REVERB ACOUSTICS

Noise and Vibration Consultants

Noise Impact Assessment
Child Care Centre
36-38 Maitland Street
Muswellbrook NSW

January 2024

Prepared for Perception Planning Pty Ltd
Report No. 23-2829-R2

Building Acoustics-Council/EPA Submissions-Modelling-Compliance-Certification

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1 INTRODUCTION

Reverb Acoustics has been commissioned to conduct a noise impact assessment for a proposed Childcare Centre at 36-38 Maitland Street, Muswellbrook. The purpose of this assessment is to theoretically determine the noise impact passing road traffic may have on operation of the centre. Further assessment has been undertaken to determine the noise impact the Centre may have on nearby sensitive receivers.

The assessment was requested by Perception Planning Pty Ltd to form part of and in support of a Development Application to Muswellbrook Shire Council (MSC) and to ensure any noise control measures are incorporated into the design of the centre.

2 TECHNICAL REFERENCE / DOCUMENTS

Bies, D.A. and Hansen, C.H. (1996). *Engineering Noise Control: Theory and Practice*. London, E & F.N. Spon.

Gréhant B. (1996). *Acoustics in Buildings.* Thomas Telford Publishing.

Templeton, D. (1997). *Acoustics in the Built Environment.*
Reed Education and Professional Publishing Ltd.

AS 2107-2016 *"Acoustics-Recommended Design Sound Levels and Reverberation Times for Building Interiors"*.

AS 1276.1-1999 *"Acoustics – Rating of sound insulation in buildings and of building elements. Part 1: Airborne sound insulation"*.

NSW Environment Protection Authority (2017). *NSW Road Noise Policy*

NSW Environment Protection Authority (2017). *Noise Policy for Industry*

Association of Australian Acoustic Consultant's (2020) *Guideline for Child Care Centre Acoustic Assessment. Version 3.*

Plans supplied by Sorenson Design & Planning, Rev C, dated 11 December 2023. Note that variations from the design supplied to us may affect the acoustic recommendations.

A Glossary of commonly used acoustical terms is presented in Appendix A to aid the reader in understanding the Report.

3 DESCRIPTION OF PROPOSAL

Perception Planning Pty Ltd seeks Development Consent for a new child care centre at 36-38 Maitland Street, Muswellbrook. The development will consist of playrooms, nursery, a kitchen, offices, amenities, a carpark, and an outdoor play area.

Potential noise sources associated with the centre that may impact upon nearby neighbours include raised voices, crying, laughter, etc, from children in the playrooms and outdoor play area, and mechanical plant (air conditioning, kitchen exhaust), and vehicle movements. Potential noise sources that may impact upon the centre include passing road traffic on Maitland Street.

Proposed operating hours for the centre are 6.30am-6.00pm Monday to Friday.

The assessment includes measurement of the existing acoustic environment at the site to provide baseline data and enable establishment of noise assessment criteria. Plans supplied by Sorenson Design & Planning show the layout of the site and the location of nearby land uses. Nearest neighbours identified during our site visits are shown on Figure 1.

Figure 1: Site Plan

Source: Six Maps

4 EXISTING ACOUSTIC ENVIRONMENT

A background and ambient noise level survey was conducted using a Class 1, Svan 977 environmental noise logging monitor, installed on the front facade of No.36 Maitland Street, approximately 15 metres from the near lane of traffic (See Figure 1). The selected location is representative of the acoustic environment in the receiver area and is considered an acceptable location for determination of the background noise in accordance with Appendix B of the NSW Environment Protection Authority's (EPA's) – Noise Policy for Industry (NPfI).

Noise levels were continuously monitored from 13 January to 20 January 2023, to determine the existing background and ambient noise levels for the area. The instrument was programmed to accumulate environmental noise data continuously and store results in internal memory. The data were then analysed to determine 15 minute Leq and statistical noise levels using dedicated software supplied with the instrument. The instrument was calibrated with a Brüel and Kjaer 4230 sound level calibrator producing 94dB at 1kHz before and after the monitoring period, as part of the instrument's programming and downloading procedure, and showed an error less than 0.5dB.

