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Environmental Noise Impact Assessment

Proposed Child Care Centre

39 Carnation Avenue, Bankstown, NSW

REPORT No
7786-1.1R REV A

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CONTENTS

TABLES

1.0 EXECUTIVE SUMMARY

A new child care centre (The Centre) is proposed to be constructed at 39 Carnation Avenue, Bankstown, NSW (the Site). The Site is located on land zoned R2 - Low Density Residential under Canterbury-Bankstown Local Environment Plan 2023.

The Site is bounded by a residential premises to the north, east and west; and Carnation Avenue to the south. Residential properties are also located on the opposite side of Carnation Avenue to the south. The Site and nearby receptors are shown in Figure 1.

The proposal will involve construction of a new two-storey child care centre building. The Centre will comprise of two outdoor play areas, three indoor play areas, office, reception, staff room, kitchen and amenities. The indoor play rooms are located on the ground and first floor levels with a basement car park with capacity for 10 vehicles.

The Centre will have a total capacity for 40 children, comprising of:

- 0-2 years old – 8 children;
- 2-3 years old – 12 children; and
- 3-5 years old – 20 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.

Canterbury-Bankstown 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 ArtMade Architects to assess the potential environmental noise impact from a proposed Child Care Centre to be constructed at 39 Carnation Avenue, Bankstown, 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 39 Carnation Avenue, Bankstown, NSW. The Site is located on land zoned R2 - Low Density Residential under Canterbury-Bankstown Local Environment Plan 2023.

The Site is bounded by a residential premises to the north, east and west; and Carnation Avenue to the south. Residential properties are also located on the opposite side of Carnation Avenue to the south. 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 - Residential - RL 25.9 1.5 m above ground level - 3 m from boundary	184 South Terrace	North
R2 - Residential - RL 25.8 1.5 m above ground level - 3 m from boundary	182 South Terrace	North East
R3A - Residential - RL 28.0 4.5 m above ground level - 1 m from boundary	37A Carnation Avenue	East
R3B - Residential - RL 23.8 1.5 m above ground level - 3 m from boundary	37A Carnation Avenue	East
R4 - Residential - RL 22.5 1.5 m above ground level - 3 m from boundary	46A Carnation Avenue	South
R5A - Residential - RL 23.1 1.5 m above ground level - 3 m from boundary	41 Carnation Avenue	West
R5B - Residential - RL 24.0 1.5 m above ground level - 3 m from boundary	41 Carnation Avenue	West
R6 - Residential - RL 24.1 1.5 m above ground level - 3 m from boundary	41A Carnation Avenue	West

Table 1 Noise Sensitive Receptors (Continued)

Receiver, Type & Location	Address	Direction from site
R7 - Residential - RL 24.7 1.5 m above ground level - 3 m from boundary	186 South Terrace	North West

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.

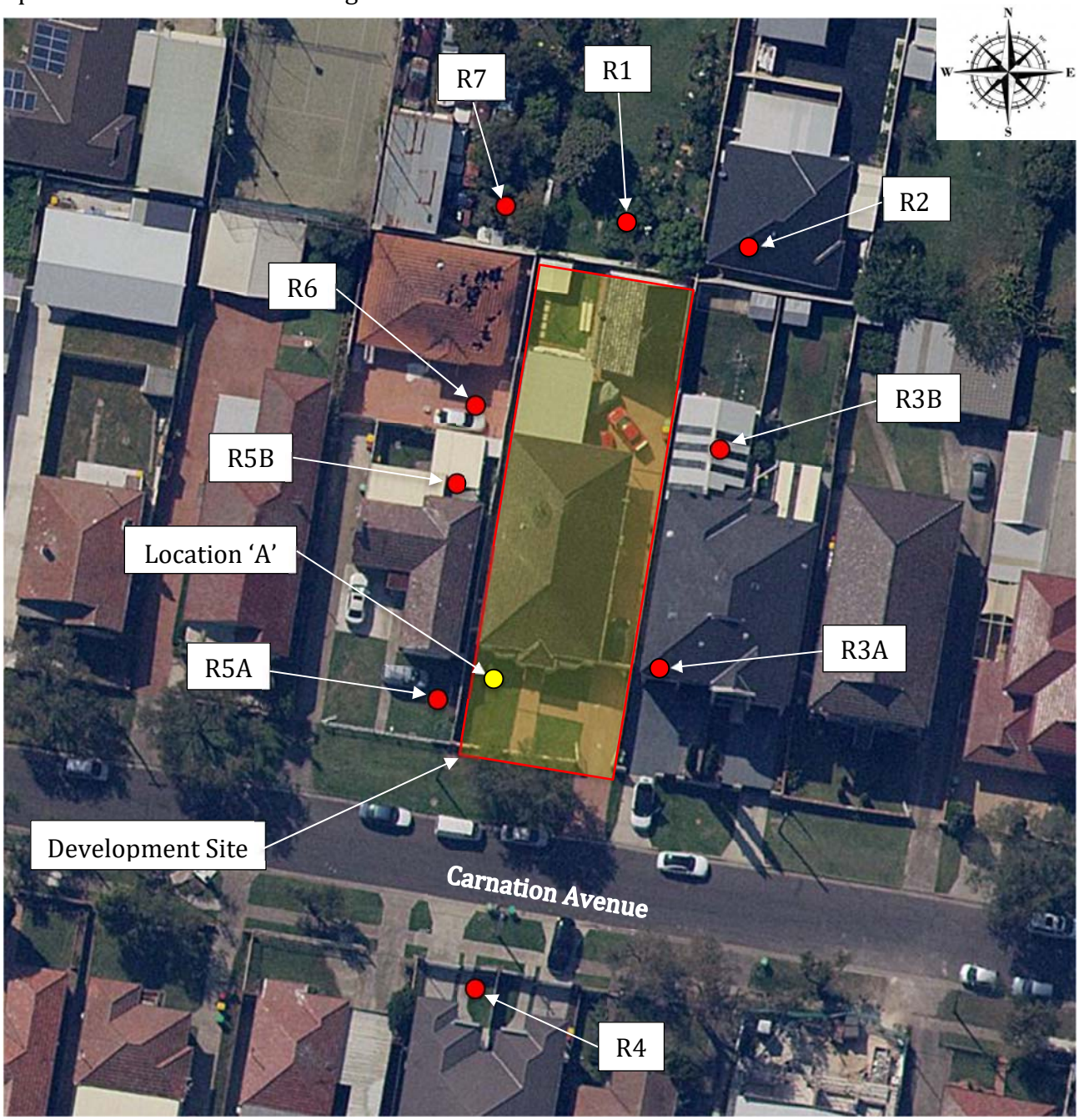


Figure 1 – Site Plan - 39 Carnation Avenue, Bankstown, NSW

3.2 Development Description

The proposal will involve construction of a new two-storey child care centre building. The Centre will comprise of two outdoor play areas, three indoor play areas, office, reception, staff room, kitchen and amenities. The indoor play rooms are located on the ground and first floor levels with a basement car park with capacity for 10 vehicles.

The proposed layout of the Centre can be seen in the architectural drawings prepared by ArtMade Architects, 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 40 children, comprising of:

- 0-2 years old – 8 children;
- 2-3 years old – 12 children; and
- 3-5 years old – 20 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.'*

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

An environmental noise monitor was placed at Location 'A' in the front yard of 39 Carnation Avenue, Bankstown, NSW, from Friday 5 May to Friday 12 May 2023, to determine the Rating Background Level. The microphone height was approximately 1.5 metres above ground level. This measured representative noise environment has been used to establish the relevant criteria for all other sensitive receivers.

As the Centre is not proposed to operate on weekends, ambient noise levels measured on weekends have been excluded from the assessment period.

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

Table 2 Ambient Background Levels – 39 Carnation Avenue, Bankstown, NSW

Noise Measurement Location	Time Period	L_{90} Rating Background Level
Location 'A'	Early Morning (6:30 am to 7 am)	**51 dBA**
	Day (7 am to 6 pm)	**42 dBA**

Meteorological conditions during the measurement surveys typically consisted of clear skies with temperatures ranging from 6°C to 24°C, at Carnation Avenue, Bankstown.

Noise level measurements adversely affected by weather conditions have been removed from calculations, where required[1]. Therefore, noise level measurements are otherwise considered reliable and representative of the background noise levels at all nearby receptor locations.

Short term ambient noise measurements were also conducted on Friday 12 May 2023 between 1.41 pm and 2.11 pm, at ground and first floor levels at Location 'A', in order to determine the noise level difference between ground and first floor heights. The result of this noise survey is shown below in Table 3.

Table 3 Short-term Rating and Ambient Background Levels

Location	Time Period	L_{90} Rating Background Level (dBA)
Location 'A'		
Ground Floor	1.41 pm – 1.56 pm	**39**
First Floor		**43**
Ground Floor	1.56 pm – 2.11 pm	**40**
First Floor		**43**

As seen in Table 3, a 3 dB level difference in L_{90} Rating Background Level was recorded between ground and first floor levels throughout the short-term monitoring period. As such, it is found that L_{90} noise levels at the first-floor level are:

Location 'A'

- (51 + 3 =) **54 dBA** $L_{90,}$ in the early morning; and
- (42 + 3 =) **45 dBA** L_{90} during the day.

[1] *Section B1.3 of the EPA's NSW Noise Policy for Industry, under 'Exception' states, 're-monitoring may not be required, where monitoring contains weather-affected data, if it can be ascertained that the affected samples are not within the expected 'quieter' times of an assessment period (day/evening/night); that is, those time periods where the lowest 10th percentile background noise level might occur.'*

4.2 Measured Road Traffic Noise Levels

The proposed development is affected by local road traffic noise from Carnation Avenue which carries low traffic volumes.

The weekday $L_{Aeq,\ 1\ hour}$ traffic noise levels measured at Location 'A' are shown below in Table 4.

Table 4 Measured $L_{Aeq,\ 1\ hour}$ Road Traffic Sound Pressure Levels – Location 'A'

Time	$L_{Aeq,\ 1\ hour}$ Road Traffic Noise (dBA)					
	Fri 05/05	Mon 08/05	Tue 09/05	Wed 10/05	Thu 11/05	Fri 12/05
7 – 8 am	-	53	54	57	53	50
8 – 9 am	-	54	53	52	52	50
9 – 10 am	-	56	54	54	49	49
10 – 11 am	-	58	53	50	48	48
11 – 12 pm	47	55	53	53	55	49
12 – 1 pm	48	53	52	49	66	51
1 – 2 pm	64	53	55	49	47	52
2 – 3 pm	49	53	53	51	50	-
3 – 4 pm	47	*51*	51	51	49	-
4 – 5 pm	49	54	53	52	50	-
5 – 6 pm	57	51	55	50	47	-

Based on the long-term measurements at Location 'A', and the calculation method show in Appendix B, Section B3 of the NSW Road Noise Policy for the 'overall $L_{Aeq,\ (1\ hour)}$', the calculated day time traffic noise level is 55 dBA at Location 'A'.

