RODNEY STEVENS ACOUSTICS

REPORT R240816R1

Revision 0

Noise Impact Assessment

Proposed Child Care Centre

3 Memory Avenue, Crookwell

PREPARED FOR:
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14 April 2025

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Noise Impact Assessment

Proposed Child Care Centre

3 Memory Avenue, Crookwell

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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (RSA) has been engaged by Blue Sox Developments Pty Ltd to prepare a Noise Impact Assessment Report for the proposed Child Care Centre to be located at 3 Memory Avenue, Crookwell.

This report details the results of a noise survey and assesses the likely impact of noise (principally from traffic noise) incident upon the proposed Child Care Centre as well as noise from the proposed Child Care Centre upon nearby residential premises.

Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix A.

2 PROPOSED DEVELOPMENT

2.1 Development Site

The proposed Child Care Centre is to be located at 3 Memory Avenue, Crookwell. The development site is currently in proximity to residential dwellings to the north, north-east, west and south with McIntosh Road to the south. The development site and its surrounding environment are mainly influenced by low level ambient traffic noise from McIntosh Road and to a lesser extent Prell Street and Memory Avenue.

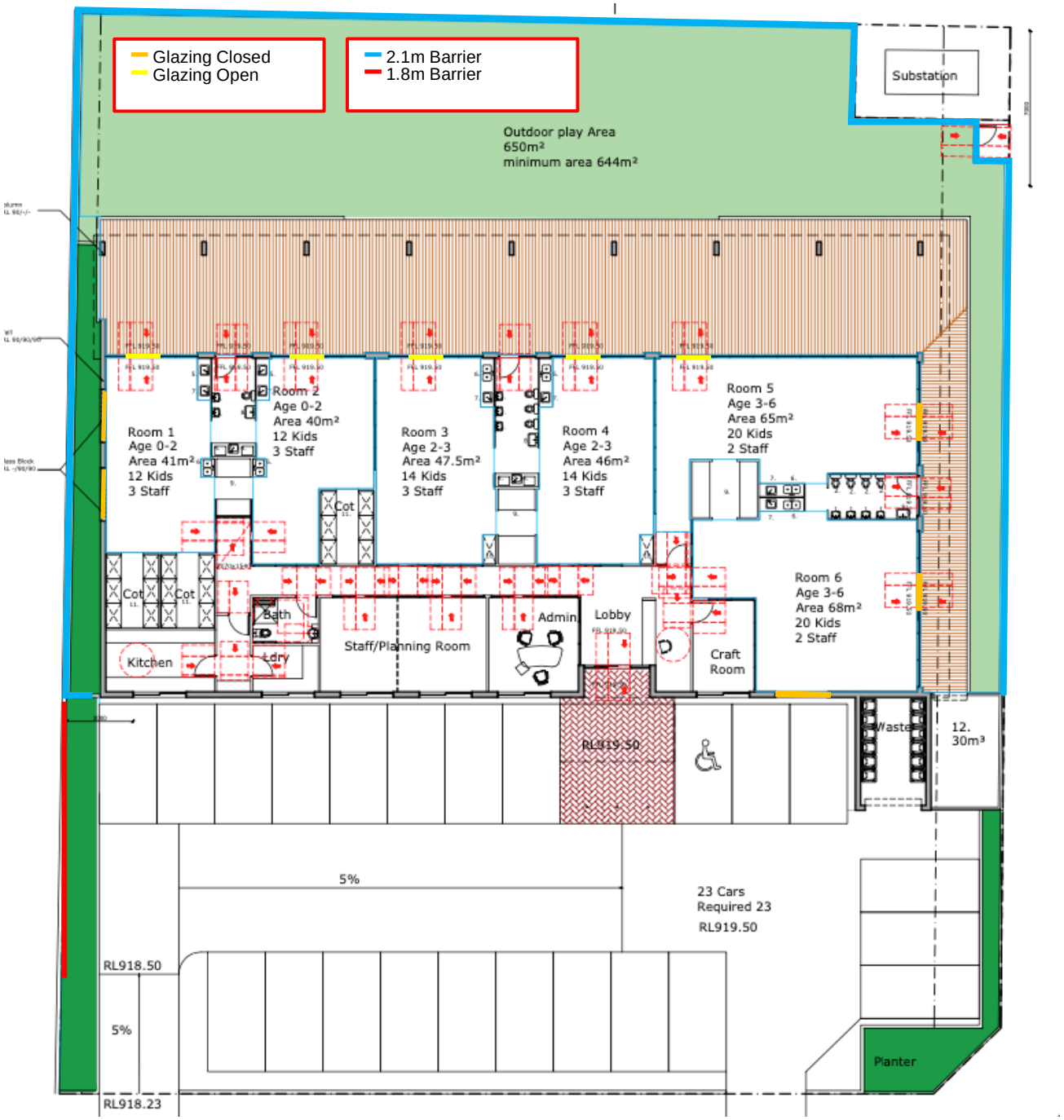
Figure 2-1 shows an aerial image of the site area and the surrounding environment.

Figure 2-1 Site Location

Aerial image courtesy of Six Maps © 2025

The following figure presents the proposed Child Care Centre Layout:

Figure 2-2 Proposed Child Care Centre Layout – Ground Level



The proposal is to construct a single storey childcare centre. The building will have 1 outdoor play area and ground level parking.

2.2 Hours of Operation

The following hours of operation are proposed:

- Monday to Friday 7:00 am until 6:00 pm

2.3 Enrolment Numbers

The proposed Child Care Centre plans to cater for up to 92 children between the ages of 0 and 6 years of age. The number of children and their age groups are as follows:

- 0-2 years old - 24 Children
- 2-3 years old - 28 Children
- 3-6 years old - 40 Children

2.4 Outdoor Play Activities

In RSA's experience with Child Care Centres, potential noise issues occur primarily when children are engaged in outdoor play activities, in terms of intrusive environmental noise to the play area and play area noise to nearby sensitive receivers.

3 BASELINE NOISE SURVEY

3.1 Unattended Noise Monitoring

In order to characterise the existing acoustical environment of the area, unattended noise monitoring was conducted between Thursday 20th February and Thursday 27th February 2025 at the logging location shown in Figure 2-1. The noise logger was located on the back yard of the site. The noise monitoring at this location is representative of the ambient noise of the area.

Logger locations were selected with consideration to other noise sources which may influence readings, security issues for noise monitoring equipment and gaining permission for access from other landowners.

Instrumentation for the survey comprised of a RION NL-42EX environmental noise logger (serial numbers 441419) fitted with microphone windshields. Calibration of the loggers was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dB(A). All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Upon consultation with historical weather reports provided by the Bureau of Meteorology, no measured data was affected by adverse weather.

The logger determines L_{A1}, L_{A10}, L_{A90} and L_{Aeq} levels of the ambient noise. L_{A1}, L_{A10}, L_{A90} are the levels exceeded for 1%, 10% and 90% of the sample time respectively (see Glossary for definitions in Appendix A). Detailed results at the monitoring location are presented in graphical format in Appendix B. The graphs show measured values of L_{A1}, L_{A10}, L_{A90} and L_{Aeq} for each 15-minute monitoring period.

3.2 Data Processing

3.2.1 Noise Emissions (Noise Policy for Industry)

In order to assess noise emission from the proposed child care centre, the data obtained from the noise logger has been processed in accordance with the procedures contained in the NSW Environmental Protection Authority's (EPA) *Noise Policy for Industry* (NPfI, 2017) to establish representative noise levels that can be expected in the residential vicinity of the site. The monitored baseline noise levels are detailed in Table 3-1.

Table 3-1 Measured Baseline Noise Levels Corresponding to Defined NPfI Periods

Location	Measurement Descriptor	Measured Noise Level – dB(A) re 20 µPa		
		Daytime 7 am - 6 pm	Evening 6 pm – 10 pm	Night-time 10 pm – 7 am
As per Figure 2-1	L_{Aeq}	47	48	42
	RBL (Background)	36	35	34

Notes: All values expressed as dB(A) and rounded to nearest 1 dB(A);

L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

L_{A90} Noise level present for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

3.2.2 Traffic Noise Intrusion (*Road Noise Policy*)

To assess noise intrusion into the outdoor play areas and internal areas of the Child Care Centre, the data obtained from the logger location has been processed to establish representative ambient noise levels from McIntosh Road and the surrounding area.

