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Environmental Noise Impact Assessment

Proposed Child Care Centre
10 Ben Bullen Place, Goulburn, NSW

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1.0 EXECUTIVE SUMMARY

A new child care centre (The Centre) is proposed to be constructed at 10 Ben Bullen Place, Goulburn, NSW (the Site). The Site is located on land zoned R2 – *Low Density Residential* under the Goulburn Mulwaree Local Environmental Plan (LEP) 2009.

The Site is bounded by a residential premises to the north, south and west, and Ben Bullen Place to the east. The Site and nearby receptors are shown in Figure 1.

The proposal will involve construction of a new single-storey child care centre building. The Centre will comprise of two outdoor play areas, six indoor play areas, two cot rooms, office, reception, meeting room, kitchen, amenities and a ground floor level car park with capacity for 20 vehicles.

The architectural drawings relied on for this assessment are prepared by Greenscape Design and attached in Appendix C.

The Centre will have a total capacity for 99 children, comprising of:

- 0-2 years old – 24 children;
- 2-3 years old – 35 children; and
- 3-5 years old – 40 children.

The proposed hours of operation for the Centre are:

- Monday to Friday: 7.00 am – 6.00 pm.

Nearby premises may be affected by the following noise sources at the Centre:

- Children playing both outside and inside;
- Car park and on-road traffic; and
- Mechanical plant.

Goulburn Mulwaree Council requires an acoustic assessment to demonstrate that the noise impact from the Centre will not adversely affect the acoustic amenity of nearby residential premises.

Acceptable noise limits have been derived from the Association of Australasian Acoustical Consultants' (AAAC) '*Guideline for Child Care Centres Acoustic Assessment*' and the Environmental Protection Authority's (EPA) *Road Noise Policy* (RNP).

Calculations show that, provided the recommendations in Section 8.0 are implemented, the levels of noise emission from the Centre and of intrusive noise at the Centre will meet the acoustic requirements established in Section 5.5, and will therefore be acceptable.



2.0 CONSULTING BRIEF

Day Design Pty Ltd was engaged by Greenscape Design on behalf of Dprojects Pty Ltd to assess the potential environmental noise impact from a proposed Child Care Centre to be constructed at 10 Ben Bullen Place, Goulburn, NSW. This commission involves the following:

Scope of Work:

- Inspect the site and environs
- Measure the background noise levels at critical locations and times
- Establish acceptable noise level criterion
- Prepare a site plan identifying the development and nearby noise sensitive locations
- Quantify noise emissions from the proposed Child Care Centre
- Quantify traffic noise intrusion to the site
- Calculate the level of noise emission, taking into account building envelope transmission loss, screen walls and distance attenuation
- Provide recommendations for noise control
- Prepare an Environmental Noise Impact Assessment Report.



3.0 SITE AND DEVELOPMENT DESCRIPTION

3.1 Site Description

The Centre is proposed to be constructed at 10 Ben Bullen Place, Goulburn, NSW. The Site is located on land zoned R2 – *Low Density Residential* under the Goulburn Mulwaree Local Environmental Plan (LEP) 2009.

The Site is currently an empty lot. Site access is via Ben Bullen Place.

The Site is bounded by residential premises to the north, south and west, and Ben Bullen Place to the east. The Site and nearby receptors are shown in Figure 1.

The nearest noise sensitive receptors to the site are also shown in Figure 1, and are presented below in Table 1.

Table 1 Noise Sensitive Receptors

Receiver, Type & Location	Address	Direction from site
R1 – Residence – RL670.7 1.5 m above ground level – 3 m from boundary	26 Bradford Drive	North
R2 – Residence – RL669.4 1.5 m above ground level – 3 m from boundary	24 Bradford Drive	North
R3a – Residence – RL668.9 1.5 m above ground level – building northern façade	6 Ben Bullen Place	South
R3b – Residence – RL669.2 1.5 m above ground level – 3 m from boundary		
R4 – Residence – RL669.5 1.5 m above ground level – at building northern façade	8 Ben Bullen Place	South
R5 – Residence – RL671.0 1.5 m above ground level – at building eastern façade	15 Samuel Place	West
R6 – Residence – RL671.0 1.5 m above ground level – at building eastern façade	12 Samuel Place	West
R7 – Residence – RL670.5 1.5 m above ground level – 3 m from boundary	28 Bradford Drive	North

As the noise sources on the Site are at varying distances from the receptors, specific distances between each noise source and receptor are used in all calculations. All distances are based upon the architectural drawings.





Figure 1 – Location Plan –10 Ben Bullen Place, Goulburn, NSW



3.2 Development Description

The proposal will involve the construction of a new single-storey child care centre building for up to 99 children. The Centre will comprise of two outdoor play areas, six indoor play areas, cot room, office, lobby, kitchen, amenities on the ground floor with a ground floor car park with capacity for 20 vehicles with driveway access via Ben Bullen Place.

The proposed layout of the Centre can be seen in the architectural drawings prepared by Greenscape Design, attached as Appendix C.

The proposed hours of operation for the Centre are:

- Monday to Friday: 7.00 am – 6.00 pm.

The Centre will have a total capacity for 99 children, comprising of:

- 0-2 years old – 24 children;
- 2-3 years old – 35 children; and
- 3-5 years old – 40 children.



4.0 MEASURED NOISE LEVELS

Noise survey instrumentation used in this assessment is listed in Appendix A. A Glossary of Acoustical Terms is included as Datasheet AC108.

4.1 Measured Ambient Noise Levels

In order to assess the severity of a possible environmental noise problem in a residential area it is necessary to measure the ambient background noise level at the times and locations of worst possible annoyance. The lower the background noise level, the more perceptible the intrusive noise becomes and the more potentially annoying.

The background noise level should be measured at a location most representative of the potentially affected receptors, in the absence of any noise sources that may be associated with the proposed development.

As specified in Section 3.1 “Background Noise Monitoring” of the AAAC’s *‘Guideline for Child Care Centre Acoustic Assessment’*, where a consultant is unable to measure the background noise level at the most affected residential receiver location, the consultant *‘shall select another suitable and equivalent location. This measured representative noise environment should be used to establish relevant criteria for all sensitive receivers.’*

During our site inspection it was determined that the potentially *most affected sensitive receiver locations* are ‘R1’ and ‘R7’ to the north, ‘R3’ and ‘R4’ to the south, and ‘R5’ and ‘R6’ to the west of the proposed Centre. Therefore, suitable and equivalent locations – Location ‘A’ and Location ‘B’ (see below) – were selected to represent *the most affected sensitive receivers*. This measured representative noise environment has been used to establish the relevant criteria for all other sensitive receivers.

Day Design notes that the background noise in the area is mainly influenced by infrequent traffic noise and some neighbourhood noises (pets, people talking and occasional yard work).

An environmental noise monitor was placed at Location ‘A’ at 6 Ben Bullen Place, and another at Location ‘B’ at 10 Ben Bullen Place, Goulburn, NSW, from Monday 4 November to Wednesday 13 November, 2024, to determine the Rating Background Level. The microphone heights were approximately 1.5 m above ground level.

As the Centre is not proposed to operate on weekends, ambient noise levels measured on Saturday 9 and Sunday 10 November 2024, have been excluded from the assessment period.



The results of the background noise survey at Location 'A' and Location 'B' are shown in the attached Appendix B, and below in Table 2.

Table 2 Ambient Background Levels –Ben Bullen Place, Goulburn, NSW

Noise Measurement Location	Time Period	L ₉₀ Rating Background Level
Location 'A' – 6 Ben Bullen Place, Goulburn	Early Morning (6:30 am – 7 am)	35
	Day (7 am to 6 pm)	35
Location 'B' – 10 Ben Bullen Place, Goulburn	Early Morning (6:30 am – 7 am)	34
	Day (7 am to 6 pm)	33

Meteorological conditions during the measurement surveys typically consisted of clear skies with temperatures ranging from 3°C to 31°C. Noise level measurements are considered reliable and representative of the background noise levels at all nearby receptor locations.



4.2 Measured Road Traffic Noise Levels

The proposed development is not affected by road traffic noise except from Ben Bullen Place which carries low traffic volumes.

The weekday $L_{Aeq, 1 \text{ hour}}$ traffic noise levels measured at Location 'A' and Location 'B' are shown below in Table 3.

Table 3 Measured $L_{Aeq, 1 \text{ hour}}$ Road Traffic Sound Pressure Levels – Location 'A'

Time	$L_{Aeq, 1 \text{ hour}}$ Road Traffic Noise (dBA)					
	Tue 05/11	Wed 06/11	Thu 7/11	Fri 8/11	Mon 11/11	Tue 12/11
7 – 8 am	53	52	57	45	51	44
8 – 9 am	49	46	66	54	55	48
9 – 10 am	42	41	54	48	43	47
10 – 11 am	43	44	54	47	49	44
11 – 12 pm	43	45	59	54	46	43
12 – 1 pm	44	46	55	56	47	43
1 – 2 pm	45	47	56	54	41	46
2 – 3 pm	49	46	57	55	46	45
3 – 4 pm	50	46	57	55	49	49
4 – 5 pm	50	47	57	56	50	50
5 – 6 pm	50	46	52	55	47	46



Table 4 Measured $L_{Aeq, 1 \text{ hour}}$ Road Traffic Sound Pressure Levels – Location ‘B’

Time	$L_{Aeq, 1 \text{ hour}}$ Road Traffic Noise (dBA)					
	Tue 05/11	Wed 06/11	Thu 7/11	Fri 8/11	Mon 11/11	Tue 12/11
7 – 8 am	43	42	45	43	44	44
8 – 9 am	44	42	52	50	42	45
9 – 10 am	42	46	58	44	44	42
10 – 11 am	44	41	57	47	44	42
11 – 12 pm	45	40	56	54	43	45
12 – 1 pm	40	46	57	58	40	42
1 – 2 pm	43	49	57	56	38	45
2 – 3 pm	50	47	60	57	42	45
3 – 4 pm	53	47	58	56	48	50
4 – 5 pm	53	48	59	59	50	50
5 – 6 pm	53	45	55	57	47	49

Based on the long-term measurements at Location ‘A’ and Location ‘B’, and the calculation method show in Appendix B, Section B3 of the NSW Road Noise Policy for the ‘overall $L_{Aeq, (1 \text{ hour})}$ ’, the calculated day time traffic noise levels are 49 dBA at Location ‘A’ and 51 dBA at Location ‘B’. These levels are used in the calculation of traffic noise intrusion for the existing site within Section 7.0 of this report.



5.0 ACOUSTIC CRITERIA

This Section presents the noise guidelines applicable to this proposal and establishes the project noise trigger levels.

5.1 Goulburn Mulwaree Development Control Plan 2009

Goulburn Mulwaree Council identify general requirements for noise and vibration from 'Non-residential development' in Section 4.2 of their 2009 Development Control Plan (DCP). Section 4.2.7 of the DCP is included below.

4.2.7 Noise and vibration – general requirements

Objectives

Minimise the impact of noise and vibration by proposed operations and on proposed developments of existing and projected future sources of noise and vibration.

Controls

Council is the appropriate regulatory authority for noise related activities, such a heavy industries, mining, extractive industry, motor racing tracks and the like under the Protection of the Environment Operations Act 1997. If development sensitive to noise were to be approved on adjacent properties to the noise source, Council will be responsible for regulating any resulting noise impacts.

Council recommends applicants utilise the following documents to assist them in making decisions relating to acceptable noise levels for noise generating and noise sensitive developments:

- *NSW Industrial Noise Policy;*
- *Environmental Criteria for Road Traffic Noise;*
- *Noise Guide for Local Government.*

The above documents are available from the NSW Environment Protection Authority website: www.environment.nsw.gov.au/noise

The impact of noise generated by a proposal can be minimised to comply with the statutory requirements in different ways. The following guidelines address means of achieving the standards.

Incorporate sound proofing for machinery or activities considered likely to create a noise nuisance during design development.

Locate noisy operational equipment within a noise insulated building away from residential areas.

Design logistically efficient business practises to minimise the use of equipment, movements per site, and number of vehicle movements per site per day.



Where sites adjoin a residential area, limit the number of hours and times at which mechanical plant and equipment is used in conjunction with the measures described above.

Ameliorate the noise and vibration impact of transport operations by using appropriate paving or track mounting and installing acoustic barriers as required to meet standards on neighbouring uses.

Incorporate appropriate noise and vibration mitigation measures into the site layout, building materials, design, orientation and location of sleeping recreation/work areas of all developments proposed in areas adversely impacted upon by road or rail related noise and vibration.'



5.2 NSW Department of Planning and Environment

5.2.1 State Environmental Planning Policy (Transport and Infrastructure) 2021

The NSW Department of Planning and Environment (DoPE) published the State Environmental Planning Policy (SEPP) (Transport and Infrastructure) 2021 on 1 March 2022. The SEPP (Transport and Infrastructure) 2021 consolidates the previous SEPP (Educational Establishments and Child Care Facilities) 2017, along with other related SEPPs.

