movement in trees
Position 5 - Swalcliffe House by court	12:25-12:40	Birdsong dominant, slight wind movement in trees, few local cars, distant aircraft and traffic
Position 6 - Swalcliffe House on patio	12:43-12:58	Slight wind movement in trees, light aircraft, distant traffic, birdsong, voices in field

The comments are indicative of the rural nature of the environment, with no significant noise sources noted other than occasional local vehicle movements on the roads. In contrast, the observations made during the equestrian event on Sunday 21 September 2014 highlight the added noise sources that the event introduced into the local environment, such as vehicles on the event ground, voices and horse noises, bells and car horns, and announcements and commentary with two on-site tannoy systems.

The overall impression from the attended measurements on Sunday 21 September 2014 was that noise due to the activity at Swalcliffe Equestrian Park was evident throughout the survey. Due to the wind direction being from the east-north-east, activity noise from the site was most notable at Swalcliffe House (Positions 5, 6 and 9).

At Partway House, bells, whistles and car horns were sounded intermittently as part of the dressage event, along with clapping and horse neighing.

At Elm Farm noise from the event was mainly noted as due to the movement of horseboxes on the site and at the site entrance to the south of Elm Farm, along with noises from horses in the horse boxes and voices at the event issuing instructions to competitors.

At Swalcliffe House announcements from one of the tannoy systems used was very clearly audible, with announcements from a second tannoy system also heard. Other noises from the event included the sound of show-jumping poles being knocked off, applause, shouting and engine noise due to vehicle movements on site.

Matthew Sweet
Consultant

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Appendix 1

Noise Units

The following section describes some of the parameters that are used to quantify noise.

Decibels dB

Noise levels are measured in decibels. The decibel is the logarithmic ratio of the sound pressure to a reference pressure ($2x10^{-5}$ Pascals). The decibel scale gives a reasonable approximation to the human perception of relative loudness. In terms of human hearing, audible sounds range from the threshold of hearing (0 dB) to the threshold of pain (140 dB).

A-weighted Decibels dB(A)

The 'A'-weighting filter emulates human hearing response for low levels of sound. The filter network is incorporated electronically into sound level meters. Sound pressure levels measured using an 'A'-weighting filter have units of dB(A) which is a single figure value to represent the overall noise level for the entire frequency range.

A change of 3 dB(A) is the smallest change in noise level that is perceptible under normal listening conditions. A change of 10 dB(A) corresponds to a doubling or halving of loudness of the sound. The background noise level in a quiet bedroom may be around 20 –30 dB(A); normal speech conversation around 60 dB(A) at 1 m; noise from a very busy road around 70-80 dB(A) at 10m; the level near a pneumatic drill around 100 dB(A).

Façade Noise Level

Façade noise measurements are those undertaken near to reflective surfaces such as walls, usually at a distance of 1m from the surface. Façade noise levels at 1m from a reflective surface are normally around 3 dB greater than those obtained under freefield conditions.

Freefield Noise Level

Freefield noise measurements are those undertaken away from any reflective surfaces other than the ground

Frequency Hz

The frequency of a noise is the number of pressure variations per second, and relates to the "pitch" of the sound. Hertz (Hz) is the unit of frequency and is the same as cycles per second. Normal, healthy human hearing can detect sounds from around 20 Hz to 20 kHz.

Octave and Third-Octave Bands

Two frequencies are said to be an octave apart if the frequency of one is twice the frequency of the other. The octave bandwidth increases as the centre frequency increases. Each bandwidth is 70% of the band centre frequency.

Two frequencies are said to be a third-octave apart if the frequency of one is 1.26 times the other. The third octave bandwidth is 23% of the band centre frequency.

There are recognised octave band and third octave band centre frequencies. The octave or third-octave band sound pressure level is determined from the energy of the sound which falls within the boundaries of that particular octave of third octave band.

Appendix 1 (continued)

Equivalent Continuous Sound Pressure Level $L_{Aeq,T}$

The 'A'-weighted equivalent continuous sound pressure level $L_{Aeq,T}$, is a notional steady level which has the same acoustic energy as the actual fluctuating noise over the same time period T. The $L_{Aeq,T}$ unit is dominated by higher noise levels, for example, the $L_{Aeq,T}$ average of two equal time periods at, for example, 70 dB(A) and 50 dB(A) is not 60 dB(A) but 67 dB(A).

The $L_{Aeq,T}$ is the chosen unit of BS 7445-1:2003 "Description and Measurement of Environmental noise".

Maximum Sound Pressure Level L_{Amax}

The L_{Amax} value describes the overall maximum 'A'-weighted sound pressure level over the measurement interval. Maximum levels are measured with either a fast or slow time weighted, denoted as $L_{Amax,f}$ or $L_{Amax,s}$ respectively.

Sound Exposure Level L_{AE} or SEL

The sound exposure level is a notional level which contains the same acoustic energy in 1 second as a varying 'A'-weighted noise level over a given period of time. It is normally used to quantify short duration noise events such as aircraft flyover or train passes.

Statistical Parameters L_N

In order to cover the time variability aspects, noise can be analysed into various statistical parameters, i.e. the sound level which is exceeded for N% of the time. The most commonly used are the $L_{A01,T}$, $L_{A10,T}$ and the $L_{A90,T}$.

