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Environmental Noise Assessment

Proposed Child Care Centre
16 Dudley Street, Punchbowl, NSW

REPORT NUMBER
7130-1.1R Rev B

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Prepared For:
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Attention: Mr Sam Sakr

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Status	Date	Prepared	Checked	Comment
Final	06/04/2020	Ricky Thom	Stephen Gauld	
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Rev B	26/03/2025	Ricky Thom	Stephen Gauld	Amended Design

Document 7130-1.1R Rev B, 38 pages plus attachments

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1.0 EXECUTIVE SUMMARY

A new two-storey child care centre (the Centre) with capacity for 60 children has been approved (DA-586/2022) at 16 Dudley Street, Punchbowl, NSW (the Site). As part of an S4.55 Modification Application, it is proposed to increase the capacity of the Centre to 68 children by adding 8 x 3-5 year old children.

The site is located on land zoned R3 – *Medium Density Residential* under the Canterbury Local Environmental Plan (LEP) 2012. The development site is bounded by residential dwellings to the north, east and south, and by Dudley Street to the west. Residential premises are also located on the opposite side of Dudley Street to the west. The site and nearby residential receptors are shown in Figure 1.

The proposal will involve the demolition of an existing single storey residential dwellings, and the construction of a new double storey Child Care Centre with basement level car park. The proposal comprises of 3 indoor play areas, 2 outdoor play areas, offices, staff room, kitchens and amenities, with a basement level car park with capacity for 11 vehicles.

The architectural drawings relied on for this assessment are prepared by Ultra Design and Engineering, dated 8 January, 2025, and attached as Appendix C.

The child care centre will have capacity for 68 children, comprising of:

- 2-3 year olds: 20 Children; and
- 3-5 year olds: (40 + 8 =) 48 Children.

The proposed hours of operation for the Child Care Centre are:

- Monday to Friday: 7.00 am – 6.00 pm.

Nearby residential premises may be affected by the following noise sources at the proposed Child Care Centre:

- Children playing both inside and outside;
- Car Park 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 Centre 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 intrusive noise at the Centre will meet the acoustic requirements established in Section 5.6, and will therefore be acceptable.

2.0 CONSULTING BRIEF

Day Design Pty Ltd was engaged by Ultra Design and Engineering to assess the potential environmental noise impact from a proposed modification to an approved Child Care Centre to be constructed at 16 Dudley Street, Punchbowl, 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 criteria
- Quantify noise emissions from the proposed Child Care Centre
- Calculate the level of noise emission, taking into account building envelope transmission loss, screen walls and distance attenuation
- Prepare a site plan identifying the development and nearby noise sensitive locations
- Provide recommendations for acoustical treatment
- Prepare an Environmental Noise Assessment Report.

3.0 SITE AND DEVELOPMENT DESCRIPTION

3.1 Site Description

The Centre is proposed to be constructed at 16 Dudley Street, Punchbowl, NSW. The site is situated on land zoned R3 – *Medium Density Residential* under the Canterbury Local Environment Plan (LEP) 2012.

The site is bounded by residential premises to the north, east and south, and by Dudley Street to the west. Residential premises are also located on the opposite side of Dudley Street to the west. The site and nearby residential receptors are shown in Figure 1.

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

Table 1 Noise Sensitive Receptors

Receptor and Type	Address	Receptor Location	Direction from site
R1a – Residential	14 Dudley Street	Front Facade	North
R1b – Residential		Middle Window	
R1c – Residential		Rear Yard	
R2a – Residential	11a Rosemont Street North	Ground Floor, Rear Yard	North-East
R2b – Residential		First Floor, Rear Façade	
R3a – Residential	18 Dudley Street	Rear Yard	South-East
R3b – Residential		Middle Window	
R3c – Residential		Front Facade	
R4 – Residential	15 Dudley Street	Front Façade	South-West

As the noise sources on the Site are at varying distance 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 – 16 Dudley Street, Punchbowl, NSW

3.2 Development Description

The proposal will involve the demolition of an existing single storey residential dwelling and the construction of a new two storey building, with basement level car park.