Table 1 shows a summary of our noise survey, including the Assessment Background Levels (ABL's), for the day, evening and night periods. From these ABL's the Rating Background Level (RBL) has been calculated, according to the procedures described in the EPA's NPfI and by following the procedures and guidelines detailed in Australian Standard AS1055-1997, "Acoustics - Description and Measurement of Environmental Noise, Part 1 General Procedures". A complete set of logger results is not shown, but available on request.

Table 1: Summary of Noise Logger Results, dB(A)

Time Period	Background L90			Ambient Leq		
	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am	Day 7am-6pm	Evening 6pm-10pm	Night 10pm-7am
13-14 Jan	-	42.4	33.5	-	66.4	62.3
14-15 Jan	50.0	44.2	35.1	67.2	63.9	60.7
15-16 Jan	49.8	45.1	37.0	67.4	65.6	64.4
16-17 Jan	52.6	45.5	45.8	69.2	66.9	65.0
17-18 Jan	52.4	43.1	43.8	69.6	67.2	64.9
18-19 Jan	53.0	46.1	38.3	69.5	67.5	66.2
19-20 Jan	54.4	50.4	39.4	70.5	68.6	66.2
20-21 Jan	52.3	-	-	69.5	-	-
RBL	**52.4**	**45.1**	**38.3**	**--**	**--**	**--**
LAeq	**--**	**--**	**--**	**69.1**	**66.8**	**64.6**

Additional attended noise level monitoring was conducted on Friday 13 January on the south side of Wilder Street, approximately 60 metres from the Maitland Street intersection. Shown below are results of our attended noise survey.

Table 2: Attended Noise Surveys – June 2022

Location	Time	Date	Lmax	L90	Leq
Wilder Street	10:30	13/01/23	76.5	41.8	62.5
Noise Source Contributions: Cont road traffic 60-62, Passing cars 70-77					

Site, weather and measuring conditions were all satisfactory during the noise survey. We therefore see no serious reason to modify the results because of influencing factors related to the site, weather or our measuring techniques.

5 CRITERIA

5.1 Road Traffic (Impact on Child Care Centre)

Section 5 of the Association of Australian Acoustic Consultant's (AAAC's) document, *Guideline for Child Care Centre Acoustic Assessment. Version 3*, states the following:

For proposals that are located within 60 metres of an arterial road, railway line, industry or win close proximity to an airport, a noise intrusion assessment should be submitted with the development application.

- The LAeq,1hr from road, rail traffic or industry at any location within the outdoor play or activity area during the hours when the Centre is operating shall not exceed **55dB(A)**.
- The LAeq,1hr from road, rail traffic or industry at any location within the indoor play or sleeping areas during the hours when the Centre is operating shall be capable (i.e. with doors and/or windows closed) of achieving **40dB(A)** within indoor activity areas and **35dB(A)** in sleeping areas.

5.2 Site Noise (Impact from Centre on Neighbours)

5.2.1 Outdoor Play Areas (Impact from Child Care Centre on Residential Receivers)

Section 3.2.1 of the AAAC's document, *Guideline for Child Care Centre Acoustic Assessment. Version 3*, specifies criteria for child care centres when the background noise level is above 40dB(A), reproduced below:

Up to 4 Hours (total) per day:
The Leq,15 minute noise level emitted from the outdoor play area shall not exceed the background noise level by more than 10dB at the assessment location. Based on a measured background noise level for day of 42dB(A),L90 the criterion is set at **52dB(A) ,Leq 15 minute**.

More than 4 Hours per day:
The Leq,15 minute noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5dB at the assessment location. Based on the measured background noise level for day of 42dB(A),L90 the criterion is set at **47dB(A) ,Leq 15 minute**.