5.0 ACOUSTIC CRITERIA

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

5.1 Canterbury Bankstown Council Requirements

Canterbury Bankstown Council, in their Canterbury-Bankstown Development Control Plan (2023), Chapter 10.1: Child Care Centres, states the following in relation to acoustic privacy and residential amenity with regard to Child Care Centres:

'SECTION 5–ACOUSTIC PRIVACY

Explanation

It is important to balance the operation of child care facilities with community expectations. To achieve this outcome, Council considers it necessary to limit the capacity of child care facilities if its activities, such as children playing outdoors, are to harmoniously co-exist with the surrounding residential amenity. This is the preferred outcome rather than resorting to noise attenuation walls.

Objectives

O1 *To ensure child care facilities do not adversely impact on the residential amenity of adjoining dwellings and the surrounding area.*

O2 *To install appropriate acoustic privacy measures which are compatible with the prevailing character of residential areas.*

Development controls

Acoustic privacy

5.1 *Air conditioning, mechanical ventilation or any other continuous noise source must not exceed the ambient level at any specified boundary by more than 5 dB(A).*

5.2 *The location and design of child care facilities must consider the projection of noise from various activities to avoid any adverse impacts on the residential amenity of adjoining land.*

For the purpose of this clause, Council requires development applications to submit an Acoustic Report prepared by a suitably qualified acoustic consultant to determine:

(a) existing noise levels at the identified sensitive receiver locations;

(b) likely noise levels to emanate from the child care facility at the identified sensitive receiver locations;

(c) whether the development must apply measures to ensure the noise of children playing in outdoor areas does not exceed 10 dB(A) above the background noise level;

(d) whether the location and setbacks of the development are sufficient to protect the acoustic privacy of adjacent dwellings;

(e) whether the location of outdoor areas should avoid living areas and bedrooms of adjacent dwellings; and

(f) whether the development must install certain noise attenuation measures to protect the acoustic privacy of adjacent dwellings.

The Acoustic Report must measure the noise readings over a 15 minute period and must provide details of all modelling assumptions including source noise data, noise monitoring positions, receiver heights and locations, prevailing meteorological conditions during the monitoring, confirmation of the methodology adopted along with a copy of the model input and output data.

5.3 *The maximum height for noise attenuation walls and fences along the boundary of the site is 2 m.'*

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 DoPIE – 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 Centres 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 $L_{eq,\ 15\ minute}$ 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.

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	$L_{Aeq,\ (1\ hour)}$ 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 Residential Receptors

For ground floor Residential Receptors – based on the measured background noise levels at Location 'A':

- (42 + 5 =) **47 dBA** $L_{eq,\ 15\ minute}$ for outdoor play; **or**
- (42 + 10 =) **52 dBA** $L_{eq,\ 15\ minute}$ for outdoor play for up to 4 hours (total) per day; and
- (42 + 5 =) **47 dBA** $L_{eq,\ 15\ minute}$ for all other noise sources including car park, mechanical plant and indoor play areas.

For first floor Residential Receptors – based on the measured background noise levels at Location 'A', with adjustment for first floor:

- (45 + 5 =) **50 dBA** $L_{eq,\ 15\ minute}$ for outdoor play all day; **or**
- (45 + 10 =) **55 dBA** $L_{eq,\ 15\ minute}$ for outdoor play for up to 4 hours (total) per day; and
- (45 + 5 =) **50 dBA** $L_{eq,\ 15\ minute}$ 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 entrance of the car park, 'R3A', 'R4' and 'R5A', 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 'R3A', 'R4' and 'R5A', – *based on the measured background noise levels at Location 'A':*

- (51 + 15 =) **56 dBA** L_{Amax} at the closest affected habitable room ground floor window of the residential premises between 6.30 am and 7 am; and
- (54 + 15 =) **59 dBA** L_{Amax} at the closest affected habitable room first floor 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 'R3A', 'R4' and 'R5A', for on – road traffic noise. Compliance at the most affected receptors will ensure compliance at all other potentially affected receptor locations further away on Bougainville Road:

- **55 dBA** (external) $L_{Aeq,\ 1\ hour}$ 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 $L_{Aeq,\ 1\ hour}$ 35 dBA during operating hours.
- Internal traffic noise levels within indoor activity areas of the Centre should not exceed $L_{Aeq,\ 1\ hour}$ 40 dBA during operating hours.
- External traffic noise levels in any outdoor play or activity area of the Centre should not exceed $L_{Aeq,\ 1\ hour}$ 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 ArtMade Architects and 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 32 cars in 1 hour arriving or leaving the Centre in the morning peak. This is equivalent to 8 vehicle trips in a 15-minute period.

For the assessment of sleep disturbance and staff arriving during the early morning shoulder period, we have assumed that two staff vehicles will arrive at the Centre between 6.30 am and 7 am and park in the designated staff parking spaces in the basement level car park.

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

The Sound Exposure Level[2] (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 of car drive-by at approximately 50 km/h	**97**	99	97	94	93	95	87	77	70
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

[2] *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, lift motor and car park exhaust fan 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 in the basement car park. The lift motor for the development is assumed to be located within a pit at the bottom of the proposed lift shaft.

We have assumed that the kitchen and toilet exhaust fans will be ducted through the façades of the development. The car park exhaust fan has been assumed to be ducted to the roof in a riser adjacent to the lift shaft.

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 $L_{eq,\ 15\ minute}$ 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[3]	**60**	61	67	62	54	54	50	45	39
Car park exhaust fan[4]	**75**	73	72	70	76	70	64	54	46
Small exhaust fan (toilet)[5]	**60**	51	47	50	53	59	43	36	31
Hydraulic lift motor[6]	**63**	59	61	55	59	58	56	52	48
Medium (double fan) outdoor condenser unit[7]	**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.

[3] *Spectral sound power level based on Fantech CPD01254FSC.*
[4] *Spectral sound power level based on Fantech RDE10010DP6/10 – Downflow Discharge Axial Fan.*
[5] *Spectral sound power level based on Fantech TD-500/150 SIL.*
[6] *Spectral sound power level based on a residential lift system previously measured by Day Design.*
[7] *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:

- 1.8 metre high fence along the northern, eastern and western boundaries including the 0-5 GF OPA;
- 1.5 metre high fence along the southern and western boundaries of the FF 2-3 OPA;
- No solid fence along the southern boundary of the Site.

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

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

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.

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

The following formula, which is well known to acoustic professionals, was used to calculate noise levels at the receptor locations:

$$L_p = L_w + 10\log(n/10) - 20\log(d) - 8 - B$$

Where: L_p = Sound Pressure Level at receptor

L_w = Sound Power Level for group of 10 children

n = number of children

d = distance from children playing to receptor

B = acoustic reduction due to barrier

The noise prediction was therefore determined by spacing the 40 children across the Centre's outdoor play areas as follows:

- Ground Floor Outdoor Play Area = 2 groups of 4 x 0-2 year olds; and
- Ground Floor Outdoor Play Area = 2 groups of 10 x 3-5 year olds; and
- First Floor 2-3s Outdoor Play Area = 2 groups of 6 x 2-3 year olds.

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

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

Receptor Location – Ground Floor (GF), First Floor (FF)	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 - 184 South Terrace (GF)	27	47	Yes
R2 - 182 South Terrace (GF)	46	47	Yes
R3A - 37A Carnation Avenue (FF)	**51**	**50**	**No (+ 1 dB)**
R3B - 37A Carnation Avenue (GF)	45	47	Yes
R4 - 46A Carnation Avenue (GF)	32	47	Yes
R5A - 41 Carnation Avenue (GF)	39	47	Yes
R5B - 41 Carnation Avenue (GF)	43	47	Yes
R6 - 41A Carnation Avenue (GF)	44	47	Yes
R7 - 186 South Terrace (GF)	39	47	Yes

As summarised in Table 9, the predicted levels of noise at the nearby receptors comply with the criteria established in Section 5.5 of this report at receptor locations 'R1', 'R2', 'R3B', 'R4', 'R5A', 'R5B', 'R6' and 'R7', however, the predicted levels of noise exceeds the criteria at receptor 'R3A' and will therefore require noise controls in Section 8.0.

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

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

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

Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 - Ground Floor Level - 184 South Terrace			
- Indoor Play	45		
- Car Park	16		
- Mechanical Plant	26		
CUMULATIVE	45	47	Yes
R2 - Ground Floor Level - 182 South Terrace			
- Indoor Play	45		
- Car Park	16		
- Mechanical Plant	27		
CUMULATIVE	46	47	Yes
R3A - First Floor Balcony - 37A Carnation Avenue			
- Indoor Play	43		
- Car Park	39		
- Mechanical Plant	37		
CUMULATIVE	45	50	Yes
R3B - Ground Floor Level - 37A Carnation Avenue			
- Indoor Play	46		
- Car Park	16		
- Mechanical Plant	29		
CUMULATIVE	46	47	Yes

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

Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R4 - Ground Floor Level - 46A Carnation Avenue			
- Indoor Play	24		
- Car Park	33		
- Mechanical Plant	26		
CUMULATIVE	34	47	Yes
R5A - Ground Floor Level - 41 Carnation Avenue			
- Indoor Play	29		
- Car Park	27		
- Mechanical Plant	34		
CUMULATIVE	36	47	Yes
R5B - Ground Floor Level - 41 Carnation Avenue			
- Indoor Play	46		
- Car Park	22		
- Mechanical Plant	34		
CUMULATIVE	46	47	Yes
R6 - Ground Floor Level - 41A Carnation Avenue			
- Indoor Play	49		
- Car Park	21		
- Mechanical Plant	31		
CUMULATIVE	**49**	47	**No (+ 2 dB)**
R7 - Ground Floor Level - 186 South Terrace			
- Indoor Play	45		
- Car Park	15		
- Mechanical Plant	27		
CUMULATIVE	43	47	Yes

As summarised in Table 10, the predicted levels of noise at the nearby receptors exceed the criteria established in Section 5.5 of this report for receptor locations 'R6'; and therefore noise controls will be required.

6.4.3 Sleep Disturbance

It is proposed that the Centre will accept children from 7 am. Two 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 two staff vehicles will arrive between 6.30 am and 7 am.

The calculated L_{AFmax} 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)
R3A - 37A Carnation Avenue (at nearest window)			
- Car Pulling into Driveway	**58**	56	**No (+ 2 dB)**
R4 - 46A Carnation Avenue (at nearest window)			
- Car Pulling into Driveway	**60**	56	**No (+ 4 dB)**
R5A - 41 Carnation Avenue (at nearest window)			
- Car Pulling into Driveway	**61**	59	**No (+ 2 dB)**

The predicted external levels of noise exceeds the noise criteria in Section 5.5.2 at 'R3A', 'R4', and 'R5A', 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 'A' to determine the likelihood of noise associated with the use of the car park causing sleep disturbance at the most affected nearby residential receivers (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 'R5A') of 61 dBA between 6.30 am and 7 am over the assessment period.

