

69-73 GEORGE STREET, MARULAN

DA Noise Assessment for Proposed Childcare Centre

11 January 2024

Dacoas Holdings Pty Ltd

TN691-01F01 Noise Assessment (r3)

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1 Introduction

Renzo Tonin & Associates was engaged to assess environmental noise impacts from the proposed childcare centre to be located at 69-73 George Street, Marulan on nearby affected sensitive receivers. Noise impact from the proposed childcare centre is assessed in accordance with the requirements of Goulburn Mulwaree Council.

The work documented in this report was carried out in accordance with the Renzo Tonin & Associates Quality Assurance System, which is based on Australian Standard / NZS ISO 9001. Appendix A contains a glossary of acoustic terms used in this report.

2 Project Description

2.1 Background Information

Development consent is required for the proposed childcare centre to be located at 69-73 George Street, Marulan. The childcare centre will accommodate up to 76 children with the breakup of children in each age group as follows:

- 16 x 0-2 years old
- 20 x 2-3 years old
- 40 x 3-5 years old

The internal areas of the proposed childcare centre will consist of four (4) indoor playrooms, two (2) cot rooms, staff room, storerooms, kitchen, toilets, laundry, offices, waste storage and reception.

The site will accommodate an outdoor play area on the southern and eastern sides of the proposed childcare centre building, split into two (2) separate playgrounds, with scheduled periods each day (weather permitted) of free play.

For noise modelling purposes and for a conservative assessment, the worst case scenario would be based on the following number of children playing in the outdoor play area at the same time:

- 16 x 0-2 years old in Playground 1
- 20 x 2-3 years old and 40 x 3-5 years old in Playground 2

Eight (8) visitor / parent car parking spaces, one (1) disabled parking space, one (1) shared space and seven (7) staff car parking spaces will be located in the outdoor car park on the southern side of the proposed childcare centre building, with access to and from George Street via a driveway. The outdoor car park forms part of the overall car park area servicing the neighbouring commercial premises.

2.2 Hours of Operation

The proposed operating hours of the childcare centre will be as follows:

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

Outdoor play is expected to occur at any time between the hours of 7:00am and 6:00pm.

2.3 Noise Issues

It is anticipated that noise issues will essentially emanate from the following sources:

- Operational noise from the use of the proposed childcare centre including:
 - Intermittent noise from the outdoor play areas and indoor areas
 - Noise generated during the hours of operation by mechanical plant
 - Noise generated by vehicle movements associated with the carpark
- Road traffic noise on public roads generated by additional vehicles associated with the operation of the childcare centre.
- Mechanical plant noise from the neighbouring commercial premises impacting on indoor and outdoor areas of the childcare centre.
- Road traffic noise from the Hume Highway (Remembrance Drive) impacting on indoor and outdoor areas of the childcare centre.

It is noted that the proposed childcare centre building will be mechanically ventilated through the use of air conditioners. Consequently, all windows and doors will be closed during the use of indoor areas of the centre. Noise emission from internal playrooms with all windows and doors closed is not considered to be a significant noise source and is therefore, not further addressed in this report.

2.4 Noise Sensitive Receivers

Residential and commercial properties potentially impacted upon by noise emissions from the proposed childcare centre were identified as follows.

Table 2-1 – Receiver Locations

Receiver ID	Address	Receiver Type	Description
R1A	65-67 George Street	Residential	Ground floor receiver location of the double storey residential property located to the south of the childcare centre site. Receiver potentially impacted by noise from the car park and outdoor play areas.
R1B	65-67 George Street	Residential	First floor receiver location of the double storey residential property located to the south of the childcare centre site. Receiver potentially impacted by noise from the car park and outdoor play areas.
R2A	69-73 George Street	Commercial	Southern receiver location of the single storey commercial premises located directly adjacent and to the south of the childcare centre site. Receiver potentially impacted by noise from the car park and outdoor play areas.
R2B	69-73 George Street	Commercial	Northeastern receiver location of the single storey commercial premises located directly adjacent and to the south of the childcare centre site. Receiver potentially impacted by noise from the car park and outdoor play areas.

Receiver ID	Address	Receiver Type	Description
R2C	69-73 George Street	Commercial	Northwestern receiver location of the single storey commercial premises located directly adjacent and to the south of the childcare centre site. Receiver potentially impacted by noise from the car park area.
R3	75 George Street	Commercial	Receiver location of the single storey commercial premises located directly adjacent and to the west of the childcare centre site. Receiver potentially impacted by noise from the car park area.
R4	77-79 Geroge Street	Commercial	Receiver location of the single storey commercial premises located directly adjacent and to the north of the childcare centre site. Receiver potentially impacted by noise from the outdoor play area.
R5A	81 George Street	Residential	Receiver location representing the eastern side of the single storey residential dwelling on the property and located to the north of the childcare centre site. Receiver potentially impacted by noise from the outdoor play area.
R5B	81 George Street	Commercial	Receiver location of the single storey commercial building on the property and located to the north of the childcare centre site. Receiver potentially impacted by noise from the outdoor play area.