Chapter 3 of the SEPP, 'Educational establishments and child care facilities', aims to establish consistent State-wide assessment requirements and design considerations for educational establishments and early education and care facilities to improve the quality of infrastructure delivered and to minimise impacts on surrounding areas. Section 3.27 of Chapter 3 of the SEPP states the following with regard to Local Council Development Control Plans that contain specific requirements, standards or controls related to Child Care Centres:

'3.27: Centre-based child care facility—development control plans

(1) A provision of a development control plan that specifies a requirement, standard or control in relation to any of the following matters (including by reference to ages, age ratios, groupings, numbers or the like, of children) does not apply to development for the purpose of a centre-based child care facility—

- (a) operational or management plans or arrangements (including hours of operation),*
- (b) demonstrated need or demand for child care services,*
- (c) proximity of facility to other early childhood education and care facilities,*
- (d) any matter relating to development for the purpose of a centre-based child care facility contained in:*
 - (i) the design principles set out in Part 2 of the Child Care Planning Guideline, or*
 - (ii) the matters for consideration set out in Part 3 or the regulatory requirements set out in Part 4 of that Guideline (other than those concerning building height, side and rear setbacks or car parking rates).*

(2) This section applies regardless of when the development control plan was made."



5.2.2 NSW DoPE – Child Care Planning Guideline

The NSW DoPE published the Child Care Planning Guideline (CCPG) in August 2017 as a supplement to the SEPP (Educational Establishments and Child Care Facilities) 2017. The CCPG was then updated in September 2021.

The SEPP states that “a consent authority must take into consideration this Guideline (CCPG) when assessing a development application (DA) for a centre-based child care facility.” The SEPP also determines the Guideline “will take precedence over a Development Control Plan (DCP), with some exceptions, where the two overlap in relation to a child care facility.”

The Guideline was introduced to ‘assist industry to deliver early childhood education facilities that are of the highest standards’ and ‘to align NSW planning controls with the National Quality Framework for early education and care, creating more certainty for developers and operators seeking service approval’.

Section 3, *Matters for Consideration*, Subsection 3.5 Visual and acoustic Privacy, contains the following for consideration:

Objective: To minimise the impact of child care facilities on the acoustic privacy of neighbouring residential developments.

C22

A new development, or development that includes alterations to more than 50 percent of the existing floor area, and is located adjacent to residential accommodation should:

- *provide an acoustic fence along any boundary where the adjoining property contains a residential use. An acoustic fence is one that is a solid, gap free fence*
- *ensure that mechanical plant or equipment is screened by solid, gap free material and constructed to reduce noise levels eg acoustic fence, building or enclosure.*

C23

A suitably qualified acoustic professional should prepare an acoustic report which will cover the following matters:

- *Identify an appropriate noise level for a child care facility located in residential and other zones*
- *Determine an appropriate background noise level for outdoor play area during times they are proposed to be in use*
- *Determine the appropriate height of any acoustic fence to enable the noise criteria to be met.*



Subsection 3.6 Noise and air pollution, contains the following for consideration:

'Considerations

Objective: To ensure that outside levels on the facility are minimized to acceptable levels.

C24

Adopt design solutions to minimise the impacts of noise, such as:

- creating physical separation between buildings and the noise source*
- orienting the facility perpendicular to the noise source and where possible buffered by other uses*
- using landscaping to reduce the perception of noise*
- limiting the number and size of openings facing noise sources*
- using double or acoustic glazing, acoustic louvres or enclosed balconies (wintergardens)*
- using materials with mass and/or sound insulation or absorption properties, such as solid balcony balustrades, external screens and soffits*
- locating cot rooms, sleeping areas and play areas away from external noise sources.'*

C25

An acoustic report should identify appropriate noise levels for sleeping areas and other non play areas and examine impacts and noise attenuation measures where a child care facility is proposed in any of the following locations:

- on industrial zoned land*
- where the ANEF contour is between 20 and 25, consistent with AS2021:2000*
- along a railway or mass transit corridor, as defined by State Environmental Planning Policy (Infrastructure) 2007*
- on a major road or busy road*
- other land that is impacted by substantial external noise.*



5.3 AAAC – Guideline for Child Care Centre Acoustic Assessment

The Association of Australasian Acoustical Consultants (AAAC) published the *Guideline for Child Care Centre Acoustic Assessment* (Guideline), in September 2020 to assist both AAAC members and local Councils to assess the noise impact from proposed child care centres both accurately and fairly (see www.aaac.org.au).

Section 3 of the AAAC Guideline states the following in relation to noise generation from child care centres, while Section 5.0 states the following in relation to noise impact on children:

3.2 Criteria - Residential Receptors

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 $L_{eq,15min}$ 45 dB(A) for the assessment of outdoor play is recommended in locations where the background noise level is less than 40 dB(A).*

Background Greater Than 40 dB(A) – *The contributed $L_{eq,15min}$ 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 $L_{eq,15min}$ 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 $L_{eq,15min}$ 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.*

3.2.2 Indoor Play Area, Mechanical Plant, Pick up and Drop off

The cumulative $L_{eq, 15 \text{ minute}}$ 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 and pick up;*
- *Other activities/operations (not including outdoor play).*

3.2.3 Sleep Disturbance

The noise impact of staff arrivals, setup, cleaning or other on-site activities prior to 7 am or during night-time hours should be assessed at nearby residential premises. The L_{Amax} noise level emitted from vehicles arriving and parking, depending on the requirements of the state or territory where the centre is located shall not exceed the background noise level by more than 15 dB outside the nearest habitable room window.

3.3 Commercial Receptors

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.'

3.4 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 $L_{eq, 15 \text{ min}}$ 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 the sensitive property boundary, and shall not exceed 45 dB(A) internally, with windows or doors of the sensitive receiver open.



Section 5 of the AAAC Guideline states the following in relation to external noise impacts on children within Child Care Centres:

'5.0 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.

5.1 Road, Rail Traffic and Industry

The $L_{Aeq,1hr}$ 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 $L_{Aeq,1hr}$ 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.'

5.4 NSW Environment Protection Authority – NSW Road Noise Policy

The NSW Road Noise Policy (RNP), in Section 2.3.1, sets out road traffic noise assessment criteria for residential land uses in Table 3. The information in that table is extracted below in Table 5.

Table 5 Road Traffic Noise Assessment Criterion - Residential

Road Category	Type of project/land use	Assessment Criteria – dB(A) Day (7 am – 10 pm)
Local roads	6. Existing residences affected by additional traffic on existing local roads generated by land use developments	$L_{Aeq, (1 \text{ hour})}$ 55 (external)



5.5 Project Noise Trigger Levels

Based on the measured background noise levels and the relevant planning instruments and legislation, the Project Noise Trigger Levels at each receptor location are as follows:

5.5.1.1 Residential Receptors

For Residential Receptors 'R2', 'R3a' and 'R3b' – based on the measured background noise levels at Location 'A':

- **45 dBA** $L_{eq, 15 \text{ minute}}$ for outdoor play;
- $(35 + 5 =)$ **40 dBA** $L_{eq, 15 \text{ minute}}$ for all other noise sources including car park, mechanical plant and indoor play areas.

For Residential Receptors 'R1', 'R4', 'R5', 'R6' and 'R7' – based on the measured background noise levels at Location 'B':

- **45 dBA** $L_{eq, 15 \text{ minute}}$ for outdoor play;
- $(33 + 5 =)$ **38 dBA** $L_{eq, 15 \text{ minute}}$ for all other noise sources including car park, mechanical plant and indoor play areas.

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.

5.5.2 Sleep Disturbance

Consideration has been given to sleep disturbance caused by noise generated from staff arriving prior to 7 am, and parking within the car park.

The following criteria is applied at the residential receptors closest to the designated staff parking spaces in the car park, 'R1' and 'R7', during the early morning period of 6.30 am to 7 am. Compliance at the most affected receptors will ensure compliance at all other potentially affected receptor locations:

For residential facades 'R1' and 'R7' – based on the measured background noise levels at Location 'B':

- $(34 + 15 =)$ **49 dBA** L_{Amax} at the closest affected habitable room window of the residential premises between 6.30 am and 7 am.



5.5.3 On-Road Traffic Noise Criterion

The following criterion will be applied at 1 metre from the most affected residential façades 'R2' and 'R3a', for on – road traffic noise. Compliance at the most affected receptors will ensure compliance at all other potentially affected receptor locations further away from Ben Bullen Place:

- **55 dBA** (external) $L_{Aeq, 1 \text{ hour}}$ between 7 am and 6 pm.

5.5.4 Noise Intrusion Criteria

Road Traffic Noise Intrusion - in accordance with the AAAC Guideline:

- Internal traffic levels within sleeping areas (Cot Rooms) of the Centre should not exceed $L_{Aeq, 1 \text{ hour}}$ 35 dBA during operating hours.
- Internal traffic noise levels within indoor activity areas of the Centre should not exceed $L_{Aeq, 1 \text{ hour}}$ 40 dBA during operating hours.
- External traffic noise levels in any outdoor play or activity area of the Centre should not exceed $L_{Aeq, 1 \text{ hour}}$ 55 dBA during operating hours.



6.0 CHILD CARE CENTRE NOISE EMISSION

The main sources of noise from the Centre will be as follows:

- Children playing both outside and inside;
- Cars entering and exiting the car park; and
- Mechanical plant serving the Centre.

Noise modelling is based on the architectural drawings prepared by Greenscape Design attached as Appendix C.

6.1 Indoor and Outdoor Play Areas

The AAAC has presented a range of A-weighted sound power levels per child in Table 1 of its '*Guideline for Child Care Centre Acoustic Assessment*'. The sound power levels of each group are presented in Table 6 and have been adopted to assess noise emissions from children in this assessment.

The sound power levels for each group are presented in Table 6 and used in this assessment.

Table 6 L_{eq} Sound Power Levels - Children Engaging in Active Play

Number and Age of Children	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	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

In the notes to Table 1 of the AAAC's *Guideline*, where passive/quiet activities are engaged in by children, the noise generated by children is generally 6 dB lower than active play.



6.2 Car Park Noise Emission

Based on the RTA's 'Guide to Traffic Generating Developments' prediction of 0.8 peak (morning 7 am-9 am) vehicle trips per child for Child Care Centres (Long-day care), we have assumed, as a worst-case scenario, a flow of cars equivalent to 79 trips in 1 hour arriving or leaving the Centre in the morning peak. This is equivalent to 20 vehicle trips in a 15-minute period.

For the assessment of sleep disturbance and staff arriving during the early morning shoulder period, we have assessed the maximum noise impact of staff arriving and parking in the car park.

For the assessment of vehicular activity associated with the car park area, we have assumed vehicles will travel at a speed of 10 km/h on the site. For noise generated by on-road traffic, we have assumed vehicles will travel at a speed of 50 km/h as they approach or leave the site.

The Sound Exposure Level¹ (SEL) and $L_{AF, max}$ sound power level and spectra of vehicle noise is shown below in Table 7 and is based on previous measurements by Day Design.

Table 7 SEL & L_{Amax} Sound Power Levels – Car Park Noise

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	63	125	250	500	1k	2k	4k	8k
SEL of car drive by at approximately 10 km/h	88	92	88	84	83	84	79	76	70
SEL level of a car driving on an inclined road at 10 km/h	85	91	89	83	81	77	72	70	64
SEL of car drive-by at approximately 50 km/h	97	99	97	94	93	95	87	77	70
SEL of car door slam, ignition and drive away	91	104	98	89	87	86	83	81	75
L_{Amax} of car entering car park	92	98	92	90	88	88	83	80	76
L_{Amax} of car door close	96	105	103	95	96	87	83	82	77

¹ SEL is the total sound energy of a single noise event condensed into a one second duration.



6.3 Mechanical Plant

The mechanical plant, including air conditioning condensers, kitchen and bathroom exhaust fans have not been selected at this stage. Therefore, a preliminary noise assessment will be based on typical units for the size of the development, with sound power levels from typical units being used.

The air conditioning condensers are assumed to be located on the northern side of the building in the south-western corner of the car park. We have assumed that the kitchen and toilet exhaust fans will be ducted through the façades of the development.

The assumed locations of these items of mechanical plant can be seen within the marked up architectural drawings attached as Appendix D.

Sound power levels used in the calculation of the noise contribution from the mechanical plant are shown in Table 8.

Table 8 **Leq, 15 minute Sound Power Levels – Mechanical Plant**

Description	Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz)								
	dBA	63	125	250	500	1k	2k	4k	8k
Small kitchen exhaust fan ²	60	61	67	62	54	54	50	45	39
Small exhaust fan (toilet) ³	60	51	47	50	53	59	43	36	31
Medium (double fan) outdoor condenser unit ⁴	69	55	55	61	67	64	62	59	45

We recommend a detailed analysis be carried out once the mechanical plant is selected and locations are finalised, prior to the issue of a Construction Certificate.

² Spectral sound power level based on Fantech CPD01254FSC.

³ Spectral sound power level based on Fantech TD-500/150 SIL.

⁴ Spectral sound power level based on Daikin RZQ140LV1 outdoor condenser unit.



6.4 Predicted Noise Levels

Knowing the sound power level of a noise source (See Table 6 to Table 8), the sound pressure level (as measured with a sound level meter) can be calculated at a remote location using suitable formulae to account for distance losses, sound barriers, etc.

Where applicable, calculations include reductions for the acoustic screening provided by fences and the proposed Centre itself. Based upon the architectural drawings attached as Appendix C, the following solid boundary heights are assumed for the Centre:

- 2.1 metre high fence along the northern boundary of the 2-5 Year Old outdoor play area;
- 2.4 metre high fence along the western boundary of the 2-5 Year Old outdoor play area;
- 2.1 metre high fence along the southern boundary of the 0-2 Year Old and 2-5 Year Old outdoor play areas;
- 1.8-metre-high fence around the northern boundary of the Site, adjacent to the car park; and,
- No solid fence along the eastern boundary of the Site.