The time periods used for this assessment are as defined in the EPA's *Road Noise Policy* (RNP, 2011). Results are presented below in Table 3-2.

Table 3-2 Traffic Noise Levels Corresponding to Defined RNP Periods

Location	Period	External Noise Levels dB(A)
Southern Facade	1 Hour	$L_{Aeq(1hour)}$ 47 dB
Southern Facade	24 Hour	$L_{Aeq(24hour)}$ 45 dB

4 NOISE GUIDELINES AND CRITERIA

4.1 Operational Noise From Child Care Centre

A guideline for the assessment of noise from child care centres has been prepared by the Association of Australian Acoustical Consultants (AAAC). The document, *AAAC Technical Guideline Child Care Centre Noise Assessment V3.0*, provides criteria for the assessment of noise intrusion into and noise emissions from Child Care Centres and also provides recommendations for treatment to minimise acoustical impacts upon neighbouring premises.

Since the time in which children are involved in outdoor play can be limited, the potential impact associated with these noise emissions reduces. The AAAC considers a total limit of 4 hours outdoor play per day (typically 2 hours in the morning and 2 hours in the afternoon) reasonable to apply a criterion of $L_{Aeq(15minute)}$ noise level emitted from the outdoor play area not exceed the background noise level by more than 10 dB at the assessment location. However, if the proposed outdoor play time is more than 4 hours per day, the $L_{Aeq(15minute)}$ noise level

emitted from the outdoor play area must not exceed the background noise level by more than 5 dB at the assessment location.

Where the measured ambient noise level of a particular area is below 40 dB(A), the AAAC provides a specific base criterion in Section 3.2.1 of the guidelines. A base criterion of a contributed $L_{eq,15min}$ 45 dB(A) for the assessment of outdoor play is recommended in locations where the background noise level is less than 40 dB(A). In this case the noise criteria for outdoor play area noise is 45 dB(A).

4.1.1 Road Noise Intrusion to Outdoor Playground

Noise levels within outdoor play areas are not covered by the Upper Lachlan Shire Council's DCP. For the assessment of road traffic noise impact on the outdoor play areas, the Association of Australian Acoustical Consultants (AAAC). The document, *AAAC Technical Guideline Child Care Centre Noise Assessment V3.0* has been used to determine the appropriate noise level. In accordance with the AAAC, the noise criterion for outdoor play areas is as follow:

- Outdoor play areas – $L_{Aeq,(1hour)}$ 55 dB(A) (external).

4.1.2 Noise Intrusion to Indoor Areas

Noise levels within indoor play areas are not covered by Upper Lachlan Shire Council's DCP. For the assessment of road traffic noise impact on the indoor play areas, the Association of Australian Acoustical Consultants (AAAC). The document, *AAAC Technical Guideline Child Care Centre Noise Assessment V3.0* has been used to determine the appropriate noise level. In accordance with the AAAC, the noise criterion for outdoor play areas is as follow:

- Indoor play areas – $L_{Aeq,(1hour)}$ 40 dB(A) (internal).
- Sleeping areas – $L_{Aeq,(1hour)}$ 35 dB(A) (internal)

4.1.3 Other Noise Emissions

Based on Section 3.2.2 of the AAAC guidelines, the cumulative $L_{eq,15\ minute}$ noise emission level resulting from the use and operation of the child care centre, with the exception of noise emission from outdoor play shall not exceed the background noise level by more than 5 dB at the assessment location. This includes the noise emission resulting from:

- Indoor play
- Mechanical plant
- Drop off and pick up
- Other activities/operations (not including outdoor play).

4.1.4 Other Sensitive Receivers

The NSW EPA's Noise policy for Industry (NPfI) provides noise criteria for non-residential sensitive receivers the specific noise criteria is presented below:

Table 4-1 Other Sensitive Receivers – Noise Criteria

Receiver	Time of Day	Recommended L_{Aeq}
School Classrooms – Internal	When in Use	35
Hospital Ward – Internal and External	Noisiest 1 Hour	35/50
Places of Worship – Internal	When in Use	40

The following table presents a summary of the noise criteria required for each activity generated by the childcare centre

Table 4-2 Noise Criteria Summary

Activity	Noise Criteria $L_{Aeq(T)}$
External Noise	
Outdoor Play	45
Indoor Play	41
Carpark	41
Mechanical	41
Other activities/operations (not including outdoor play)	41
Internal Noise	
Indoor Play Areas	40
Sleeping Areas	35

5 NOISE IMPACT ASSESSMENT

5.1 Road Traffic Noise Intrusion into Centre

5.1.1 Outdoor Play Area

Based on the measured road traffic noise level of $L_{Aeq(1hour)}$ 47 dB(A) from McIntosh Road, the predicted traffic noise impacts at the outdoor play areas are presented in Table 5-1.

The following assumptions have been made in the noise modelling of the road traffic noise impacts on the outdoor play areas:

- A 2.1 and 1.8 meter high solid barriers are in place along the boundaries (Refer to Figure 2-2)
- The height of children between the ages of 0 and 3 years have an average height of 1 meter, children 3 and 6 have an average height of 1 metre;
- The outdoor play areas are located to the north of the site and it is shielded by the child care building to the south.
- Road traffic noise impacts have been modelled from the centre line of the road to approximately the middle of the outdoor play areas.

Table 5-1 Predicted Road Traffic Noise Levels Into Outdoor Play Areas

Area	Predicted L_{Aeq} Road Traffic Noise Level – dB(A)	Noise Criterion L_{Aeq} – dB(A)	Compliance (Yes / No)
Outdoor Play Area – Ground	39	55	Yes

Existing road traffic noise levels in the Outdoor Play areas are predicted to comply with the $L_{Aeq,(1hour)}$ 55 dB(A) (external) criterion stipulated in Section 4.1.1. Based on this assessment no additional no control measures will be required.

5.1.2 Indoor Areas

The typical outdoor to indoor noise reductions provided by most standard glazed facades (i.e. without special acoustical treatment) is generally accepted as being 10 dB(A) through an open window and in the order of 20 dB(A) with windows closed.

The facade road traffic noise at the proposed child care centre building is calculated to be $L_{Aeq(1hour)}$ 47 dB(A) on the southern facade. Taking into account the distance, shielding and glazing performance, the resultant indoor noise levels for opened and closed windows at the northern facade, corresponding to the typical noise reductions are as follow:

Table 5-2 Predicted Road Traffic Noise Levels Into Indoor Areas

Area	Predicted L_{Aeq} Road Traffic Noise Level – dB(A)		Noise Criterion L_{Aeq} – dB(A)	Compliance (Open / Closed)
	Windows Open	Windows Closed		
0-2 Years - 1	35	25	40	Open
0-2 Years - 2	29	19	40	Open
2-3 Years - 3	28	18	40	Open
2-3 Years - 4	28	18	40	Open
3-6 Years - 5	35	25	40	Open
3-6 Years - 6	37	27	40	Open

We note that the doors leading to the outdoor play areas (north) can be open.

The predicted internal noise levels are likely to comply with the 40 dB(A) criteria with windows opened.

5.2 Mechanical Plant Noise Assessment

Mechanical ventilation may be installed at the proposed childcare centre, the operation of such mechanical plant must be in accordance with the relevant regulations such as the Building Code of Australia (BCA Vol.1, Part 4.5 *Ventilation of rooms*) and AS1668.2-2002 *The use of ventilation and air conditioning in buildings* will be required.

A specific mechanical plant selection has not been supplied at this stage. It is anticipated that the building will be serviced by typical mechanical ventilation/air conditioning equipment.