5.2.2 Indoor Play Areas, Mechanical Plant, Pick-Up and Drop-Off (Impact from Child Care Centre on Residential Receivers)

Section 3 of the AAAC's document, *Guideline for Child Care Centre Acoustic Assessment. Version 3*, specifies the following limits for impacts from indoor play areas, mechanical plant and pick-up drop-off of children, at residential locations:

The cumulative Leq,15 minute noise emission level resulting from the use of the child care centre, with the exception of outdoor play discussed above, shall not exceed the background noise level by more than 5dB at the assessment location as defined above. Based on a measured background noise levels, assessment criteria are as follows:

Day **47dB LAeq,15 Minute** 7am to 6pm Mon to Sat or 8am to 6pm Sun and Pub Hol.

5.3 Criteria Summary

Various criteria are described in previous Sections of this report for external noise sources such as traffic on public roads, activities associated with commercial developments and people on city streets. The adopted criteria for this assessment are summarised below:

Impact on Neighbours:

Outdoor Play:	**52/47dB(A),Leq DAY (external)**
Indoor Play, Mech Plant & Site Traffic:	**47dB(A),Leq DAY (external)**

Impact on Centre:

Road Traffic	**55dB(A),Leq DAY (outdoor play areas)**
"	**40/35dB(A),Leq DAY (indoor areas)**

6 METHODOLOGY

6.1 Road Traffic (Impact from Passing Traffic on Child Care)

Applicable noise level metrics are those calculated from measurements at the site. A +2.5dB(A) does not need to be applied, as measurements were conducted 1 metre from the existing building facade. Received traffic noise for 2023 is calculated as follows:

Measured noise level + facade correction = received noise 2023

Applying the above formula gives:

Day 69.1dB(A) + 0.0dB(A) = **69.1dB(A) Leq** 7am – 10pm

No nearby RMS traffic stations could be identified near the development, therefore an AADT of 25,000 vehicles has been adopted for assessment purposes along the new England Highway (Maitland Street). A figure of 5% heavy vehicles has also been adopted. The AADT for the year 2023 was applied to our computer programme, based on the EPA and RMS approved CoRTN Method of Traffic Noise Prediction, and noise levels were calculated to the theoretical facades of the centre. The CoRTN values are merely arbitrary, as calculated noise levels are adjusted to correlate with our measured peak external noise levels, with the intention is to provide a (theoretical) means of determining the degree of noise control required for a particular building component.

Equivalent continuous noise levels were calculated for each traffic lane separately on the basis that the noise source (i.e. the traffic) was located in approximately the centre of the respective lane. In particular, this gives an accurate estimation of the location of bus and truck and bus exhausts which are generally located on the right-hand side, being approximately at the same point for both traffic directions.

Our calculations have been modified to compensate for the differing acoustic centres of cars and heavy vehicles, by modelling each separately and logarithmically adding received noise levels.

Once the traffic noise level at the outer face of each building element was determined, the required Rw was calculated in accordance with the mathematical procedure given in AS3671-1989 *"Acoustics - Road traffic noise intrusion - Building siting and construction"*. This procedure is based on the required internal noise level shown in Section 5.1.

6.2 Site Activities (Impact from Centre on Neighbours)

Future noise sources on the site cannot be measured at this time, consequently typical noise levels from child care centres have been sourced from our library of technical data. This library has been accumulated from measurements taken in many similar situations on other sites, and allows theoretical predictions of future noise impacts at each receiver and recommendations concerning noise control measures to be incorporated in the design of the site.

The calculated acoustic sound power (dB re 1pW) for all likely noise sources on the site is then theoretically propagated to the receiver, taking into account attenuation due to distance, topographical features and any intervening barriers. Atmospheric absorption, directivity and ground absorption have been ignored in the calculations. Where noise impacts above the criteria are identified, suitable noise control measures are implemented and reassessed to demonstrate satisfactory received noise levels in the residential area.