Noise emission calculations also include reductions provided by the following time period correction, where relevant:

- Time period correction of $(10 \times \log [1/900]) = -29.5$ dB for SEL noise levels associated with the use of car parks in a 15 minute period - $L_{eq, 15 \text{ minute}}$ calculations only; and
- Time period correction of $(10 \times \log [1/3600]) = -35.6$ dB for SEL noise levels associated with the use of car parks in a 1 hour period - $L_{eq, 1 \text{ hour}}$ calculations only.

Calculations of noise emission from the indoor play area include reductions for operable glazing in the façade. For the purposes of our calculations, we have assumed all operable glazing to be of a standard construction (5 mm glass) and to be open (50% of the window area).

All noise modelling calculations for noise generating components of the Centre were performed within DGMR iNoise 2024 noise modelling software using noise propagation equations of ISO 9613-1 – ‘Acoustics – Attenuation of sound during propagation outdoors. Part 1: Calculation of the absorption of sound by the atmosphere’, and ISO 9613-1 – ‘Acoustics – Attenuation of sound during propagation outdoors. Part 2: Attenuation of sound during propagation outdoors. Part 2: General method of calculation’.

As a worst-case scenario, noise emission has been modelled with all children engaged in simultaneous outdoor play, as discussed in Section 6.4.1. Noise levels are calculated to all receptor locations outlined in Table 1.

Table 9 and Table 10 show the predicted noise levels at the residential receptors from the activities discussed previously, during the day periods.



6.4.1 Outdoor Play Area Noise Levels

Based upon a review of World Health Organization (WHO) data for average children heights, the notes to Table 1 of the *AAAC's Guideline* recommends a source height of 1.0 metre above ground level for all children.

The approximate locations of the noise sources (children) used for the assessment of the outdoor play area are shown in the attached Appendix D. All noise sources in each outdoor play area shown in Appendix D are assessed as being outside at the same time to achieve the overall worst case predicted noise levels at each of the receiver locations.

The $L_{eq, 15 \text{ minute}}$ noise levels at all receptor locations for children engaged in outdoor play are calculated to be as shown in Table 9.

Table 9 Predicted $L_{eq, 15 \text{ minute}}$ Noise Levels – Outdoor Play

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – 26 Bradford Drive	45	45	Yes
R2 – 24 Bradford Drive	33	45	Yes
R3a – 6 Ben Bullen Place	45	45	Yes
R3b – 6 Ben Bullen Place	45	45	Yes
R4 – 8 Ben Bullen Place	46	45	No (+1 dB)
R5 – 15 Samuel Place	50	45	No (+5 dB)
R6 – 12 Samuel Place	49	45	No (+4 dB)
R7 – 28 Bradford Drive	48	45	No (+3 dB)

As summarised in Table 9, the predicted levels of noise at the nearby receptors will comply with the criteria established in Section 5.5 of this report for receptors 'R1', 'R2', 'R3a' and 'R3b', but will exceed the criteria at receptor locations 'R4', 'R5', 'R6' and 'R7'. As such, noise controls will be required, as recommended in Section 8.0.



6.4.2 Cumulative Noise Level - Indoor Play Area, Car Park and Mechanical Plant

The predicted worst case cumulative $L_{eq, 15\text{minute}}$ noise levels at all receptor locations are calculated to be as shown in Table 10.

Table 10 Predicted Cumulative $L_{eq, 15\text{ minute}}$ Noise Levels – Indoor Play, Mechanical Plant & Car Park

Receptor Location and Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – 26 Bradford Drive			
- Indoor play areas	43		
- Car park	27		
- Mechanical	33		
Cumulative Noise Level	43	38	No (+5 dB)
R2 – 24 Bradford Drive			
- Indoor play areas	34		
- Car park	<20		
- Mechanical	20		
Cumulative Noise Level	34	40	Yes
R3a – 6 Ben Bullen Place			
- Indoor play area	48		
- Car park	20		
- Mechanical	22		
Cumulative Noise Level	58	40	No (+8 dB)
R3b – 6 Ben Bullen Place			
- Indoor play area	50		
- Car park	<20		
- Mechanical	22		
Cumulative Noise Level	50	40	No (+10 dB)
R4 – 8 Ben Bullen Place			
- Indoor play area	47		
- Car park	<20		
- Mechanical	<20		
Cumulative Noise Level	47	38	No (+9 dB)



Table 10 Predicted Cumulative $L_{eq, 15 \text{ minute}}$ Noise Levels – Indoor Play, Mechanical Plant & Car Park – Continued

Receptor Location and Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R5 – 15 Samuel Place			
- Indoor play areas	51		
- Car park	<20		
- Mechanical	25		
Cumulative Noise Level	51	38	No (+13 dB)
R6 – 12 Samuel Place			
- Indoor play areas	49		
- Car park	<20		
- Mechanical	28		
Cumulative Noise Level	49	38	No (+11 dB)
R7 – 28 Bradford Drive			
- Indoor play areas	43		
- Car park	<20		
- Mechanical	30		
Cumulative Noise Level	43	38	No (+5 dB)

As summarised in Table 10, the predicted levels of noise at the nearby receptors will comply with the criteria established in Section 5.5 of this report for receptor 'R2', but will exceed at all other receptor locations. As such, noise controls will be required, as recommended in Section 8.0.



6.4.3 Sleep Disturbance

It is proposed that the Centre will accept children from 7 am. Four staff members are assumed to arrive prior to 7 am, to prepare for the arrival of the children, with more staff and parents arriving after 7 am. In order to assess the potential for sleep disturbance from staff vehicle activity, we have assumed that four staff vehicles will arrive between 6.30 am and 7 am.

As shown in the architectural drawings, the staff parking spaces are located on the northern side of the car park. As such, we have assumed that the staff vehicles will park in the closest staff spaces to the lobby entry, in the north-eastern corner.

The calculated $L_{AF,max}$ noise levels at the nearest affected residential receptor locations to the car park are shown in Table 11 below.

Table 11 Predicted $L_{AF,max}$ Noise Levels – Sleep Disturbance

Receptor Location and Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – 26 Bradford Drive			
- Car Pulling into Driveway	48	49	Yes
- Car Door Closing	57	49	No (+8 dB)
R7 – 28 Bradford Drive			
- Car Pulling into Driveway	42	49	Yes
- Car Door Closing	47	49	Yes

As seen in Table 11, the predicted level of noise emission from staff arriving prior to 7 am will comply with the sleep disturbance criteria established in Section 5.5 at receptor location 'R7'. However, the predicted external levels of noise exceeds the noise criteria in Section 5.5 at 'R1', and will require a maximum noise level event assessment, as outlined in Section 2.5 of the NSW EPA Noise Policy for Industry, as follows.

Day Design has conducted a detailed maximum noise level event assessment of the existing ambient noise levels – particularly the L_{max} events - at Location 'B' to determine the likelihood of noise associated with the use of the car park causing sleep disturbance at the most affected nearby residential receiver 'R1' (see Table 11). Compliance at the most affected nearby residential receiver will ensure compliance at all other receiver locations.



Table 12 shows the total L_{\max} events greater than or equal to the maximum predicted L_{\max} noise level (at 'R1') of 57 dBA between 6.30 am and 7 am over the assessment period.

Table 12 Total L_{\max} Events at Location 'B' During Assessment Period

Morning/Date	Measured L_{\max} Noise Level Events \geq 57 dBA	Measured L_{\max} Noise Level (dBA) Range \geq 57 dBA
<i>Early Morning – 6.30 am to 7 am (2 x 15 minute periods each early morning)</i>		
Morning 1 - 5/11/2024	2	57 – 71
Morning 2 - 6/11/2024	2	71 – 72
Morning 3 - 7/11/2024	2	65 – 67
Morning 4 - 8/11/2024	2	68 – 69
Morning 5 - 9/11/2024	2	65 – 73
Morning 6 - 10/11/2024	2	72 – 73
Morning 7 - 11/11/2024	2	63 – 64
Morning 8 - 12/11/2024	1	61
Morning 9 - 13/11/2024	2	63 – 64
Average per morning	2	66
Total	17	-

Table 12 above shows that L_{\max} noise events greater than or equal to 57 dBA are common at Location 'B' during the early morning periods. A total of 18 x 15 – minute periods (early morning) were analysed, with 17, or 94%, featuring an L_{\max} noise event greater than or equal to 57 dBA.

An average of two L_{\max} noise events (out of 2) greater than or equal to 57 dBA were measured over the assessment period for each early morning period, with an average L_{\max} noise level of 66 dBA. As shown in Table 11, the maximum predicted L_{\max} noise level from noise associated with car doors closing (at 'R1') is 57 dBA – 9 dB lower than the average.

Day Design is of the opinion that due to the existing number and level of the L_{\max} noise events greater than or equal to 57 dBA at Location 'B', the L_{\max} noise events associated with staff cars arriving at the development site are not likely to cause sleep disturbance at 'R1', and will therefore be acceptable at all residential receiver locations.



6.4.4 On-Road Traffic

The external $L_{eq, 1 \text{ hour}}$ noise levels at the most affected residential receiver locations 'R2' and 'R3a' from noise associated with on-road traffic throughout the day are calculated to be as shown below in Table 13.

Table 13 Predicted $L_{eq, 1 \text{ hour}}$ Noise Levels – On – Road Traffic

Receiver Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R2 – 24 Bradford Drive	34	55	Yes
R3a – 6 Ben Bullen Place	40	55	Yes

The predicted external noise levels from on-road traffic are within the noise criteria in Section 5.0, and are therefore acceptable.



7.0 NOISE INTRUSION – ROAD TRAFFIC NOISE

7.1 External Road Traffic Noise Levels – Outdoor Play Areas

Based on the long-term measurements at Location 'A' and Location 'B', and the calculation method shown in Appendix B, Section B3 of the NSW Road Noise Policy for the 'overall $L_{Aeq, (1 \text{ hour})}$ ', the calculated equivalent $L_{Aeq, 1 \text{ hour (traffic)}}$ level is shown below in Table 14.

Table 14 Predicted $L_{eq, 1 \text{ hour}}$ Noise Levels – Noise within Outdoor Play Areas

Outdoor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
0-2 Year Old Outdoor Play Area	49	55	Yes
2-5 Year Old Outdoor Play Area	50	55	Yes

The calculated levels for the outdoor play area comply with the noise criteria in Section 5.5 and is therefore acceptable.

7.2 Road Traffic Noise Intrusion Assessment – Indoor Playrooms

The internal $L_{eq, 1 \text{ hour}}$ road traffic noise level within the proposed indoor play rooms has been calculated to be as shown in Table 15. The indoor playrooms will be subject to road traffic noise from Ben Bullen Place. Based on the architectural drawings attached as Appendix C, the cot rooms will have no external windows, and are therefore not assessed.

Calculations assume that standard construction and the recommended glazing thicknesses (as detailed in Section 6.4) has been used throughout.

Table 15 Calculated $L_{eq, 1 \text{ hour}}$ Road Traffic Noise Levels – Indoor Play Rooms

Receptor Location	Calculated Noise Level $L_{eq, 1 \text{ hour}}$ (dBA)		Noise Criterion (dBA)	Compliance (Yes/No)
<i>Windows and Doors</i>	Open	Closed		
Indoor Play Room 1 (0-2 Years)	39	29	40	Yes/Yes
Indoor Play Room 2 (0-2 Years)	39	29	40	Yes/Yes
Indoor Play Room 3 (2-3 Years)	38	28	40	Yes/Yes
Indoor Play Room 4 (2-3 Years)	38	28	40	Yes/Yes
Indoor Play Room 5 (3-5 Years)	38	28	40	Yes/Yes
Indoor Play Room 6 (3-5 Years)	34	24	40	Yes/Yes

It can be seen that the calculated internal levels of road traffic noise are below the noise criteria established in Section 5.5, and is therefore acceptable, provided the building construction outlined in Section 6.4 is satisfactorily implemented.



8.0 NOISE CONTROL RECOMMENDATIONS

8.1 Management Plan

We recommend the Centre's management implement a Noise Management Plan that should include, but not be limited to, the following:

- Ensuring all staff and parents are provided with a copy of the Centre's Noise Management Plan and its implications for them during their time at the Centre.
- The name and contact details of the Centre's Manager should be clearly displayed at the front of the building to ensure neighbours can contact that person at any time the Centre is operating.
- Ensuring a sufficient number of educators are provided to supervise children's outside play to discourage unnecessarily loud activities.
- Carers/staff should be educated to control the level of their voice while outdoors.
- Facilitating children's small group play when outside, and encouraging educators to engage in children's play and facilitate friendships between children.
- Crying children should be comforted as quickly as possible and moved indoors.
- Staff arriving prior to 7 am and parking in the 'Staff' area should ensure they do not create unnecessary noise.

8.1.1 Indoor Activity Area Window/Door Closure

- Sliding doors in the southern façades of the 2-3 Year Old and 3-5 Year Old rooms should be closed when these rooms are in use, to limit the noise emission to nearby residences.
- Sliding doors in the western and northern façades of the 2-3 Year Old rooms should be closed when these rooms are in use, to limit the noise emission to nearby residences.

Glazed elements to remain closed are highlighted in the attached Appendix D. As these doors are required to be closed, alternative ventilation may need to be provided. Rooms are to be ventilated to the standards set out in clause F6D6 of the Building Code of Australia and Australian Standard AS1668.2. An air conditioning system with fresh air supply will satisfy this requirement.



8.1.2 Permissible Outdoor Play Scenarios

The maximum number of children in the outdoor play areas at any one time must be limited to one of the following scenarios:

Group A

- Up to 24 children, 0-2 years old; and
- Up to 35 children, 2-3 years old.