The new two storey Child Care Centre will include 3 indoor play areas, 2 outdoor play areas, offices, staff room, kitchens and amenities. The basement level car park with capacity for 11 vehicles, with driveway access from Dudley Street, along the western boundary of the site.

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

The proposed hours of operation for the Child Care Centre are:

- Monday to Friday: 7.00 am – 6.00 pm.

The child care centre will have capacity for 68 children, comprising of:

- 2-3 year olds: 20 Children; and
- 3-5 year olds: (40 + 8 =) 48 Children.

4.0 MEASURED NOISE LEVELS

Noise survey instrumentation used in this assessment is listed in Appendix A.

Noise descriptors used in this assessment include:

L_{Aeq} The equivalent continuous noise level is the A weighted sound pressure level, energy averaged over a period of time. 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 noise level events. Many studies show that human reaction to level-varying sounds tends to relate closely to the L_{Aeq} noise level.

L_{90} The ambient L_{90} background noise level is a statistical measure of the sound pressure level that is exceeded for 90% of the measuring period (typically 15 minutes).

RBL The Rating Background Level (RBL) is defined by the EPA's Noise Policy for Industry, as the median value of the (lower) tenth percentile of L_{90} ambient background noise levels for day, evening or night periods, measured over a number of days during the proposed days and times of operation.

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

Two environmental noise monitors were placed in the rear yard of 16 Dudley Street, Punchbowl, from Monday 7 December to Wednesday 16 December, 2020, to determine the Rating Background Level at ground and first floor levels. The locations of these noise monitors are shown in Figure 1 as Location 'A' and Location 'B', for heights of 1.5 metres above ground level and 4.5 metres above ground level respectively.

The noise monitors at Location 'A' and Location 'B' are considered representative of existing ambient levels for residential receptors surrounding the site.

The results of the ambient noise surveys at Locations 'A' and 'B' are shown in the attached Appendix B and below in Table 2. While the child care centre is not proposed to be operational during the night time period, noise levels during these times are shown to provide a complete overview of the acoustic environment.

Table 2 Rating and Ambient Background Levels – 16 Dudley Street, Punchbowl

Location	Time Period	L_{90} Rating Background Level (dBA)	Existing L_{Aeq} Noise Levels (dBA)
Location 'A' – 16 Dudley Street, Punchbowl *Ground Floor Level*	**Day (7 am to 6 pm)**	**41**	**54**
	Evening (6 pm to 10 pm)	**42**	**51**
	Night (10 pm to 7 am)	*36*	*49*
Location 'B' – 16 Dudley Street, Punchbowl *First Floor Level*	**Day (7 am to 6 pm)**	**46**	**59**
	Evening (6 pm to 10 pm)	**46**	**58**
	Night (10 pm to 7 am)	*40*	*53*

Meteorological conditions during the measurement survey typically consisted of clear skies with temperatures ranging from 13°C to 30°C. While atmospheric conditions were considered ideal for noise monitoring, rainfall was recorded during the night on Monday 14 December and Tuesday 15 December, 2020. High levels of wind were also measured during the day on Thursday 10 December, 2020. This data has been removed from the data set when calculating noise levels shown in Table 2. Therefore, noise level measurements were considered reliable and typical for the receptor area.

4.1 Measured Road Traffic Noise Levels

The proposed development is affected by road traffic noise from Dudley Street, which carriers low to moderate traffic volumes.

The weekday $L_{Aeq,\ 1\ hour}$ traffic noise levels measured at Location 'A' and Location 'B' are shown below in Table 3 and Table 4 respectively.