Figure 1 – Site, Surrounds and Monitoring & Receiver Locations



3 Acoustic Environment

Background noise varies over the course of any 24 hour period, typically from a minimum at 3am in the morning to a maximum during morning and afternoon traffic peak hours. Therefore, the NSW 'Noise Policy for Industry' (NPfI, Environment Protection Authority 2017) requires that the level of background and ambient noise be assessed separately for the daytime, evening and night-time periods. The NPfI defines these periods as follows:

- **Day** is defined as 7:00am to 6:00pm, Monday to Saturday and 8:00am to 6:00pm Sundays & Public Holidays.
- **Evening** is defined as 6:00pm to 10:00pm, Monday to Sunday & Public Holidays.
- **Night** is defined as 10:00pm to 7:00am, Monday to Saturday and 10:00pm to 8:00am Sundays & Public Holidays.

It is noted that due to no safe and secure location available for installing a noise monitor, long term unattended noise monitoring was not conducted.

Nevertheless, reference is made to the NPfI to obtain background noise levels. Table 2.1 of the NPfI provides minimum assumed rating background levels (RBLs) for the day, evening and night periods as follows.

Table 3-1 – Minimum Rating Background Levels (RBL), dB(A)

Day	Evening	Night
35	30	30

Notes: 1. Based on minimum RBLs presented in Table 2.1 of the NPfI

The minimum rating background levels presented above provides for a conservative assessment as the existing ambient noise environment is dominated by noise from surrounding commercial premises and traffic along George Street and the Hume Highway. Therefore, the existing background noise levels would be much higher than the minimum rating background levels presented in Table 3-1.

Given that the proposed childcare centre will operate during the day period, only the day period will be assessed from herein.

4 Operational Noise Assessment

4.1 Operational Noise Criteria

Reference is made to the following guidelines and regulations specific to the operation of childcare centres within NSW.

- NSW State Environmental Planning Policy (Transport and Infrastructure) 2021
- NSW Department of Planning & Environment's 'Child Care Planning Guideline' (September 2021)
- NSW Department of Planning & Environment's 'NSW Code of Practice Part 5 Activities' (August 2017)
- 'NSW Education and Care Services National Regulations' (December 2021).

It is noted that the above guidelines and regulations do not specifically nominate noise criteria for the operation of childcare centres. Therefore, operational noise impact from the proposed childcare centre to the surrounding residential and commercial receivers will be assessed in accordance with the noise criteria stipulated in the Association of Australasian Acoustical Consultants (AAAC) 'Guideline for Child Care Centre Acoustic Assessment' (Version 3.0, September 2020).

4.1.1 Outdoor Play Areas

The following noise criteria as presented in the AAAC Guideline have been adopted for the operation of the outdoor play area of the proposed childcare centre for residential receivers.

***"Base Criteria** – With the development of child care centres in residential areas, the background noise level within these areas can at certain times, be low. Thus, a base criterion of a contributed $L_{Aeq,15\ min}$ 45 dB(A) for the assessment of outdoor play is recommended in locations where the background noise level is less than 40 dB(A).*

***Background Greater Than 40 dB(A)** – The contributed $L_{Aeq,15\ min}$ noise level emitted from an outdoor play and internal activity areas shall not exceed the background noise level by more than 5 or 10 dB at the assessment location, depending on the usage of the outdoor play area. AAAC members regard that a total time limit of approximately 2 hours outdoor play per morning and afternoon period should allow an emergence above the background of 10 dB (i.e. background + 10 dB if outdoor play is limited to 2 hours in the morning and 2 hours in the afternoon).*

***Up to 4 hours (total) per day** – if outdoor play is limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed $L_{Aeq,15\ min}$ noise level emitted from the outdoor play shall not exceed the background noise level by more than 10 dB at the assessment location.*

More than 4 hours (total) per day – If outdoor play is not limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed $L_{Aeq,15\ min}$ noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB at the assessment location.

The assessment location is defined as the most affected point on or within any residential receiver property boundary. Examples of this location may be:

- 1.5 m above ground level;
- on a balcony at 1.5 m above floor level;
- outside a window on the ground or higher floors."

Based on the AAAC noise criteria presented above, the absence of noise monitoring data and for a conservative assessment, the 'base criteria' has been applied for the assessment of noise from the proposed outdoor play area.

Therefore, the applicable noise limit for each residential receiver location is presented in Table 4 1 below.

Table 4-1 – Noise Criteria for Outdoor Play Area, dB(A)

Receiver Location	Applicable Noise Criteria – $L_{Aeq,15\ min}$
Receiver R1A – 65-67 George Street (ground floor)	45 ¹
Receiver R1B – 65-67 George Street (first floor)	
Receiver R5A – 81 George Street (eastern)	

Notes: 1. AAAC guideline 'base criteria'

4.1.2 Mechanical Plant and Car Park

The following noise criteria as presented in the AAAC Guideline have been adopted for noise from mechanical plant and the car park area servicing the proposed childcare centre for residential receivers.

"The cumulative $L_{eq,15\ min}$ noise emission level resulting from the use and operation of the child care centre, with the exception of noise emission from outdoor play discussed above, shall not exceed the background noise level by more than 5 dB at the assessment location as defined above. This includes the noise emission resulting from:

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

Therefore, based on the above requirement and the minimum daytime RBL presented in Table 3-1, the applicable noise limits for each residential receiver location are as follows.