6.3 Mechanical Plant (Impact from Centre on Neighbours)

Selection of mechanical plant has not been finalised at this stage. We have therefore sourced manufacturers' noise emission data for similar sized developments. Air conditioning plant will be located at within the ground level plant room at the south east corner of the building beneath the office. We have also assumed a typical V53 vertical exhaust fan with the outlet located on the roof above the kitchen. The Sound Power Level, Lw dB(A), of anticipated mechanical plant is shown in the following Tables. The sound power of the proposed plant is propagated to residential locations taking into account sound intensity losses due to geometric spreading, with additional minor losses such as molecular absorption, directivity and ground absorption ignored in the calculations. As a result, predicted received noise levels are expected to slightly overstate actual received levels and thus provide a measure of conservatism. Comparison of the predicted noise levels produced by the plant and the allowable level are compared to give the noise impact at the receiver.

Table 3: Lw Typical Split-System Air Conditioning Condenser

		Octave Band Centre Frequency, Hz							
Item	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Plant	**72**	44	53	60	62	63	70	52	41

Table 4: Lw of typical Kitchen Exhaust

		Octave Band Centre Frequency, Hz							
Item	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Plant	**74**	39	45	70	69	67	64	51	31

7 ANALYSIS

7.1 Road Traffic Noise (Impact on Development)

Shown below is a sample calculation detailing the procedure followed in order to calculate required glazing in the 0-2 Years Activity Room on the north west facade. The traffic noise level at the outer face of the glazing is calculated as follows,

Table 5: Sample Calculation - Traffic Impact at 0-2 Years Activity Room

		Octave band Sound Pressure Levels, dB(A)							
Propagation calculation	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Facade traffic noise, Leq	69	49	57	58	62	64	61	55	47
Architectural shielding[1]		-5	-5	-5	-5	-5	-5	-5	-5
Directivity/distance Correction[2]		-2	-2	-2	-2	-2	-2	-2	-2
Traffic noise at window	62	42	50	51	55	57	54	48	40

1. Intervening structure. 2. Includes angle of incidence correction.

As the criterion for the Activity Room is 40dB(A), see Section 5.1, the required traffic noise reduction is *TNR* = 62-40 = 22dB(A). The traffic noise attenuation, *TNA*, required of the glazing is calculated according to the equation given in Clause 3.4.2.6 of AS 3671,

$$TNA = TNR + 10\log_{10}[(S/S_f) \times 3/h \times 2T_{60} \times C] \qquad \textit{equation 1}$$

where S = Surface area of glazing = 7m²

S_f = Surface area of floor = 72m²

h = Ceiling height, assumed to be 3.0m

T_{60} = Reverberation time, s

C = No. of components = 4 (glazing, wall, roof, door)

Using the values listed above gives

TNA = 19dB(A) for the glazing

Substituting this value into the equation given in Clause 3.4.3.1 of AS3671 gives

Rw = TNA + 6 ≈ 25

Based on the above calculations, glazing to 0-2 Years Activity Room must have a tested Rw25 acoustic rating. Based on laboratory performances data, this would consist of 4-6mm clear float/safety glass with standard felt seals at sliders. See Section 8 for a complete glazing schedule and required building construction.

Note that road traffic noise levels are also below the 55dB(A),Leq criteria in the outdoor area and no special acoustic features will be required for the outdoor area fencing to attenuate road traffic noise. See Section 7.2 for further recommendations in regard to fence requirements.

7.2 Outdoor Play Areas (Impact from Centre on Neighbours)

We understand that a total of 63 children may be at the centre. Based on Sound Power Levels (Lw's) detailed in the AAAC's document *Guideline for Child Care Centre Acoustic Assessment. Version 3*, the following noise levels apply for children in the outdoor area:

Number of Children	*Age Group*	*Lw Children x10 dB(A)*	*Lw Children Total dB(A)*
20	0-2 years	78	81
25	2-3 years	85	89
55	3-5 years	87	94

Assuming all children may be in the outdoor area at the same time, a combined noise level of 90dB(A) may occur for a worst-case situation. Technical papers submitted to the Proceedings of Acoustics in relation to child care centres in NSW revealed that noise levels from children in outdoor play areas reduced by up to 9dB(A) when averaged over a 15 minute assessment period. Based on the above figures this equates to an average noise level of 81dB(A),Leq for the outdoor play area. The sources were placed randomly over the available areas and the resulting sound pressure level was propagated to nearest residences using an equation[1] giving the sound field due to an incoherent plane radiator. The following Table shows calculations to predict the noise impact at nearest residential boundaries. Allowances have been made for inclusion of a 1200mm high acoustic barrier at the permitter of the outdoor area.