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

Morning/Date	Measured L_{max} Noise Level Events ≥ 61 dBA	Measured L_{max} Noise Level (dBA) Range ≥ 61 dBA
Early Morning – 6.30 am to 7 am (2 x 15 minute periods each early morning)		
Morning 1 - 08/05/2023	2	72-76
Morning 2 - 09/05/2023	2	65-72
Morning 3 - 10/05/2023	2	70-72
Morning 4 - 11/05/2023	2	64-67
Morning 5 - 12/05/2023	2	68-80
Average per morning	2	71
Total	14	-

Table 12 above shows that L_{max} noise events greater than or equal to 61 dBA are common at Location 'A' during the early morning periods. A total of 14 x 15 – minute periods (early morning) were analysed, with 14, or 100%, featuring an L_{max} noise event greater than or equal to 61 dBA.

An average of two L_{max} noise events (out of 2) greater than or equal to 61 dBA were measured over the assessment period for each early morning period, with an average L_{max} noise level of 71 dBA. As shown in Table 11, the maximum predicted L_{max} noise level from noise associated with staff entering the basement car park via the driveway (at 'R5A') is 61 dBA – 10 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 61 dBA at Location 'A', the L_{max} noise events associated with two staff cars arriving at the development site are not likely to cause sleep disturbance at 'R5A', and will therefore be acceptable at all residential receiver locations.

6.4.4 On-Road Traffic

The external $L_{eq,\ 1\ hour}$ noise levels at the most affected residential receiver locations 'R3A', 'R4' and 'R5A' from noise associated with on–road traffic throughout the day are calculated to be as shown below in Table 13.

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

Receiver Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R3A - 37A Carnation Avenue (at nearest window)	48	55	Yes
R4 - 46A Carnation Avenue (at nearest window)	49	55	Yes
R5A - 41 Carnation Avenue (at nearest window)	45	55	Yes

The predicted external noise levels from on–road traffic are within the noise criteria in Section 5.5.3, and are therefore acceptable.

7.0 NOISE INTRUSION – ROAD TRAFFIC NOISE

7.1 External Road Traffic Noise Levels – Outdoor Play Areas

The existing $L_{Aeq,\ 1\ hour}$ road traffic noise level was measured at Location 'A' to be 55 dBA. Based on the measurements at Location 'A', taking into account screening provided by the Centre, the calculated equivalent $L_{Aeq,\ 1\ hour\ (traffic)}$ level is shown below in Table 14.

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

Outdoor Location	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
Outdoor Play Area – Ground Floor 0-2 & 3-5 year olds	38	55	Yes
Outdoor Play Area – First Floor 2-3 year olds	40	55	Yes

The calculated levels for the outdoor play area comply the noise criteria in Section 5.5.3 and are therefore acceptable.

7.2 Road Traffic Noise Intrusion Assessment – Indoor Playrooms

Using the external $L_{eq,\ 1\ hour}$ road traffic noise level measured at Location 'A' and the calculated equivalent $L_{Aeq,\ 1\ hour\ (traffic)}$ levels in Table 14, internal $L_{eq,\ 1\ hour}$ road traffic noise level within the proposed indoor play rooms has been calculated to be as shown in Table 15.

Up to a 10 dB reduction can be achieved from outside to inside, with windows and doors open. Standard building construction such as concrete block, brick or lightweight stud walls and metal-deck, concrete or ceramic tile roof with plasterboard ceiling, and standard 4 mm thick glazing can achieve a minimum 20 dB reduction with windows and doors closed.

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

Receptor Location	Calculated Noise Level $L_{eq,\ 1\ hour}$ (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
Indoor Play Room 1 (0-2 Years) - Facing Outdoor Play Area	28	40	Yes
Indoor Play Room 2 (2-3 Years) - Facing Outdoor Play Area	30	40	Yes
Indoor Play Room 3 (3-5 Years) - Facing Outdoor Play Area	28	40	Yes

It can be seen that the calculated internal levels of road traffic noise are below the noise criteria established in Section 5.5.4, and is therefore acceptable.

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

- Windows in the northern façade of "Room 3 (2-3 Years Room)" indoor activity area should be closed during operating hours.

As these windows 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, see AC810-6B will satisfy this requirement.

8.1.2 Permissible Outdoor Play Scenarios

Note: for all Scenarios below, the 0-2 year olds are designated to the GF OPA only..

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

- Up to 8 children, 0-2 years old, within the Ground Floor Outdoor Play Area;
- Up to 12 children, 2-5 years old, within the First Floor Outdoor Play Area;
- Up to 20 children, 2-5 years old, within the Ground Floor Outdoor Play Area; and
- Remaining children inside.

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 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.

We recommend the following barrier heights and locations:

8.2.1 Outdoor Play Areas – Recommended Sound Barrier Walls for Permissible Outdoor Play For All Day Play

- 1.8 metre high fence along the northern and western boundaries of the GF OPA;
- 2.1 metre high fence along the eastern boundary of the GF OPA; and
- 1.5 metre high fence along the southern and western boundaries of the FF OPA.

8.2.2 Site Boundary Fences

- 1.8 metre fence along the eastern and western boundary of the Site from the Centre's front setback to the GF OPA; and
- 1.2 metre fence along the northern and southern boundary of the Site from the Centre's front setback to Carnation Avenue.

8.3 Acoustic Treatment to Soffit of Outdoor Play Areas

To reduce the amount of reflected noise within the outdoor play areas, we recommend that the soffits of these outdoor play areas be lined with sound absorptive insulation such as 50 mm thick polyester insulation with minimum density 32 kg/m^3. The insulation should be faced with perforated metal or perforated fibre cement sheeting (minimum 20% open area).

Alternatively, any other product providing a minimum NRC 0.8 may be used to line the soffits of the outdoor play areas.

8.4 Glazing and Glazed Doors

Table 16 specifies minimum sound reduction index (R_w) ratings required for the indoor play rooms, however an alternative glazing specification may be used if the R_w is achieved or exceeded.

Table 16 Schedule of Glazed Windows

Room Description	Min Rw	Typical Glazing Specification
Play Rooms	26	5 mm glass in a sliding/hinged/fixed frame with acoustic seals

Unless otherwise specified, window frames may be either sliding/awning, or hinged casement style and be of robust sound-barrier construction having interlocking stiles and neoprene (Q-lon or similar) or vinyl finned seals to minimise sound leakage.

This schedule of construction is typical and for general guidance to the architect in preparing final construction drawings and specifications. Other constructions that provide the same or better Sound Transmission Loss performance may also be acceptable.

It is most important that any sound leakage paths around the windows be sealed off. We recommend that prior to the fitting of the architraves around the windows, the space between the frames and the wall structure be sealed off with silicone or polyurethane mastic and backing rods installed behind. The window architraves can then be fitted.

8.4.1 Walls, Roofs and Ceilings

External walls may be of standard masonry or stud wall construction with minimum 90 mm thick glasswool insulation installed within the wall cavities.

Roofs may be of standard metal deck or concrete tile construction with 10 mm thick standard plasterboard ceilings installed. Roof cavities should have minimum 90 mm thick glasswool insulation installed within.

8.5 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 Building Code of Australia and Australian Standards AS1668.2.

8.6 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 – All Day Play

Once the noise control recommendations in Section 8.2.1 are incorporated into the operation of the Centre, the calculated sound pressure level at the nearby receptors from the outdoor play areas will be as shown in Table 17.

These predicted noise levels at the residential receptors are assessed against the criteria for outdoor play all day, as derived in Section 5.5.

Table 17 Predicted $L_{eq,\ 15\ minute}$ Noise Levels – Outdoor Play – All Day

Receptor Location – Ground Floor (GF), First Floor (FF)	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 - 184 South Terrace (GF)	27	47	Yes
R2 - 182 South Terrace (GF)	43	47	Yes
R3A - 37A Carnation Avenue (FF)	50	50	Yes
R3B - 37A Carnation Avenue (GF)	43	47	Yes
R4 - 46A Carnation Avenue (GF)	32	47	Yes
R5A - 41 Carnation Avenue (GF)	39	47	Yes
R5B - 41 Carnation Avenue (GF)	43	47	Yes
R6 - 41A Carnation Avenue (GF)	44	47	Yes
R7 - 186 South Terrace (GF)	39	47	Yes

9.2 Cumulative Noise Level - Indoor Play Area, Car Park and Mechanical Plant After Noise Controls

Once the noise control recommendations in Section 8.1.1 are incorporated into the operation of the Centre, the calculated sound pressure level at the nearby receptors from the cumulative noise levels will be as shown in Table 18.

Table 18 Predicted Cumulative $L_{eq,\ 15\ minute}$ Noise Levels – Indoor Play, Mechanical Plant & Car Park – After Noise Controls

Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1 - Ground Floor Level - 184 South Terrace			
- Indoor Play	24		
- Car Park	16		
- Mechanical Plant	26		
CUMULATIVE	28	47	Yes
R2 - Ground Floor Level - 182 South Terrace			
- Indoor Play	25		
- Car Park	16		
- Mechanical Plant	27		
CUMULATIVE	29	47	Yes
R3A - First Floor Balcony - 37A Carnation Avenue			
- Indoor Play	42		
- Car Park	39		
- Mechanical Plant	37		
CUMULATIVE	44	50	Yes
R3B - Ground Floor Level - 37A Carnation Avenue			
- Indoor Play	34		
- Car Park	16		
- Mechanical Plant	28		
CUMULATIVE	35	47	Yes
R4 - Ground Floor Level - 46A Carnation Avenue			
- Indoor Play	24		
- Car Park	33		
- Mechanical Plant	26		
CUMULATIVE	34	47	Yes

Table 18 Predicted Cumulative $L_{eq,\ 15\ minute}$ Noise Levels – Indoor Play, Mechanical Plant & Car Park – After Noise Controls - Continued

Description	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R5A - Ground Floor Level - 41 Carnation Avenue			
- Indoor Play	29		
- Car Park	27		
- Mechanical Plant	34		
CUMULATIVE	36	47	Yes
R5B - Ground Floor Level - 41 Carnation Avenue			
- Indoor Play	32		
- Car Park	22		
- Mechanical Plant	34		
CUMULATIVE	36	47	Yes
R6 - Ground Floor Level - 41A Carnation Avenue			
- Indoor Play	32		
- Car Park	21		
- Mechanical Plant	31		
CUMULATIVE	35	47	Yes
R7 - Ground Floor Level - 186 South Terrace			
- Indoor Play	23		
- Car Park	15		
- Mechanical Plant	27		
CUMULATIVE	28	47	Yes

10.0 CONCLUSION

Day Design Pty Ltd was engaged by ArtMade Architects to assess the potential environmental noise impact from a proposed Child Care Centre to be constructed at 39 Carnation Avenue, Bankstown, 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 39 Carnation Avenue, Bankstown, NSW, will meet the acceptable noise level requirements of the Association of Australasian Acoustical Consultants' *Guideline for Child Care Centres Acoustic Assessmen*t and the Environmental Protection Authority's *NSW Road Noise Policy,* as detailed in Section 5.5 of this report, and is considered acceptable.

