

42.4883.R9:ZSC

16<sup>th</sup> May, 2012

Communities NSW

Locked Bag 1422

SILVERWATER NSW 2128

Attention: Ms R. Ginger

**SOUTHERN HIGHLANDS REGIONAL SHOOTING COMPLEX**  
**WATTLE RIDGE ROAD, HILL TOP**

The purpose of this report is to present the results of an acoustic testing carried out in relation to operations at the 300 metre firing position on the existing 800 metre range at the Southern Highlands Regional Shooting Complex.

The Southern Highlands Shooting Complex is required under conditions of consent from the Minister of Planning to undertake acoustic compliance monitoring of noise emission from the existing rifle range.

Noise measurements for shooting ranges have since the early 1980s been based on a “Linear Peak Hold” measurement. This descriptor indicates the absolute maximum level measured using a Linear (no weighting) frequency response.

Typical noise level measurements for general noise matters utilise the A-weighting response. The A-weighted filter has rise times that are too slow for a peak impulse from a rifle shot and therefore cannot be used for the measurements of rifles.

Under the conditions of consent there is a requirement to undertake periodic monitoring.

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Issues as to the methodology of determining the measured level for compliance purposes (logarithmic average or arithmetic average), monitoring locations, reporting requirements and a cover over the 800 metre firing position are the subject of an application to modify the consent. As part of the review process an undertaking was given by Communities NSW to coordinate the testing so that representatives of the community could be present.

Testing was carried out on Saturday 28<sup>th</sup> April 2010 of the existing 300 metre firing position at reference locations in Hill Top (locations A1, A2 and B2) and near the rural residential property to the north west of the range (location A4a).

## **Measurement Techniques**

For the purpose of compliance testing, measurements were conducted as unattended and attended measurements.

Attended sound level measurements in the residential area of Hill Top were carried out using two Bruel & Kjaer Modular Sound Level Meters Type 2260 with Sound Enhanced Software Package BZ7206. Both meters are calibrated to manufacturer's standards.

Unattended measurements to the side of the firing position were conducted using a used a Larson Davis LD831 Sound Level Meter with the data being recorded for subsequent analysis. This sound level meter has current calibration to manufacturer's standards.

All sound level meters are classified as Type 1 meters.

The reference calibration level of each meter was checked prior to and after measurements with a Bruel & Kjaer Sound Level Calibrators Type 4231.

All attended measurements incorporated time splice recording for subsequent analysis if required.



## Measurement Procedures & Results

Appendix A shows the location of the Southern Highlands Shooting Complex off Wattle Ridge Road. The Google map shows the existing 800 metre range and the measurement locations used for the compliance testing.

The nature of the distance from the range to the residential receiver locations A1, A2, A4, and B2 (reference locations identified by GHD) can result in many of the shots being inaudible.

Accordingly unattended (logger) measurements were recorded using ½ second sampling at Location L7 being 50 metres to the east of the 300 metre firing position.

As the targets remain in a fixed position, the use of different firing distances involves the firing position moving back from the targets. Therefore for fixed receiver locations there can be a significant difference in noise levels – dependent upon the firing position, which can vary from day to day and even on a single day.

For the distances to residential receivers used in this compliance test the influence of ambient noise and wind can result in peak hold linear levels greater than that of shooting.

It is noted that there is some confusion in the GHD reports as to identification of the location in Starlight Place (location B2). For some reports Location B2 appears to be the nearest residential boundary location to the existing (and future) range, and is considered by some residents to be the most critical/nearest residential receiver location.

The B2 location was identified by GHD as a test site for military weapons and became a request for monitoring from residents. In one GHD report location B2 is identified as A2 with a description of Rocky Waterholes Road. On this basis the compliance monitoring for this test program utilised GHD locations A1, B2 and A2. We see that on some occasions GHD had location A2 on private property off the western end of Rocky Waterholes Road whereas we were located at the western end of the bitumen road.



With respect to the property to the NW location A4 (used by GHD) is removed from the residence on that property. For the purpose of the compliance test we utilised location A4A being on the site boundary of the property adjacent to the bushwalkers car park at the end of the road and the same distance as the dwelling from the range.