Table 6: Noise Impact from Children in Outdoor Area, dB(A),Leq. Propagated to Nearest Residences

Location/Activity	Receivers
	Nearest Residences South/West
Average Lw dB(A)	81
Average Barrier loss[1]	8
Received	**45**
Criteria (day)	**47dB(A),Leq**
Impact	**-**

1. Acoustic fences.

As can be seen by the results in the above Table, noise from children in the outdoor play area is predicted to be compliant with the criteria at nearest residential receivers, providing acoustic fences 1800mm above FGL: are erected at boundary between the outdoor play area and adjoining residences. Higher noise received levels will be experienced if greater numbers of children are in the play area. We understand our client will be applying administrative noise control to reduce noise impacts, i.e. younger and older children will be in the play areas at different times. Implementation of the above strategy will result in a further 3-4dB(A) reduction in noise. See Section 8 for detailed acoustic recommendations.

Previous noise studies conducted by Reverb Acoustics at child care centres reveal that children playing in indoor activity rooms also have the potential to create high noise levels. Crying from younger children may also occur, although a separate enclosed cot room will be used to minimise disruption. In the unlikely event that complaints should arise, we recommend closing windows/doors facing towards the residence of concern. During warmer months this may create ventilation problems. We therefore suggest installing ceiling fans to supplement air conditioning. It should be acknowledged that children will be put down for sleep on an individual (on demand) basis, thus reducing the chance of several children crying at the same time.

[1] Equation (5.104), DA Bies and CH Hansen, *Engineering Noise Control*, E & FN Spon, 1996.

7.3 Mechanical Plant (Impact from Centre on Neighbours)

Received noise produced by anticipated mechanical plant associated with the centre is shown in Tables 7 and 8, propagated to nearest receivers. Table 9 shows the results of the combined noise impact from all mechanical plant at nearest receivers.

Table 7: Calculated SPL, Air Conditioning Plant – South East Plant Room Propagated to Nearest Receivers

		Octave Band Centre Frequency, Hz							
Item	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Lw, plant (x2)	**75**	47	56	63	65	66	73	55	44
Distance loss, 6m		-24	-24	-24	-24	-24	-24	-24	-24
IL louvre[1]		-4	-6	-9	-13	-14	-12	-12	-8
SPL at receiver	**39**	19	26	30	28	28	37	19	12
Criteria (day)	**47**								
Impact	**0**								

1. Acoustic louvre.

Table 8: Calculated SPL, Kitchen Exhaust Centre Roof Propagated to Nearest Receivers

		Octave Band Centre Frequency, Hz							
Item	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Lw, exhaust fan	**74**	39	45	70	69	67	64	51	31
Distance loss, 8m		-26	-26	-26	-26	-26	-26	-26	-26
Barrier loss[1]		-6	-7	-8	-10	-12	-15	-18	-21
SPL at receiver	**38**	7	12	36	33	28	23	7	-
Criteria (day)	**46**								
Impact	**0**								

1. Barrier at perimeter of exhaust.

Table 9: Combined Noise Impact – Mechanical Plant Propagated to Nearest Residential Receivers

		Octave Band Centre Frequency, Hz							
Noise Path	**dB(A)**	**63**	**125**	**250**	**500**	**1k**	**2k**	**4k**	**8k**
Air conditioning	39	19	26	30	28	28	37	19	12
Kitchen exhaust	38	7	12	36	33	28	23	7	-
Combined	**42**	20	27	37	34	31	38	20	12
Criteria (day)	**47**								
Impact	**0**								