It is likely that the relevant noise criteria may be met through the use of conventional noise control methods (e.g. selection of equipment on the basis of quiet operation and, where necessary, providing enclosures, localised barriers, silencers and lined ductwork).

An appropriately qualified acoustic consultant should review the mechanical plant associated with the development at the detailed design stage when final plant selections have been made.

5.3 Operational Noise Emissions to Nearby Residences

5.3.1 Outdoor Play Activities Noise Impact

Potential noise management issues occur primarily when children are engaged in outdoor play activities. Noise generated by the children in the outdoor play area will occur at limited times throughout the day, with numbers of children playing and periods of play managed by the Centre staff.

The Association of Australian Acoustical Consultants (AAAC) technical guideline for Child Care Centre Noise Assessment V3.0 provides the following sound power levels (Lw) for various age groups of children

Table 5-3 Effective Sound Power Levels ($L_{Aeq, 15min}$) for Groups of 10 Children Playing

Noise Descriptor	Noise Level (dB) at Octave Band Centre Frequency (Hz)								
	63	125	250	500	1 k	2 k	4 k	8 k	Overall dB(A)
0 to 2 Years	54	60	66	72	74	71	67	64	78
2 to 3 Years	61	67	73	79	81	78	74	70	85
3 to 5 Years	64	70	75	81	83	80	76	72	87

If applicable, an adjustment to the above sound power levels of -6 dB could be applied in each age group for children involved in passive play.

Calculations have been made based on the spectra above assuming all the children will be playing outside at the one time. The levels were scaled to reflect the overall sound power levels presented by the AAAC to determine the likely noise levels at nearby receivers due to 92 children playing in the Outdoor Play areas of the proposed Child Care Centre.

The following assumptions have been made in the noise modelling of the Outdoor Play areas noise impacts on the neighbouring residences:

- 24 children between the ages of 0 and 2 with total sound power level of 81 dB(A), 28 children between the ages of 2 and 3 with total sound power level of 89 dB(A) and 40 children between the ages of 3 and 6 with total sound power level of 93 dB(A) will be playing in the proposed outdoor play areas;
- The height of the residential receivers has been assumed to be 1.5 metres for residential buildings on their respective level;
- Source height in the outdoor play area, i.e. children height, have been taken to be 1 meter from the ground;
- The proposed 2.1 and 1.8 meter high solid barriers (Refer to Figure 2-2) along the boundaries of the outdoor play areas have been taken into account in the noise model;
- Resulting noise levels have been calculated to the most affected point and elevation on the boundary of the affected receivers

The following figure shows the receiver locations in relation to the proposed Child Care Centre. Table 5-4 shows the address of each affected receiver

Figure 5-1 Receiver Locations

Table 5-4 Sensitive Receivers

Receiver	Number of Levels	Sensitive Receiver's Address
R1	2	1 McIntosh Road
R2	2	103 Laggan Road
R3	2	1 Memory Avenue
R4	2	3 Memory Avenue
R5	1	8 McIntosh Road
R6	1	10 McIntosh Road

The predicted noise levels experienced by nearest residential receivers are presented in Table 5-5 below. Noise levels have been calculated at the most affected boundary heights. The noise levels presented below are representative of the worst case scenarios for receiver.

Table 5-5 Predicted Outdoor Play Activities Noise Emission

Receiver	Predicted Outdoor Play Activities Noise at Neighbouring Residents – dB(A)	Criteria	Compliance
R1	32	45	Yes
R2	37	45	Yes
R3	40	45	Yes
R4	39	45	Yes
R5	29	45	Yes
R6	28	45	Yes

Noise from the outdoor play activities at the surrounding residences is predicted to comply with the 45 dB(A) criterion with scenario presented above.

Based on the above assessment of the outdoor play activities noise emissions, a 2.1-meter high solid barriers must be implemented along the boundaries. (Please refer to Section 6.4 for further details)

5.3.2 Noise Emissions from Indoor Activities

Calculations have been carried out to ascertain the noise breakout from indoor activities to the neighbouring premises. The predicted noise levels indicate that the noise criteria will not be exceeded if the windows are in the configuration shown in Figure 2-2 the resulting noise levels are presented in Table 5-6 below. Noise levels have been calculated at the most affected boundary heights.

Table 5-6 Predicted Indoor Play Activities Noise Emission

Receiver	Predicted Indoor Play Activities Noise at Neighbouring Residents – dB(A)	Criteria	Compliance
R1	<10	41	Yes
R2	<10	41	Yes
R3	10	41	Yes
R4	12	41	Yes
R5	<10	41	Yes
R6	<10	41	Yes

The assessment criterion for indoor play of 41 dB(A) can be achieved with the windows in the configuration shown in Figure 2-2.

The glazing for the windows on the western façade must have a minimum Rw 32, all remaining glazing can be standard, we note that the R_w rating is required for the complete glazing and frame assembly. The minimum glazing thicknesses will not necessarily meet the required R_w rating without an appropriate frame system. It will be therefore necessary to provide a window glass and frame system having a laboratory tested acoustic performance meeting the specified requirements

Noise emissions from indoor activities will comply the specific noise criteria at the neighbouring residential receivers with the internal layout proposed.

5.3.3 Carpark Emission

The proposed car park is to be located on the south entry of the site, it has a capacity of 23 car spaces, calculations of noise from the carpark have been based on typical noise generating events within a carpark such as, door slams, engine starts and cars driving away. We have assumed a scenario where 12 cars enter or leave the carpark in a span of 15 minutes.

The sound power levels of the vehicle movements have been sourced from RSA's noise spectra library and include the following:

Table 5-7 Carpark Sound Power Levels

Activity	Sound Power Level dB(A)
Door Slam	98
Engine Start	98
Vehicle Pass By	94

The calculated noise levels from the activities carried out within the carpark are presented in the table below:

Table 5-8 Calculated Carpark Noise Levels

Receiver	Predicted Carpark Activities Noise at Neighbouring Residents – dB(A)	Criteria	Compliance
R1	23	41	Yes
R2	12	41	Yes
R3	12	41	Yes
R4	19	41	Yes

Receiver	Predicted Carpark Activities Noise at Neighbouring Residents – dB(A)	Criteria	Compliance
R5	38	41	Yes
R6	22	41	Yes

We note that a 1.8 meter solid barrier on the western carpark boundary have been used for calculation purposes, please refer to Section 6.4.

5.3.4 Cumulative Noise Emissions

The following table presents the cumulative noise emissions from indoor play area, mechanical plant and carpark. This results assume that all these noise generating activities are occurring simultaneously.

Table 5-9 Cumulative Child Care Centre Noise Levels

Receiver	Predicted Cumulative Noise at Neighbouring Residents – dB(A)	Criteria	Compliance
R1	23	45	Yes
R2	13	45	Yes
R3	14	45	Yes
R4	20	45	Yes
R5	38	45	Yes
R6	22	45	Yes

6 RECOMMENDATIONS

The following recommendations must be implemented in order to achieve compliance with the criteria requirements from Upper Lachlan Shire Council.

6.1 Outdoor Play Areas

In order to achieve compliance with council's noise requirements for outdoor play, the following must be implemented:

- All children can engage in outdoor play at a time
- No music is to be played in the outdoor areas

- Playground equipment that allows a child to be more than 0.5 above the ground level should not be used
- Children must be supervised at all times

6.2 Indoor Play Areas

In order to achieve compliance with council's noise requirements for outdoor play, the following must be implemented:

- The windows must follow the configuration shown in Figure 2-2,
- All indoor play area glazing must have a minimum rating of Rw 32, all remaining glazing can be standard

6.3 Car Park Noise Control Measures

The following noise control measures and management plan should be implemented for the carpark space:

- Parents and guardians should be informed of the importance of noise minimisation when entering or exiting the site, dropping off or picking up children. This includes avoiding raising your voice within the centre's carpark area or beeping car horn.