Group B

- Up to 20 children, 3-5 years old.

Staff to child ratios shall be maintained in accordance with the requirements stipulated in the National Quality Framework (NQF).

8.2 Sound Barrier Fences

The proposed sound barrier walls specified within Section 6.4 this report may be constructed from 3 rail 'solid capped and lapped' timber, 10 mm thick solid polycarbonate (not hollow), 6.38 mm thick laminated glass or masonry. The construction shall be free of visible air gaps to provide an impervious sound barrier.

If required, where an existing boundary fence is to be maintained (and is of sound construction), and to achieve the required vertical heights recommended in the following sections, a new upper portion of fence should be constructed on top of the existing fence. A transparent material such as 10 mm thick UV resistant solid polycarbonate (not hollow) may be used, cantilevered inwards at 45 degrees, as shown in Appendix E1. The construction shall be free of visible air gaps to provide an impervious sound barrier.

Alternatively, steel posts may be placed 0.5 to 1 metre stepped in from the existing fences and have 10 mm thick polycarbonate sheeting installed vertically on the outside of the steel posts and then angled inwards to the required vertical height. The vertical section is required to start a minimum of 0.5 or 1 metre (relative to distance from the boundary fence) below the maximum height of the existing fence line, as shown in Appendix E2.

We recommend the following barrier heights and locations:

8.2.1 Outdoor Play Areas – Recommended Sound Barrier Walls for Permissible Outdoor Play (Groups A and B)

- 2.1 metre high fence along the northern boundary of the 2-5 Year Old outdoor play area;
- 2.4 metre high fence along the western boundary of the 2-5 Year Old outdoor play area; and,
- 2.1 metre high fence along the southern boundary of the 0-2 Year Old and 2-5 Year Old outdoor play areas.



8.2.2 Site Boundary Fences

- 1.8 metre fence along the northern boundary of the Site along the boundary of the car park; and,
- 1.8 metre fence along the western boundary of the Site.

8.3 Mechanical Plant & Equipment – Construction Certificate

The specifications for the mechanical plant have not yet been selected for this development. For typical mechanical plant and equipment with sound power levels not exceeding those listed in Table 8, it is reasonable and feasible to acoustically treat the associated plant area (absorptive lining, etc) or equipment itself so that noise will not impact the neighbouring properties.

Once mechanical plant has been selected, a detailed acoustic assessment should be made, prior to the issue of a Construction Certificate. We recommend that the mechanical services engineers select mechanical plant equipment with the lowest sound power levels to reduce the amount of acoustic treatment necessary to achieve the noise criteria at nearby residential receivers.

The cumulative noise emissions from the mechanical plant system, and use of the indoor play areas and car park is not to exceed the project noise trigger levels specified in Section 5.5.

We offer to provide detailed noise controls when specifications of the mechanical plant equipment have been finalised.

Rooms are to be ventilated to the standards set out in clause F6D6 of the 2022 Building Code of Australia and Australian Standards AS1668.2.

8.4 Construction Disclaimer

Recommendations made in this report are intended to resolve acoustical problems only. We make no claims of expertise in other areas of building construction and therefore the recommended noise controls should be implemented into the building design in consultation with other specialists to ensure they meet the structural, fire, thermal or other aspects of building construction.

We encourage clients to check with us before using materials or equipment that are alternative to those specified in our Acoustical Report.

The integrity of acoustic structures is very dependent on installation techniques. Therefore, the use of contractors that are experienced in acoustic construction is encouraged.



9.0 PREDICTED NOISE LEVELS – AFTER NOISE CONTROLS

9.1 Outdoor Play Areas

Once the noise controls recommendations in Section 8.0 are incorporated into the operation of the Centre, the noise emission from the outdoor play area will be as shown in Table 16.

Table 16 Predicted L_{eq} , 15 minute Noise Levels – Outdoor Play – After Noise Controls

Receptor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
Group A			
R1 – 26 Bradford Drive	39	45	Yes
R2 – 24 Bradford Drive	28	45	Yes
R3a – 6 Ben Bullen Place	42	45	Yes
R3b – 6 Ben Bullen Place	42	45	Yes
R4 – 8 Ben Bullen Place	42	45	Yes
R5 – 15 Samuel Place	44	45	Yes
R6 – 12 Samuel Place	44	45	Yes
R7 – 28 Bradford Drive	43	45	Yes
Group B			
R1 – 26 Bradford Drive	41	45	Yes
R2 – 24 Bradford Drive	28	45	Yes
R3a – 6 Ben Bullen Place	39	45	Yes
R3b – 6 Ben Bullen Place	39	45	Yes
R4 – 8 Ben Bullen Place	41	45	Yes
R5 – 15 Samuel Place	45	45	Yes
R6 – 12 Samuel Place	45	45	Yes
R7 – 28 Bradford Drive	44	45	Yes



9.2 Indoor Play Areas

Once the noise control recommendations in Section 8.0 are incorporated into the operation of the Centre, the calculated cumulative sound pressure level from indoor play, car park and mechanical plant at the nearby residential receptors will be as shown in Table 17.

Table 17 Predicted Cumulative $L_{eq, 15 \text{ minute}}$ Noise Levels – Indoor Play, Mechanical Plant & Car Park – After Noise Controls

Receptor Location and Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 – 26 Bradford Drive			
- Indoor play areas	<20		
- Car park	27		
- Mechanical	33		
Cumulative Noise Level	34	38	Yes
R3a – 6 Ben Bullen Place			
- Indoor play area	34		
- Car park	20		
- Mechanical	22		
Cumulative Noise Level	35	40	Yes
R3b – 6 Ben Bullen Place			
- Indoor play area	34		
- Car park	<20		
- Mechanical	22		
Cumulative Noise Level	34	40	Yes
R4 – 8 Ben Bullen Place			
- Indoor play area	27		
- Car park	<20		
- Mechanical	<20		
Cumulative Noise Level	28	38	Yes
R5 – 15 Samuel Place			
- Indoor play areas	<20		
- Car park	<20		
- Mechanical	25		
Cumulative Noise Level	26	38	Yes



Table 17 Predicted Cumulative $L_{eq, 15 \text{ minute}}$ Noise Levels – Indoor Play, Mechanical Plant & Car Park – After Noise Controls – Continued

Receptor Location and Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R6 – 12 Samuel Place			
- Indoor play areas	<20		
- Car park	<20		
- Mechanical	28		
Cumulative Noise Level	28	38	Yes
R7 – 28 Bradford Drive			
- Indoor play areas	<20		
- Car park	<20		
- Mechanical	30		
Cumulative Noise Level	30	38	Yes



10.0 CONCLUSION

Day Design Pty Ltd was engaged by Greenscape Design on behalf of Dprojects Pty Ltd to assess the potential environmental noise impact from a proposed Child Care Centre to be constructed at 10 Ben Bullen Place, Goulburn, NSW.

Calculations show that the intrusive noise levels will meet the noise level requirements of the NSW Department of Planning and Environment's *Child Care Planning Guideline* and the Association of Australasian Acoustical Consultants' *Guideline for Child Care Centres Acoustic Assessment*, and be considered acceptable.

Calculations also show that, provided the noise control recommendations made in Section 8.0 of this report are implemented, the level of noise emitted by the proposed Child Care Centre at 10 Ben Bullen Place, Goulburn, NSW, will meet the acceptable noise level requirements of the Association of Australasian Acoustical Consultants' *Guideline for Child Care Centres Acoustic Assessment* and the Environmental Protection Authority's *NSW Road Noise Policy*, as detailed in Section 5.5 of this report, and is considered acceptable.



Ricky Thom, BA, BE(Mech)Hons, MIEAust

Acoustical Engineer

for and on behalf of Day Design Pty Ltd

AAAC MEMBERSHIP

Day Design Pty Ltd is a member company of the Association of Australasian Acoustical Consultants, and the work herein reported has been performed in accordance with the terms of membership.

APPENDICES

Appendix A – Instrumentation

Appendix B – Ambient Noise Survey

Appendix C – Architectural Drawings dated 14 November 2024

Appendix D – Approximate Noise Source Locations and Noise Control Recommendations
Mark-up

Appendix E – Sound Barrier Wall Boundary Treatment

AC108-1 to 4 – Glossary of Acoustical Terms



NOISE SURVEY INSTRUMENTATION

Noise level measurements and analysis in this report were made with instrumentation as follows:

Table A1 Noise Survey Instrumentation

Description	Model No	Serial No
Infobyte Noise Logger (Type 2)	iM4	117
Condenser Microphone 0.5" diameter	MK 250	117
Infobyte Noise Logger (Type 1)	iM4	120
Condenser Microphone 0.5" diameter	MK 250	15361
Acoustical Calibrator	B&K 4231	2095415

An environmental noise logger is used to continuously monitor ambient noise levels and provide information on the statistical distribution of noise during an extended period of time. The Infobyte Noise Monitor is a Type 1 or Type 2 precision environmental noise monitor meeting all the applicable requirements of AS1259 for an integrating-averaging sound level meter.

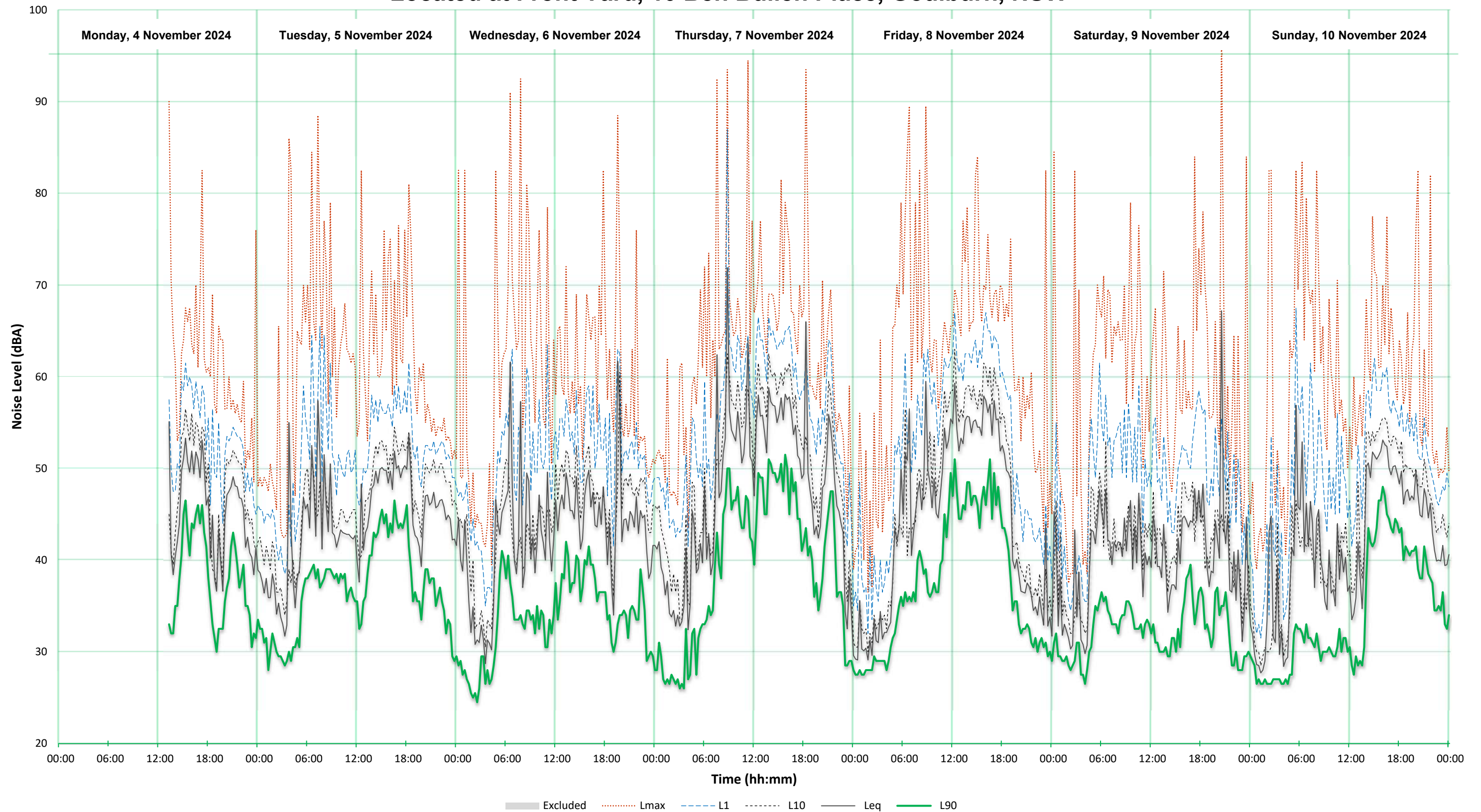
All instrument systems had been laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement system was also field calibrated prior to and after noise surveys. Calibration drift was found to be less than 1 dB during unattended measurements. No adjustments for instrument drift during the measurement period were warranted.