Results in the above Tables show that noise emissions from anticipated mechanical plant will be compliant with the EPA (and therefore Council) criteria at nearest residences, based on typical source noise levels. See Section 8 for further recommendations to ensure compliance

7.4 Site Vehicles (Impact from Development on Neighbours)

Vehicles entering, leaving and manoeuvring on the site have the potential to impact on nearest residents. Peak vehicle numbers are expected in the morning or afternoon when parents drop off or pickup their children. The RMS Guide to Traffic Generating Developments suggests traffic numbers for child care centres during peak periods. Shown below are the adopted and proposed traffic numbers due to the development:

Child Care Centres
= 1.4 x number children (peak period)
= 1.4 x 100
= 140 vehicle movements/hour

The above predictions equate to approximately 35-40 vehicle trips for a 15 minute assessment period. Table 10 shows calculations to predict the noise impact at nearest residential boundaries.

Table 10: Site Vehicles - Propagated to Nearest Residential Boundaries

Activity	Car Enter/Leave	Car Park	Car Accelerate at Exit
Lw dB(A)	77	75	86
Ave Dist to rec (m)	10	10	10
Dur of event (sec)	5	10	2
No. of events	40	40	20
Barrier loss/Direct[1]	5	5	5
Rec dB(A),Leq	37.5	38.5	39.5
Combined	**43**		
Criteria (day)	**47dB(A),Leq**		
Impact	**-**		

1. Boundary fence.

As can be seen by the above results, noise from vehicles entering, leaving and manoeuvring on the site during peak periods is predicted to be compliant with the criteria, providing acoustic fences are erected at specified locations. Fence construction is discussed in more detail in Section 8.

8 SUMMARY OF RECOMMENDED NOISE CONTROL

8.1 Proposed operating hours of 6.30am-6.00pm Monday to Friday are acceptable.

8.2 The outdoor play area must only be used during the day 7am-6pm.

8.3 Similar calculations to those in Section 7 were performed for all building elements. From these calculations, a schedule of required glazing has been compiled, shown below. The glazing systems, sighted in the following Table, are presented as a guide for the supplier:

Glazing Systems: Type A: Standard glazing. No acoustic requirement.
Type B: Single-glaze 5-8mm clear float glass.
Type C: Single glaze laminated or VLam Hush glass

Note: The typical glazing shown in the following Table should be used as a guide only. The supplier of the window/door must be able to provide evidence from a registered laboratory that the complete system will achieve the specified Rw performance, i.e. do not simply install our recommended glass in a standard window frame.

Table 11: Glazing Schedule

Facade	Room	Description	Required Rw Must Achieve for Compliance	Typical Glazing System (Not for Specification)
Front *south west*	Office	Window	**34**	Type C
	Meeting	Window	**34**	Type C
	Waiting	Window	**30**	Type C
	Entry	Window	**28**	Type B or C
	Entry	Door	**26**	See Note 1
Side *north west*	0-2 Activity	Door	**23**	Type B
	0-2 Activity	Window	**25**	Type B
	Nappy Change	Window	**-**	No acoustic requirement
	2-5 Activity	Door	**24**	See Note 1
	2-5 Activity	Windows	**-**	No acoustic requirement
Rear *north east*	All	All	**-**	No acoustic requirement
Side *south east*	2-5 Activity	Windows	**-**	No acoustic requirement
	Corridor	Door	**-**	No acoustic requirement
	Staff	Window	**-**	No acoustic requirement
	Kitchen	Window	**-**	No acoustic requirement
	Amenities	Windows	**-**	No acoustic requirement

NOTE 1: 30-40mm solid core, glazed sections minimum 5mm safety glass.