Table 4-2 – Noise Criteria for Mechanical Plant and Car Park, dB(A)

Receiver Location	Applicable Noise Criteria – $L_{Aeq,15\text{ min}}$
Receiver R1A – 65-67 George Street (ground floor)	
Receiver R1B – 65-67 George Street (first floor)	35 + 5 = 40
Receiver R5A – 81 George Street (eastern)	

4.1.3 Commercial Receivers

The following noise criteria as presented in the AAAC Guideline have been adopted for the cumulative operational noise levels emitted from the proposed childcare centre impacting commercial receivers.

“The cumulative $L_{eq,15\text{ min}}$ noise level emitted from the use and operation of the child care centre shall not exceed 65 dB(A), from all activities (including outdoor play), when assessed at the most affected point on or within any commercial property boundary.”

Therefore, the applicable noise limit for each commercial receiver location is presented in Table 4-3 below.

Table 4-3 – Cumulative Noise Criteria, dB(A)

Receiver Location	Applicable Noise Criteria – $L_{Aeq,15\text{ min}}$
Receiver R2A – 69-73 Geroge Street (southern)	
Receiver R2B – 69-73 Geroge Street (northeastern)	
Receiver R2C – 69-73 Geroge Street (northwestern)	
Receiver R3 – 75 Geroge Street	65 ¹
Receiver R4 – 77-79 George Street	
Receiver R5B – 81 George Street (western)	

Notes: 1. AAAC guideline commercial receptor criteria

4.2 Noise Sources

4.2.1 Outdoor Play Areas

As previously stated, the proposed childcare centre will cater for up to 76 children in total, comprising of:

- 16 x 0-2 years old
- 20 x 2-3 years old
- 40 x 3-5 years old

The sound power levels recommended in the AAAC Guideline have been used in the noise calculations for the outdoor play areas. Table 1 of the AAAC Guideline provides source noise levels for different age groups of children playing and is reproduced in Table 4-4. It is noted that the AAAC Guideline

recommends a correction of -6 dB to the source noise levels when children are involved in passive play. However, for modelling purposes and for a conservative assessment, it is assumed that passive play would not occur in the outdoor play areas.

Table 4-4 – AAAC Sound Power Levels ($L_{Aeq,15 \text{ min}}$) for Groups of 10 Children Playing

Number and Age of Children	Sound Power Level (dB re. 1 pW)								
	Overall dB(A)	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
10 children ages 0 to 2 years	78	54	60	66	72	74	71	67	64
10 children aged 2 to 3 years	85	61	67	73	79	81	78	74	70
10 children aged 3 to 6 years	87	64	70	75	81	83	80	76	72

- Notes:
1. 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
 2. For simplicity, based upon a review of World Health Organization (WHO) data, a single recommended height of 1 metre is suggested as the source heights.

By way of explanation the "sound power level" is not the same as the "sound pressure level". The "sound power level" is the source emission strength analogous to the wattage of a light bulb (a higher wattage producing a higher light intensity at any distance). Having established the sound power level of children at play, the sound pressure level then decreases with distance and is further reduced by interposed acoustic barriers.

The sound power levels presented in Table 4-4 are scaled to take into consideration the actual number of children at the proposed childcare centre in each age group to enable prediction of noise levels to receiver locations.

Table 4-5 shows the sound power levels used in the calculations, when converted for the appropriate number of children in each age group.

Table 4-5 – $L_{Aeq,15 \text{ min}}$ Sound Power Level of Children Playing Outside

Number and Age of Children	Sound Power Level (dB re. 1 pW)								
	Overall dB(A)	Octave Band Centre Frequencies (Hz)							
		63	125	250	500	1k	2k	4k	8k
Playground 1									
16 children aged 0 to 2 years	80	56	62	68	74	76	73	69	66
Total for Playground 1	80	56	62	68	74	76	73	69	66
Playground 2									
20 children aged 2 to 3 years	88	64	70	76	82	84	81	77	73
40 children aged 3 to 5 years	93	70	76	81	87	89	86	82	78
Total for Playground 2	94	71	77	83	89	91	88	84	80

4.2.2 Car Park Vehicle Movement

The car park area of the proposed childcare centre is to be located in an outdoor car park with access to and from George Street Road via a driveway. The car park is to accommodate staff vehicles as well as parents and visitors. The outdoor carpark area of the childcare centre forms part of the overall car park area servicing the neighbouring commercial premises, with specific allocated spaces for staff and parents / visitors.

Noise generated by car park activities that typically contribute to the overall L_{Aeq} noise level emission from a site includes doors closing, vehicle engines starting and vehicles moving. To assess the impact of these noise, the L_{Aeq} noise levels were determined for the relevant period based on the number of vehicle activities expected to occur during that period at the nearest affected residential premises. Results of sound power level measurements from our database and library files have been used for the purpose of this assessment.

The sound power levels of the car park activities which are anticipated to impact the nearest affected receivers are shown in Table 4-6 below.

Table 4-6 – Sound Power Levels of Car Park Activities

Activity	Sound Power Level, dB(A) re. 1 pW
Vehicle door closing	86
Vehicle engine starting	92
Vehicle moving (10km/h) per metre	79

The number of vehicle movements for the proposed childcare centre was based on future traffic generation data presented in the Traffic & Parking Impact Assessment report (November 2023) prepared by Hemanote Consultants. The provided data predicts the peak number of vehicle movements from parents dropping off / picking up children (i.e. not staff vehicles) occurring during the 7:00am to 9:00am morning peak period, to be **61 trips (31 in / 30 out)**. For a conservative assessment, the vehicle movements during the morning peak one hour period have been assumed to be all 61 trips (31 in / 30 out).