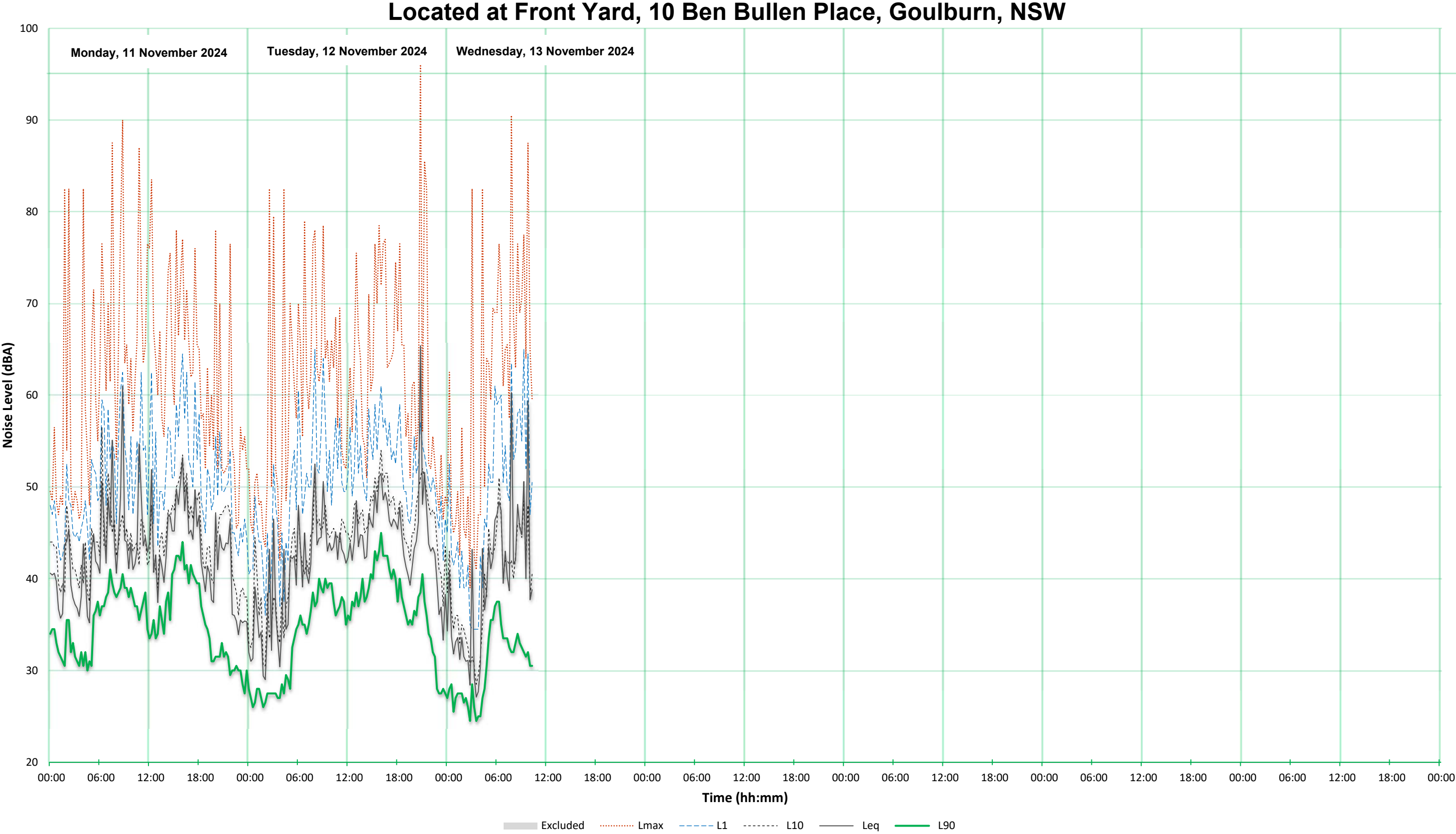
AMBIENT NOISE SURVEY

8086-1
Appendix B

Located at Front Yard, 10 Ben Bullen Place, Goulburn, NSW



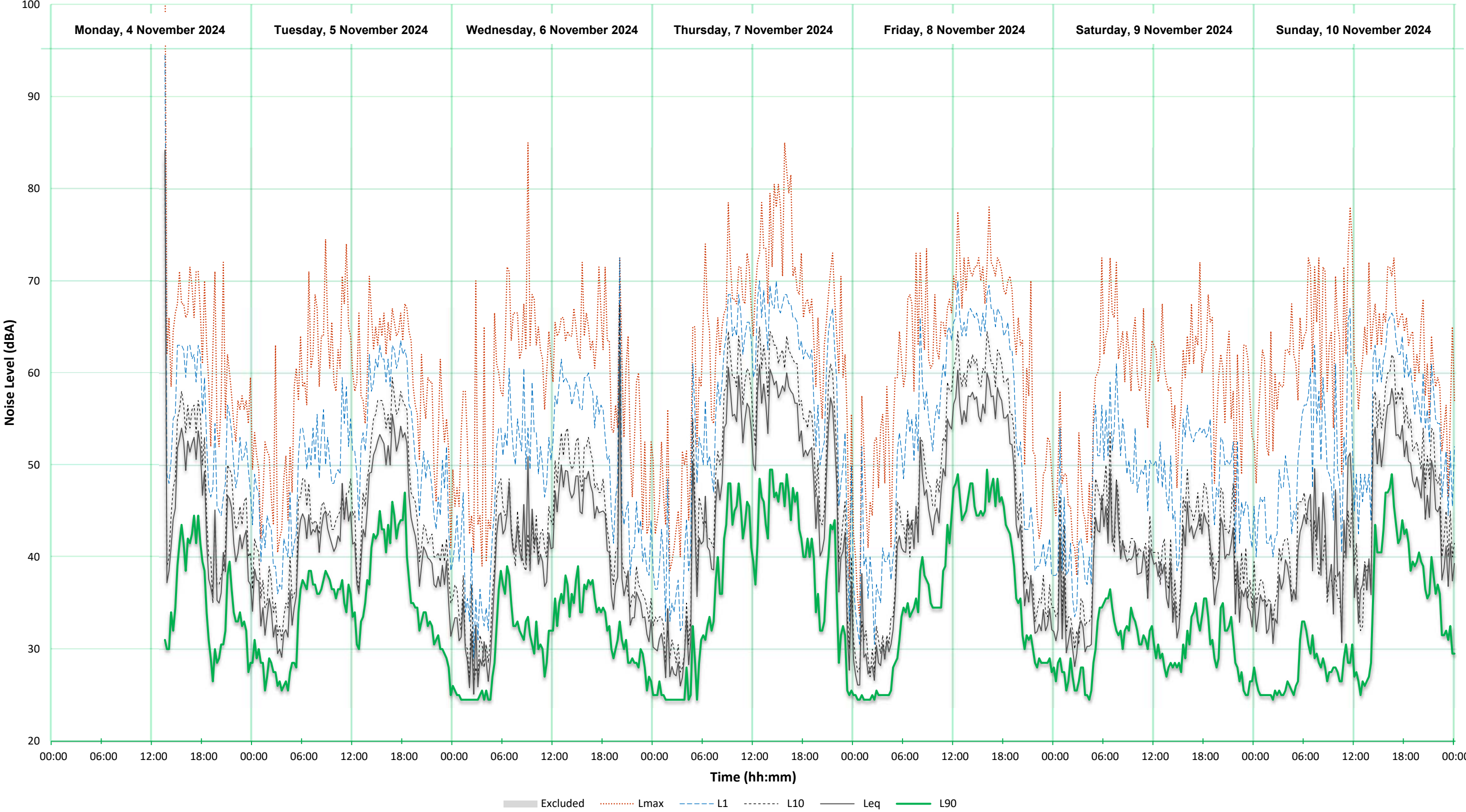
AMBIENT NOISE SURVEY



AMBIENT NOISE SURVEY

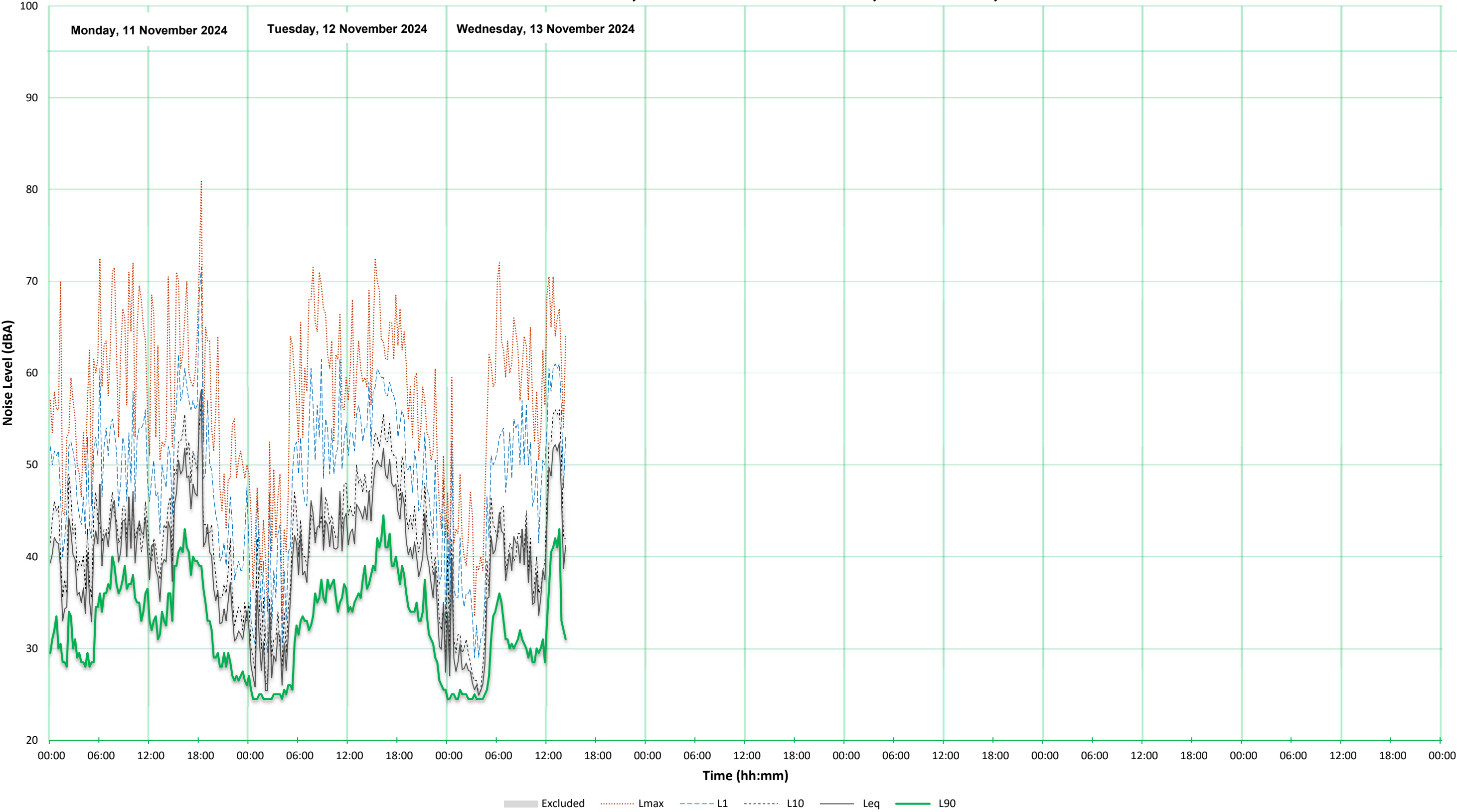
8086-1
Appendix B

Located at Rear Yard, 10 Ben Bullen Place, Goulburn, NSW



AMBIENT NOISE SURVEY

Located at Rear Yard, 10 Ben Bullen Place, Goulburn, NSW



SITE LEGEND

BOUNDARY

PEDESTRIAN ACCESS

VEHICLE ACCESS

EXISTING TREE TO REMAIN

1 SITE PLAN
1:150

FOR DA

- ALL BUILDING WORK TO COMPLY WITH BCA AND AS CODES AND RELEVANT AUTHORITIES REQUIREMENTS.
- ALL STEEL, CONCRETE AND TIMBER WORK TO BE IN ACCORDANCE WITH STRUCTURAL ENGINEERS SPECIFICATIONS AND RELEVANT SAA CODES.
- LARGER SCALE DRAWINGS TAKE PRECEDENCE OVER SMALLER.
- ALL DIMENSIONS TO BE CONFIRMED ON SITE. CONTACT THE ARCHITECT IF ANY DOUBT OR DISCREPANCY ARISES.
- READ FIGURED DIMENSIONS IN PREFERENCE TO SCALING.