In view of the need to obtain Linear Peak Hold measurements each B & K 2260 meter was set to measure and display the Linear Peak Hold value with the observer at each location manually writing down the results (level and time) when a shot was audible. At times a shot may be audible but show no measureable increase on the meter.

The B & K 2260 meter display provides the maximum value in each second and permits identification of the noise level, whereas other digital displays have different updates and may not actually show the maximum level. Furthermore it is essential to utilise attended measurements at critical residential locations in view of the ambient noise and wind in the area that can give rise to levels higher than shooting.

Use of the unattended meter time splice recordings necessitates manual processing of the data.

The Saturday afternoon shooting was associated with the Full Bore discipline from the 300 metre position. Generally there was no wind present, although from time to time a slight wind was observed to move the leaves in trees.

The testing in the residential area involved simultaneous testing at locations A1 and B2, with the resident's observers at location A1.

It is noted that some difficulty was experienced in the monitoring at location A1 by reason of noise generated by the observers masking noise from the shooting.

At location B2 during the testing a resident from the property to the north attended the front boundary of that property, approximately 20 metres from the monitoring location. A dog accompanying the resident started barking and the resident proceeded to call out. No response was provided and the resident then left.



However, towards the end of the monitoring at location B2 a number of significantly louder “shots” were observed that were significantly different in frequency character to the previous monitoring over some 45 minutes so as to stand out. What was also apparent was the direction of the shots was from the north, whereas all the other shots had been detected as from the north west. Subsequent analysis of the results from the on-site location could not obtain correlation with the particular “shots” in question. The character of the different shots (that produced the higher level) was so different to the other shots that the source of these “shots” being from the range is questioned.

After 1 hour of monitoring the monitoring staff moved to location A2 and A4a.

The shooting continued until the ammunition was depleted and did not continue for a full hour. No shots could be detected at location A4a.

Appendix B sets out the results of the attended monitoring in relation to the 5 residential assessment locations. The results for the operator observed levels correlated with the audible shot are shown in the tables.

During the course of monitoring in Hill Top it was observed that noise from birds, aircraft, people/observers and vehicles produced maximum L peak hold levels greater than that obtained from the shooting.

The results of the unattended monitoring near the firing bench utilised the time splice facility of the meter. Due to the close proximity of the unattended meter the identification of individual shots is obvious.



The following table provides a summary of the range of noise levels identified in Appendix B.

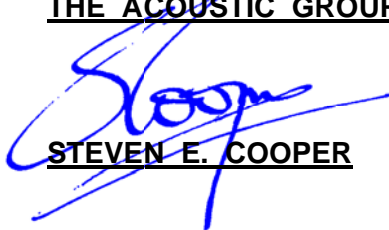
TABLE 1: Linear Peak Hold Levels

Location	Measured Shooting Levels			
	Min	Max	Arth Ave	No of shots
L7	104	121	115	225
A1	60	87	70	94
A2	50	84	65	92
B2	62	87	72	75
A4A	na	Na	na	0

We trust the above satisfies your immediate requirements.

