RAPT CONSULTING

Acoustic Assessment – 127 New England Highway Lochinvar, NSW

Prepared for

Brown Commercial Building

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Relationships Attention Professional Trust

Document Details

Acoustic Assessment – 127 New England Highway Lochinvar, NSW

Prepared For:

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Prepared By:

RAPT Consulting

18&19 / 10 Kenrick Street

The Junction, NSW 2291

ABN: 30330220290

www.raptconsulting.com.au

Document ID	Rev No.	Date	Author	
2225695_250805	0	05 August 2025	Gregory Collins -MAAS	

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1. Introduction

1.1 Background

RAPT Consulting has been engaged to undertake an acoustic assessment for Brown Commercial Building to inform a Development Application (DA) for a proposed childcare centre at 127 New England Highway Lochinvar, NSW.

The proposed hours of operation will be 7am-6pm.

Childcare places will be provided as follows:

- Age 0-2yrs – 28 children
- Age 2-3yrs – 40 children
- Age 3-5yrs – 40 children

The site and surrounding area is shown in Figure 1-1 and draft site plan is shown in Figure 1-2.

Figure 1-1 Site and Surrounding Area

Figure 1-2 Draft Site Plan (Source: Brown Commercial Building)

1.2 Assessment Objectives

This acoustic assessment considers the potential impacts of the operation of the proposal to neighbouring properties. The purpose is to assess potential noise from the project and to recommend mitigation measures where required.

The outcomes of this assessment include where necessary recommendations for potential noise mitigation and management measures designed to achieve an acceptable noise amenity for residential (dwelling) occupants and other sensitive receivers surrounding the study area.

1.3 Scope

The acoustic assessment scope of work included:

- Initial desk top review to identify noise sensitive receptors from aerial photography
- Undertake noise measurements to determine ambient and background noise levels
- Establish project noise goals for the operation of the project
- Identify the likely principal noise sources during operation and their associated noise levels
- assessment of potential noise impacts associated with operation aspects of the project
- provide recommendations for feasible and reasonable noise mitigation and management measures, where noise objectives may be exceeded.

1.4 Relevant Guidelines

The relevant policies and guidelines for noise assessments in NSW that have been considered during the preparation of this assessment include:

- Noise Policy for Industry (NPfI) (NSW EPA, 2017)
- Association of Australian Acoustical Consultants Publication, Guideline for Child Care Centre Acoustic Assessment Assessing Vibration: A Technical Guideline (V3.0).

1.5 Limitations

The purpose of the report is to provide an independent acoustic assessment for the proposal.

It is not the intention of the assessment to cover every element of the acoustic environment, but rather to conduct the assessment with consideration to the prescribed work scope.

The findings of the acoustic assessment represent the findings apparent at the date and time of the assessment undertaken. It is the nature of environmental assessments that all variations in environmental conditions cannot be assessed and all uncertainty concerning the conditions of the ambient environment cannot be eliminated. Professional judgement must be exercised in the investigation and interpretation of observations.

In conducting this assessment and preparing the report, current guidelines for acoustics, noise were referred to. This work has been conducted in good faith with RAPT Consulting's understanding of the client's brief and the generally accepted consulting practice.

No other warranty, expressed or implied, is made as to the information and professional advice included in this report. It is not intended for other parties or other uses.

2. Existing Environment

2.1 Receptors

The site is zoned as R1 General Residential. A map showing the land use zonings in the vicinity of the proposal are shown in Figure 2-1.