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FOR	ISSUE	DATE	AMENDMENT	FOR	ISSUE	DATE	AMENDMENT	DRAWING
								DRAWN
								CO
								CHECKED
								DB
								APPROVED
								DB

CHILDCARE CENTRE AT 10 BEN BULLEN PI, GOULBURN NSW 2580	Scale:	As indicated @A1
SITE PLAN	Date:	14-11-2024
GREENSCAPE DESIGN & ASSOCIATES	Project Number :	241018
SUITE 1/175 JOHNSON ST, BYRON BAY, NSW 2481	Drawing Number :	DA101
INFO@GREENSCAPEDSIGN.COM.AU	Rev :	



FOR DA

- ALL BUILDING WORK TO COMPLY WITH BCA AND AS CODES AND RELEVANT AUTHORITIES REQUIREMENTS.
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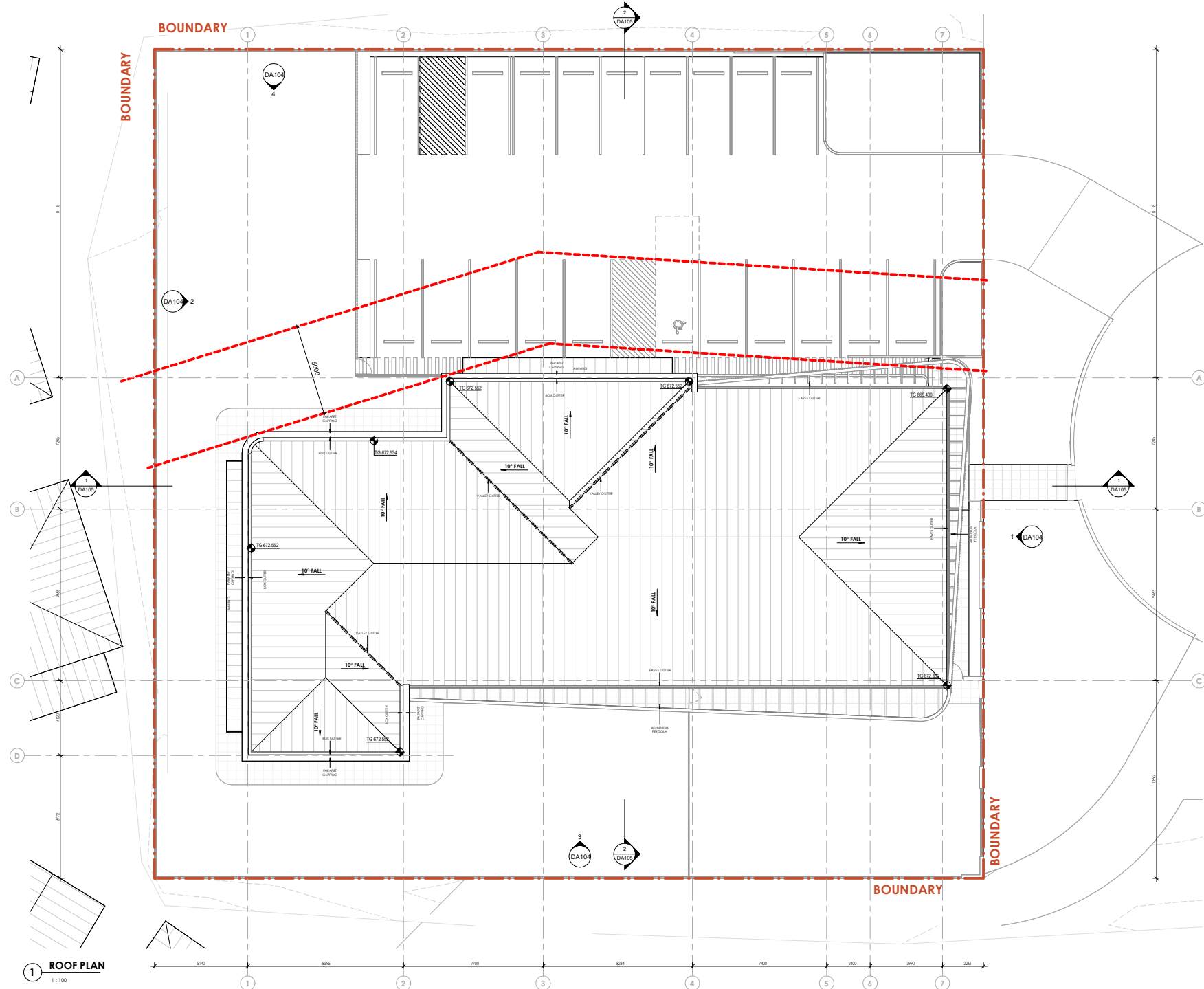
FOR	ISSUE	DATE	AMENDMENT	FOR	ISSUE	DATE	AMENDMENT

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	DRAWN: CG
	CHECKED DB
	APPROVED DB



CHILD CARE CENTRE AT 10 BEN BULLEN PI, GOULBURN NSW 2580
GROUND FLOOR PLAN
GREENSPACE & ASSOCIATES <small>SUITE 107 JOURNALITE DRIVE PMB 100/345M</small>

Scale:	1:100 @A1
Date:	14-11-2024
Project Number:	Drawing Number:
241018	DA102
Rev:	



1 ROOF PLAN
1:100

FOR DA

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FOR	ISSUE	DATE	AMENDMENT	FOR	ISSUE	DATE	AMENDMENT

DRAWN	CO
CHECKED	DB
APPROVED	DB

TRUE NORTH

CHILDCARE CENTRE AT 10 BEN BULLEN PL, GOULBURN NSW 2580

ROOF PLAN

GREENSCAPE DESIGN & ASSOCIATES

SUITE 1/175 JOHNSON ST, BYRON BAY, NSW 2481

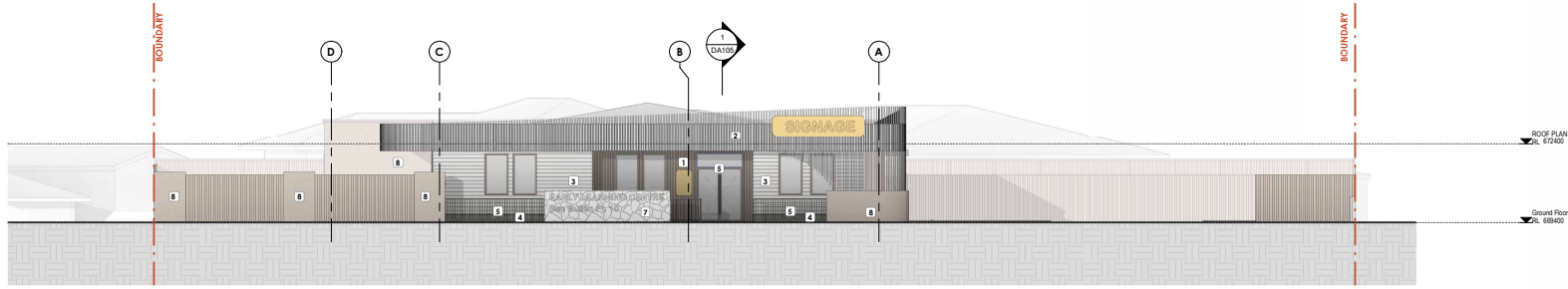
INFO@GREENSCAPEDSIGN.COM.AU

Scale:	1:100 @A1
Date:	14-11-2024
Project Number:	241018
Drawing Number:	DA103
Rev:	

MATERIALS LEGEND	
	1 ALUMINUM CLICK-ON CLADDING PROFILE: SCOUTPRO 3000 R3000 COLOR: DARK GREY CONCRETE METALLIC - 117125M HATT DETAILS: APPROVED BY ARCHITECT
	2 ALUMINUM SCREENS PROFILE: SCOUTPRO 3000 R3000 COLOR: NATURAL WHITE PAINTING WITH WHITE CONCRETE CLADDING
	3 FIBRE CEMENT CLADDING PROFILE: SHED AREA 1000X2000 COLOR: DARK GREY CONCRETE METALLIC - 117125M HATT
	4 CONCRETE PLINTH COLOR: NATURAL RECONCRETE
	5 METAL FENCING & DOOR AND WINDOW FRAMES COLOR: DARK GREY CONCRETE METALLIC - 117125M HATT DETAILS: APPROVED BY ARCHITECT
	6 STEEL ROOFING, FASCIA'S GUTTER & DOWNPIPES COLOR: COLORBOND BLAZE GREY
	7 NATURAL STONE WALL CLADDING PROFILE: LUCAS STONE - WHITE SANDSTONE

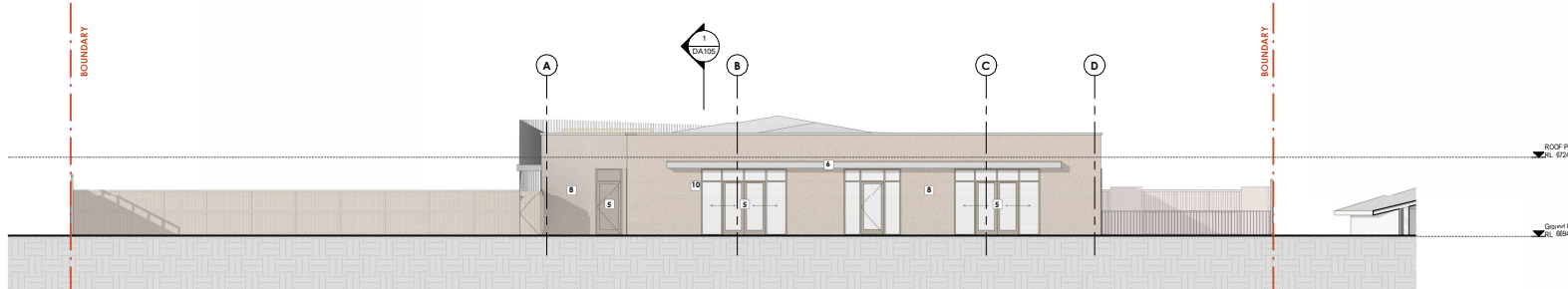
1 NORTH Elevation

1 : 100



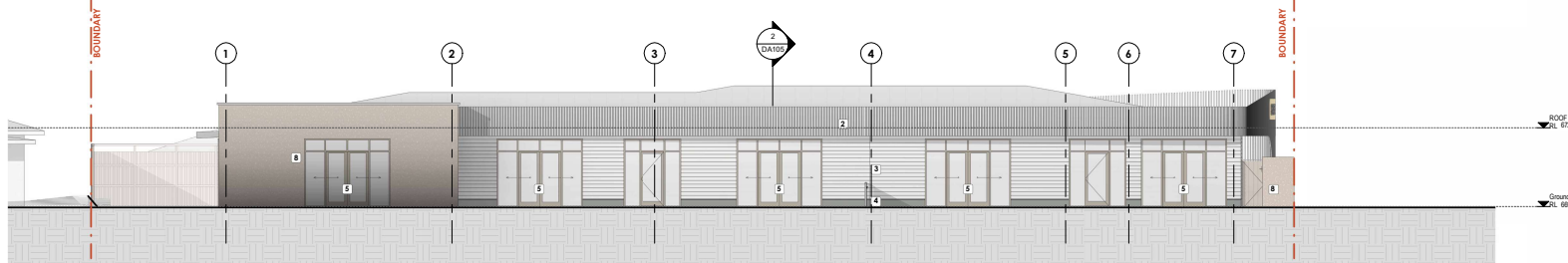
2 SOUTH Elevation

1 : 100



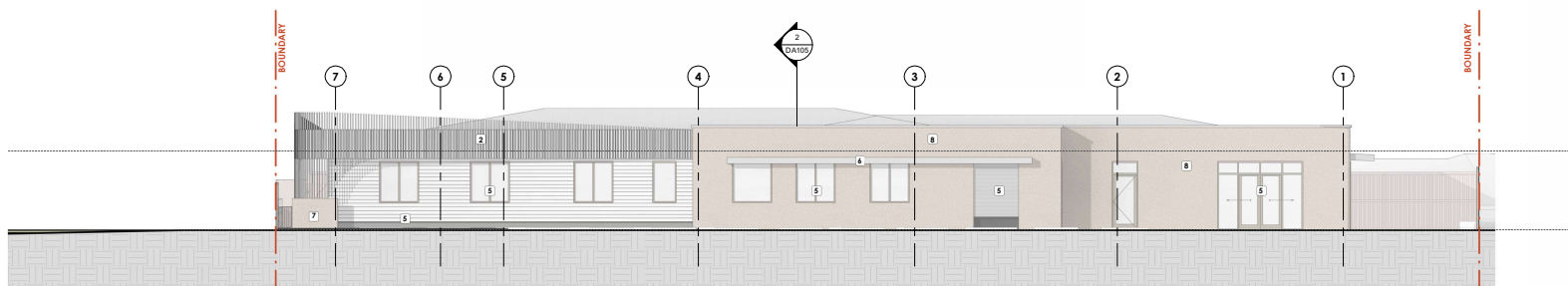
3 EAST Elevation

1 : 100



4 WEST Elevation

1 : 100



MATERIALS LEGEND

	1 ALUMINUM CLICK-ON CLADDING PROFILE: SCAPTION DOWN-BLOCKS COLOUR: DARK GREY (TIMBER COMPLEMENTAL - 177788) HART OR SIMILAR APPROVED BY ARCHITECT
	2 ALUMINUM SCREENS PROFILE: SCAPTION DOWN-BLOCKS COLOUR: NATURAL WHITE (MATCHING WITH FIBRE CEMENT CLADDING)
	3 FIBRE CEMENT CLADDING PROFILE: SCAPTION DOWN-BLOCKS COLOUR: LIGHT GREY (TIMBER COMPLEMENTAL - 177788) HART OR SIMILAR APPROVED BY ARCHITECT
	4 CONCRETE PLINTH COLOUR: NATURAL BECON FRESH
	5 METAL FENCING & DOOR AND WINDOW FRAMES COLOUR: DARK GREY (TIMBER COMPLEMENTAL - 177788) HART OR SIMILAR APPROVED BY ARCHITECT
	6 STEEL ROOFING, FASCIA GUTTERS & DOWNPIPES COLOUR: COLORBOND SHAD GREY
	7 NATURAL STONE WALL CLADDING PATTERN: LODGE STONE WHITE SANDSTONE
	8 RENDER COLOUR: BRICK LIGHT BROWN, MATCHING WITH STONE WALL CLADDING

FOR DA

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FOR	ISSUE	DATE	AMENDMENT	FOR	ISSUE	DATE	AMENDMENT	DRAFTING
								DRN: CO
								CHK: DB
								APP: DB