Yours faithfully,

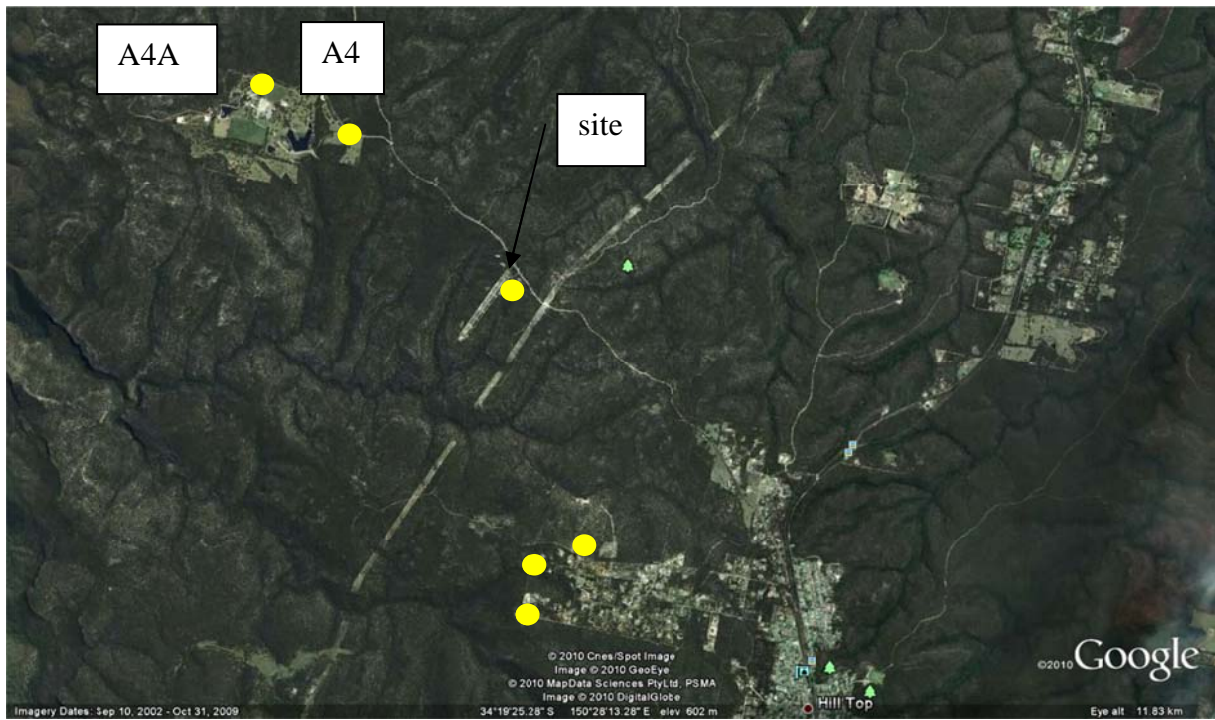
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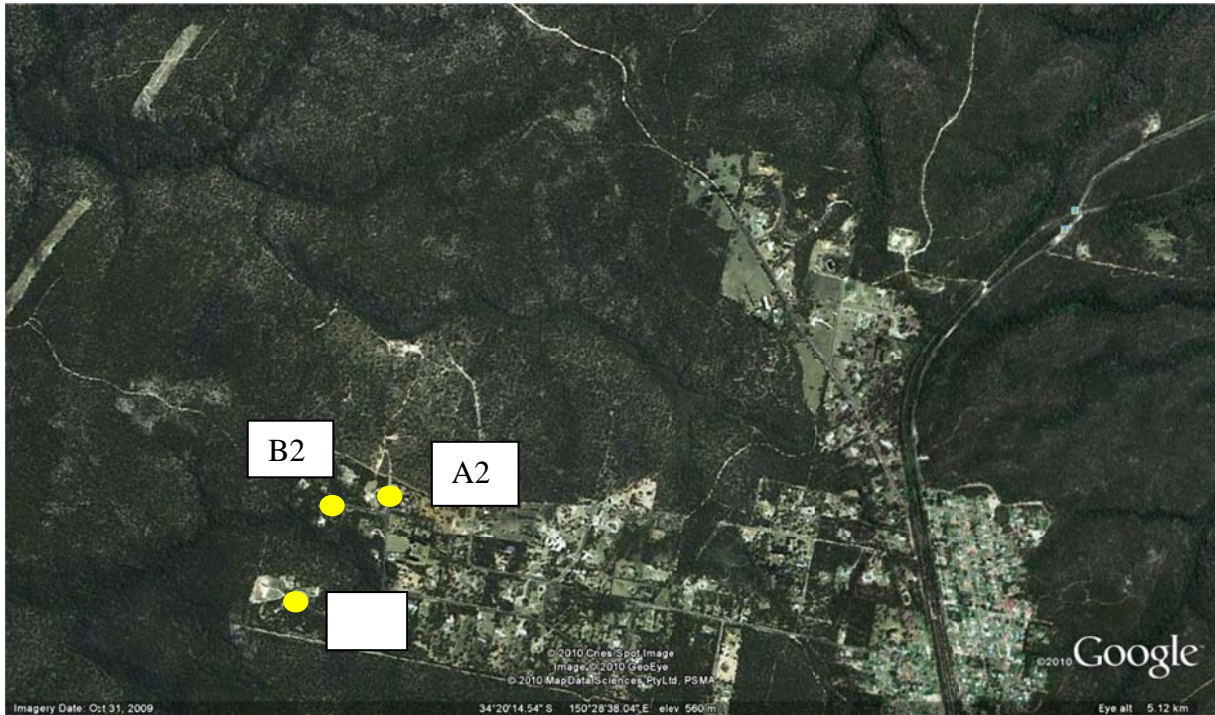