4.2.3 Mechanical Plant

The details and noise emission levels of mechanical plant items to be installed are yet to be finalised at this early DA stage of the project. Therefore, noise emissions from these sources are dealt with in a general manner in the following sections of this report.

4.3 Predicted Noise Level

Noise emissions were predicted by modelling the noise sources, receiver locations, topographical features of the intervening area, and possible noise control treatments using Cadna-A (version 2023) noise modelling computer program. The modelling program calculates the contribution of each noise source at each specified receiver point and allows for the prediction of the total noise from a site.

The noise prediction model takes into account:

- Location of noise sources and receiver locations
- Height of sources and receivers
- Separation distances between sources and receivers
- Ground type between sources and receivers (hard/soft)
- Attenuation from barriers (natural and purpose built).

The noise predictions are based on the following architectural drawings prepared by Creative Drafting Services.

Table 4-7 – Architectural Drawings

Drawing Number	Issue	Date
231370-A0.00	A	September 2023
231370-A1.00	A	September 2023
231370-A1.01	A	September 2023
231370-A1.02	A	September 2023
231370-A1.03	A	September 2023
231370-A1.04	A	September 2023
231370-A1.05	A	September 2023
231370-A1.06	A	September 2023
231370-A1.07	A	September 2023
231370-A1.08	A	September 2023

For noise modelling purposes, it is assumed that 1.8 m high solid common boundary fences (acting as acoustic fences) are to be located along the northern, southern and eastern boundaries of the site. Noise predictions include losses due to shielding provided by the 1.8 m high boundary fences and any retaining walls proposed.

Furthermore, the noise predictions also consider attenuation due to distances and shielding from buildings (e.g. garages, sheds, childcare centre building, etc) and roof coverings / awnings.

4.3.1 Outdoor Play Areas

Predicted noise levels for the outdoor play area are based on the worst-case scenario and the corresponding source noise levels presented in Section 4.2.1 above, where all children are playing in the outdoor play area at the same time.

Table 4-8 below presents the predicted noise levels from children playing in the outdoor play area impacting on the nearby affected residential receiver locations.

Table 4-8 – Predicted $L_{Aeq,15 \text{ min}}$ Noise Levels from Outdoor Play Areas, dB(A)

Receiver Location	Noise Criteria	Predicted Noise Levels	Comply?
Receiver R1A – 65-67 George Street (ground floor)	45	24	Yes
Receiver R1B – 65-67 George Street (first floor)	45	27	Yes
Receiver R5A – 81 George Street (eastern)	45	31	Yes

Notes: 1. Predicted noise levels based on all 76 children playing outside at the same time

Results presented in Table 4-8 above indicate that the noise impacts from the outdoor play area of the proposed childcare centre are predicted to comply at all the nominated residential receivers when all 76 children are playing in the outdoor play area and the acoustic boundary fences described previously are implemented.

Therefore, no further noise mitigation measures would be required to reduce noise impacts from children playing in the outdoor play area.

4.3.2 Car Park Vehicle Movement on Site

Noise levels from car park vehicle activities have been predicted to the nominated sensitive residential receivers. The predictions are based on 61 vehicle movements (31 in and 30 out) into and out of the car park used by visitors / parents' during the morning peak one hour period.

Table 4-9 – Predicted $L_{Aeq,15 \text{ min}}$ Noise Levels from Car Park Activities, dB(A)

Receiver Location	Noise Criteria	Predicted Noise Levels	Comply?
Receiver R1A – 65-67 George Street (ground floor)	40	26	Yes
Receiver R1B – 65-67 George Street (first floor)	40	32	Yes

Notes: 1. Only residential receivers impacted by the carpark and driveway are presented.

Results presented above indicate that noise impacts from car park activities are predicted to comply at all the nominated affected residential receivers.

Therefore, no further noise mitigation measures would be required to reduce noise impacts from car park activities.

4.3.3 Cumulative Activities

Cumulative noise levels from all activities within the childcare centre have been predicted to the nominated commercial receivers. These predictions are based on the worst-case scenario from all activities including outdoor play and car park vehicle activities.

Table 4-8 below presents the predicted cumulative noise levels at the nearby affected commercial receiver locations.

Table 4-10 – Predicted $L_{Aeq,15\text{ min}}$ Cumulative Noise Levels, dB(A)

Receiver Location	Noise Criteria	Predicted Noise Levels	Comply?
Receiver R2A – 69-73 Geroge Street (southern)	65	39	Yes
Receiver R2B – 69-73 Geroge Street (northeastern)	65	44	Yes
Receiver R2C – 69-73 Geroge Street (northwestern)	65	41	Yes
Receiver R3 – 75 Geroge Street	65	41	Yes
Receiver R4 – 77-79 George Street	65	30	Yes
Receiver R5B– 81 George Street (western)	65	28	Yes

Notes: 1. Predicted noise levels based on all 76 children playing outside and associated car park activities

Results presented in Table 4-10 indicate that cumulative noise emissions including the outdoor play area and car park activities are predicted to comply at all the nominated commercial receivers.