CHILD CARE CENTRE AT 10 BEN BULLEN PI, GOULBURN NSW 2580	Scale: 1 : 100 @A1
ELEVATIONS	Date: 14-11-2024
GREENSCAPE DESIGN & ASSOCIATES	Project Number : 241018 Drawing Number : DA104 Rev :
SUITE 1/175 JOHNSON ST, BYRON BAY, NSW 2481	INFO@GREENSCAPEDSIGN.COM.AU

CHILD CARE AREA AND OCCUPATION CALCULATIONS

Age Group	No. of Kids	Req. Indoor	Prop. Indoor	Req. Outdoor	Prop. Outdoor	Staff	RMS
0-2	24	78.0m ²	83.70m ²	148m ²	170.28m ²	6	4
2-3	35	113.75m ²	113.97m ²	525m ²	90.25m ²	7	6
3-5	40	130m ²	130.19m ²			4	7
TOTAL	99	321.75 m²	327.86m²	693m²	762.53m²	17	19

PARKING

PARKING:	REQUIREMENTS
STAFF MEMBERS:	1 PER MEMBER
VISITORS:	1 PER 6 CHILDREN
PROPOSED:	25 PARKING SPOTS
STAFF MEMBERS:	16
VISITORS:	8 + 1 DISABLED

CHILD CARE REQ STORAGE CALCULATIONS

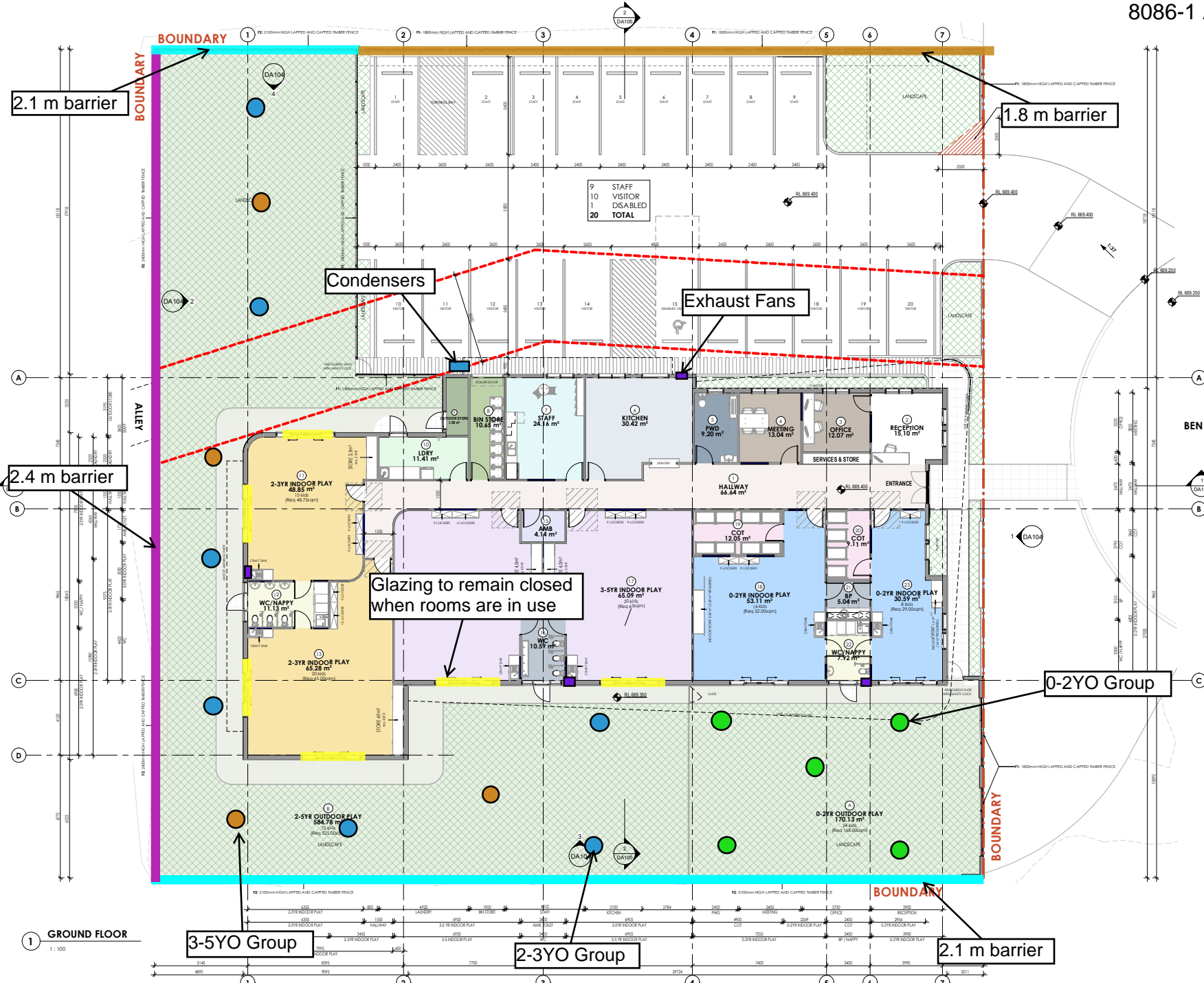
Age Group	No. of Kids	Req. Indoor	Prop. Indoor	Req. Outdoor	Prop. Outdoor
0-2	24	4.80m ³	4.80m ³	7.20m ³	7.20m ³
2-3	35	7.00m ³	6.40m ³	10.50m ³	22.50m ³
3-5	40	8.00m ³	6.40m ³	12.00m ³	
TOTAL	99	19.80m³	21.60m³	29.70m³	29.70m³

FACILITIES

JUNIOR SANITARY FACILITIES		
TOILETS		
0-2 YR OLD: 1 PER CHILDCARE	PROPOSED	COMPLIES
2-3 YR OLD: 1 PER 10 CHILDREN	4	YES
3-5 YR OLD: 1 PER 10 CHILDREN	4	YES
BATHS		
0-2 YR OLD: 1 PER CHILDCARE	1	YES
2-3 YR OLD: 1 PER 10 CHILDREN	4	YES
3-5 YR OLD: 1 PER 10 CHILDREN	4	YES
NAPPY CHANGE		
0-2 YR OLD: REQUIRED	1	YES
2-3 YR OLD: REQUIRED	1	YES
3-5 YR OLD: NOT REQUIRED	-	-
BOTTLE PREP		
0-2 YR OLD: REQUIRED	1	COMPLIES
0-3 YR OLD: REQUIRED	1	COMPLIES
LAUNDRY		
0-3 YR OLD: REQUIRED	1	YES
ADULT SANITARY FACILITIES		
REQUIRED FOR 14 STAFF	PROPOSED	COMPLIES
1 UNisex FACILITY YES	1	SHOWER
FOOD PREP/KITCHEN		
REQUIRED	1	COMPLIES
	1	YES

AREA

TOTAL	2081.45m²
Proposed Building	1438m ²
Proposed Outdoor	643m ²
TOTAL	450m²



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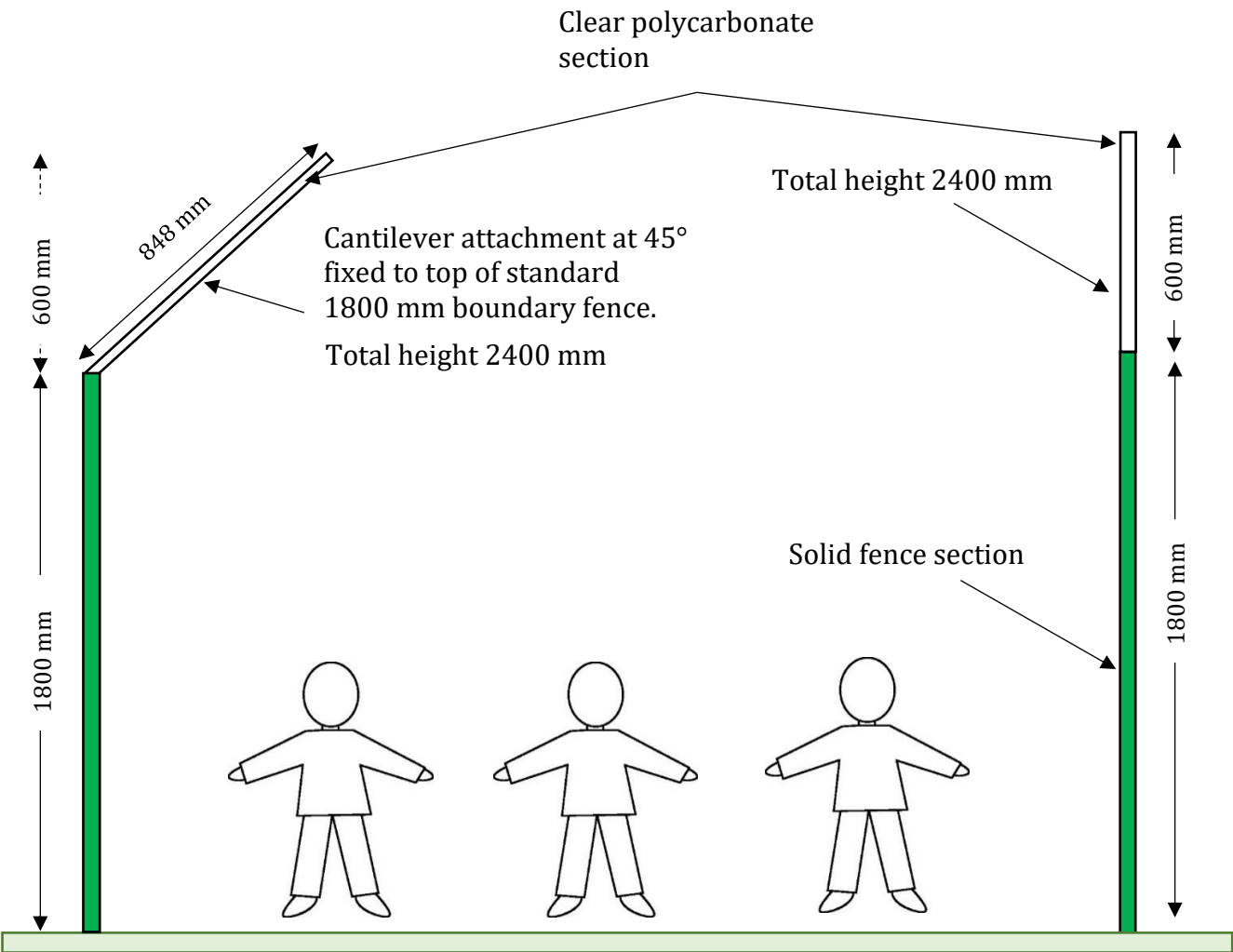


FOR	ISSUE	DATE	AMENDMENT	FOR	ISSUE	DATE	AMENDMENT
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	APPROVED				APPROVED		



CHILDCARE CENTRE AT 10 BEN BULLEN PL, GOULBURN NSW 2580	Scale:	1:100 @A1
GROUND FLOOR PLAN	Date:	14-11-2024
GREENSCAPE DESIGN & ASSOCIATES	Project Number:	241018
SUITE 1/15 JONSON ST, BYRON BAY, NSW 2481	Drawing Number:	DA102
INFO@GREENSCAPEDSIGN.COM.AU	Rev:	

OUTDOOR PLAY AREA

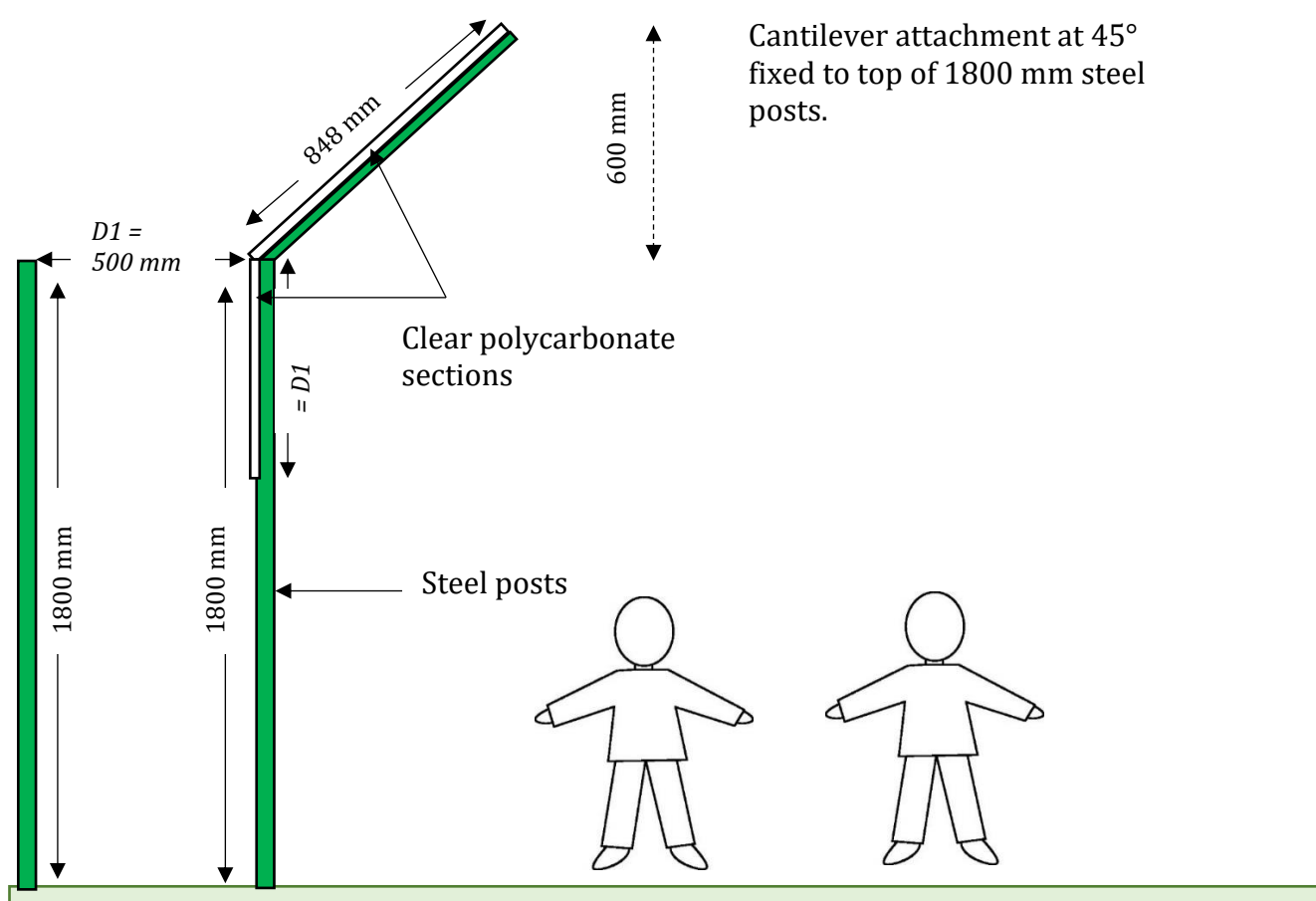


Not To Scale



OUTDOOR PLAY AREA

Total height 2400 mm



Not To Scale

ACOUSTICAL – Pertaining to the science of sound, including the generation, propagation, effects and control of both noise and vibration.