8.4 Acoustic fences must be erected at the following locations (also see Figure 2):

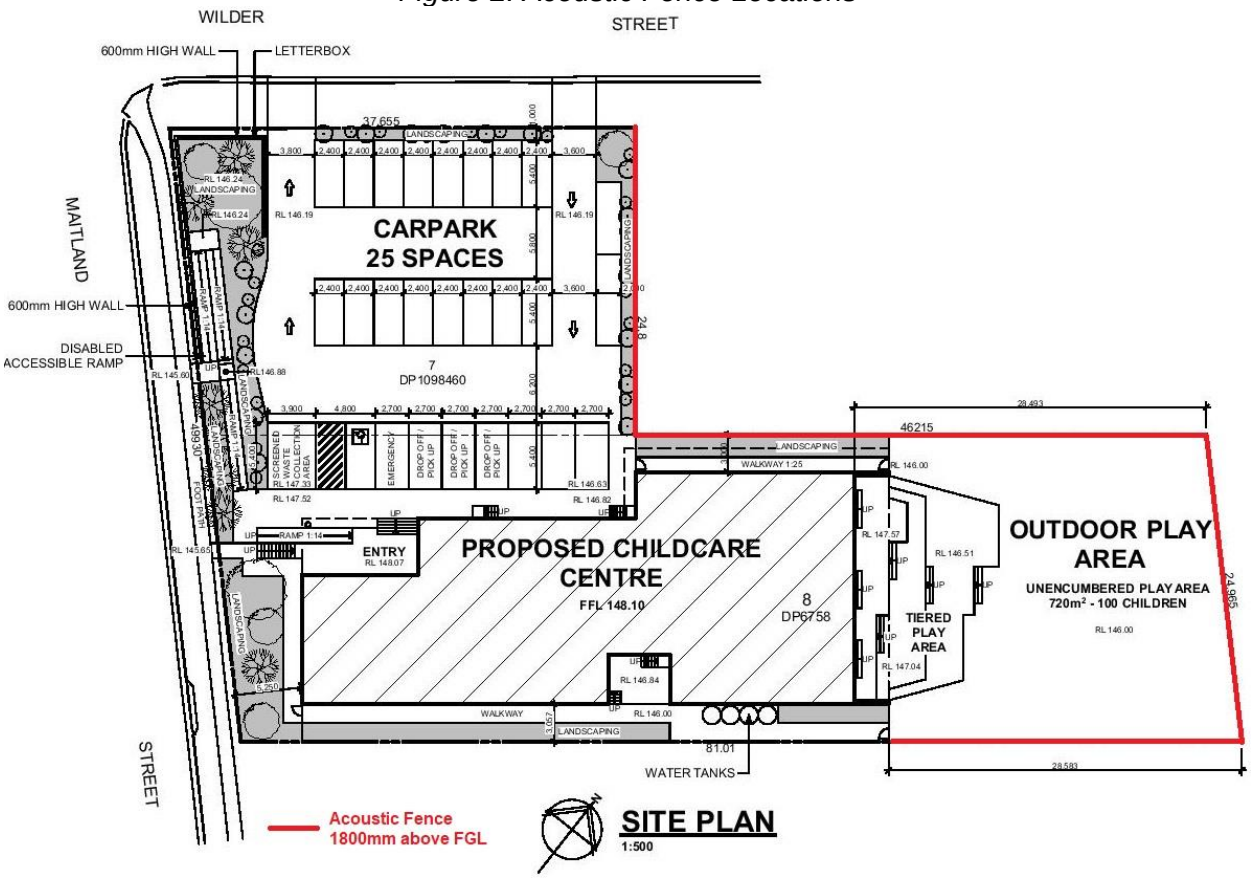
Location	*Height Above FGL*
NE Boundary Carpark	1800mm
NW Bdry (PART)	1800mm
NW Boundary Outdoor Play	1800mm
NE Boundary Outdoor Play	1800mm
SE Boundary Outdoor Play	1800mm

Acceptable forms of construction include Colorbond (minimum 0.6mm BMT), lapped and capped timber, Hebel Powerpanel, masonry. No significant gaps should remain in the fence to allow the passage of sound below the recommended height.

Other construction options are available if desired, providing the fence or wall is impervious and of equivalent or greater surface mass than the above options.

Note that existing boundary fences may remain, providing they are in good condition and satisfy the above requirements, i.e. 1800mm height, acceptable construction materials, no significant gaps, etc.

