ACOUSTICS AND AIR

SOUTHERN HIGHLANDS REGIONAL SHOOTING COMPLEX

ENVIRONMENTAL NOISE MONITORING

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PREPARED FOR

OFFICE OF SPORT
6 B FIGTREE DRIVE
SYDNEY OLYMPIC PARK NSW 2127

WILKINSON MURRAY

DOCUMENT CONTROL

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TABLE OF CONTENTS

GLOSSARY OF ACOUSTIC TERMS

Most environments are affected by environmental noise which continuously varies, largely as a result of road traffic. To describe the overall noise environment, a number of noise descriptors have been developed and these involve statistical and other analysis of the varying noise over sampling periods, typically taken as 15 minutes. These descriptors, which are demonstrated in the graph below, are here defined.

Maximum Noise Level (L_{Amax}) – The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

L_{A1} – The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} level for 99% of the time.

L_{A10} – The L_{A10} level is the noise level which is exceeded for 10% of the sample period. During the sample period, the noise level is below the L_{A10} level for 90% of the time. The L_{A10} is a common noise descriptor for environmental noise and road traffic noise.

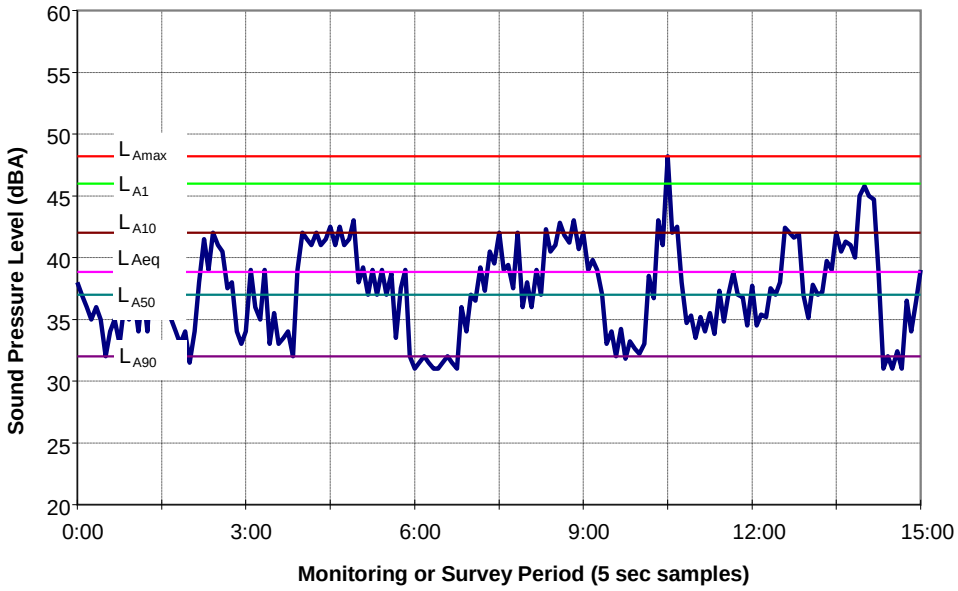
L_{A90} – The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} level for 10% of the time. This measure is commonly referred to as the background noise level.

L_{Aeq} – The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is also a common measure of environmental noise and road traffic noise.

ABL – The Assessment Background Level is the single figure background level representing each assessment period (daytime, evening and night time) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.

RBL – The Rating Background Level for each period is the median value of the ABL values for the period over all of the days measured. There is therefore an RBL value for each period – daytime, evening and night time.

Typical Graph of Sound Pressure Level vs Time



1 INTRODUCTION

Wilkinson Murray has been commissioned to conduct noise monitoring of the operation of new firing distances at the Southern Highlands Regional Shooting Complex (SHRSC). Monitoring was completed to provide an indicative received noise level from the usage of new firing distances.

Noise monitoring was completed based on the methodology outlined in the NSW EPA document *"Target Shooting Ranges: Application Note for Assessing Noise Compliance" (EPA Application Note)*.