**STEVEN E. COOPER**



**APPENDIX A:** Measurement Locations







**APPENDIX B:** Measurement Results – Saturday 28<sup>th</sup> April 2012

Location A1. 1:45pm – 2:45pm

75	65	69	71	70	67	61	68	67	81
67	70	63	70	<40	<40	<40	60	75	69
79	75	68	70	N/A	74	71	76	69	69
65	67	70	63	60	65	63	87	69	64
69	67	<40	72	67	N/A	N/A	N/A	N/A	66
69	73	70	76	69	65	82	77	64	66
74	85	N/A	N/A	71	N/A	N/A	74	N/A	N/A
68	N/A	N/A	N/A	N/A	N/A	74	78	79	79
72	80	72	69	72	65	62	65	69	69
72	77	73	71	73	67	76	69	<40	60
71	74	67	65	62	64	66	66	70	66

Where N/A (not applicable) indicates shot masked by other noise sources

B2 300m. 1:40pm-2:40pm

68	70	66	67	67	54	65	65	60	<50
67	64	66	56	63	64	64	65	61	65
69	66	61	61	61	62	62	62	66	67
62	67	67	67	61	64	69	68	72	71
63	60	62	68	72	62	N/A	67	N/A	N/A
<40	<40	<40	63	66	63	56	50	61	64
57	67	65	<40	65	62	<40	<40	63	64
66	N/A	N/A	N/A	N/A	62	59	66	64	68
64	65	67	78	76	73	<40	66	78	68
68	71	77	67	67	84	81	<40	<40	<40
<40	N/A	61	61	66	<40	64	65	59	66
67	66								

Where N/A (not applicable) indicates shot masked by other noise sources



A2 - 300m. 2:54pm-3:50pm

82	73	70	85	76	87	78	74	74	81
70	74	75	74	71	74	65	71	73	77
72	73	72	80	73	78	80	71	71	73
72	77	69	66	75	67	70	72	75	77
76	79	79	77	70	72	69	78	73	71
68	68	69	69	71	65	63	67	62	80
72	66	N/A	75	73	70	71	71	71	74
64	<40	<40	<40	68	70	N/A	68	69	67

Where N/A (not applicable) indicates shot masked by other noise sources

L7 – 300m. 1:25pm-3:25pm

117	118	117	117	116	117	117	116	117	117
112	118	112	117	116	111	117	111	116	110
116	111	119	111	117	112	116	111	119	112
114	113	117	117	116	114	118	116	115	116
114	116	113	115	115	116	115	116	114	116
114	119	120	115	119	120	104	115	119	115
119	115	119	120	113	119	120	113	119	113
119	113	113	110	112	113	112	104	110	113
112	112	112	112	112	115	112	115	111	113
113	113	115	114	111	113	113	112	112	115
114	114	114	113	115	116	111	111	117	111
110	116	110	115	111	111	110	116	110	111
115	115	116	115	115	115	117	116	117	116
114	115	116	117	113	116	115	115	112	116
114	116	113	114	118	114	118	116	117	114
114	118	117	118	115	119	112	118	115	115



113	115	112	116	112	118	113	118	112	115
116	115	115	117	115	117	114	118	115	114
117	116	115	117	114	117	114	117	118	110
119	120	110	120	109	121	109	116	121	109
119	110	120	120	118	109	119	108	118	109
115	108	118	109	117	108	116	117	117	115
116	117	115	116	117					