Therefore, no further noise mitigation measures would be required to reduce cumulative noise emissions from the proposed childcare centre.

4.4 Recommendations

The following recommendations provide in-principle noise control solutions to maintain noise compliance at the noise sensitive receivers. This information is presented for the purpose of Council approvals process and cost planning and shall not be used for construction unless otherwise approved in writing by the acoustic consultant. Assistance of an acoustic consultant must be sought at the detailed design phase of these works to provide the necessary design details and specifications.

Before committing to any form of construction or committing to any contractor, advice should be sought from an acoustic consultant to ensure that adequate provisions are made for any variations which may occur as a result of changes to the design and form of construction.

The advice provided here is in respect of acoustics only. Supplementary professional advice may need to be sought in respect of fire ratings, structural design, buildability, fitness for purpose and the like.

4.4.1 Physical Mitigation

The solid boundary fences (acting as acoustic fences) along the northern, eastern and southern boundaries of the site are to be 1.8 m high as shown in Figure 2.

Note that the heights of the fences are referenced to the ground level directly under the corresponding fence.

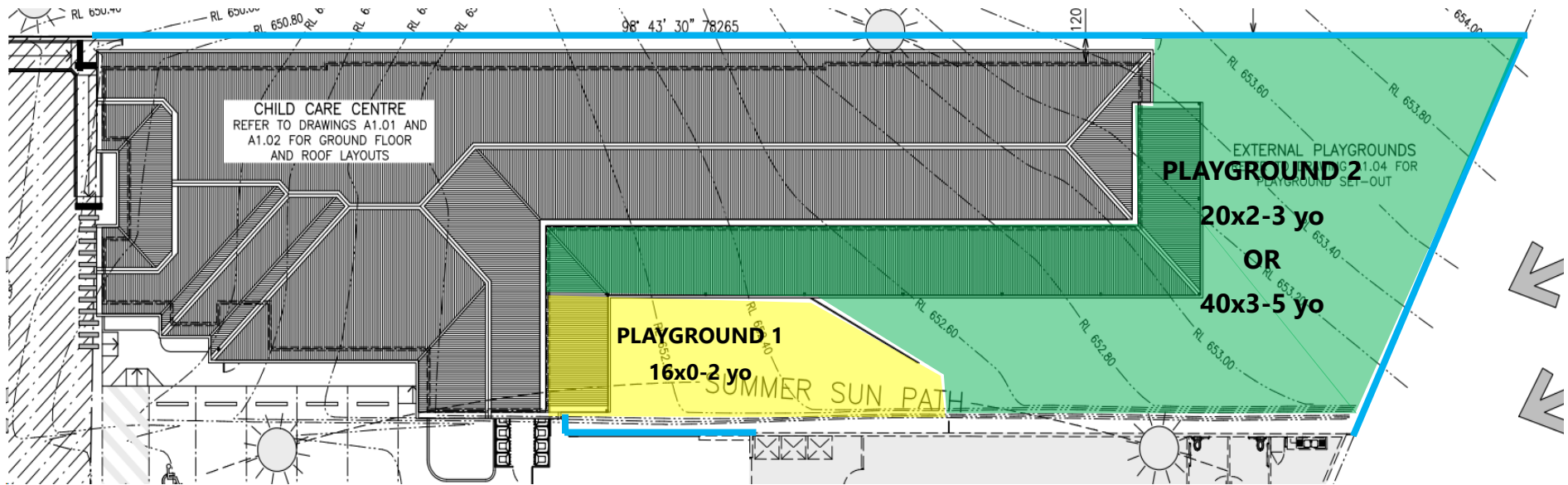
The construction of the fences can be from any durable material with sufficient mass to prevent direct noise transmission e.g. masonry, steel, fibrous-cement, timber, acrylic or polycarbonate, selected to withstand the weather elements. A double-skinned profiled sheet steel construction with a minimum 50 mm cavity between the sheets and each sheet having 0.6 mm minimum base metal thickness (e.g.

'Colorbond' fence or similar) is adequate for use as an acoustic fence. A treated timber lapped and capped fence could be used, provided it has no gaps so that it can perform as an effective acoustic fence. Where acrylic or polycarbonate sheets are to be used to form part of the fences, the thickness of the sheets should be a minimum 12 mm thick.

Furthermore, all boundary fences should give regard to the following to maintain acoustic integrity and for the fences to perform as noise screens:

- Any penetrations through the fabric of the fence should be sealed air tight
- All joints and gaps between fence / planks / sheets should be sealed air tight
- Any gaps between the fences and the ground should be filled to ensure that the fence provides appropriate noise attenuation.

Figure 2 – Recommended Boundary Fences and Playground Areas



— 1.8 m solid boundary fences

4.4.2 Management Measures

The following management measures should be implemented as part of the operation of the proposed childcare centre:

- Signs should be erected at appropriate, prominent locations, to advise the following:
 - that staff and parents converse at a very low volume
 - that parents not call out to their children when delivering or collecting their children
 - that gates not be slammed.
- Children who are loudly crying outdoors should be comforted by staff and if the child continues to cry loudly then they should be taken inside.
- No music should be played in any outdoor areas at any time.

4.4.3 Mechanical Plant

Mechanical plant associated with the childcare centre has the potential to impact on nearby residential properties. However, as details for mechanical plant are not available at this stage of the development, the following in-principle noise management measures are provided for mechanical plant servicing the proposed development.