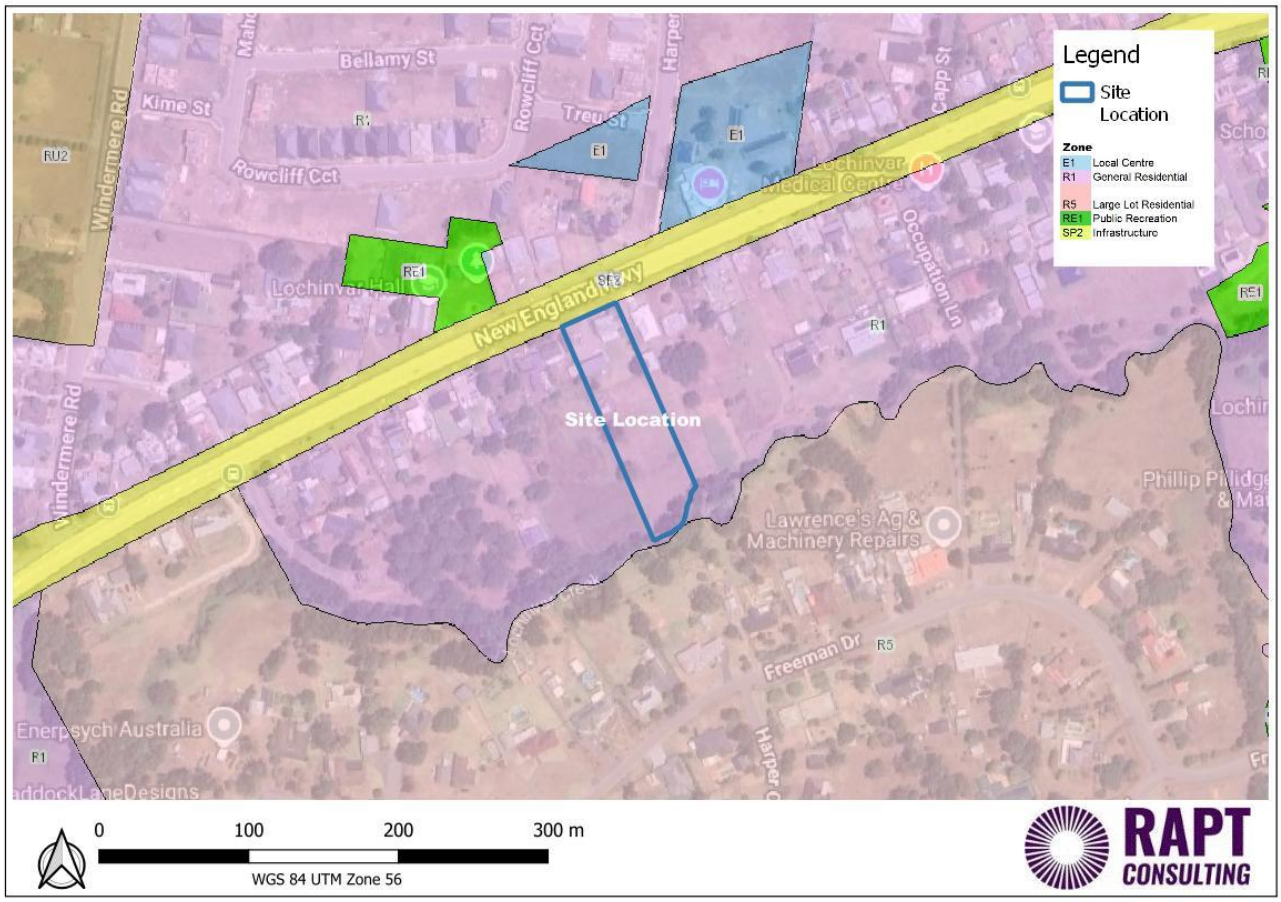


Figure 2-1 Land Use Zonings

Nearest receptors to the proposal assessed in this acoustic assessment are identified in Table 2-1 and Figure 2-2. Other receptors are located in these areas however the locations selected are considered representative of the localised noise environment in the vicinity of the locations selected.

Table 2-1 Nearest Assessed Receptors to the Proposal

Receiver ID	Location	Receptor Type	Easting	Northing
R1	125 New England Highway	Residential	354598	6380800
R2	131 New England Highway	Residential	354546	6380779

Receiver ID	Location	Receptor Type	Easting	Northing
R3	17 Freeman Drive	Residential	354662	6380641
R4	124 New England Highway	Residential	354539	6380854
R5	Future Residential 127 New England Highway	Residential	354606	6380747

Figure 2-2 Assessed Receptors

2.2 Background and Ambient Noise

To establish background and ambient noise levels, noise monitoring was undertaken by RAPT Consulting undertaken at the site 127 New England Highway from 18 April to 24 April 2024 at the northern façade of the property and 26 June to 3 July 2025 in the backyard of the property in proximity to where the proposed outdoor play area will be. Site observations noted the location was considered indicative of the local ambient noise environment and this site also presented as secure location whereby minimising the risk of theft or vandalism to the monitoring equipment. Additionally, they are considered as acceptable locations for determination of the background noise with consideration to the NSW Environment Protection Authority's (EPA's) – Noise Policy for Industry (NPfI). During site visits it was noted that road traffic, distant road traffic and natural wildlife primarily described the ambient noise environment and is indicative of a sub-urban noise environment.

The monitoring locations is shown in Figures 2-2 - 2-4.

Figure 2-3 Noise Monitoring Location

Figure 2-4 Northern Façade Monitoring Location

Figure 2-5 Backyard Monitoring Location

Monitoring was undertaken using a RION NL-43 noise loggers with Type 2 Precision. Calibration was checked prior to and at the conclusion of the measurements with no significant drift. These loggers are capable of measuring continuous sound pressure levels and are able to record L_{Amin}, L_{A90}, L_{A10}, L_{Amax} and L_{Aeq} noise descriptors. The instrument was programmed to accumulate environmental noise data continuously over sampling periods of 15 minutes for the entire monitoring period.