6.4 Acoustic Barrier and Awning Details

A 2.1 and 1.8 meter high solid barriers along the boundaries must be implemented (Refer to Figure 2-2)

Acoustic barrier is required to provide the adequate noise attenuation, the construction material of the barriers must have a surface density of 15 kg/m^2 and be free from holes and gaps. Some suitable materials include:

- 25 mm thick plywood timber panelling
- 9 mm thick fibre cement sheet
- 75mm thick Hebel Powerpanel
- 12 mm thick Perspex, polycarbonate or Danpalon
- 6 mm toughened laminated safety glass
- Any other approved material which meets the above surface density specification

A typical material used in childcare centres is Perspex, which is a polycarbonate material. The use of the 12 mm thick Perspex or 6 mm glass for this purpose which has a surface mass of 14.3 kg/m^2 will meet the mass requirements detailed above and be suitable for use as it is transparent and will not unduly restrict light or vision.

All barriers must be free of gaps and penetrations and it is particularly important to ensure that the gap at the bottom of the barrier is minimised as far as practicable. The base of the barriers should be well sealed at the junction where the barrier meets the floor, but still be designed to allow proper water drainage.

7 CONCLUSION

Rodney Stevens Acoustics has conducted a review of the proposed childcare centre at 3 Memory Avenue, Crookwell. The assessment has comprised the establishment of noise criteria and assesses noise impacts regarding relevant statutory requirements.

Noise emissions from the outdoor area play activities to the nearest residential receivers have been calculated to comply with the noise criterion, where all children are playing outside at any given time. A 2.1 meter high solid barrier along the boundaries must be implemented to minimise the noise impact from the outdoor areas (Refer to Section 6.4).

Noise emissions from the indoor play activities to the nearest residential receivers have been calculated to comply with the noise criterion, with the window configurations shown in Figure 2-2.

Noise emissions from the carpark to the nearest residential receivers have been calculated to comply with the noise criterion, a 1.8 meter solid barrier on the western boundary must be erected. (Refer to Section 6.4)

Traffic noise intrusion into the indoor areas has been assessed to comply with the noise criteria as set out in Section 4.1.1.

Criteria for noise emissions from mechanical plant has been established, a further acoustic survey by a qualified acoustic consultant will be required once mechanical plant schedules have been selected.

Based on our assessment the proposed Child Care Centre at 3 Memory Avenue, Crookwell complies with the noise criteria provided that the noise control measures recommended is implemented. It is therefore recommended that planning approval be granted for the proposed development on the basis of acoustics.

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Approved by:

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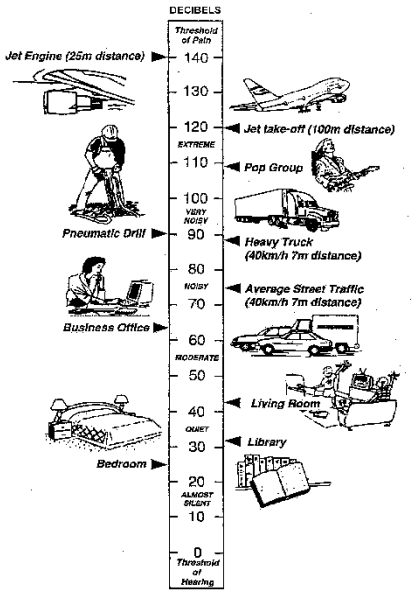
Principal Acoustic Consultant

Appendix A – Acoustic Terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The total noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	Includes noise annoyance due to: character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) character of the environment (e.g. very quiet suburban, suburban, urban, near industry) miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, taking into account the following factors: Noise mitigation benefits (amount of noise reduction provided, number of people protected). Cost of mitigation (cost of mitigation versus benefit provided). Community views (aesthetic impacts and community wishes). Noise levels for affected land uses (existing and future levels, and changes in noise levels).
Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.

Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.
Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).
Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10th percentile min L_{A90} noise level measured over all day, evening and night time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	Sound (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.



dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Sound power Level (SWL)

The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.

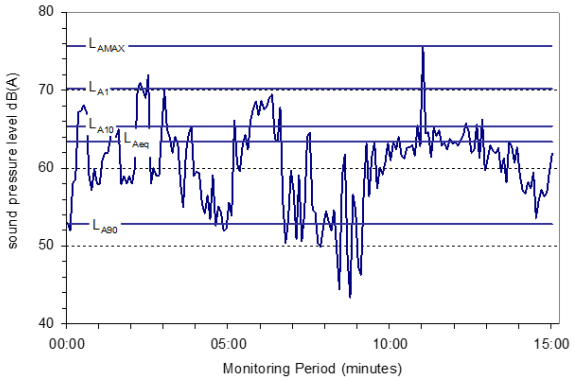
Sound Pressure Level (SPL)

The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.

Statistic noise levels

Noise levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level.

A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:



Key descriptors:

L_{Amax} Maximum recorded noise level.

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

L_{A10} Noise level present for 10% of the 15 minute interval. Commonly referred to the average maximum noise level.

L_{Aeq} Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.