Benjamin Lamont

Benjamin Lamont, BE(Aero), MEngSc(Mech)
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
Appendix D – Approximate Nosie Source Locations and Noise Control Recommendations Mark-up
AC810-6B – Silenced Air Relief Intake
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

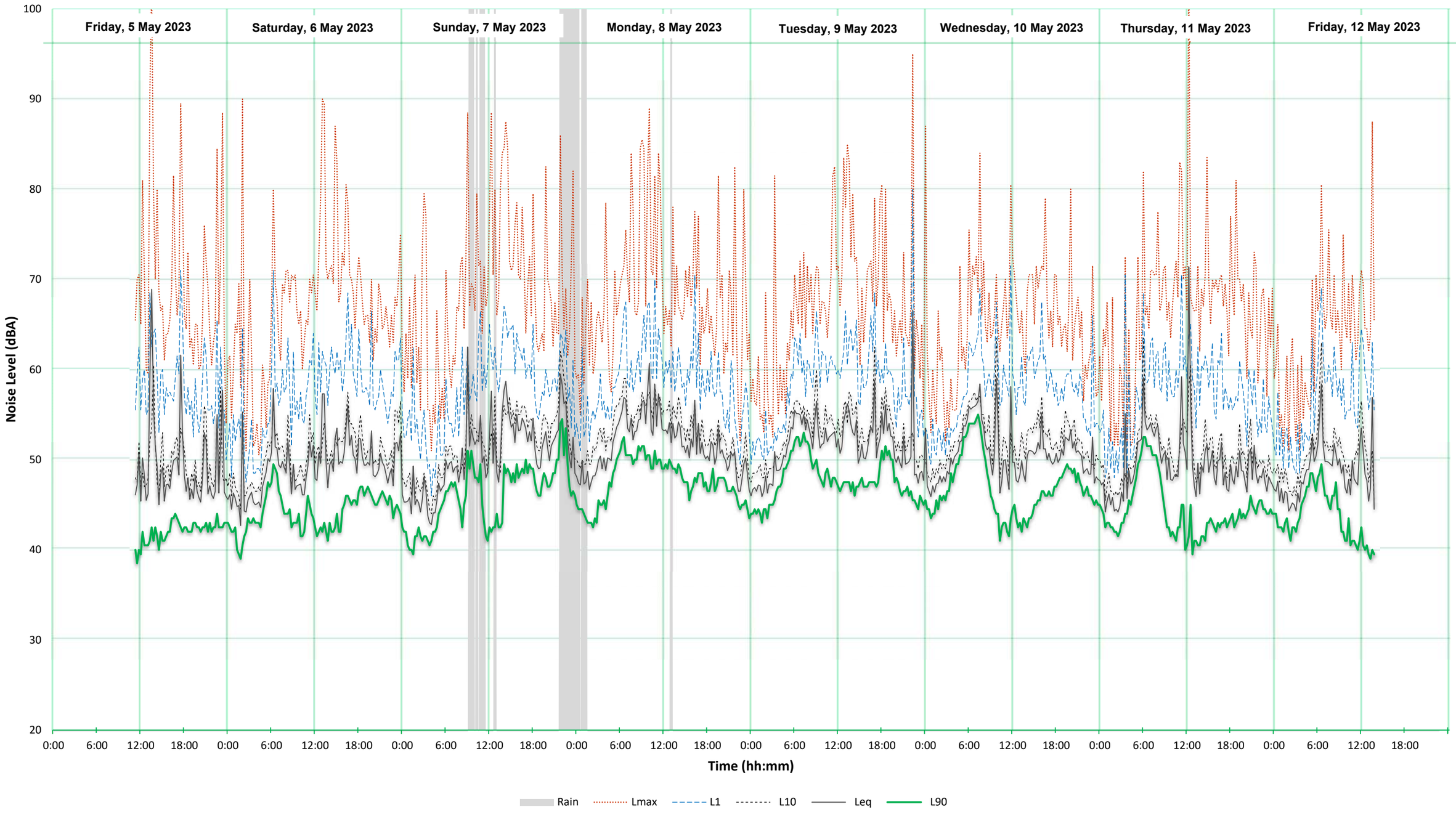
Description	Model No	Serial No
Infobyte Noise Logger (Type 2)	iM4	123
Condenser Microphone 0.5" diameter	MK 250	123
NTi Audio Noise Logger (Class 1) DD20	XL2	A2A-20865-E0
NTi Microphone	MC230A	A23487
NTi Preamplifier	MA220	10891
Acoustical Calibrator	B&K 4231	3025991

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 Monitors iM4 #123 are a Type 2 precision environmental noise monitors, respectively, meeting all the applicable requirements of AS1259 for an integrating-averaging sound level meter.

An audio noise logger is used to continuously monitor ambient noise levels and audio wav files. It provides information on the statistical distribution of noise during an extended period of time. The NTi XL2 Noise Monitor is a Class 1 precision sound level meter housed inside a weather resistant enclosure. All meters comply with the applicable requirements of AS IEC 61672.1:2004 "Electroacoustics – Sound Level Meters" and are suitable for field use.

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 0.5 dB during unattended and less than 0.3 dB during attended measurements. No adjustments for instrument drift during the measurement period were warranted.

Located at 34 Carnation Avenue, Bankstown, NSW



ARTIST'S IMPRESSION ONLY

39 CARNATION AVENUE
BANKSTOWN, NSW 2200

CHILDCARE CENTRE

DEVELOPMENT APPLICATION

ARCHITECTURAL DRAWING LIST - DA			
SHEET NUMBER	SHEET NAME	CURRENT REVISION	CURRENT REVISION DATE
DA00.00	COVER PAGE	A	28.07.23
DA02.01	SITE PLAN / DEMOLITION	A	28.07.23
DA03.01	BASEMENT FLOOR PLAN	A	28.07.23
DA03.02	GROUND FLOOR FLOOR PLAN	A	28.07.23
DA03.03	FIRST FLOOR PLAN	A	28.07.23
DA03.04	AREA CALCULATIONS	A	28.07.23
DA04.01	EXTERNAL ELEVATIONS	A	28.07.23
DA05.01	SECTIONS & EXTERNAL FINISHES	A	28.07.23
DA06.01	SHADOW DIAGRAMS	A	28.07.23
DA06.02	VIEWS FROM SUN	A	28.07.23
DA06.03	OUTDOOR PLAY AREA SOLAR/SHADE CALCS	A	28.07.23

ISSUE	DATE	DESCRIPTION
A	28.07.23	ISSUE FOR DA

ASSOCIATED CONSULTANTS

PLANNER	AVENUE TOWN PLANNING
ACCESS	ERGON CONSULTING
ACOUSTICS	DAY DESIGN
QS	PBA
STORMWATER, ESM, FLOOD	GREENVIEW
GEOTECH, PSI, DSI, RAP	JK ENVIRONMENTS
LANDSCAPE	EARTH MATTERS
TRAFFIC	TRAFFIX
WASTE	DICKEN SOLUTIONS