Condition A9 of the Conditions of Approval stipulates the Firearm Noise Limits and states the following:

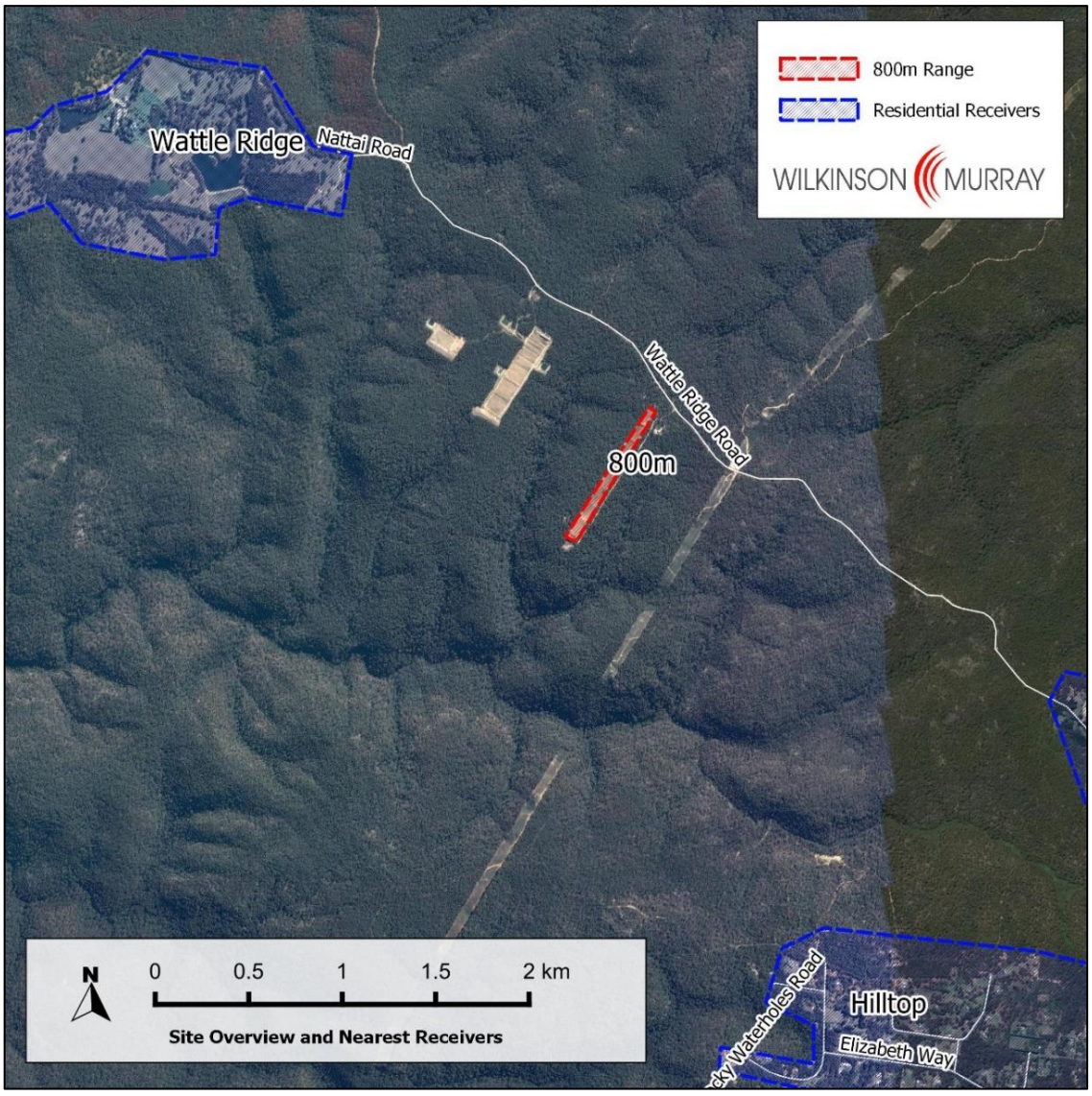
> *The noise from firearms or use of the site must not exceed LZpeak 75dB at the following locations:*
>
> *a) At the south-western end of Rocky Waterholes Road, Hill Top (representing residences at 1, 2 and 4 Rocky Waterholes Road); and*
>
> *b) At Nattai Road, Hill Top, adjacent to the western entrance to the Wattle Ridge Farm (representing the existing residence).*
>
> *The assessment of noise compliance from the Southern Highlands Regional Complex shall be undertaken in accordance with the EPA's Target Shooting Ranges: Application Note for Assessing Noise Compliance (2015).*