L_{A90} Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

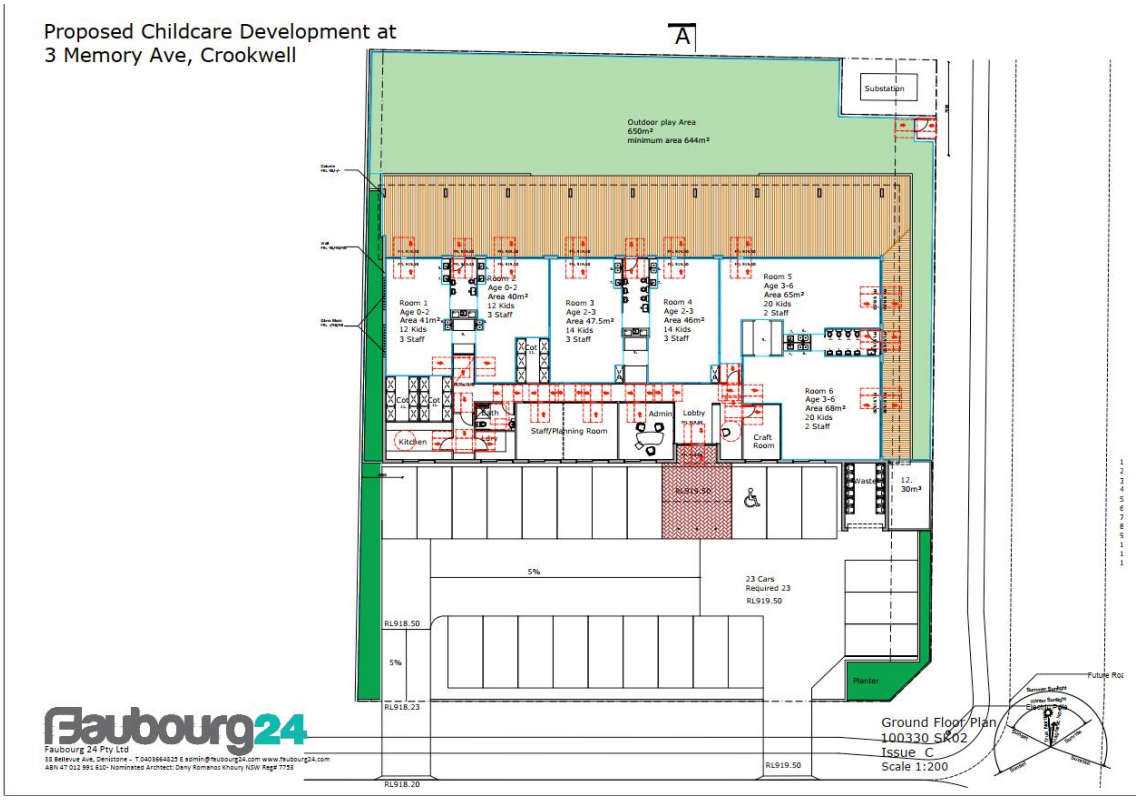
Threshold

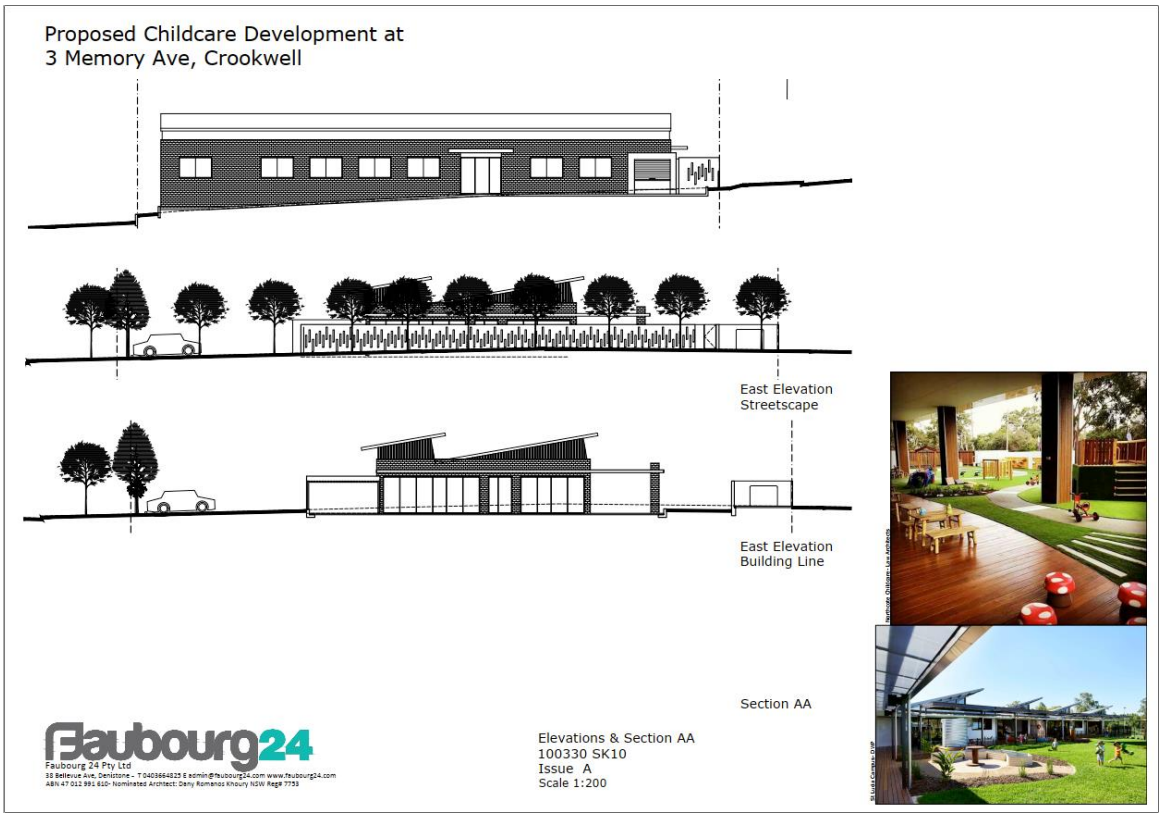
The lowest sound pressure level that produces a detectable response (in an instrument/person).

Tonality

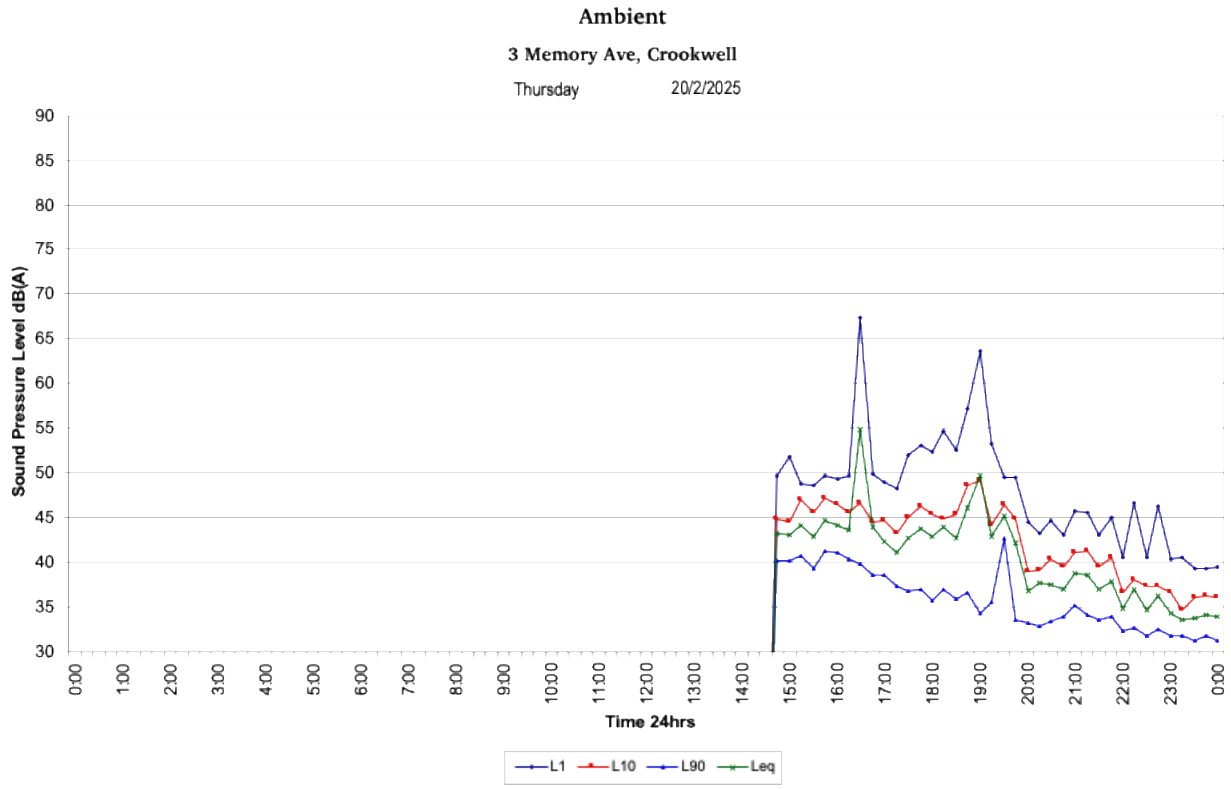
Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dB(A) penalty is typically applied to noise sources with tonal characteristics