The noise surveys were conducted with consideration to the procedures described in Australian Standard AS 1055:2018, “Acoustics – Description and Measurement of Environmental Noise” and the NSW Noise Policy for Industry (NPfI). Calibration was checked before and after each measurement and no significant drift occurred. The acoustic instrumentation used carries current NATA calibration and complies with AS/NZS IEC 61672.1-2019-Electroacoustics – Sound level meters – Specifications.

The L_{A90} descriptor is used to measure the background noise level. This descriptor represents the noise level that is exceeded for 90 percent of the time over a relevant period of measurement. In line with the procedures described in the EPA’s NPfI, the assessment background level (ABL) is established by determining the lowest tenth-percentile level of the L_{A90} noise data acquired over each period of interest. The background noise level or rating background level (RBL) representing the day, evening and night-time assessment periods is based on the median of individual ABL’s determined over the entire monitoring duration. The RBL is representative of the average minimum background sound level, or simply the background level.

The L_{Aeq} is the equivalent continuous noise level which would have the same total acoustic energy over the measurement period as the varying noise actually measured, so it is in effect an energy average.

Weather information for the unattended noise logging was obtained from the Bureau of Meteorology Maitland AWS for the monitoring period and any data adversely affected by rain, wind (more than 5 m/s as per NPfI) or extraneous noise were discarded.

The RBL and ambient LAeq levels are provided in Table 2-2 below.

Table 2-2 Background and Ambient Noise Monitoring Results

	Rating background level, L_{A90}, dB(A)			Ambient noise levels, L_{Aeq} dB(A)		
Period	**Day[1]**	**Evening[1]**	**Night[1]**	**Day[1]**	**Evening[1]**	**Night[1]**
18-24 April 2024	53	37	33	67	63	63
26 June – 3 July 2025	47	40	31	55	51	50

Note 1 Day: 7:00 to 18:00 Monday to Saturday and 8:00 to 18:00 Sundays & Public Holidays
Evening: 18:00 to 22:00 Monday to Sunday & Public Holidays
Night: 22:00 to 7:00 Monday to Saturday and 22:00 to 8:00 Sundays & Public Holidays

Note 2 As outlined in the NPfI, the evening or night criteria or management levels are set no louder than that daytime or evening levels. Number in brackets (XX) represents actual measured RBL determined for assessment period.

3. Acoustic Objectives

3.1 Operational Noise

The New South Wales *Noise Policy for Industry* (NPfI) provides guidance on the assessment of operational noise impacts. The guidelines include both intrusive and amenity criteria that are designed to protect receivers from noise significantly louder than the background level and to limit the total noise level from all sources near a receiver.

Intrusive noise levels set by the NPfI control the relative audibility of operational noise compared to the background level. Amenity criteria limit the total level of extraneous noise. Both sets of criteria are calculated and the lower of the two in each time period normally apply. Intrusive criteria are simply 5 decibels above the measured (or adopted) background level with a minimum of 40 dB(A) for daytime and 35 dB(A) for evening and night time.

Amenity noise levels are determined based on the overall acoustic characteristics of the receiver area and the existing level of noise excluding other noises such as traffic and insects. Residential receiver areas are characterised into 'urban', 'suburban', 'rural' or other categories based on land uses, the existing level of noise from industry, commerce, and road traffic. Project amenity noise levels are the recommended amenity noise level (Table 2.1 of the NPfI) minus 5 dB(A) and plus 3 dB(A) to convert from a period level to a 15-minute level. The project noise trigger level is the lower value between the intrusive and the amenity noise levels.

The NPfI noise criteria are planning levels and are not mandatory limits required by legislation however the noise criteria assist the regulatory authorities to establish licensing conditions. Where noise criteria are predicted to be exceeded, feasible and reasonable noise mitigation strategies should be considered. In circumstances where noise criteria cannot be achieved negotiation is required to evaluate the economic, social and environmental costs and benefits of the development against the noise impacts.

The NPfI is generally intended for large and complex industrial sources and are not strictly applicable to child-care facilities. Rather, The NSW Draft Noise Guide for Local Government refers to the Association of Australasian Acoustical Consultants (AAAC), guideline for Child Care Centre Acoustic Assessment for assessing these proposals and will be referred to in this assessment.

3.2 AAAC Childcare Centre Guideline

The Association of Australian Acoustical Consultants (AAAC) has prepared a Guideline for Child Care Centre Acoustic Assessment and provides the following:

3.2.1 Outdoor Play Area

The noise impact from children at play in a child care centre differs from the domestic situation in that it is a business carried out for commercial gain, the number of children can be far greater than in a domestic situation and the age range of the children at the centre does not significantly vary over time as it would in a domestic situation. However, the noise from children is vastly different, in both character and duration, from industrial, commercial or even domestic machine noise. The sound from children at play, in some circumstances, can be pleasant, with noise emission generally only audible during the times the children play

outside. Night time, weekend or public holiday activity is not typical and child care centres have considerable social and community benefit.