2 SITE DESCRIPTION

The SHRSC is located on Wattle Ridge Road, Hilltop, NSW. The complex is situated within the Nattai National Park. The complex currently consists of an 800m range, clubhouse, and an amenities block. The range currently only operates on weekends however, the existing approval allows for up to 4 days of operation a week. No notable topographical shielding is present between the range and receivers.

The nearest residential receivers include Wattle Ridge Farm, located approximately 2.5km to the North West, and Hilltop township located approximately 3km to the south-east. No notable topographical shielding is present between the range and receivers.

Figure 2-1 Site Overview and Nearest Receivers



3 NOISE ASSESSMENT

3.1 Methodology

Attended monitoring was completed between 10.15am and 12.15pm on 11 November 2018.

Measurements were conducted using a Brüel & Kjær Type 2250 Sound Level Meter and a SVAN 977A Sound Level Meter. Both meters conform to Australian Standard 1259 *Acoustics – Sound Level Meters* as a Type 1 Precision Sound Level Meter which has an accuracy suitable for field and laboratory use. The calibration of the meters was checked before and after the measurements with a Brüel & Kjær Type 4231 sound level calibrator and no significant drift was noted.

All equipment has been laboratory calibrated within the previous two years in accordance with our in-house Quality Assurance Procedures.

Both meters were set to measure L_{zPeak} levels in accordance with EPA's Application. Noise compliance was determined by the manual method described in the Application note.

Noise monitoring locations were selected to be consistent with previous compliance measurements. An ARL Ngara was also installed on range to track number of shots fired.

Figure 3-1 presents monitoring locations relative to the site and receivers and **Table 3-1** summarises the attended monitoring information. Photos of the monitoring set up are shown in Appendix B.