- Acoustic assessment of mechanical services equipment will need to be undertaken during the detail design phase of the development to ensure that they shall not either singularly or in total emit noise levels which exceed the noise limits specified in Section 4.1.2.
- Mechanical plant noise emission can be controllable by appropriate mechanical system design and implementation of common engineering methods that may include any of the following:
 - procurement of 'quiet' plant;
 - strategic positioning of plant away from sensitive neighbouring premises, maximising the intervening shielding between the plant and sensitive neighbouring premises;
 - commercially available silencers or acoustic attenuators for air discharge and air intakes of plant;
 - acoustically lined and lagged ductwork;
 - acoustic screens and barriers between plant and sensitive neighbouring premises; and/or
 - partially enclosed or fully enclosed acoustic enclosures over plant.
- Mechanical plant shall have their noise specifications and their proposed locations checked prior to their installation on site.

5 Mechanical Plant Noise Assessment

5.1 Mechanical Plant Impact on Outdoor Play Area

Potential noise from mechanical plant servicing the neighbouring commercial premises impacting the proposed outdoor play area of the childcare centre is assessed against the AAAC Guideline. The guideline sets out the following criteria:

"The $L_{Aeq,1 hr}$ noise level from road traffic, rail or industry at any location within the outdoor play or activity area during the hours when the Centre is operating should not exceed 55 dB(A)."

An inspection on site was undertaken on Wednesday 13th December 2023 to determine the potential impact from the neighbouring commercial premises' mechanical plant. It was observed that the neighbouring mechanical plant was audible intermittently, typically during periods where traffic noise from the Hume Highway was low. Therefore, short term attended measurements at different locations within the proposed childcare centre site, representing the outdoor play area, were conducted to determine the potential mechanical plant noise intrusion onto the future outdoor play area.

During the attended measurements, any noise from traffic along the Hume Highway was excluded as it did not represent the mechanical plant noise.

Table 5-1 – Measured L_{Aeq} Noise Levels from Neighbouring Mechanical Plant, dB(A)

Measurement Location	Noise Criteria	Measured Noise Levels ¹	Comply?
69-73 George Street (southern boundary)	55	50	Yes
69-73 George Street (centre)	55	50	Yes
69-73 George Street (western boundary)	55	50	Yes

Notes: 1. Measured noise levels represent mechanical plant noise only. Traffic noise from the Hume Highway has been excluded.

From the table above, it can be seen that the mechanical plant noise impact on the future outdoor play area was measured to comply with the AAAC noise criterion.

5.2 Mechanical Plant Impact on Indoor Area

The AAAC stipulates a noise criterion for mechanical noise impacting on indoor areas of a childcare centre and is reproduced below.

"The $L_{Aeq,1 hr}$ noise level from road traffic, rail or industry at any location within the indoor activity or sleeping areas of the Centre during the hours when the centre is operating shall be capable (ie with doors and/or windows closed) of achieving 40 dB(A) within indoor activity areas and 35 dB(A) in sleeping areas."

As highlighted earlier, the proposed childcare centre building will be mechanically ventilated through the use of air conditioners. Consequently, all windows and doors will be fixed and/or closed during the use of the indoor areas of the centre. Mechanical plant noise intrusion from the neighbouring

commercial premises into the internal areas of the centre with all windows and doors closed is not considered to be significant.

Nevertheless, based on the measured noise levels of 50dB(A) within the future outdoor play area (see Table 5-1), a 10dB(A) reduction would be required through the building facade in order to achieve the 40dB(A) internal noise limit. Typically, a lightweight building with windows open would achieve a minimum 10dB(A) reduction. Furthermore, the cot rooms of the childcare centre do not have any walls that form part of the facades of the building. Therefore, mechanical plant noise levels within the childcare centre would comply with the AAAC internal noise criterion.

6 Road Traffic Noise Assessment

6.1 Road Traffic Noise Impact on Outdoor Play Area

Potential noise impact from road traffic on the Hume Highway upon the proposed outdoor play area of the childcare centre is assessed against the AAAC Guideline. The guideline sets out the following requirement:

"The $L_{Aeq,1 hr}$ noise level from road traffic, rail or industry at any location within the outdoor play or activity area during the hours when the Centre is operating should not exceed 55 dB(A)."

Given that the outdoor play area is located at the rear of the site and is not shielded from traffic noise by the childcare centre building, traffic noise from the Hume Highway is expected to potentially impact the outdoor play area.

Traffic flow information was obtained from the Transport for NSW Traffic Volume Viewer website. The worst 1 hour traffic period during operational hours of the childcare centre was determined as shown in the table below.

Table 6-1 – Existing Traffic Volumes for the Hume Highway (2023)

Road	Direction	Peak Hour (2:00pm to 3:00pm)
M31 Hume Highway (east of George Street, Station ID. T0274-PR)	Northbound	1023
	Southbound	820

Notes: 1. Based on traffic data obtained from Transport for NSW website: <https://maps.transport.nsw.gov.au/egeomaps/traffic-volumes/#/?z=6>

Based on the above traffic volumes, the road traffic noise level impacting the future outdoor play area was predicted and the results are presented in Table 6-2.