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 Leq,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).

Background Greater Than 40 dB(A) – The contributed Leq,15min 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 (ie 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 Leq,15 minute 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 Leq,15 minute noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB at the assessment location.

3.2.2 Other Noise emission

The cumulative Leq,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 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 / Pick up
- Other activities / operations (not including outdoor play)

3.2.3 Commercial Receptors

The cumulative Leq,15min 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.

3.2.4 Other Sensitive Receptors

Where appropriate, assessment should include consideration of noise emission to other sensitive uses including schools, hospitals, places of worship and parks (active and passive). Depending on the requirements of the state or territory where the centre is located, in the absence of applicable noise criteria for such a sensitive use, the cumulative $L_{eq,15min}$ 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 the sensitive property boundary, and shall not exceed 45 dB(A) internally, with windows or doors of the sensitive receiver open.

3.3 Project Operational Noise Goals

The Child Care Centre is expected to operate during daytime hours only. Project noise goals are based on background monitoring results and recommendations outlined in Section 3.2.1 and 3.2.2. Project noise goals are provided in Table 3-1.

Table 3-1 AAAC Project Noise Goals dB(A) Leq(15min)

	Day 7am to 6pm
Rating Background Level $L_{A90(Period)}$	47
Residences: Children Sounds Outdoor Play	57
Residences: Indoor Sounds, Mechanical Plant and Pick up / Drop off $L_{Aeq(15min)}$	52
Commercial Premises (When in use) $L_{Aeq(15min)}$	65
Other Sensitive Receptors $L_{Aeq(15min)}$	Internal Noise Level 45 dB(A) Outdoor Noise Level 55 dB(A) (assumes 10dB(A) loss through an open window (Section 2.6 NSW NPfI)

3.4 External Noise Impact on Children

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

The LAeq,1hr 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).

The LAeq,1hr 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.

4. Acoustic Assessment

4.1 Operational Noise

Acoustic modelling was undertaken using Bruel and Kjaer's "Predictor" to predict the effects of construction noise. Predictor is a computer program for the calculation, assessment and prognosis of noise propagation. Predictor calculates environmental noise propagation according to ISO 9613-2, "Acoustics – Attenuation of sound during propagation outdoors". The method predicts the sound pressure level under meteorological conditions favourable to propagation from sources of known sound emission. These conditions are for downwind propagation or equivalently under a well-developed moderate ground based temperature inversion. Terrain topography, ground absorption, atmospheric absorption and relevant shielding objects are taken into account in the calculations.

Other Key assumptions in the model include:

- topographical information was obtained from NSW Government Spatial Services
- all areas were modelled considering a conservative ground factor of 0.5 to account for mixed surfaces
- all residential and commercial receivers were modelled at 1.5 metres above the ground surface.

Site layout and building structures were based on information provided at the time of the assessment.

Mechanical Plant

At this stage, the mechanical plant has not been selected for the development. However, it is not uncommon for the mechanical plant not to be selected prior to submitting a development application. Mechanical plant may consist of an air conditioning system and exhaust fans. A typical range of sound power levels for mechanical plant is given in Table 4-1 below.

Table 4-1Typical Mechanical Plant Sound Power Levels

Plant Type	SWL dB(A)
Small (single fan) condenser	65
Medium (double fan) condenser	70
Large (double fan) condenser	80

At this stage it is assumed the units will be located on the roof top. 2 Medium double fan condenser units have been assumed to be operating from the roof top in this assessment.

Pick Up / Drop Off

The carpark for pick up / drop off has the capacity 108 children. Based on the RMS (formally the RTA) 'Guide to Traffic Generating Developments' a prediction of 1.4 peak vehicle trips per child across 2 hours during peak operating times of 7:00 to 9:00am for pre-schools as per

Table 3.6 of the guide has been assumed. This has been converted to a 15-minute trip rate which is shown in Table 4-2.

Table 4-2 15-minute Operational Traffic Volume

Time of Day	Peak Vehicle Trips/Child	Total Trips for 104 Children in Period	Trips as a 15 minute rate
7:00-9:00am	1.4	151	19

Onsite pick up / drop off noise modelling assumptions include a car with a 10km/hr sound power level of 81dB(A) and a sound power level of a car door opening and closing of 78dB(A) which has been sourced from RAPT consultings' internal sound level database.

Children Outdoor Play Area

The outside play area will be used only during the centre hours of operation, depending on the weather conditions.