Figure 2: Acoustic Fence Locations



8.5 No acoustic treatment is required for air conditioning or exhaust plant that satisfies the following noise emission limits:

Item	*Lw, dB(A)*	*SPL at 1m dB(A)*	*Location*
Air conditioning Plant	65	59	SE cnr at GL
Exhaust plant	67	61	Roof above Kitchen

8.6 If noise emissions from individual items of air conditioning plant exceed the limits shown in Item 8.5 acoustic louvres will be required for ventilation of the plant room in place of standard ventilation louvres. The louvres must have the following insertion loss values (typically Fantech SBL1, Nap Silentflo 300S Line or Robertson Type 7010):

Required Insertion Loss Values for Acoustic Barriers/Plant Room Louvres – dB

	Octave Band Centre Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
NR	10	12	15	19	20	18	18	14
STL	4	6	9	13	14	12	12	8

8.7 If noise emissions from exhaust plant exceed the limits shown in Item 8.5 above acoustic barriers must be constructed to enclose the fan discharge. Barriers must fully enclose at least three sides towards any residence. In our experience, a more efficient and structurally secure barrier is one that encloses all four sides. The barrier must extend at least 600mm above and below the fan centre and/or the discharge outlet and must be no further than 1200mm from the edges of the exhaust. Barrier construction should consist of *either* Acoustisorb panels (available through Modular Walls) *or* CFG Acoustic+ Panels (available thru Con-Form Group).

8.8 The contractor responsible for supplying and installing the plant should be asked to supply evidence that installed plant meets specified noise emission limits, or that noise control included with the plant is effective in reducing the sound level to the specified limit. Once selection and location of plant has been finalised, details should be forwarded to the acoustic consultant for approval.

8.9 We recommend applying (non-mandatory) administrative noise control in regard to use of the outdoor play area, i.e. ensure younger and older children are in the play areas at different times. Implementation of the above strategy will result in a further 2-3dB(A) reduction in noise.

8.10 It is strongly recommended that waste collection be restricted to 7.00am to 6.00pm.

8.11 Construction Certificate documentation must be forwarded to Reverb Acoustics to ensure all recommendations within this report have been incorporated into the design of the site.

9 CONCLUSION

A noise impact assessment for a proposed Childcare Centre at 36-38 Maitland Street, Muswellbrook, has been completed. The assessment has shown that the site is suitable for the intended purpose, subject to our recommendations. With these or equivalent measures in place, noise impacting on the centre is predicted to be compliant with the criteria.

An assessment of external noise impacting on the development and nearest neighbours has resulted in the compilation of required acoustic modifications and strategies detailed in Section 8 to meet the requirements of the AAAC and EPA.

In conclusion, providing the recommendations given in this report are implemented, external noise impacts will comply with the requirements of the EPA, AAAC and MSC within habitable spaces of the proposed development. We therefore see no acoustic reason why the proposal should be denied.

Steve Brady M.A.S.A. A.A.A.S.
Principal Consultant

APPENDIX A
Definition of Acoustic Terms

Definition of Acoustic Terms

Term	Definition
dB(A)	A unit of measurement in decibels (A), of sound pressure level which has its frequency characteristics modified by a filter ("A-weighted") so as to more closely approximate the frequency response of the human ear.
ABL	*Assessment Background Level* – A single figure representing each individual assessment period (day, evening, night). Determined as the L90 of the L90's for each separate period.
RBL	*Rating Background Level* – The overall single figure background level for each assessment period (day, evening, night) over the entire monitoring period.
Leq	Equivalent Continuous Noise Level - which, lasting for as long as a given noise event has the same amount of acoustic energy as the given event.
L90	The noise level which is equalled or exceeded for 90% of the measurement period. An indicator of the mean minimum noise level, and is used in Australia as the descriptor for background or ambient noise (usually in dBA).
L10	The noise level which is equalled or exceeded for 10% of the measurement period. L_{10} is an indicator of the mean maximum noise level, and was previously used in Australia as the descriptor for intrusive noise (usually in dBA).