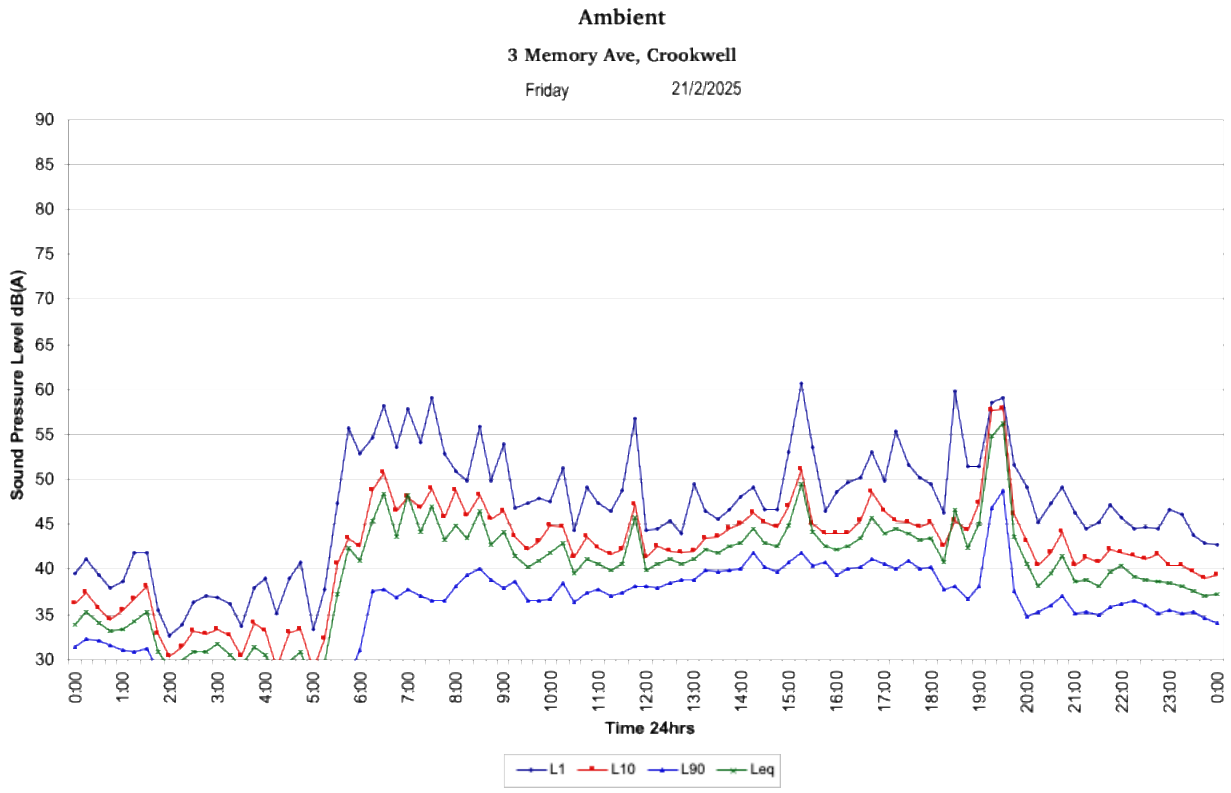
Appendix B – Architectural Plans

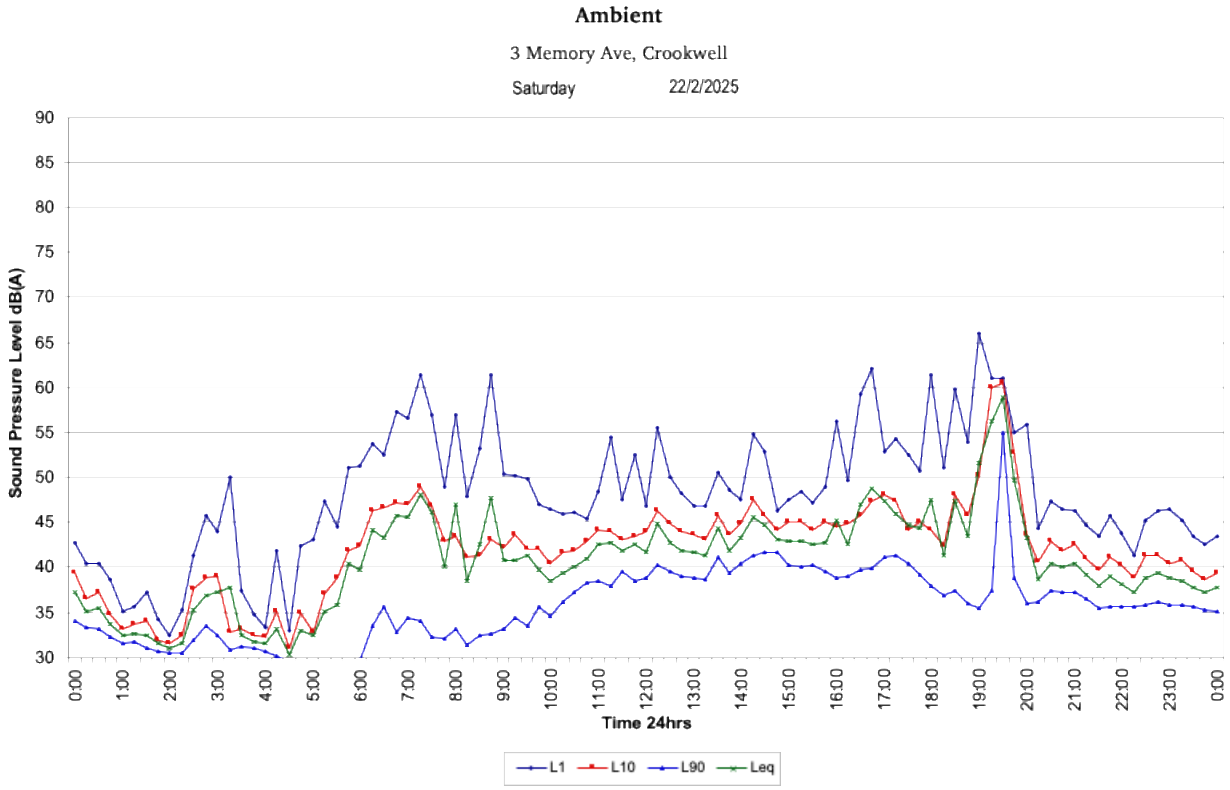


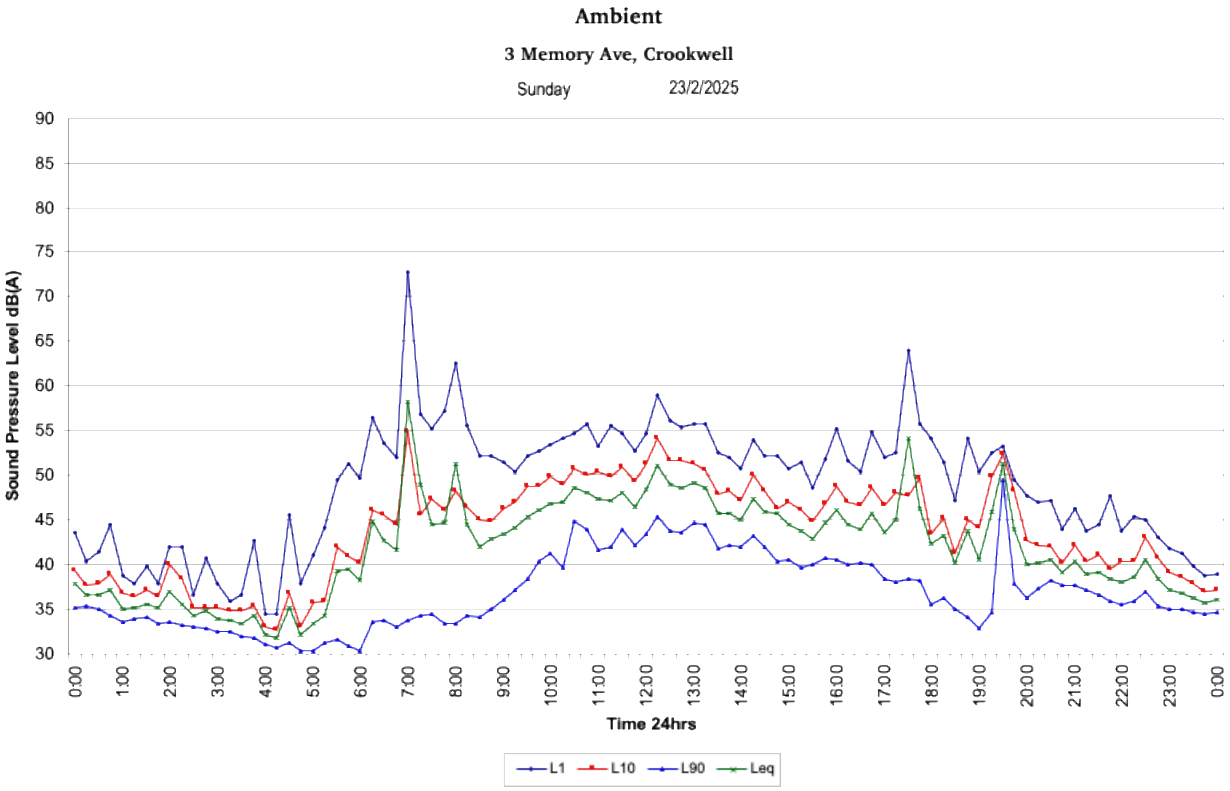


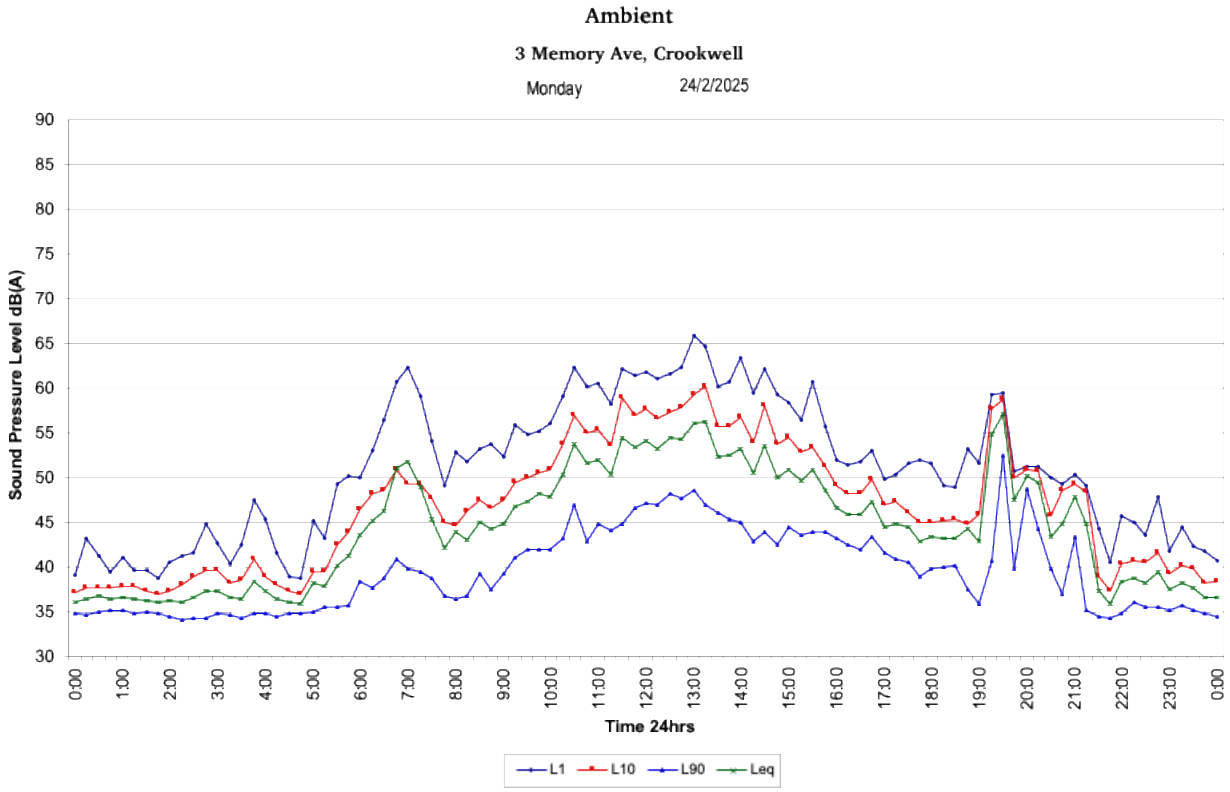
Appendix C – Logger Graphs

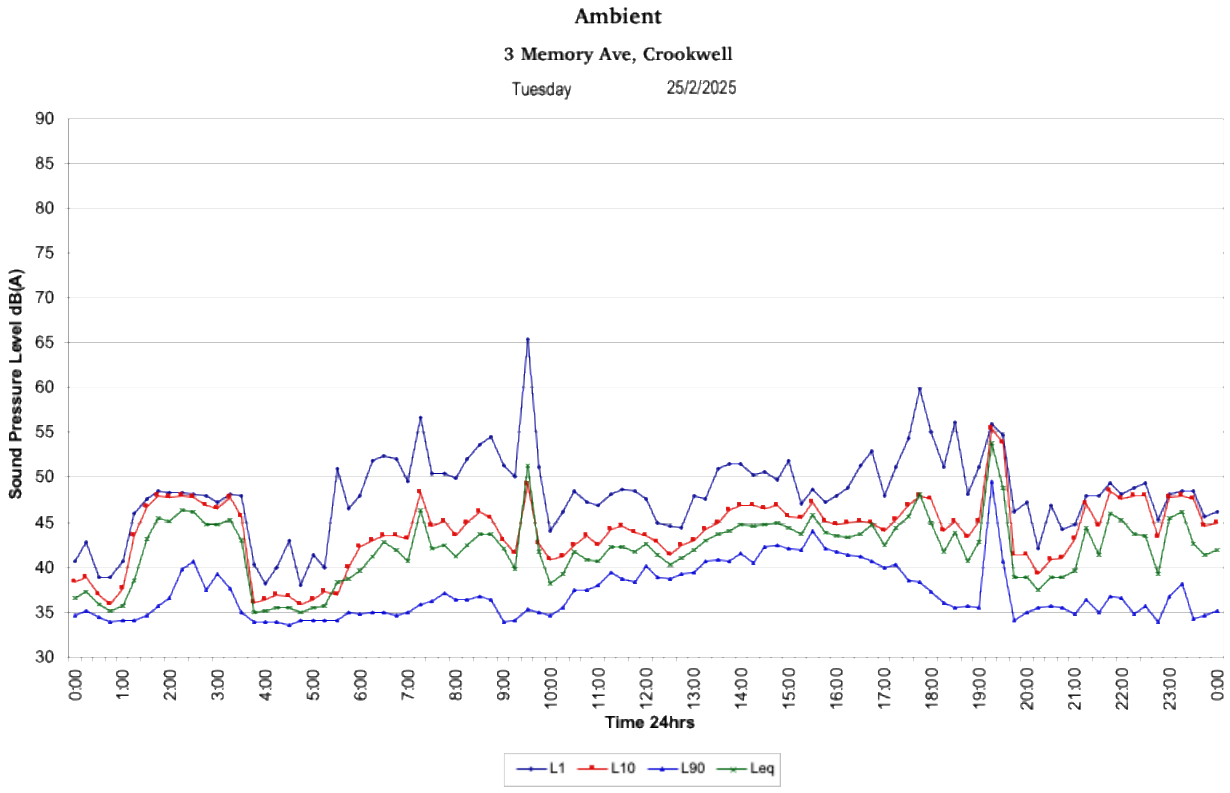


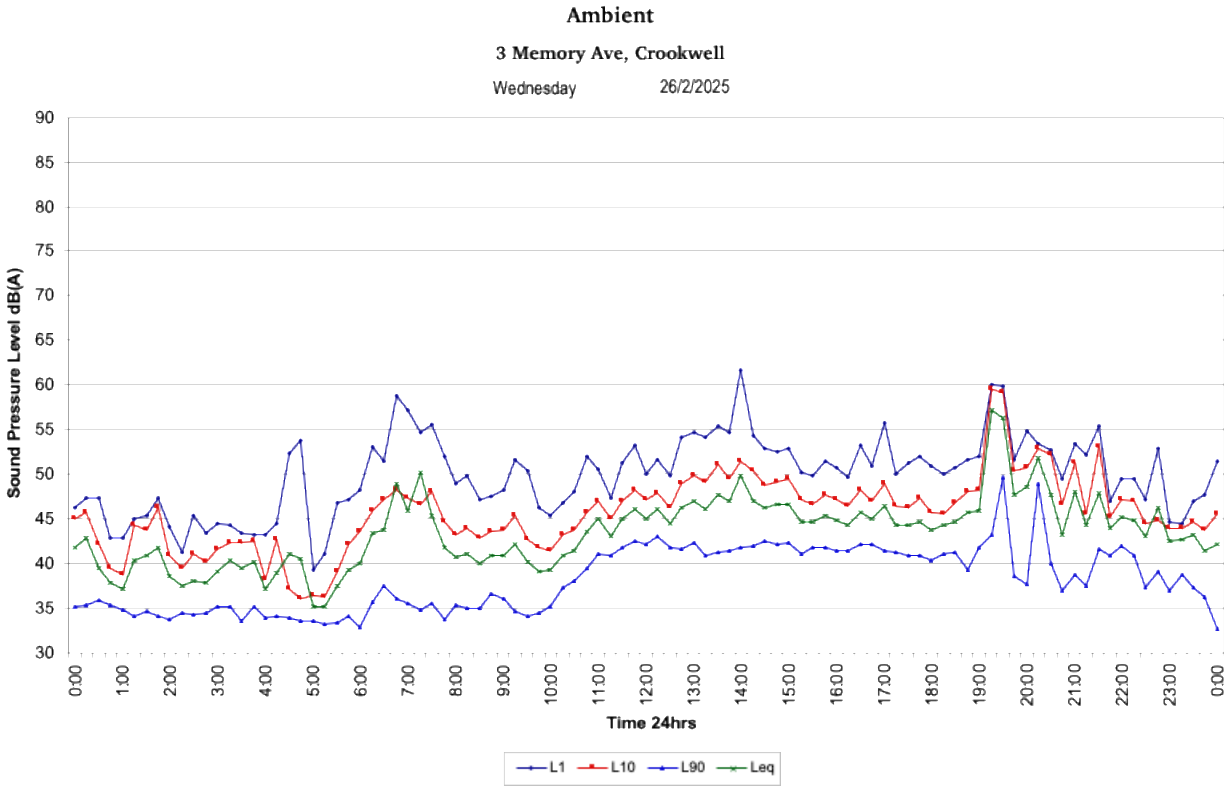


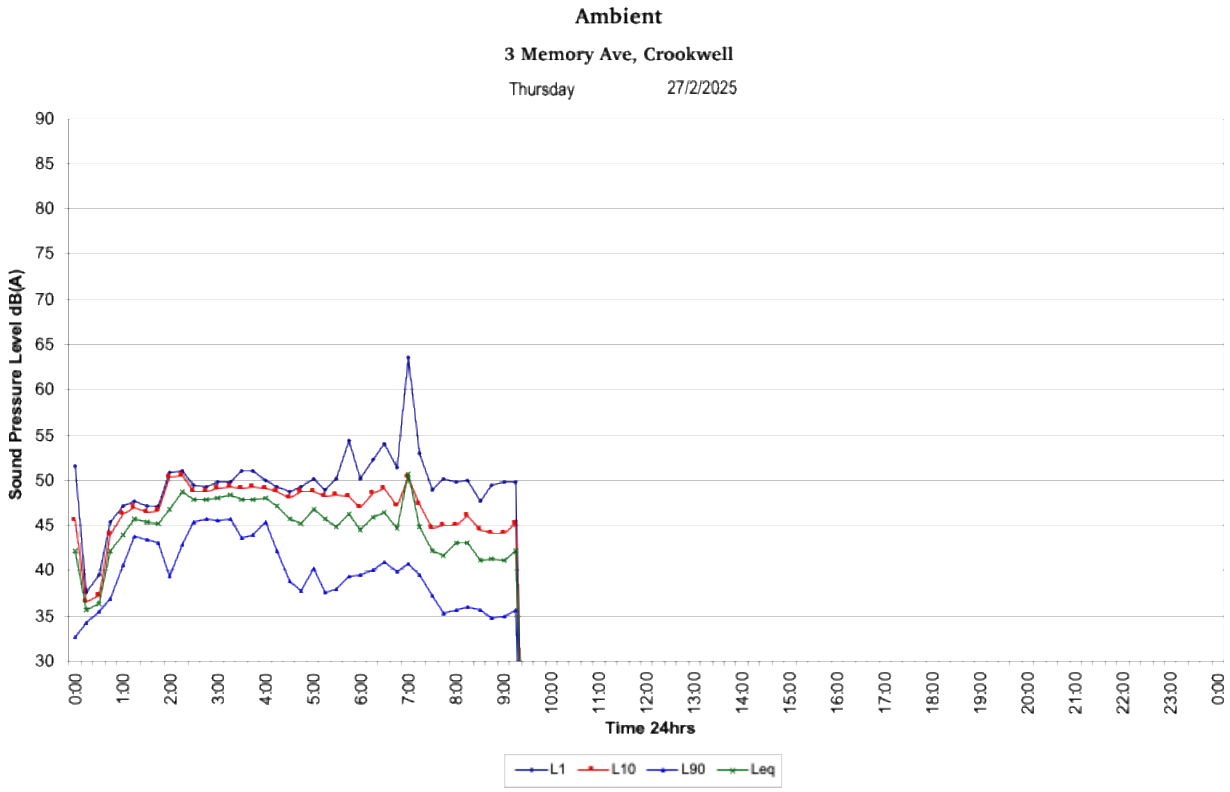

Ambient
3 Memory Ave, Crookwell
Saturday 22/2/2025
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Ambient
3 Memory Ave, Crookwell
Sunday 23/2/2025
Sound Pressure Level dB(A)
Time 24hrs
L1 L10 L90 Leq


Ambient
3 Memory Ave, Crookwell
Monday 24/2/2025
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time 24hrs
L1 L10 L90 Leq


Ambient
3 Memory Ave, Crookwell
Tuesday 25/2/2025
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00 1:00 2:00 3:00 4:00 5:00 6:00 7:00 8:00 9:00 10:00 11:00 12:00 13:00 14:00 15:00 16:00 17:00 18:00 19:00 20:00 21:00 22:00 23:00 0:00
Time 24hrs
L1 L10 L90 Leq


Ambient
3 Memory Ave, Crookwell
Wednesday 26/2/2025
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq


Ambient
3 Memory Ave, Crookwell
Thursday 27/2/2025
Sound Pressure Level dB(A)
90
85
80
75
70
65
60
55
50
45
40
35
30
0:00