All outdoor activities are fully supervised and monitored. Teachers and children are encouraged to participate in quiet play activities.

The specified outdoor play policy and times shall be adhered to. Exceptional circumstances may apply. The centre manager shall ensure that outdoor play activities are conducted in an orderly fashion and that excessive noise from children playing, etc., is avoided wherever possible and practical.

The sound levels of children playing in the indoor and particularly, the outdoor areas vary widely depending on many factors such as the:

- number of children vocal at any one time
- activity that the children are engaged in
- type of voice (from shout to whisper)
- age of the children
- directionality of voice
- distance between the children and the receiver point for outdoor and indoor areas
- height of the child (i.e. whether standing or seated) for outdoor areas, and
- reverberation ('echo') in the room for indoor or semi-enclosed areas.

Children under 1 year of age are generally not walking or talking, although, they do cry and make sound. Nevertheless, they do not significantly contribute to 15 minute averaged noise levels in outdoor areas.

For older children, there are marginal differences in groups of children from 2 to 3 years of age and those from 3 to 5 years of age.

Table 4-3 which is duplicated from Table 1 of the AAAC Guideline provides recommended sound power levels for lots of 10 children, within the different age groupings, along with a recommended source height.

Table 4-3 Effective Sound Power Levels LAeq(15min) for Groups of 10 Children Playing

Number and Age of Children	Sound Power Levels [dB] at Octave Band Centre Frequencies [Hz]								
	dB(A)	63	125	250	500	1k	2k	4k	8k
10 Children - 0 to 2 years	78	54	60	66	72	74	71	67	64
10 Children - 2 to 3 years	85	61	67	73	79	81	78	74	70
10 Children - 3 to 5 years	87	64	70	75	81	83	80	76	72

Note 2 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.

Note 3 For simplicity, based upon a review of World Health Organization (WHO) data, a single recommended source height of 1metre is suggested as the source heights.

These numbers have been converted to suit the proposed childcare places shown in Table 4-4.

Table 4-4 Adopted Sound Power Levels LAeq(15min)

Number and Age of Children	Sound Power Levels [dB] at Octave Band Centre Frequencies [Hz]								
	dB(A)	63	125	250	500	1k	2k	4k	8k
28 Children - 0 to 2 years	82	58	64	70	76	78	75	71	68
40 Children - 2 to 3 years	91	67	73	79	85	87	84	80	76
40 Children - 3 to 5 years	93	70	76	81	87	89	86	82	78

These situations have assumed the children will be playing all throughout the outdoor play areas and have been set up as area sources rather than a single point source as the children will be playing all throughout the nominated outdoor play areas. This is a much more realistic representation of a playground situation rather than assuming a single cumulative point source.

Based on a review of the drawings, a 1.8 metre acoustic fence has been assumed to be installed and modelled on the eastern and southern boundary of the site. Acoustic fences are impervious to the ground to the recommended height and are generally constructed from colorbond, lapped and capped timber, bricks, hebel power panel, concrete blocks. No gaps should exist in the fence. There are other options available, and the higher the fence, the greater the density and being as close as possible to the source in question make an acoustic fence more effective. A material surface density of 10 kg/m2 is typically sufficient with consideration to ISO 9613.

Indoor Rooms

The indoor noise levels of playroom areas is dependent on the room acoustics, in particular the amount of acoustic absorbent materials used as opposed to 'hard' surfaces.

Childcare centre reverberant noise levels can be as high as 80 dB(A) or 75 dB(A) at 1 metre within play-room areas with all hard surfaces. Typical noise levels within playrooms over a 15-minute period can generally be approximately 62 dB(A) $L_{Aeq(15min)}$ inclusive of music and

other activities. Walls have been conservatively assumed to be 15mm plywood 12 kg/m^2, the floors wooden floorboards and the ceilings gyprock. The NSW Environmental Noise Management Manual specifies that standard window glazing of a building will typically attenuate the external noise levels by at least 20dB(A) with the windows closed and 10 dB(A) with the windows open (allowing for natural ventilation). Windows have been assumed to be open for this assessment.

4.2 Modelled Operational Noise Results

Predicted sound pressure levels dB(A) at the assessed receiver locations arising from the proposed development are provided in Table 4-5 and Figure 4-1 and includes all items outlined in Section 4.1 operating simultaneously for a reasonable worst-case scenario. Results are in dB(A) $L_{eq(15min)}$.