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ARCHITECT

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PROJECT

CHILDCARE CENTRE

PROJECT ADDRESS

39 CARNATION AVENUE
BANKSTOWN

SHEET NAME

COVER PAGE

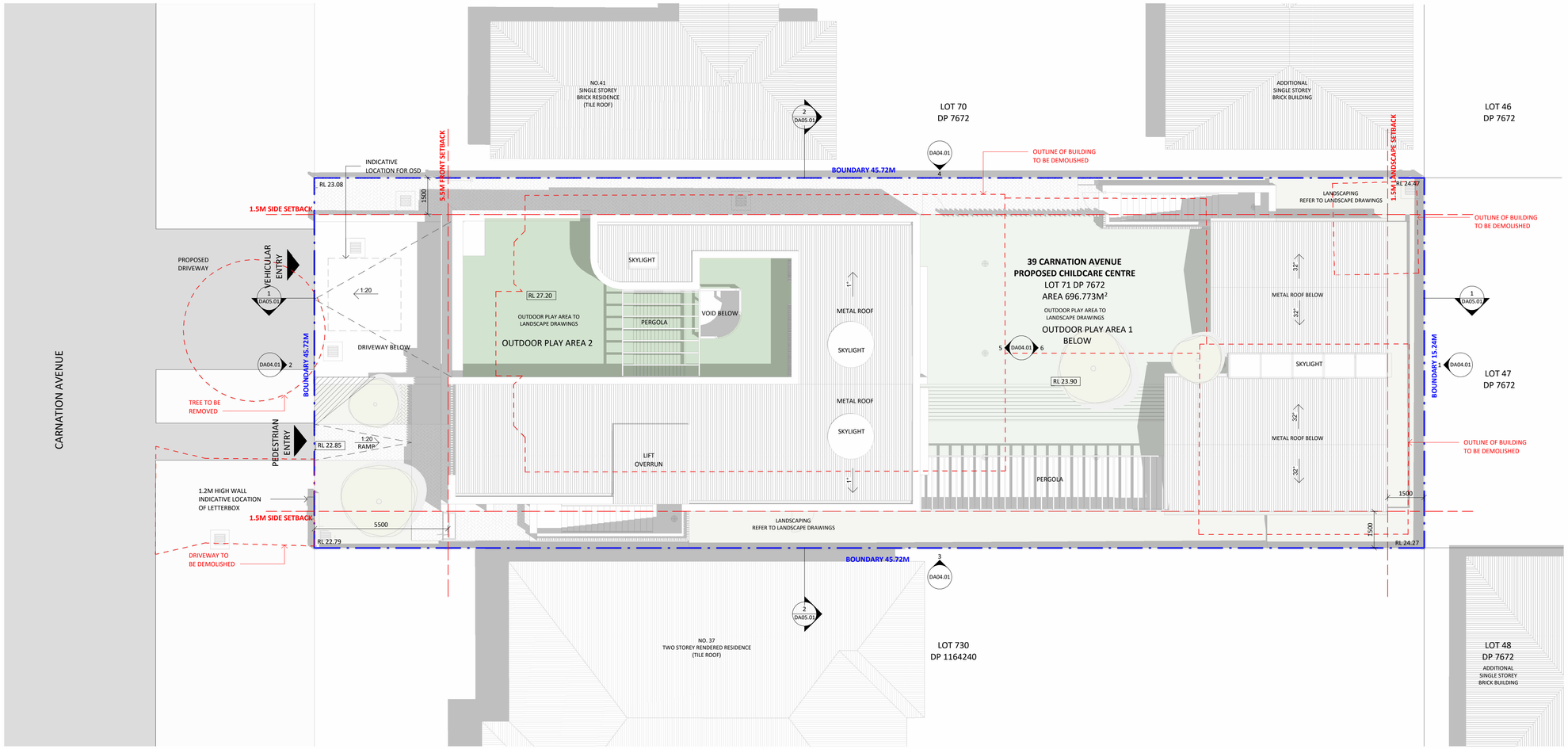
ISSUED FOR DEVELOPMENT APPLICATION

Project number	Sheet No.	Issue	Phase
23710	DA00.00	A	DA

Sheet Size	Scale	L.G.A.
A1		CANTERBURY BANKSTOWN COUNCIL

Drawn By	Checked By	Date
TA	BR	28.07.23

NOT FOR CONSTRUCTION



1 SITE / DEMOLITION PLAN
1 : 100

0 1 2 3 4 5
1 : 100

GENERAL NOTES

- ALL EXISTING BUILDING ELEMENTS TO BE CHECKED ON SITE U.N.O
- DEMOLITION TO BE IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND TO BE CARRIED OUT BY A LICENCED CONTRACTOR U. N.O
- REFER TO SW DRAWINGS FOR DRAINAGE DESIGN.
- REFER TO LANDSCAPE DRAWINGS FOR LANDSCAPE DESIGN.
- KITCHEN AREA TO BE ACCORDANCE WITH NSW AS4674, FOOD ACT 2003, FOOD REGULATION 2015 AND FOOD STANDARD CODES 3.2.2 AND 3.2.3.

LANDSCAPE LEGEND

- EXISTING TREE / TREE TO BE RETAINED
- TREE TO BE REMOVED
- NEW TREE
- LANDSCAPING / BUFFER
- LINE OF STRUCTURAL ROOT ZONE (SRZ)
- LINE OF TREE EXCLUSION ZONE (TEZ)
- LINE OF TREE PROTECTION ZONE (TPZ)

NOTE: REFER TO ARBORIST REPORT FOR FURTHER DETAILS

ABBREVIATIONS

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F.	- FIXED
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GL	- GROUND LINE
GLZ	- GLAZING
EX.GL	- EXISTING GROUND LINE
REQ.	- REQUIREMENTS
XX.XX	- PROPOSED LEVEL
XX.XX	- EXISTING LEVEL
XX.XX	- SPOT LEVEL (PLAN)
XX.XX	- SPOT LEVEL (ELEVATION)

SITE CALCULATIONS

TOTAL SITE AREA:	696.773 M²
PERMITTED BUILDING HEIGHT	= 9 M
PERMITTED TOTAL FSR	= 0.4:1
PROPOSED TOTAL FSR	= 0.38:1
PERMITTED TOTAL FLOOR SPACE	= 348.39 M²
PROPOSED TOTAL FLOOR SPACE	= 268.25 M²
GROUND	= 170.05 M²
FIRST	= 98.20 M²
MIN REQUIRED LANDSCAPE	= 30% (209.03M²)
PROPOSED LANDSCAPE	= 52.7% (367.45M²)

OUTDOOR PLAY AREA SCHEDULE

AREA	AGE	NO. CHLDRN	UNENCUMBERED REQ.AREA	UNENCUMBERED AREA
OUTDOOR PLAY AREA 1	AGES 3-5	28	196 m²	196.60 m²
OUTDOOR PLAY AREA 2	AGES 2-3	12	84 m²	85.55 m²
TOTAL		40	280 m²	282.15 m²

INDOOR PLAYROOM SCHEDULE

ROOM	AGE	NO. CHLDRN	NO. STAFF	UNENCUMBERED REQ.AREA	UNENCUMBERED AREA
PLAYROOM 1	AGES 0-2	8	2	26 m²	30.05 m²
PLAYROOM 2	AGES 3-5	20	2	65 m²	66.05 m²
PLAYROOM 3	AGES 2-3	12	2	39 m²	39.00 m²
TOTAL		40	6	130 m²	135.10 m²

INTERNAL STORAGE SCHEDULE

NAME	NO. CHLDRN	REQ VOL	VOL
INT ST 1	8	1.60 m³	2.90 m³
INT ST 2	20	4.00 m³	4.15 m³
INT ST 3	12	2.40 m³	Not Placed
TOTAL	40	8.00 m³	7.05 m³

EXTERNAL STORAGE SCHEDULE

NAME	NO. CHLDRN	REQ VOL	VOL
EX ST 1	28	8.40 m³	8.85 m³
EX ST 2	10	3.00 m³	3.40 m³
TOTAL	38	11.40 m³	12.20 m³

PARKING SCHEDULE

PARKING	NO. SPACES
ACCESSIBLE	1
STAFF	4
VISITOR	5
TOTAL	10

NOT FOR CONSTRUCTION

ISSUE	DATE	DESCRIPTION
A	28.07.23	ISSUE FOR DA

ASSOCIATED CONSULTANTS

PLANNER	AVENUE TOWN PLANNING
ACCESS	ERSGON CONSULTING
ACOUSTICS	DAY DESIGN
QS	PBA
STORMWATER, ESM, FLOOD	GREENVIEW
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PROJECT

CHILDCARE CENTRE

PROJECT ADDRESS

39 CARNATION AVENUE
BANKSTOWN

SHEET NAME

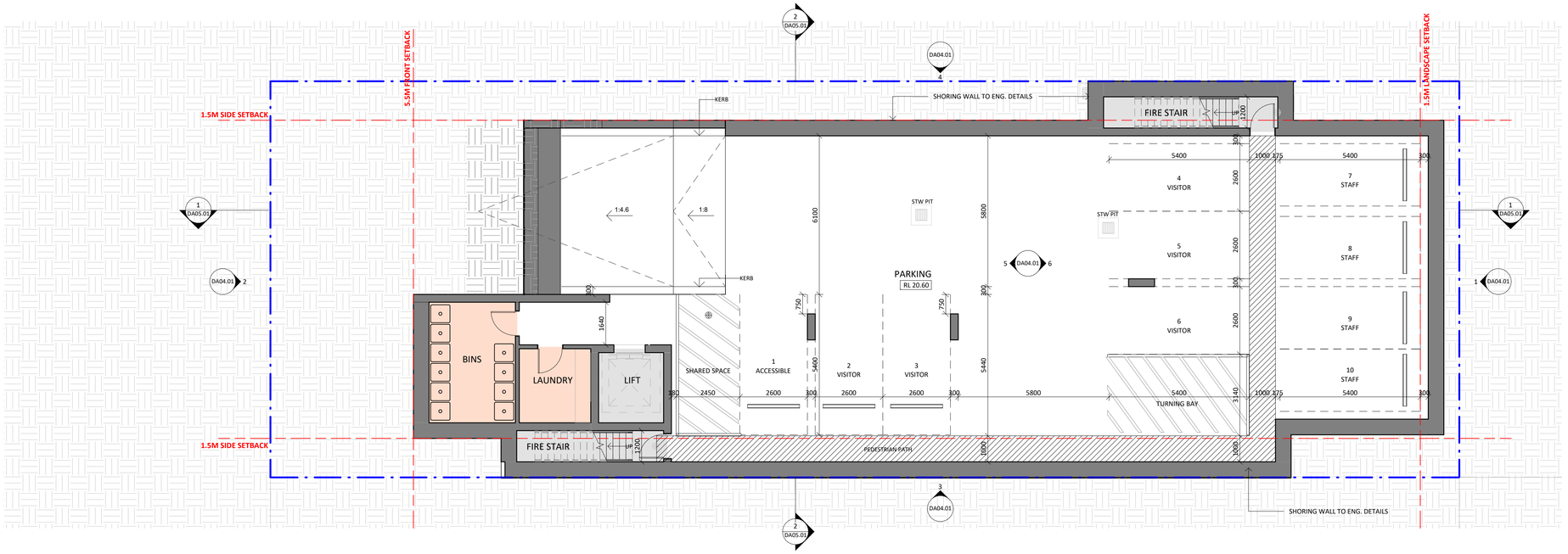
SITE PLAN / DEMOLITION

ISSUED FOR DEVELOPMENT APPLICATION

Project number	Sheet No.	Issue	Phase
23710	DA02.01	A	DA

Sheet Size	Scale	L.G.A.
A1	As indicated	CANTERBURY BANKSTOWN COUNCIL

Drawn By	Checked By	Date
TA	BR	28.07.23



1 BASEMENT PLAN
1 : 100

GENERAL NOTES

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LANDSCAPE LEGEND

- EXISTING TREE / TREE TO BE RETAINED
- TREE TO BE REMOVED
- NEW TREE
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- LINE OF STRUCTURAL ROOT ZONE (SRZ)
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OUTDOOR PLAY AREA SCHEDULE				
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INTERNAL STORAGE SCHEDULE			
NAME	NO. CHLDRN	REQ.VOL	VOL
INT ST 1	8	1.60 m³	2.90 m³
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TOTAL	38	11.40 m³	12.20 m³

PARKING SCHEDULE	
PARKING	NO. SPACES
ACCESSIBLE	1
STAFF	4
VISITOR	5
TOTAL	10

NOT FOR CONSTRUCTION

ISSUE	DATE	DESCRIPTION
A	28.07.23	ISSUE FOR DA

ASSOCIATED CONSULTANTS

PLANNER	AVENUE TOWN PLANNING
ACCESS	ERGON CONSULTING
ACOUSTICS	DAY DESIGN
QS	PBA
STORMWATER, ESM, FLOOD	GREENVIEW
GEOTECH, PSI, DSI, RAP	JK ENVIRONMENTS
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PROJECT