Table 6-2 – Predicted $L_{Aeq,1 hour}$ Traffic Noise Levels for Outdoor Play Area, dB(A)

Receiver Location	Noise Criteria	Peak Movements ¹	Predicted Noise Levels	Comply?
Outdoor Play Area	55	1,843	52	Yes

From the table above, it can be seen that the road traffic noise from the Hume Highway impacting on the outdoor play area is predicted to comply with the AAAC noise criterion.

6.2 Road Traffic Noise Impact on Indoor Area

The AAAC stipulates a noise criterion for road noise impacting on indoor areas of a childcare centre and is reproduced below.

"The $L_{Aeq,1 hr}$ noise level from road traffic, rail or industry at any location within the indoor activity or sleeping areas of the Centre during the hours when the centre is operating shall be capable (ie with

doors and/or windows closed) of achieving 40 dB(A) within indoor activity areas and 35 dB(A) in sleeping areas."

As stated previously, the proposed childcare centre building will be mechanically ventilated through the use of air conditioners. Consequently, all windows and doors will be fixed and/or closed during the use of indoor areas of the centre. Noise emission from road traffic on the Hume Highway into the internal areas of the centre with all windows and doors closed is not considered to be significant.

Nevertheless, based on the predicted noise levels of 52dB(A) within the future outdoor play area (see Table 6-2), an 12dB(A) reduction would be required through the building facade in order to achieve the 40dB(A) internal noise limit. Typically, a lightweight building with windows open would achieve a minimum 10dB(A) reduction. Given the brick construction of the childcare centre building, the required 12dB(A) reduction would easily be achieved. Furthermore, the cot rooms of the childcare centre do not have any walls that form part of the facades of the building and would not be impacted by traffic noise from the Hume Highway. Therefore, traffic noise levels within the childcare centre would comply with the AAAC internal noise criterion

6.3 Road Traffic Noise Impact to Existing Receivers

Noise impact from the potential increase in traffic on George Street due to the childcare centre's operation is assessed against the NSW 'Road Noise Policy' (RNP, 2011). The RNP sets out criteria to be applied to particular types of road and land uses. These noise criteria are to be applied when assessing noise impact and determining mitigation measures for developments that are potentially affected by road traffic noise associated with the proposed childcare centre, with the aim of preserving the amenity appropriate to the land use.

For a conservative assessment, George Street is classified as a local road. Therefore, for *"existing residences affected by additional traffic on existing local roads generated by land use development"* the following road traffic noise criterion applies:

- Day (7:00am to 10:00pm) – $L_{Aeq,1 \text{ hour}}$ **55 dB(A)**

Furthermore, the RNP states the following regarding increase in traffic noise due to the proposed childcare centre:

"For existing residences and other noise sensitive land uses affected by additional traffic on existing roads generated by land use development, any increase in the total traffic noise level should be limited to 2 dB above that of the corresponding 'no build option'."

Traffic counts on George Street and in the vicinity of the childcare centre site were undertaken by Hemanote Consultants on Wednesday 25th October 2023 during the morning (7:00am to 10:00am) and afternoon (3:00pm to 6:00pm) peak periods. Results of the traffic counts are presented in the Traffic & Parking Impact Assessment prepared by Hemanote Consultants (dated November 2023) and reproduced in the table below.

Table 6-3 – Traffic Survey Results for George Street

Road	Direction	No. of Vehicle Movements	
		Morning Peak Hour (8:00am to 9:00am)	Afternoon Peak Hour (3:30pm to 4:30pm)
George Street (south of Thoroughfare Street)	Northbound	106	120
	Southbound	63	35

Note: 1. Traffic data for section of George Street in the vicinity of the childcare centre site.

As discussed previously, traffic generation due to the proposed childcare centre was estimated to be up to 61 trips (31 in / 30 out) during the morning peak period.

Therefore, based on the existing morning peak hour traffic volumes and the estimated additional traffic due to the proposed childcare centre, road traffic noise levels were predicted for residences located along George Street and results are presented in Table 6-4 below.

Table 6-4 – Predicted $L_{Aeq,1\text{ hour}}$ Traffic Noise Levels along George Street, dB(A)

Receiver	Criterion	Peak Hour Movements ¹		Distance to Road ²	Predicted Noise Level		Comply?
		Existing	Future		Existing	Future	
Residences on George Street	55	169	230 (169 + 61)	14 m	56	58	Yes

Notes: 1. Based on morning peak hour movements

2. Based on typical distance from facade of dwelling to road.

From the table above, the existing and future (ie. with the childcare centre operating) traffic noise levels were predicted to be over the nominated RNP local road criterion for residences along George Street. However, in accordance with the RNP, future traffic noise levels due to the additional traffic associated with the childcare centre are predicted to not increase by more than 2dB(A) for residences along George Street.

Therefore, road traffic noise levels generated by vehicles associated with the proposed childcare centre are considered to comply with the applicable RNP requirements.

7 Conclusion

Renzo Tonin & Associates has completed an assessment of environmental noise impact from the proposed childcare centre to be located at 69-73 George Street, Marulan. Noise impact from the proposed childcare centre upon potentially affected receivers have been quantified and compared to relevant NSW guidelines and regulations and the AAAC noise guidelines for childcare centres.

Operational noise from the outdoor play area of the proposed childcare centre was predicted to comply with the applicable noise criteria at all residential receivers, whilst noise from car park activities was also predicted to comply. Cumulative operational noise emissions were also predicted to comply with the applicable noise criteria at all commercial receivers.