Table 4-5 Operational Noise Results dB(A) Leq(15min)

Receiver ID	Non Outdoor Play Noise Goal	Non Outdoor Play Modelled Results	Comply? Yes / No	Outdoor Play Noise Goal	Outdoor Play Modelled Results	Comply? Yes / No
R1	52	27	Yes	57	50	Yes
R2	52	46	Yes	57	33	Yes
R3	52	23	Yes	57	41	Yes
R4	52	40	Yes	57	31	Yes
R5	52	33	Yes	57	50	Yes

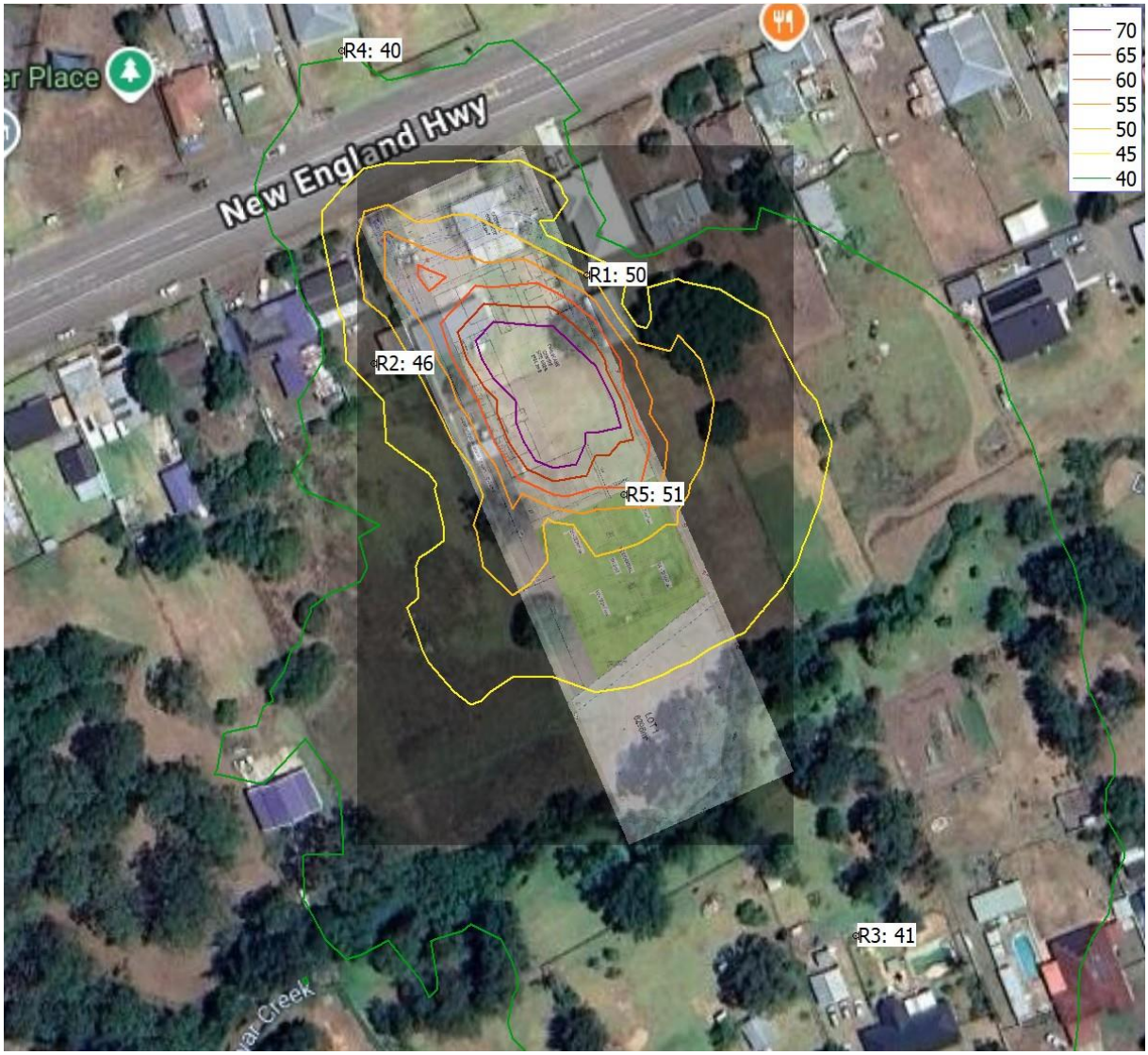


Figure 4-1 Cumulative Operational Results dB(A) Leq(15min)

The results of the assessment indicate compliance can be expected at all nearest receivers even in the unlikely event that all of the abovementioned noise sources are operating simultaneously.

The noise levels generated during outdoor play periods will vary according to the following factors:

- The number of children in the area – students will be spread around the outdoor play areas
- The level of noise made by each child – this is obviously different from individual to individual, and various factors such as age, personality, mood, activity and countless other factors will play a part. The louder events are not capable of being sustained over an extended period, and

- The location of the children relevant to the residences – as the distance between the source and the receiver increases, the noise level at the receiver will decrease.