CHILDCARE CENTRE

PROJECT ADDRESS

39 CARNATION AVENUE
BANKSTOWN

SHEET NAME

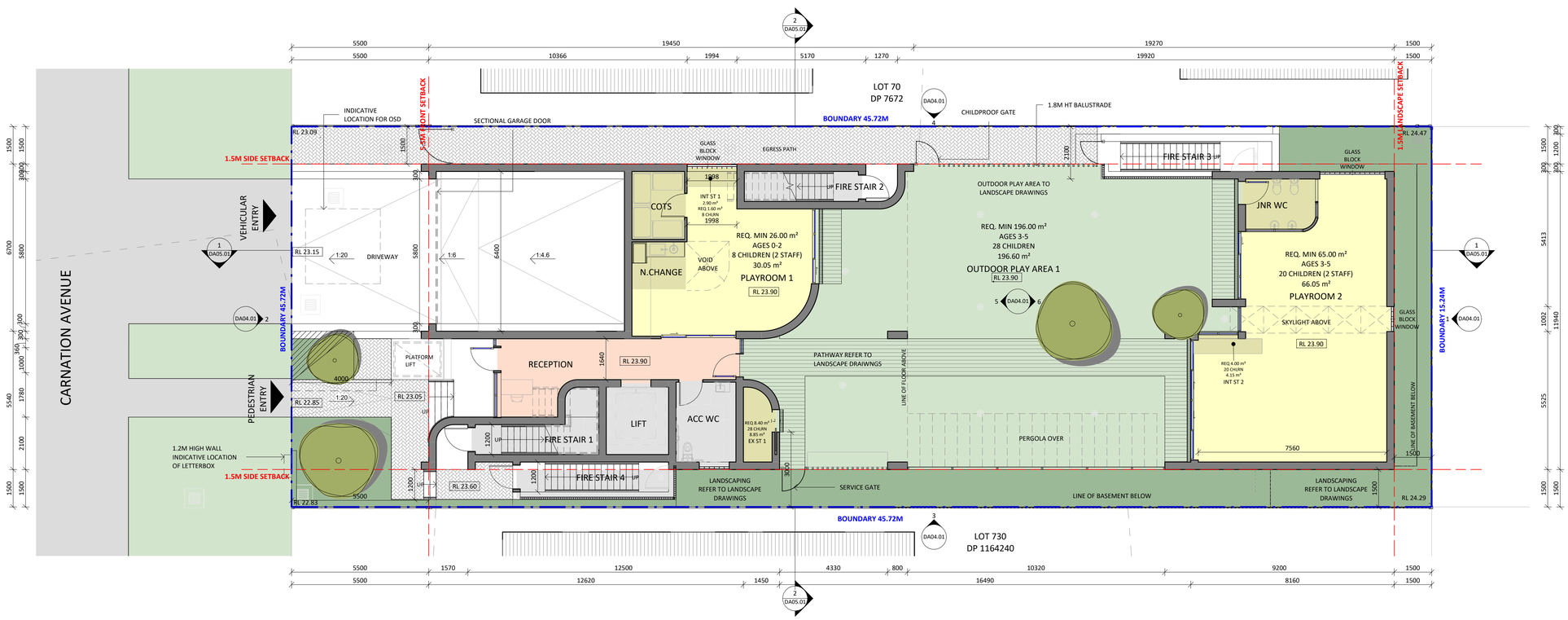
BASEMENT FLOOR PLAN

ISSUED FOR DEVELOPMENT APPLICATION

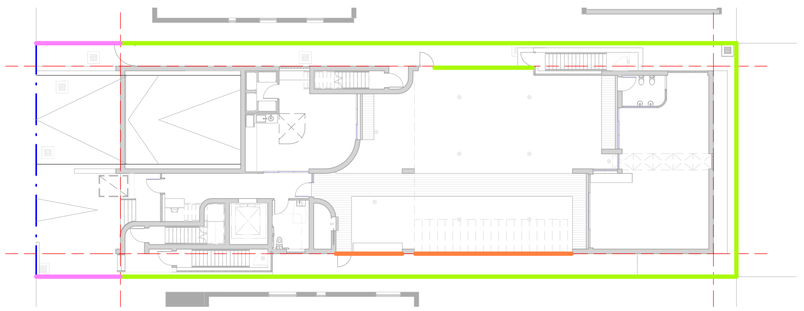
Project number	Sheet No.	Issue	Phase
23710	DA03.01	A	DA

Sheet Size	Scale	L.G.A.
A1	As indicated	CANTERBURY BANKSTOWN COUNCIL

Drawn By	Checked By	Date
TA	BR	28.07.23



1 GROUND FLOOR PLAN
1 : 100



2 GROUND FLOOR PLAN FENCE/BARRIER DIAGRAM
1 : 200

DA - FENCE LEGEND

- 2.1M HIGH BARRIER/FENCE
- 1.8M HIGH BARRIER/FENCE
- MIN. 1.5M HIGH BARRIER/FENCE
- 1.2M HIGH BARRIER/FENCE

NOTE:
- ALL ACOUSTIC BARRIERS IN ACCORDANCE WITH ACOUSTIC REPORT.
- REFER TO SHEET DA05.01 FOR FENCE DETAILS.

0 1 2 3 4 5
1 : 100

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OUTDOOR PLAY AREA SCHEDULE

AREA	AGE	NO. CHLDRN	UNENCUMBERED REQ.AREA	UNENCUMBERED AREA
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EX ST 1	28	8.40 m³	8.85 m³
EX ST 2	10	3.00 m³	3.40 m³
TOTAL	38	11.40 m³	12.20 m³

PARKING SCHEDULE

PARKING	NO. SPACES
ACCESSIBLE	1
STAFF	4
VISITOR	5
TOTAL	10

NOT FOR CONSTRUCTION

ISSUE	DATE	DESCRIPTION
A	28.07.23	ISSUE FOR DA

ASSOCIATED CONSULTANTS

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ACOUSTICS	DAY DESIGN
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PROJECT
CHILDCARE CENTRE

PROJECT ADDRESS
39 CARNATION AVENUE
BANKSTOWN

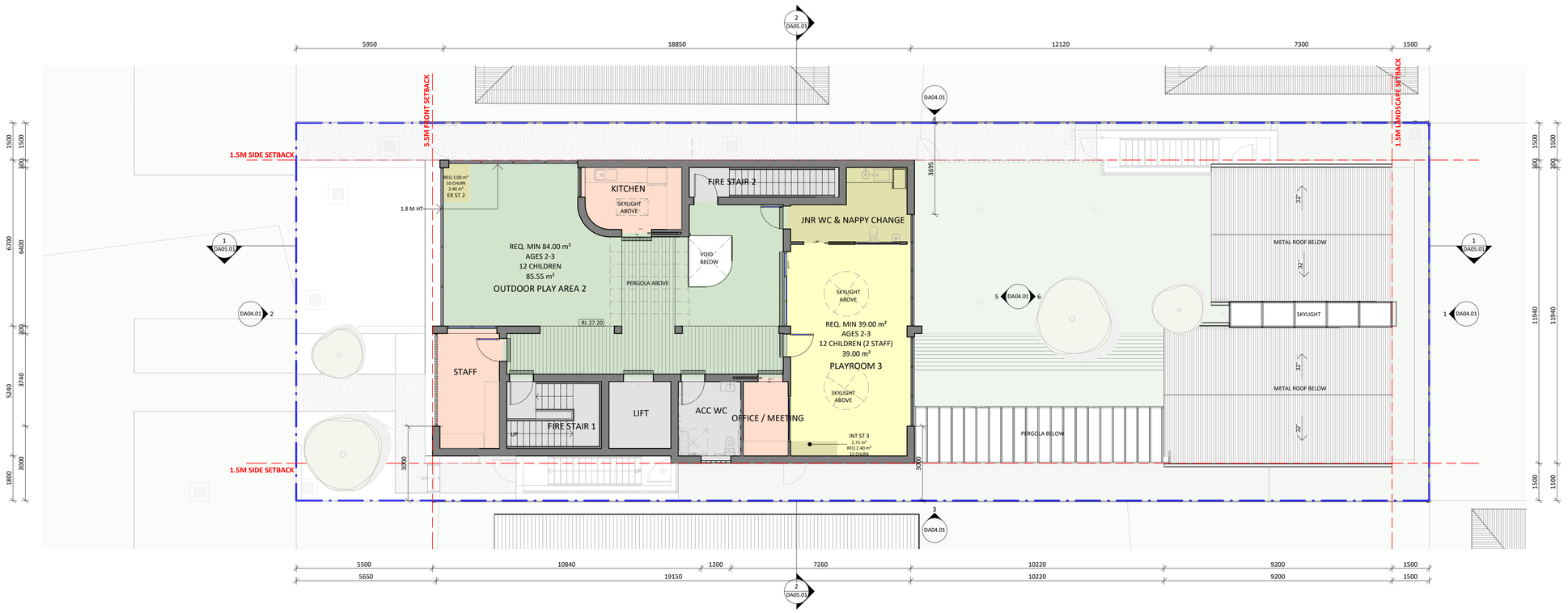
SHEET NAME
GROUND FLOOR FLOOR PLAN

ISSUED FOR DEVELOPMENT APPLICATION

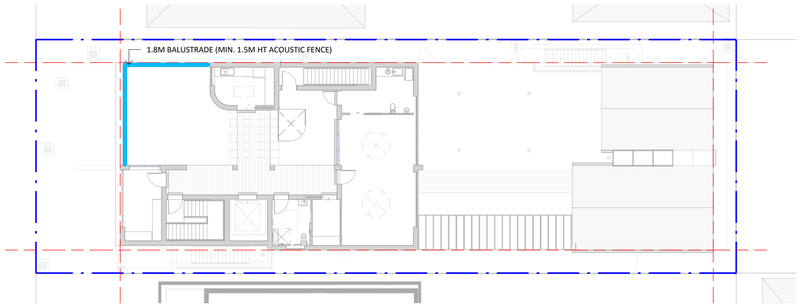
Project number	Sheet No.	Issue	Phase
23710	DA03.02	A	DA

Sheet Size	Scale	L.G.A.
A1	As indicated	CANTERBURY BANKSTOWN COUNCIL

Drawn By	Checked By	Date
TA	BR	28.07.23



1 FIRST FLOOR PLAN
1 : 100



2 FIRST FLOOR PLAN FENCE / BARRIER DIAGRAM
1 : 200

DA - FENCE LEGEND

- 2.1M HIGH BARRIER/FENCE
- 1.8M HIGH BARRIER/FENCE
- MIN. 1.5M HIGH BARRIER/FENCE
- 1.2M HIGH BARRIER/FENCE

NOTE:
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OUTDOOR PLAY AREA SCHEDULE				
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			REQ AREA	AREA
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TOTAL	38	11.40 m³	12.20 m³