AMBIENT NOISE – The ambient noise level at a particular location is the overall environmental noise level caused by all noise sources in the area, both near and far, including road traffic, factories, wind in the trees, birds, insects, animals, etc.

AUDIBLE – means that a sound can be heard. However, there are a wide range of audibility grades, varying from “barely audible” to “just audible”, “clearly audible” and “prominent”. Chapter 83 of the NSW Environment Protection Authority – Environmental Noise Control Manual (1985) states:

“noise from a particular source might be offensive if it is clearly audible, distinct from the prevailing background noise and of a volume or character that a reasonable person would be conscious of the intrusion and find it annoying or disruptive”.

It follows that the word “audible” in an environmental noise context means “clearly audible”.

BACKGROUND NOISE LEVEL – Silence does not exist in the natural or the built-environment, only varying degrees of noise. The Background Noise Level is the average minimum dBA level of noise measured in the absence of the noise under investigation and any other short-term noises such as those caused by cicadas, lawnmowers, etc. It is quantified by the L_{A90} or the dBA noise level that is exceeded for 90 % of the measurement period (usually 15 minutes).

- **Assessment Background Level (ABL)** is the single figure background level representing each assessment period – day, evening and night (ie three assessment background levels are determined for each 24hr period of the monitoring period). Determination of the assessment background level is by calculating the tenth percentile (the lowest tenth percent value) of the background levels (L_{A90}) for each period (refer: NSW Industrial Noise Policy, 2000).
- **Rating Background Level (RBL)** as specified by the Environment Protection Authority is the overall single figure (L_{A90}) background noise level representing an assessment period (day, evening or night) over a monitoring period of (normally) three to seven days.

The RBL for an assessment period is the median of the daily lowest tenth percentile of L_{90} background noise levels.

If the measured background noise level is less than 30 dBA, then the Rating Background Level (RBL) is considered to be 30 dBA.

DECIBEL – The human ear has a vast sound-sensitivity range of over a thousand billion to one. The decibel is a logarithmic unit that allows this same range to be compressed into a somewhat more comprehensible range of 0 to 120 dB. The decibel is ten times the logarithm of the ratio of a sound level to a reference sound level. See also Sound Pressure Level and Sound Power Level.

Decibel noise levels cannot be added arithmetically since they are logarithmic numbers. If one machine is generating a noise level of 50 dBA, and another similar machine is placed beside it, the level will increase to 53 dBA, not 100 dBA. Ten similar machines placed side by side increase the sound level by 10 dBA, and one hundred machines increase the sound level by 20 dBA.

dBA – The human ear is less sensitive to low frequency sound than high frequency sound. We are most sensitive to high frequency sounds, such as a child’s scream. Sound level meters have an inbuilt weighting network, termed the dBA scale, that approximates the human loudness response at quiet sound levels (roughly approximates the 40 phon equal loudness contour).



However, the dBA sound level provides a poor indication of loudness for sounds that are dominated by low frequency components (below 250 Hz). If the difference between the “C” weighted and the “A” weighted sound level is 15 dB or more, then the NSW Industrial Noise Policy recommends a 5 dBA penalty be applied to the measured dBA level.

dbc – The dbc scale of a sound level meter is similar to the dBA scale defined above, except that at high sound intensity levels, the human ear frequency response is more linear. The dbc scale approximates the 100 phon equal loudness contour.

EQUIVALENT CONTINUOUS NOISE LEVEL, L_{Aeq} – Many noises, such as road traffic or construction noise, vary continually in level over a period of time. More sophisticated sound level meters have an integrating electronic device inbuilt, which average the A weighted sound pressure levels over a period of time and then display the energy average or L_{Aeq} sound level. Because the decibel scale is a logarithmic ratio the higher noise levels have far more sound energy, and therefore the L_{Aeq} level tends to indicate an average which is strongly influenced by short term, high level noise events. Many studies show that human reaction to level-varying sounds tends to relate closely to the L_{Aeq} noise level.

FREE FIELD – This is a sound field not subject to significant reflection of acoustical energy. A free field over a reflecting plane is usually outdoors with the noise source resting on hard flat ground, and not closer than 6 metres to any large flat object such as a fence or wall; or inside an anechoic chamber.

FREQUENCY – The number of oscillations or cycles of a wave motion per unit time, the SI unit being the Hertz, or one cycle per second.

IMPACT ISOLATION CLASS (IIC) – The American Society for Testing and Materials (ASTM) has specified that the IIC of a floor/ceiling system shall be determined by operating an ISO 140 Standard Tapping Machine on the floor and measuring the noise generated in the room below. The IIC is a number found by fitting a reference curve to the measured octave band levels and then deducting the sound pressure level at 500 Hz from 110 decibels. Thus the higher the IIC, the better the impact sound isolation.

IMPACT SOUND INSULATION ($L_{nT,w}$) – Australian Standard AS ISO 717.2 – 2004 has specified that the Impact Sound Insulation of a floor/ceiling system be quantified by operating an ISO 140 Standard Tapping Machine on the floor and measuring the noise generated in the room below. The Weighted Standardised Impact Sound Pressure Level ($L_{nT,w}$) is the sound pressure level at 500 Hz for a reference curve fitted to the measured octave band levels. Thus the lower $L_{nT,w}$ the better the impact sound insulation.

IMPULSE NOISE – An impulse noise is typified by a sudden rise time and a rapid sound decay, such as a hammer blow, rifle shot or balloon burst.

INTRUSIVE NOISE LEVEL, L_{Aeq} – The level of noise from a factory, place of entertainment, etc. in NSW is assessed on the basis of the average maximum noise level, or the L_{Aeq} (15 min). This is the energy average A weighted noise level measured over any 15 minute period.

LOUDNESS – The degree to which a sound is audible to a listener is termed the loudness. The human ear perceives a 10 dBA noise level increase as a doubling of loudness and a 20 dBA noise increase as a quadrupling of the loudness.



MAXIMUM NOISE LEVEL, L_{Amax} – The rms maximum sound pressure level measured on the "A" scale of a sound level meter during a noise survey is the L_{Amax} noise level. It may be measured using either the Fast or Slow response time of the meter. This should be stated.

NOISE RATING NUMBERS – A set of empirically developed equal loudness curves has been adopted as Australian Standard AS1469-1983. These curves allow the loudness of a noise to be described with a single NR number. The Noise Rating number is that curve which touches the highest level on the measured spectrum of the subject noise. For broadband noise such as fans and engines, the NR number often equals the dBA level minus five.

NOISE – Noise is unwanted sound. Sound is wave motion within matter, be it gaseous, liquid or solid. "Noise includes sound and vibration".

NOISE REDUCTION COEFFICIENT – See: "Sound Absorption Coefficient".

OFFENSIVE NOISE - (Reference: Dictionary of the Protection of the Environment Operations Act 1997). *"Offensive Noise means noise:*

- (a) that, by reason of its level, nature, character or quality, or the time at which it is made, or any other circumstances:*
 - (i) is harmful to (or likely to be harmful to) a person who is outside the premise from which it is emitted, or*
 - (ii) interferes unreasonably with (or is likely to interfere unreasonably with) the comfort or repose of a person who is outside the premises from which it is emitted, or*
- (b) that is of a level, nature, character or quality prescribed by the regulations or that is made at a time, or in other circumstances prescribed by the regulations."*

PINK NOISE – Pink noise is a broadband noise with an equal amount of energy in each octave or third octave band width. Because of this, Pink Noise has more energy at the lower frequencies than White Noise and is used widely for Sound Transmission Loss testing.

REVERBERATION TIME, T_{60} – The time in seconds, after a sound signal has ceased, for the sound level inside a room to decay by 60 dB. The first 5 dB decay is often ignored, because of fluctuations that occur while reverberant sound conditions are being established in the room. The decay time for the next 30 dB is measured and the result doubled to determine the T_{60} . The Early Decay Time (EDT) is the slope of the decay curve in the first 10 dB normalised to 60 dB.

SOUND ABSORPTION COEFFICIENT, α – α Sound is absorbed in porous materials by the viscous conversion of sound energy to heat energy as the sound waves pass through it. Sound is similarly absorbed by the flexural bending of internally damped panels. The fraction of incident energy that is absorbed is termed the Sound Absorption Coefficient, α . An absorption coefficient of 0.9 indicates that 90 % of the incident sound energy is absorbed. The average α from 250 to 2000 Hz is termed the Noise Reduction Coefficient (NRC).

SOUND ATTENUATION – If an enclosure is placed around a machine, or a silencer is fitted to a duct, the noise emission is reduced or attenuated. An enclosure that attenuates the noise level by 30 dBA, reduces the sound energy by one thousand times.

SOUND EXPOSURE LEVEL (SEL) – The total sound energy of a single noise event condensed into a one second duration or in other words it is an L_{eq} (1 sec).



SOUND PRESSURE LEVEL, L_p – The level of sound measured on a sound level meter and expressed in decibels, dB, dBA, dBC, etc. $L_p = 20 \times \log (P/P_0) \dots \text{dB}$

where P is the rms sound pressure in Pascal and P_0 is a reference sound pressure of 20 μPa .
 L_p varies with distance from a noise source.

SOUND POWER LEVEL, L_w – The Sound Power Level of a noise source is an absolute that does not vary with distance or with a different acoustic environment.

$$L_w = L_p + 10 \log A \dots \text{dB, re: } 1\text{pW,}$$

where A is the measurement noise-emission area in square metres in a free field.

SOUND TRANSMISSION CLASS (STC) – An internationally standardised method of rating the sound transmission loss of partition walls to indicate the decibels of noise reduction of a human voice from one side to the other. (Refer: Australian Standard AS1276 – 1979)

SOUND TRANSMISSION LOSS – The amount in decibels by which a random sound is reduced as it passes through a sound barrier. A method for the measurement of airborne Sound Transmission Loss of a building partition is given in Australian Standard AS1191 - 2002.

STATISTICAL EXCEEDENCE SOUND LEVELS, L_{A90} , L_{A10} , L_{A1} , etc – Noise which varies in level over a specific period of time (usually 15 minutes) may be quantified in terms of various statistical descriptors:

The L_{A90} is the dBA level exceeded for 90 % of the time. In NSW the L_{A90} is measured over periods of 15 minutes, and is used to describe the average minimum or background noise level.

The L_{A10} is the dBA level that is exceeded for 10 % of the time. In NSW the L_{A10} measured over a period of 10 to 15 minutes. It was until recently used to describe the average maximum noise level, but has largely been replaced by the L_{Aeq} for describing level-varying noise.

The L_{A1} is the dBA level that is exceeded for 1 % of the time. In NSW the L_{A1} may be used for describing short-term noise levels such as could cause sleep arousal during the night.

STEADY NOISE – Noise, which varies in level by 6 dBA or less, over the period of interest with the time-weighting set to “Fast”, is considered to be “steady”. (Refer AS 1055.1 1997)

WEIGHTED SOUND REDUCTION INDEX, R_w – This is a single number rating of the airborne sound insulation of a wall, partition or ceiling. The sound reduction is normally measured over a frequency range of 100 to 3,150 Hertz and averaged in accordance with ISO standard weighting curves (Refer AS/NZS 1276.1:1999).

Internal partition wall $R_w + C$ ratings are frequency weighted to simulate insulation from human voice noise. The $R_w + C$ is always similar in value to the STC rating value. External walls, doors and windows may be $R_w + C_{tr}$ rated to simulate insulation from road traffic noise. This is normally a lower number than the STC rating value.

WHITE NOISE – White noise is broadband random noise whose spectral density is constant across its entire frequency range. The sound power is the same for equal bandwidths from low to high frequencies. Because the higher frequency octave bands cover a wider spectrum, white noise has more energy at the higher frequencies and sounds like a hiss.