Traffic noise from Hume Highway was considered to not impact the indoor and outdoor play areas of the proposed childcare centre. Noise along public roads impacting residences due to traffic generated by the proposed childcare centre was also predicted to comply with the relevant RNP noise requirements for residences along George Street.

APPENDIX A Glossary of Terminology

The following is a brief description of the technical terms used to describe noise to assist in understanding the technical issues presented.

Adverse weather	Weather effects that enhance noise (that is, wind and temperature inversions) that occur at a site for a significant period of time (that is, wind occurring more than 30% of the time in any assessment period in any season and/or temperature inversions occurring more than 30% of the nights in winter).																																														
Ambient noise	The all-encompassing noise associated within a given environment at a given time, usually composed of sound from all sources near and far.																																														
Assessment period	The period in a day over which assessments are made.																																														
Assessment Point	A point at which noise measurements are taken or estimated. A point at which noise measurements are taken or estimated.																																														
Background noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation, when extraneous noise is removed. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the L90 noise level (see below).																																														
Decibel [dB]	<p>The units that sound is measured in. The following are examples of the decibel readings of common sounds in our daytime environment:</p> <table border="0"> <tr> <td>threshold of hearing</td> <td>0 dB</td> <td>The faintest sound we can hear</td> </tr> <tr> <td></td> <td>10 dB</td> <td>Human breathing</td> </tr> <tr> <td>almost silent</td> <td>20 dB</td> <td></td> </tr> <tr> <td></td> <td>30 dB</td> <td>Quiet bedroom or in a quiet national park location</td> </tr> <tr> <td>generally quiet</td> <td>40 dB</td> <td>Library</td> </tr> <tr> <td></td> <td>50 dB</td> <td>Typical office space or ambience in the city at night</td> </tr> <tr> <td>moderately loud</td> <td>60 dB</td> <td>CBD mall at lunch time</td> </tr> <tr> <td></td> <td>70 dB</td> <td>The sound of a car passing on the street</td> </tr> <tr> <td>loud</td> <td>80 dB</td> <td>Loud music played at home</td> </tr> <tr> <td></td> <td>90 dB</td> <td>The sound of a truck passing on the street</td> </tr> <tr> <td>very loud</td> <td>100 dB</td> <td>Indoor rock band concert</td> </tr> <tr> <td></td> <td>110 dB</td> <td>Operating a chainsaw or jackhammer</td> </tr> <tr> <td>extremely loud</td> <td>120 dB</td> <td>Jet plane take-off at 100m away</td> </tr> <tr> <td>threshold of pain</td> <td>130 dB</td> <td></td> </tr> <tr> <td></td> <td>140 dB</td> <td>Military jet take-off at 25m away</td> </tr> </table>		threshold of hearing	0 dB	The faintest sound we can hear		10 dB	Human breathing	almost silent	20 dB			30 dB	Quiet bedroom or in a quiet national park location	generally quiet	40 dB	Library		50 dB	Typical office space or ambience in the city at night	moderately loud	60 dB	CBD mall at lunch time		70 dB	The sound of a car passing on the street	loud	80 dB	Loud music played at home		90 dB	The sound of a truck passing on the street	very loud	100 dB	Indoor rock band concert		110 dB	Operating a chainsaw or jackhammer	extremely loud	120 dB	Jet plane take-off at 100m away	threshold of pain	130 dB			140 dB	Military jet take-off at 25m away
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dB(A)	A-weighted decibels. The A-weighting noise filter simulates the response of the human ear at relatively low levels, where the ear is not as effective in hearing low frequency sounds as it is in hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter.																																														
dB(C)	C-weighted decibels. The C-weighting noise filter simulates the response of the human ear at relatively high levels, where the human ear is nearly equally effective at hearing from mid-low frequency (63Hz) to mid-high frequency (4kHz), but is less effective outside these frequencies.																																														

Frequency	Frequency is synonymous to pitch. Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
Impulsive noise	Having a high peak of short duration or a sequence of such peaks. A sequence of impulses in rapid succession is termed repetitive impulsive noise.
Intermittent noise	The level suddenly drops to that of the background noise several times during the period of observation. The time during which the noise remains at levels different from that of the ambient is one second or more.
L _{Max}	The maximum sound pressure level measured over a given period.
L _{Min}	The minimum sound pressure level measured over a given period.
L ₁	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L ₁₀	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L ₉₀	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
L _{eq}	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
Reflection	Sound wave changed in direction of propagation due to a solid object obscuring its path.
SEL	Sound Exposure Level (SEL) is the constant sound level which, if maintained for a period of 1 second would have the same acoustic energy as the measured noise event. SEL noise measurements are useful as they can be converted to obtain Leq sound levels over any period of time and can be used for predicting noise at various locations.
Sound	A fluctuation of air pressure which is propagated as a wave through air.
Sound absorption	The ability of a material to absorb sound energy through its conversion into thermal energy.
Sound level meter	An instrument consisting of a microphone, amplifier and indicating device, having a declared performance and designed to measure sound pressure levels.
Sound pressure level	The level of noise, usually expressed in decibels, as measured by a standard sound level meter with a microphone.
Sound power level	Ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Tonal noise	Containing a prominent frequency and characterised by a definite pitch.