PARKING SCHEDULE	
PARKING	NO. SPACES
ACCESSIBLE	1
STAFF	4
VISITOR	5
TOTAL	10

NOT FOR CONSTRUCTION

ISSUE	DATE	DESCRIPTION
A	28.07.23	ISSUE FOR DA

ASSOCIATED CONSULTANTS

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PROJECT

CHILDCARE CENTRE

PROJECT ADDRESS

39 CARNATION AVENUE
BANKSTOWN

SHEET NAME

FIRST FLOOR PLAN

ISSUED FOR DEVELOPMENT APPLICATION

Project number	Sheet No.	Issue	Phase
23710	DA03.03	A	DA

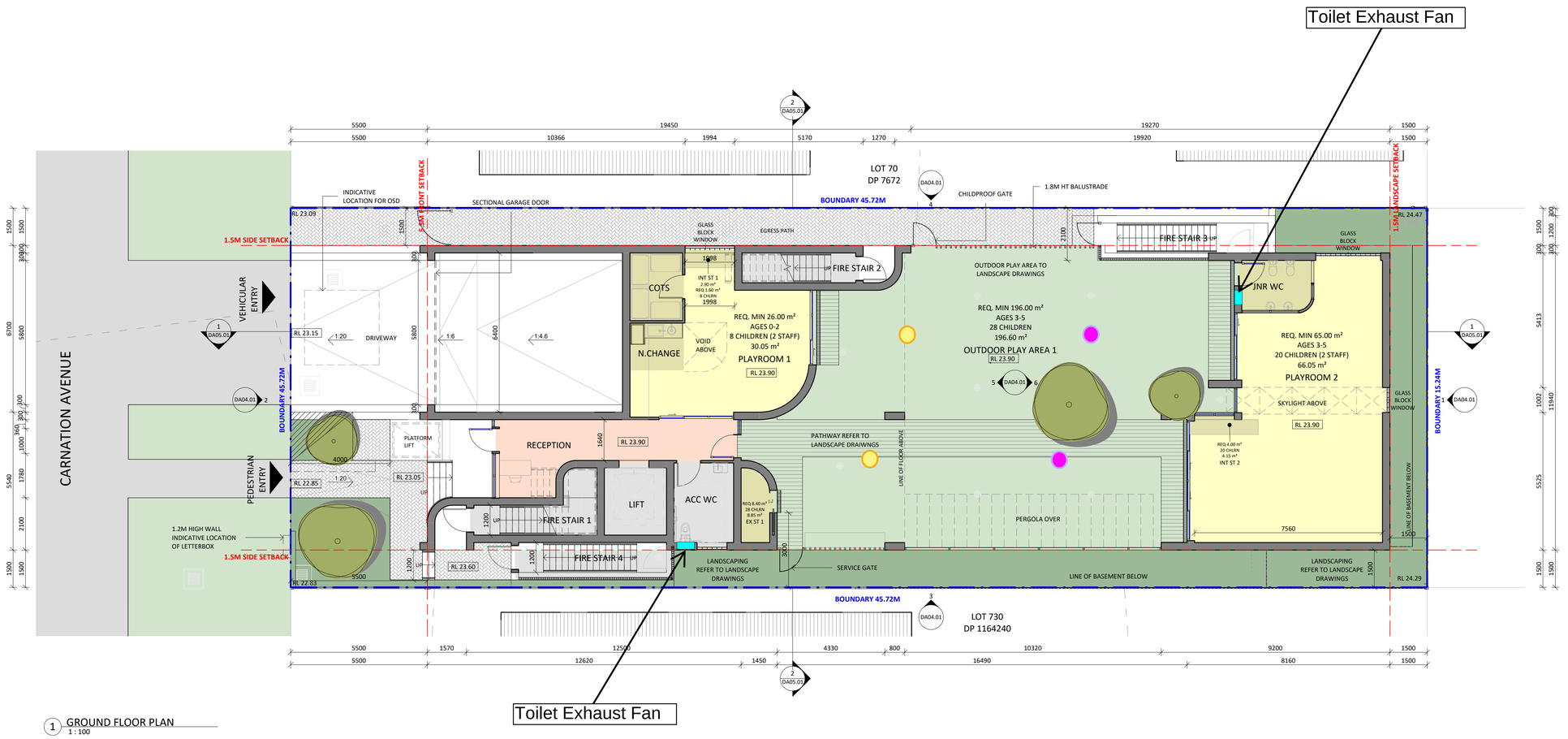
Sheet Size	Scale	L.G.A.
A1	As indicated	CANTERBURY BANKSTOWN COUNCIL

Drawn By	Checked By	Date
TA	BR	28.07.23

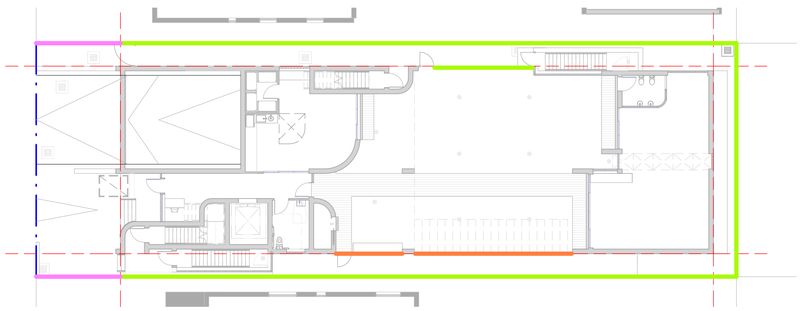
7786-1 Rev A Appendix D

Key:

- 4 x 0-2 yr old children
- 10 x 3-5 yr old children



1 GROUND FLOOR PLAN
1 : 100



2 GROUND FLOOR PLAN FENCE/BARRIER DIAGRAM
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OUTDOOR PLAY AREA SCHEDULE				
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TOTAL		40	280 m²	282.15 m²

INDOOR PLAYROOM SCHEDULE					
ROOM	AGE	NO. CHLDRN	NO. STAFF	UNENCUMBERED REQ AREA	UNENCUMBERED AREA
PLAYROOM 1	AGES 0-2	8	2	26 m²	30.05 m²
PLAYROOM 2	AGES 3-5	20	2	65 m²	66.05 m²
PLAYROOM 3	AGES 2-3	12	2	39 m²	39.00 m²
TOTAL		40	6	130 m²	135.10 m²

INTERNAL STORAGE SCHEDULE			
NAME	NO. CHLDRN	REQ VOL	VOL
INT ST 1	8	1.60 m³	2.90 m³
INT ST 2	20	4.00 m³	4.15 m³
INT ST 3	12	2.40 m³	Not Placed
TOTAL	40	8.00 m³	7.05 m³

EXTERNAL STORAGE SCHEDULE			
NAME	NO. CHLDRN	REQ VOL	VOL
EX ST 1	28	8.40 m³	8.85 m³
EX ST 2	10	3.00 m³	3.40 m³
TOTAL	38	11.40 m³	12.20 m³

PARKING SCHEDULE	
PARKING	NO. SPACES
ACCESSIBLE	1
STAFF	4
VISITOR	5
TOTAL	10

NOT FOR CONSTRUCTION

0 1 2 3 4 5
1 : 100

GENERAL NOTES

- ALL EXISTING BUILDING ELEMENTS TO BE CHECKED ON SITE U.N.O
- DEMOLITION TO BE IN ACCORDANCE WITH AUSTRALIAN STANDARDS AND TO BE CARRIED OUT BY A LICENCED CONTRACTOR U. N.O
- REFER TO SW DRAWINGS FOR DRAINAGE DESIGN.
- REFER TO LANDSCAPE DRAWINGS FOR LANDSCAPE DESIGN.
- KITCHEN AREA TO BE ACCORDANCE WITH NSW AS4674, FOOD ACT 2003, FOOD REGULATION 2015 AND FOOD STANDARD CODES 3.2.2 AND 3.2.3.

LANDSCAPE LEGEND

- EXISTING TREE / TREE TO BE RETAINED
- TREE TO BE REMOVED
- NEW TREE
- LANDSCAPING / BUFFER
- LINE OF STRUCTURAL ROOT ZONE (SRZ)
- LINE OF TREE EXCLUSION ZONE (TEZ)
- LINE OF TREE PROTECTION ZONE (TPZ)

NOTE: REFER TO ARBORIST REPORT FOR FURTHER DETAILS

ABBREVIATIONS

ENG.	- ENGINEER
ESL	- EXISTING SLAB LEVEL
EXT	- EXTERIOR
FFL	- FINISH FLOOR LEVEL
F.	- FIXED
FSL	- FINISH SURFACE LEVEL
GL	- GROUND LINE
GLZ	- GLAZING
EX.GL	- EXISTING GROUND LINE
REQ.	- REQUIREMENTS
XX.XX	- PROPOSED LEVEL
XX.XX	- EXISTING LEVEL
XX.XX	- SPOT LEVEL (PLAN)
XX.XX	- SPOT LEVEL (ELEVATION)

ISSUE	DATE	DESCRIPTION
A	28.07.23	ISSUE FOR DA

ASSOCIATED CONSULTANTS

PLANNER	AVENUE TOWN PLANNING
ACCESS	ERGON CONSULTING
ACOUSTICS	DAY DESIGN
QS	P&A
STORMWATER, ESM, FLOOD	GREENVIEW
GEOTECH, PSI, DSI, RAP	JK ENVIRONMENTS
LANDSCAPE	EARTH MATTERS
TRAFFIC	TRAFFIX
WASTE	DICKEN SOLUTIONS

NOTES
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- Do not scale from this drawing, use given written dimensions
- Drawing not for construction purposes

CLIENT

M. ABDEL KARIM

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|P: 02 8760 9300 |hello@artmade.com.au | www.artmade.com.au