Figure 3-1 Noise Monitoring Locations

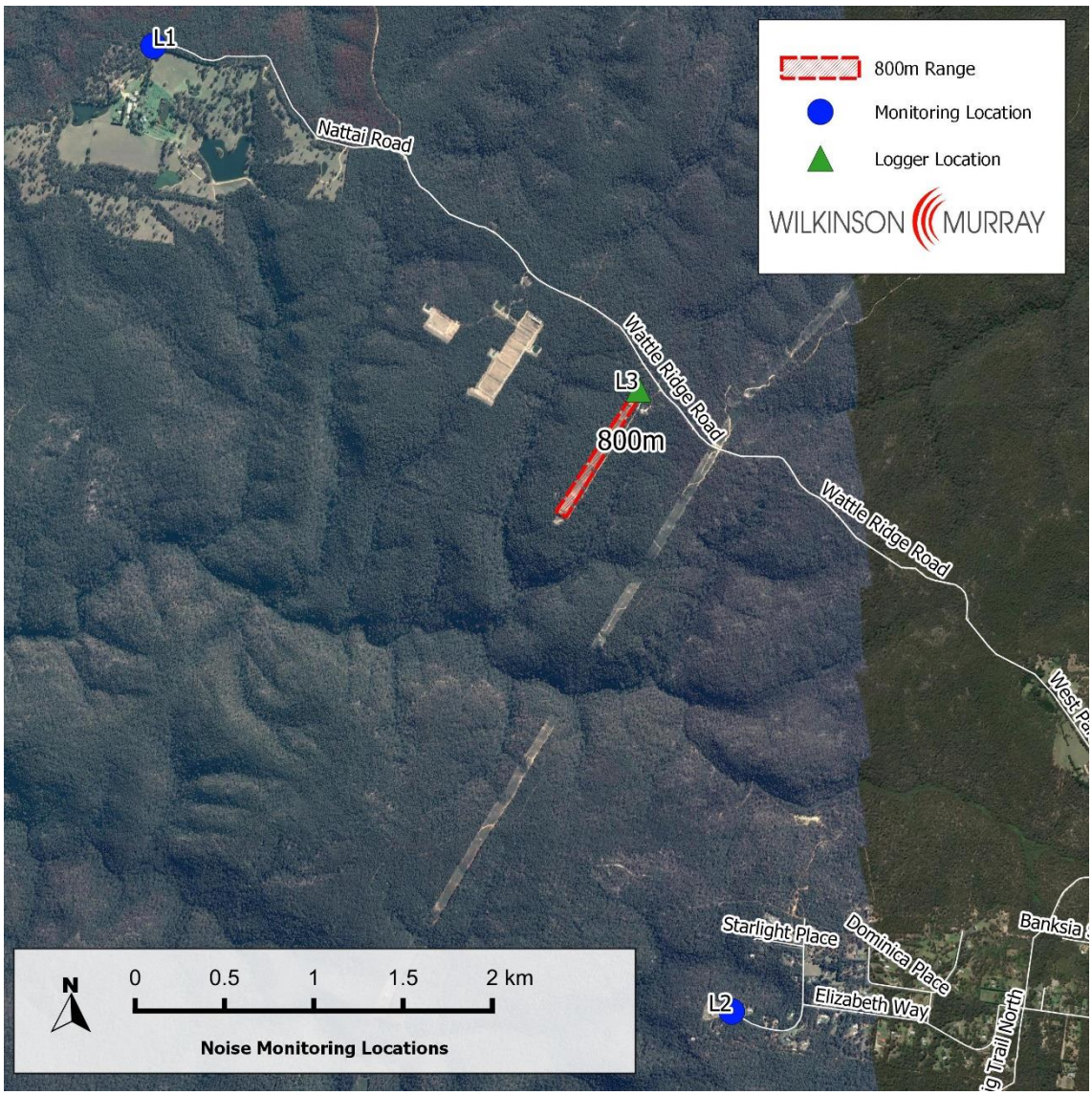


Table 3-1 Summary of Monitoring Setup

Location No.	Location	Logger	SN
L1	Wattle Ridge Farm	SVAN 977A	59633
L2	Rocky Waterhole	Brüel & Kjær 2250	3008381
L3	800m Range	ARL Ngara	8780FC

3.2 Noise Monitoring Results

Noise monitoring was conducted for shots at 200m, 300m, 400m, 500m, 600, and 700m firing distances. Monitoring was also conducted for various firing distances between 10m and 100m. During 400m measurements, there was a resident operating a chainsaw making which all shots unmeasurable for location L2. All shots were fired without the use of temporary acoustic shielding. Fixed acoustic barriers are in place at 800m, 400m, and 100m distances.

Table 3-2 summarises monitoring results. The raw data is summarised in Appendix A.

Table 3-2 Noise Monitoring Results - dB L_{zPeak}

Firing Distance	No. of Shots	No. of Measured Shots		Arithmetic Average	
		L1	L2	L1	L2
10-100	20	5	9	59	65
200	10	7	6	57	68
300	10	2	5	62	72
400	10	3	Extraneous	59	Extraneous
500	10	9	3	58	71
600	30	18	15	63	70
700	30	21	23	61	68

From the noise monitoring results, the arithmetic average of the received shot levels at all firing distances is below the 75dB L_{zPeak} criterion.

4 CONCLUSION

Wilkinson Murray has conducted noise monitoring of the operation of the 800m range at the Southern Highlands Regional Shooting Complex to determined received levels from the operation of various firing distances.