1:00
2:00
3:00
4:00
5:00
6:00
7:00
8:00
9:00
10:00
11:00
12:00
13:00
14:00
15:00
16:00
17:00
18:00
19:00
20:00
21:00
22:00
23:00
0:00
Time 24hrs
L1
L10
L90
Leq

Appendix D – Calibration Certificates

Acoustic Research Labs Pty Ltd
Unit 36/14 Loyalty Rd
North Rocks NSW AUSTRALIA 2151
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Octave Band Filter
IEC 61260-3:2016

Calibration Certificate

Calibration Number C24756

Client Details	Rodney Stevens Acoustics PO Box 522 Wahroonga NSW, 2076
Filter Model Number :	Rion NL-43EX
Filter Serial Number :	N/A
Instrument Serial Number :	00441419
Microphone Serial Number :	206889
Pre-amplifier Serial Number :	34177
Firmware Version :	v1.02

Atmospheric Conditions

Ambient Temperature :	21.8 °C
Relative Humidity :	57.5 %
Barometric Pressure :	101.43 kPa

Calibration Technician :	Peter Elters	**Secondary Check:**	Cooper Sallway
Calibration Date :	15 Oct 2024	**Report Issue Date :**	16 Oct 2024

Approved Signatory : Ken Williams

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
Midband Relative Attenuation (Clause 10)	**Pass**	Operating Range Lower Limit (Clause 12)	**Pass**
Linearity, Range and Overload (Clause 11)	**Pass**	Relative Attenuation (Clause 13)	**Pass**

The filter submitted for testing successfully completed the periodic tests of IEC 61260-3, for the environmental conditions under which the tests were performed. However, no general statement or conclusion can be made about conformance of the filter to the full specifications of IEC 61260-1:2014 because (a) evidence was not publicly available, from an independent testing organization responsible for pattern approvals, to demonstrate that the model of filter fully conformed to the class 2 specifications in IEC 61260-1:2014 and (b) because the periodic tests of IEC 61260-3 cover only a limited subset of the specifications in IEC 61260-1:2014.

Uncertainties of Measurement -

Electrical Tests

-5 dB < ΔA(Ω) ≤ 40 dB	*±0.12 dB*
40 dB < ΔA(Ω) ≤ 120 dB	*±0.2 dB*

Environmental Conditions

Temperature	*±0.1 °C*
Relative Humidity	*±1.9 %*
Barometric Pressure	*±0.11 kPa*

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025 - Calibration.

The results of the tests, calibrations and/or measurements included in this document are traceable to SI units.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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