PROJECT

CHILDCARE CENTRE

PROJECT ADDRESS

39 CARNATION AVENUE
BANKSTOWN

SHEET NAME

GROUND FLOOR FLOOR PLAN

ISSUED FOR DEVELOPMENT APPLICATION

Project number	Sheet No.	Issue	Phase
23710	DA03.02	A	DA

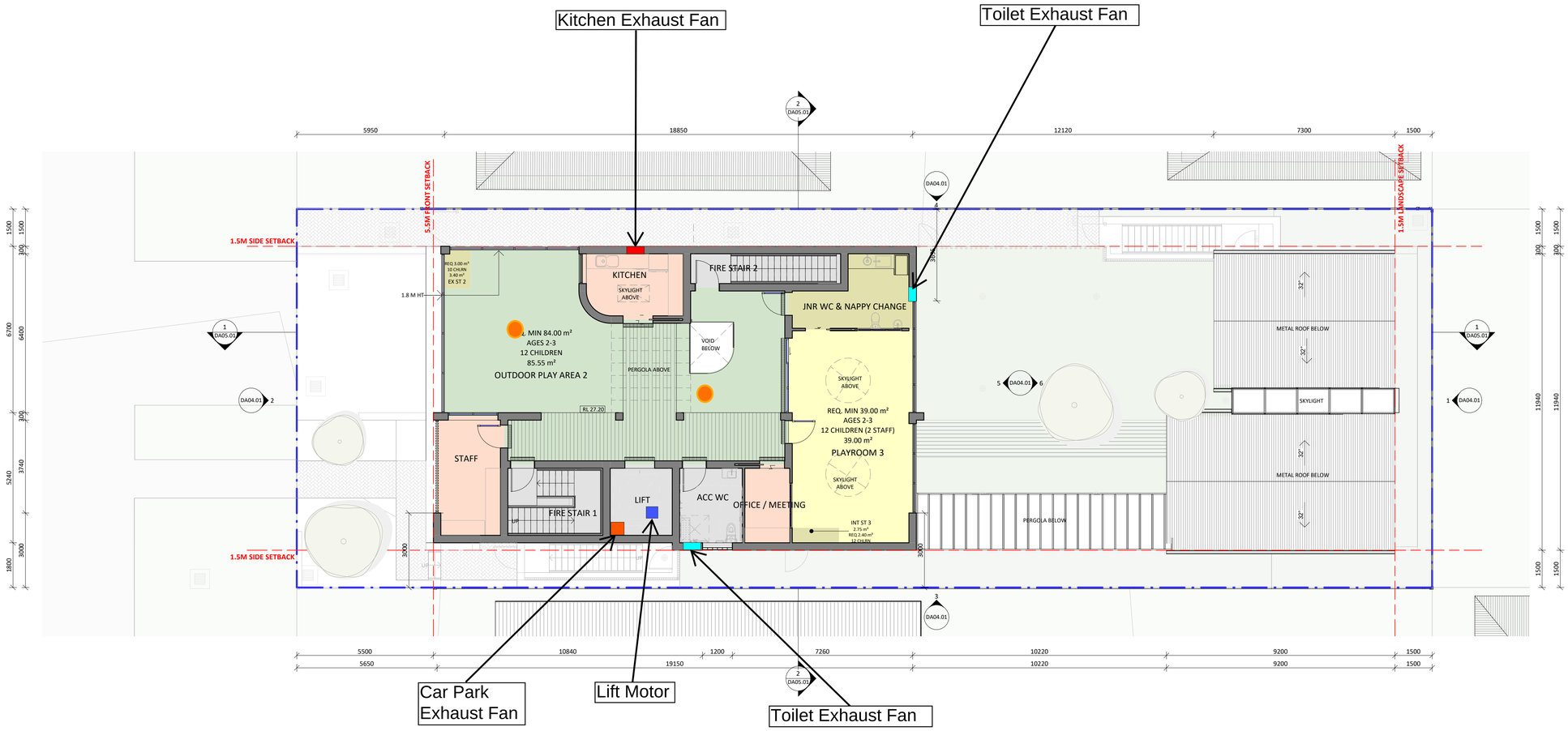
Sheet Size	Scale	L.G.A.
A1	As indicated	CANTERBURY BANKSTOWN COUNCIL

Drawn By	Checked By	Date
TA	BR	28.07.23

Key:

- 6 x 2-3 yr old children

7786-1 Rev A Appendix D

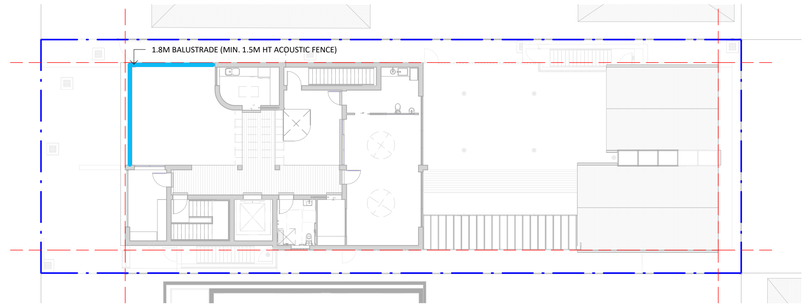


1 FIRST FLOOR PLAN
1 : 100

DA - FENCE LEGEND

- 2.1M HIGH BARRIER/FENCE
- 1.8M HIGH BARRIER/FENCE
- MIN. 1.5M HIGH BARRIER/FENCE
- 1.2M HIGH BARRIER/FENCE

NOTE:
- ALL ACOUSTIC BARRIERS IN ACCORDANCE WITH ACOUSTIC REPORT.
- REFER TO SHEET DA05.01 FOR FENCE DETAILS.



2 FIRST FLOOR PLAN FENCE / BARRIER DIAGRAM
1 : 200

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GEOTECH, PSI, DSI, RAP	JK ENVIRONMENTS
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PROJECT

CHILDCARE CENTRE

PROJECT ADDRESS

39 CARNATION AVENUE
BANKSTOWN

SHEET NAME

FIRST FLOOR PLAN

OUTDOOR PLAY AREA SCHEDULE				
AREA	AGE	NO. CHLDRN	UNENCUMBERED REQ AREA	UNENCUMBERED AREA
OUTDOOR PLAY AREA 1	AGES 3-5	28	196 m²	196.60 m²
OUTDOOR PLAY AREA 2	AGES 2-3	12	84 m²	85.55 m²
TOTAL		40	280 m²	282.15 m²

INDOOR PLAYROOM SCHEDULE					
ROOM	AGE	NO. CHLDRN	NO. STAFF	UNENCUMBERED REQ AREA	UNENCUMBERED AREA
PLAYROOM 1	AGES 0-2	8	2	26 m²	30.05 m²
PLAYROOM 2	AGES 3-5	20	2	65 m²	66.05 m²
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TOTAL		40	6	130 m²	135.10 m²

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EX ST 1	28	8.40 m³	8.85 m³
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TOTAL	38	11.40 m³	12.20 m³

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STAFF	4
VISITOR	5
TOTAL	10

NOT FOR CONSTRUCTION

ISSUED FOR DEVELOPMENT APPLICATION

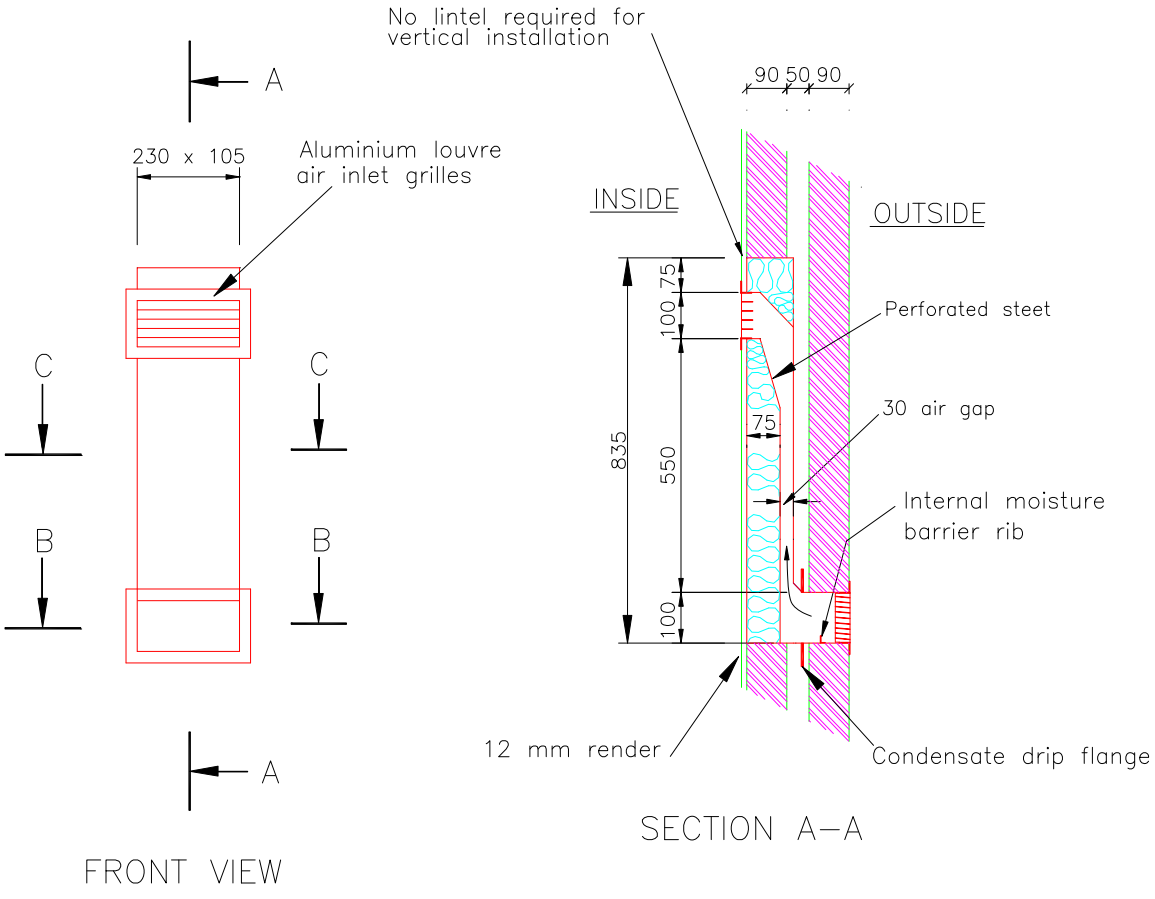
Project number	Sheet No.	Issue	Phase
23710	DA03.03	A	DA

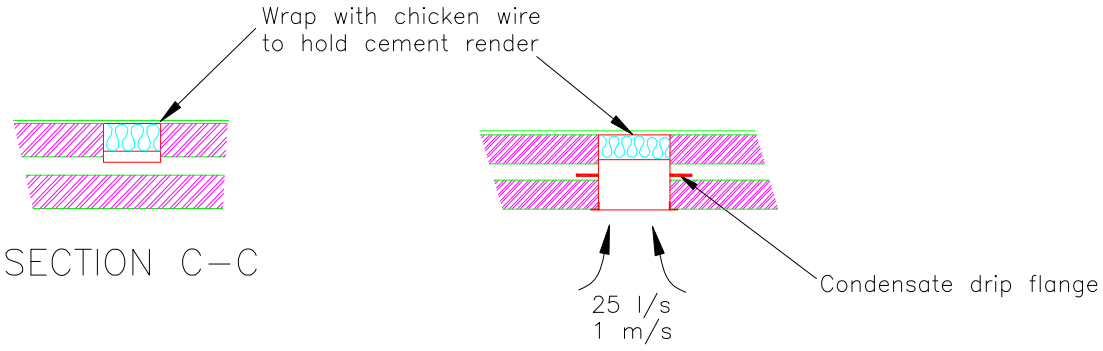
Sheet Size	Scale	L.G.A.
A1	As indicated	CANTERBURY BANKSTOWN COUNCIL

Drawn By	Checked By	Date
TA	BR	28.07.23

SILENCED AIR RELIEF INTAKE
AIR DUCT SINGLE OUTLET

AC810-6B





NOTES

1. Air Intake Silencer 1.6mm galv. steel casing Not less than 32kg/m^3 density 75mm fibreglass wool insulation faced with 0.6mm 25% open area perforated galv. steel.
2. Duct to built into wall with no air gaps between bricks and duct.
3. Duct may be mounted vertically or horizontally

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. $L_p = 20 \times \log (P/P_o)$ ... dB

where P is the rms sound pressure in Pascal and P_o 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.

$L_w = L_p + 10 \log A$ ... dB, re: 1pW,
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.