In general, the impact of outdoor activity noise from childcare facilities is considered to be sufficiently mitigated by the site zoning and the limited periods of outdoor recreational activities, that is during dedicated recess and lunch breaks, occurring from Monday to Friday. Additionally, one could expect significantly lower noise levels for passive play.

One of the most effective measures that be implemented in conjunction with the physical noise controls is a noise management plan (NMP). The NMP should be incorporated within the centres overall management plan. Examples of management measures that may be incorporated into a NMP include:

- Limiting the number of children outside. The number of children within the Centre or playing in the outdoor play areas at any one time may be limited to reduce the noise impact. A reduction in the number of children by half will reduce the noise impact by approximately 3 dB.
- Staff are fully aware of the need to control excessively noisy behaviour to maintain compliance with the noise limits
- Outdoor play activities are designed and managed to maintain children's interest and attention
- Whilst active play is encouraged, screaming and shouting is not – it is considered that this type of behaviour can be intimidating to other children
- Crying children should be taken inside the centre and comforted
- The behaviour of children should be monitored and modified as required by adequately trained child care workers
- Parents and guardians should be informed of the importance of noise minimisation when entering the site, dropping off or picking up children
- Carers / staff should be educated to control the level of their voice while outside
- Management and staff should immediately address complaints relating to noise and where possible act immediately to satisfy the complaint. Any complaint made will be recorded in the Complaints Register and dealt with as detailed in this Plan. If required, the centre shall meet with neighbours to address ongoing matters as they arise and to ensure contingency plans are in place
- If a complaint is made, centre management should record details of the occurrence and actions taken. Where applicable, completed forms will detail the following:
    - The date and time of the complaint
    - The method by which the complaint was made
    - Any personal details of the complainant which were provided by the complainant
    - The nature of the complaint
    - Description of noise source that is the subject of complaint, duration of event

- Location of complainant during time of incident, and general area in which the noise source was located
- Identification of related noise activities and locations that could have or are known to have contributed to the incident
- Any follow-up contact with the complainant, and
- If no action was taken, the reason why no action was taken.

4.3 External Noise Assessment

4.3.1 External Noise

The existing ambient noise environment is complex with many noise sources including road and rail traffic noise. The daytime LAeq noise level during the monitoring period was 67 dB(A) at the northern façade of the existing property and 55 dB(A) in the location of the proposed children play area which complies with recommended external noise levels. The layout of the proposed site should also sufficiently shield and attenuate traffic noise from the children play area and therefore is expected to be acceptable.

4.3.2 Internal Noise

The recommended internal noise levels are provided in Table 4-6.

Table 4-6 Recommended Internal Noise Levels dB(A) Leq

Type of Occupancy	Noise Level
Sleeping areas	35dB(A) Windows Closed
Other Activity Areas	40dB(A) Windows Closed

The NSW Environmental Noise Management Manual specifies that standard window glazing of a building will typically attenuate the external noise levels by at least 20dB(A) with the windows closed and 10 dB(A) with the windows open (allowing for natural ventilation). This means that an external noise level of 60 Leq dB(A) and 55 Leq dB(A) would result in compliance with the internal noise level goals for activity areas and sleeping areas outlined in Table 4-5.

The Department of Planning Guideline “Development near Rail Corridors and Busy Roads – Interim Guideline” (Guideline) provides acoustic performance of building elements taken from Appendix C of the guideline and is reproduced in Figure 4-2.

Category of Noise Control Treatment	R_w of Building Elements (minimum assumed)				
	Windows/Sliding Doors	Frontage Facade	Roof	Entry Door	Floor
Category 1	24	38	40	28	29
Category 2	27	45	43	30	29
Category 3	32	52	48	33	50
Category 4	35	55	52	33	50
Category 5	43	55	55	40	50

Figure 4-2 Categories of Noise Control Treatments

Acoustically speaking, windows are usually the weakest parts of a facade. An open or acoustically ineffective window will adversely compromise the effect of an otherwise acoustically effective facade. Proper installation is critical to the effectiveness of noise attenuation of windows and other building elements. Therefore, given the measured exterior noise levels associated with the project, it is recommended that as a minimum, Category 3 of noise control treatment be utilised for building envelope particularly for glazing in the design of this development.

It is also recommended building layouts be examined for example locating sleeping areas away from road frontages where practicable. Examples of category 3 building types are shown in Figure 4-4. Other options exist provided the right reduction index (Rw) is satisfied.