The noise monitoring determined that the received levels of shots firing from the 10-100m, 200m, 300m, 400m, 500m, 600m and 700m firing points does not exceed the 75dB L_{zPeak} level criterion for measuring noise on shooting ranges in NSW without the use of temporary acoustic barriers.

APPENDIX A

NOISE MEASUREMENT RESULTS

Wattle Ridge Noise Monitoring Data

Firing Distance	No.	Pre-Shot L_{zPeak}	Shot L_{zPeak}	Difference	Category
10m-100m	1	x	x	x	x
	2	x	x	x	x
	3	w	w	w	w
	4	57	58	1	B
	5	58	61	3	B
	6	54	55	1	B
	7	57	58	1	B
	8	x	x	x	x
	9	x	x	x	x
	10	x	x	x	x
	11	w	w	w	w
	12	w	w	w	w
	13	w	w	w	w
	14	x	x	x	x
	15	x	x	x	x
	16	x	x	x	x
	17	x	x	x	x
	18	61	63	2	B
	19	w	w	w	w
	20	59	61	2	B
200m	1	52	53	1	B
	2	51	55	4	A
	3	52	63	11	A
	4	55	60	5	A
	5	51	53	2	B
	6	53	58	5	A
	7	51	54	3	B
	8	x	x	x	x
	9	x	x	x	x
	10	x	x	x	x
300m	1	x	x	x	x
	2	x	x	x	x
	3	x	x	x	x
	4	x	x	x	x
	5	52	61	9	A
	6	x	x	x	x
	7	60	63	3	B
	8	x	x	x	x
	9	x	x	x	x
	10	x	x	x	x
400m	1	x	x	x	x
	2	x	x	x	x
	3	x	x	x	x
	4	x	x	x	x
	5	56	57	1	B
	6	57	58	1	B
	7	x	x	x	x
	8	57	63	6	A
	9	x	x	x	x
	10	x	x	x	x

Firing Distance	No.	Pre-Shot L_{zPeak}	Shot L_{zPeak}	Difference	Category
500m	1	x	x	x	x
	2	56	59	3	B
	3	52	57	5	A
	4	56	59	3	B
	5	56	57	1	B
	6	55	58	3	B
	7	51	57	6	A
	8	55	57	2	B
	9	x	x	x	x
	10	x	x	x	x
600m	1	x	x	x	x
	2	71	73	2	B
	3	67	69	2	B
	4	54	56	2	B
	5	65	66	1	B
	6	x	x	x	x
	7	x	x	x	x
	8	62	65	3	B
	9	57	58	1	B
	10	61	64	3	B
	11	54	56	2	B
	12	57	58	1	B
	13	55	60	5	A
	14	56	58	2	B
	15	60	61	1	B
	16	x	x	x	x
	17	x	x	x	x
	18	x	x	x	x
	19	60	62	2	B
	20	59	64	5	A
	21	53	55	2	B
	22	53	58	5	A
	23	x	x	x	x
	24	55	56	1	B
	25	x	x	x	x
	26	w	w	w	w
	27	w	w	w	w
	28	x	x	x	x
	29	56	57	1	B
	30	x	x	x	x
700m	1	65	68	3	B
	2	71	76	5	A
	3	63	64	1	B
	4	x	x	x	x
	5	x	x	x	x
	6	64	58	-6	NA
	7	56	58	2	B
	8	57	58	1	B
	9	52	53	1	B
	10	55	56	1	B
	11	56	58	2	B
	12	57	58	1	B
	13	w	w	w	w

Firing Distance	No.	Pre-Shot L_{zPeak}	Shot L_{zPeak}	Difference	Category
	14	w	w	w	w
	15	56	59	3	B
	16	63	65	2	B
	17	58	67	9	A
	18	57	58	1	B
	19	x	x	x	x
	20	x	x	x	x
	21	x	x	x	x
	22	54	61	7	A
	23	54	61	7	A
	24	56	58	2	B
	25	59	67	8	A
	26	61	69	8	A
	27	56	58	2	B
	28	60	61	1	B
	29	x	x	x	x
	30	x	x	x	x