$L_{A01,T}$ is the 'A'-weighted level exceeded for 1% of the time interval T and is often used to gives an indication of the upper maximum level of a fluctuating noise signal.

$L_{A10,T}$ is the 'A'-weighted level exceeded for 10% of the time interval T and is often used to describe road traffic noise. It gives an indication of the upper level of a fluctuating noise signal. For high volumes of continuous traffic, the $L_{A10,T}$ unit is typically 2–3 dB(A) above the $L_{Aeq,T}$ value over the same period.

$L_{A90,T}$ is the 'A'-weighted level exceeded for 90% of the time interval T, and is often used to describe the underlying background noise level. It is defined in British Standard 4142 as the background noise unit and is used for establishing the reference against which industrial noises are assessed.

Appendix 2

Instrumentation and Calibration

Date and Positions of Survey

Sunday 21 September 2014

Vicinity of Swalcliffe Park

The external noise survey positions are shown in Appendix 4 and were all free field.

Surveys carried out by

Dr Richard Lyons

Weather Conditions

Dry, sunny, 13 to 16°C, wind 3 to 4 m/s, increasing to 5m/s later in the survey, east-north-easterly

Instrumentation used (Serial Number)

Norsonic 140 Sound Level Meter (1403138)
Norsonic 1251 Calibrator (31991)

Calibration

The sensitivity of the meter was verified on site immediately before and after the survey.
The measured calibration levels were as follows:

Survey Position	Start Cal	End Cal
Sunday 21 September 2014	113.8 dB(A)	113.7 dB(A)

The meter and calibrator are tested monthly against a Brüel and Kjær Pistonphone, type 4220 (serial number 375806) and a Norsonic Calibrator, type 1253 (serial number 22906) with UKAS approved laboratory certificate of calibration.

In addition, the meter and calibrator undergo traceable calibration at an external laboratory every two years.

Appendix 3

Noise Survey Results

Sunday 21 September 2014

Measurement Position	Time	dB $L_{Aeq, T}$	dB $L_{Amax, F}$	dB $L_{A10, T}$	dB $L_{A90, T}$	Observations / Comments
Position 6 - Swalcliffe House by patio	11:10 – 11:25	48	65	51	41	Tannoy consistently on speech. Horses neighing. Breeze in trees. Tannoy description clearly audible. Occasionally 2nd tannoy heard. Sound of poles falling. Clapping. Engine noise from vehicle in field. Bell. Car on road. Breeze in trees.
Position 2a - Partway House in garden	11:37 – 11:52	47	66	49	37	Local road traffic. Breeze in trees. Car door slams and voices in field with event. Horses neighing. Birdsong. Distant tannoy heard. Aircraft. Occasional car horns sounding. Loud clapping and voices from field.
Position 5 - Swalcliffe House by courts	12:06 – 12:21	46	72	48	40	Distant aircraft. Tannoy very clearly audible. Breeze in trees. Poles falling. Occasional horsebox and car passing on lane. Shouting, clapping and voices in field throughout measurement.
Position 3 - Elm Farm Front Garden	12:39 – 12:54	48	68	51	35	Road traffic in distance. Occasional banging hoofs from horse boxes. Light breeze in trees.
Position 1 - Partway House by pool	13:02 – 13:17	46	66	49	40	Distant road traffic. Car horn, bell and whistle sounding. Tannoy occasionally just audible. Horse noise. Breeze in trees.

Appendix 3 (continued)

Measurement Position	Time	dB $L_{Aeq, T}$	dB $L_{Amax, F}$	dB $L_{A10, T}$	dB $L_{A90, T}$	Observations / Comments
Position 9 - Swalcliffe House front lawn	13:22 – 13:37	52	69	55	46	Cars passing on lane. Horse neighs. Tannoy. Horns, bells and whistles sounding. Voices shouting and clapping. Breeze in trees. Aircraft. Tannoy operating less. Horsebox movement in field.
Position 5 - Swalcliffe House by courts	13:40 – 13:55	51	67	53	44	Bells and whistles sounding. Horsebox movement. Horse neighing. Noise from event clearly audible with tannoy speech, bells, voices, horses, falling poles and clapping. Passing cars on lane. Wind in trees.

Appendix 4

Noise Survey Positions used on 01 August 2014

Ref	Position	Measurement Position Description
Position 1	Partway House by pool	South west of pool, ~ 1 m to wooden gate into paddock, by hedges
Position 2a	Partway House in garden	In rear garden~ 25 metres from house façade.
Position 3	Elm Farm front lawn	On lawn, adjacent to patio, ~ 3.5 m to façade of house, ~ 2 m high wall along most of garden boundary
Position 5	Swalcliffe House by tennis court	South east of dwelling, near northern corner of tennis court, ~ 12 m to edge of Grange Lane
Position 6	Swalcliffe House on patio	Corner of patio area closest to Grange Lane, ~ 3.5 m to house façade
Position 6a	Swalcliffe House front lawn	On front lawn adjacent to entrance driveway, to north of house

N.B. Plans show the approximate positions of the noise survey positions

Appendix 4 (continued)

Measurement Positions Used for Survey on 21 September 2014

Appendix 4 (continued)

Measurement Positions for Partway House and Elm Farm

Appendix 4 (continued)

Measurement Positions for Swalcliffe House