Category No.	Building Element	Standard Constructions	sample
3	**Windows/Sliding Doors**	Openable with minimum 6.38mm laminated glass and full perimeter acoustic seals	
	Frontage Facade	**Brick Veneer Construction:** 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally.	
		Double Brick Cavity Construction: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or sheet metal roof with sarking, 1 layer of 13mm sound-rated plasterboard fixed to ceiling joists, R2 insulation batts in roof cavity.	
	Entry Door	45mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	Concrete slab floor on ground	

Figure 4-3 Category 3 Building Element Examples

5. Conclusion

This noise assessment has been undertaken to inform a Development Application (DA) for a proposed childcare centre at 127 New England Highway Lochinvar, NSW.

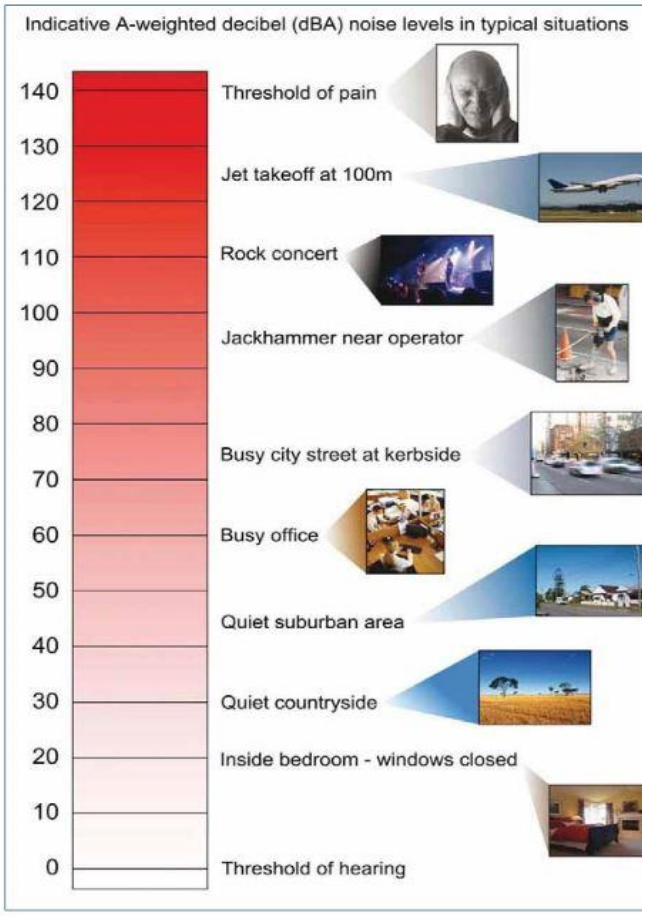
Operational Noise

The results of the assessment indicate compliance with noise goals can be met. While compliance is expected, a standard set of management measures has been provided to deal with the unlikely event of any noise issues.

External Noise

Based on the monitoring results inclusive of road traffic, natural sounds and cumulative ambient noise environment and the information provided regarding the development, it is expected compliance with established noise goals can be achieved provided design measures similar to what has been outlined in Section 4.3 of this report are investigated and implemented.

Appendix A: Glossary of Acoustic Terms

Term	Definition
dB	Decibel is the unit used for expressing the sound pressure level (SPL) or power level (SWL) in acoustics. The picture below indicates typical noise levels from common noise sources. 
dB(A)	Frequency weighting filter used to measure 'A-weighted' sound pressure levels, which conforms approximately to the human ear response, as our hearing is less sensitive at very low and very high frequencies.
$L_{Aeq(period)}$	Equivalent sound pressure level: the steady sound level that, over a specified period of time, would produce the same energy equivalence as the fluctuating sound level actually occurring.
$L_{A10(period)}$	The sound pressure level that is exceeded for 10% of the measurement period.
$L_{A90(period)}$	The sound pressure level that is exceeded for 90% of the measurement period.
L_{Amax}	The maximum sound level recorded during the measurement period.
Noise sensitive receiver	An area or place potentially affected by noise which includes:

	A residential dwelling. An educational institution, library, childcare centre or kindergarten. A hospital, surgery or other medical institution. An active (e.g. sports field, golf course) or passive (e.g. national park) recreational area. Commercial or industrial premises. A place of worship.
Rating Background Level (RBL)	The overall single-figure background level representing each assessment period (day/evening/night) over the whole monitoring period.
Feasible and Reasonable (Noise Policy for Industry Definition)	**Feasible** mitigation measure is a noise mitigation measure that can be engineered and is practical to build and/or implement, given project constraints such as safety, maintenance and reliability requirements. Selecting **Reasonable** measures from those that are feasible involves judging whether the overall noise benefits outweigh the overall adverse social, economic and environmental effects, including the cost of the mitigation measure. To make a judgement, consider the following: Noise impacts Noise mitigation benefits Cost effectiveness of noise mitigation Community views.
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).