Notes: w: wind affected
X: extraneous noise affected

Rocky Waterholes Noise Monitoring Data

Firing Distance	No.	Pre-Shot L_{zPeak}	Shot L_{zPeak}	Difference	Category
10m-100m	1	x	x	x	x
	2	x	x	x	x
	3	65	68	3	B
	4	x	x	x	x
	5	x	x	x	x
	6	w	w	w	w
	7	68	74	6	A
	8	71	75	4	A
	9	x	x	x	x
	10	65	72	7	A
	11	x	x	x	x
	12	x	x	x	x
	13	x	x	x	x
	14	w	w	w	w
	15	55	60	5	A
	16	57	62	5	A
	17	61	65	4	A
	18	63	68	5	A
	19	63	67	4	A
	20	w	w	w	w
200m	1	x	x	x	x
	2	w	w	w	w
	3	31	65	34	A
	4	62	66	3	B
	5	w	w	w	w
	6	60	66	5	A
	7	x	x	x	x
	8	62	68	6	A
	9	70	72	2	B
	10	67	73	6	A
300m	1	61	68	7	A
	2	69	75	6	A
	3	x	x	x	x
	4	w	w	w	w
	5	w	w	w	w
	6	71	76	5	A
	7	65	71	6	A
	8	w	w	w	w
	9	70	71	1	B
	10	x	x	x	x
400m	1	X	X	X	X
	2	X	X	X	X
	3	X	X	X	X
	4	X	X	X	X
	5	X	X	X	X
	6	X	X	X	X
	7	X	X	X	X
	8	X	X	X	X
	9	X	X	X	X
	10	X	X	X	X

Firing Distance	No.	Pre-Shot L_{zPeak}	Shot L_{zPeak}	Difference	Category
500m	1	59	60	1	B
	2	x	x	x	x
	3	w	w	w	w
	4	w	w	w	w
	5	w	w	w	w
	6	65	74	9	A
	7	71	79	8	A
	8	w	w	w	w
	9	x	x	x	x
	10	x	x	x	x
600m	1	x	x	x	x
	2	65	72	7	A
	3	65	78	13	A
	4	x	x	x	x
	5	x	x	x	x
	6	x	x	x	x
	7	x	x	x	x
	8	x	x	x	x
	9	72	74	2	B
	10	57	64	7	A
	11	x	x	x	x
	12	62	72	10	A
	13	x	x	x	x
	14	62	67	5	A
	15	x	x	x	x
	16	x	x	x	x
	17	71	75	4	A
	18	x	x	x	x
	19	x	x	x	x
	20	61	70	9	A
	21	x	x	x	x
	22	x	x	x	x
	23	57	65	8	A
	24	58	73	15	A
	25	67	76	9	A
	26	x	x	x	x
	27	68	74	6	A
	28	59	63	4	A
	29	64	69	5	A
	30	59	62	3	B
700m	1	57	70	13	A
	2	57	71	14	A
	3	57	58	1	B
	4	58	79	21	A
	5	67	74	7	A
	6	58	62	4	A
	7	69	77	8	A
	8	53	68	15	A
	9	52	69	17	A
	10	56	67	11	A
	11	x	x	x	x
	12	56	67	11	A
	13	61	75	14	A

Firing Distance	No.	Pre-Shot L_{zPeak}	Shot L_{zPeak}	Difference	Category
	14	x	x	x	x
	15	x	x	x	x
	16	63	70	7	A
	17	58	70	12	A
	18	59	69	10	A
	19	58	63	5	A
	20	55	61	6	A
	21	59	63	4	A
	22	x	x	x	x
	23	x	x	x	x
	24	x	x	x	x
	25	x	x	x	x
	26	60	66	6	A
	27	60	72	12	A
	28	60	68	8	A
	29	56	64	8	A
	30	60	65	5	A

Notes: w: wind affected
X: extraneous noise affected

APPENDIX B

TYPICAL NOISE MONITORING SETUP

Typical Noise Monitoring Set Up – Wattle Ridge