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

Time	$L_{Aeq,\ 1\ hour}$ Road Traffic Noise (dBA)				
	Tuesday 08/12/2020	Wednesday 09/12/2020	Friday 11/12/2020	Monday 14/12/2020	Tuesday 15/11/2020
7 – 8 am	54	52	52	54	51
8 – 9 am	54	52	53	50	51
9 – 10 am	54	49	54	52	53
10 – 11 am	51	49	51	51	55
11 – 12 pm	47	48	52	50	53
12 – 1 pm	54	47	51	52	52
1 – 2 pm	52	49	52	52	55
2 – 3 pm	51	50	54	53	*57*[1]
3 – 4 pm	50	51	51	55	54
4 – 5 pm	52	54	52	54	55
5 – 6 pm	52	53	51	52	53

[1] *We are of the opinion that noise levels shown in italics are not the result of local traffic noise, and have therefore been excluded from this assessment*

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

Time	$L_{Aeq,\ 1\ hour}$ Road Traffic Noise (dBA)				
	Tuesday 08/12/2020	Wednesday 09/12/2020	Friday 11/12/2020	Monday 14/12/2020	Tuesday 15/11/2020
7 – 8 am	*67*[1]	53	59	56	53
8 – 9 am	56	54	59	52	53
9 – 10 am	56	52	61	54	55
10 – 11 am	54	52	57	*62*[1]	56
11 – 12 pm	50	51	60	55	56
12 – 1 pm	59	51	58	55	56
1 – 2 pm	61	51	61	54	57
2 – 3 pm	62	57	60	54	58
3 – 4 pm	64	59	64	57	57
4 – 5 pm	65	62	65	56	59
5 – 6 pm	65	59	60	54	57

Based on the long-term measurements at Locations 'A' and 'B', 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 levels at Locations 'A' and 'B' are 54 dBA and 59 dBA respectively. These levels are used in the calculation of traffic noise intrusion for the proposed development within Section 7.0 of this report.

5.0 NOISE CRITERIA

5.1 Notice of Determination – DA-586/2022

Condition 1.3 of the *Conditions of Consent* for DA-586/2022 outlines the following acoustic requirements for the development:

'1.3. The updated acoustic report submitted in support of this application, prepared by Day Design Pty Ltd titled 'Environmental Noise Assessment, Proposed Child Care Centre, 16 Dudley Street, Punchbowl, NSW', report number: 7130-1.1R Rev A dated 6 December 2022 and recommendations forms part of the development consent.'

This revised report retains the same acoustic criteria and recommendations as previously presented within the approved acoustic report (7130-1.1R Rev A, dated 6 December 2022).

5.2 Canterbury Bankstown Development Control Plan

City of Canterbury Bankstown in its Bankstown Development Control Plan (DCP) 2015, Part B6 'Child Care Centres' Section 5 – Acoustic Privacy and Management outlines the following requirements in relation to acoustics:

Objective

The objectives are:

a) To have child care centres that do not adversely impact on the residential amenity of adjoining dwellings and the surrounding area.

b) To have development that installs appropriate acoustic privacy measures which are compatible with the prevailing character of residential areas.

c) To have the ongoing operation and management of child care centres maintain residential amenity.

Development controls

The development controls to achieve the objectives are:

Acoustic privacy

1. *Air conditioning, mechanical ventilation or any other continuous noise source must not exceed the ambient level at any specific boundary by more than 5 dB(A).*
2. *The location and design of child care centres 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 centre at the identified sensitive receiver locations;

c) Whether the development must apply measures to ensure the noise of the 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;

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, confirmations of the methodology adopted along with a copy of the model input and output data.

3. *The maximum height for the noise for noise attenuation walls and fences along the boundary of an allotment is 2 meters.*

Hours of operation

4. *Council may limit the hours of operation of child care centres to 7.00 am to 6.00 pm Monday to Friday*

Management plans

5. *Council must require the operator of a child care centre in Zone R2 Low Density residential … to organise and chair a Neighbourhood Liaison Committee. The purpose of the Committee is for the operator and neighbours to resolve any issues, such as traffic and noise, arising from the operation of the child care centre. The operation of the Committee must ensure:*

a) The membership of the Neighbourhood Liaison Committee must include residents who live next to and opposite the child care centre.

b) The neighbourhood Liaison Committee must meet at least four times during the first 24 months of the child care centre operating.

c) The operator of the child care centre must forward the meeting minutes to Committee members.

d) The operator of the child care centre may forward the meeting minutes to Council for information purposes.

The operator of the child care centre may terminate the Committee once it meets at least four times during the first 24 months of the child care centre operating, or may choose to extend the functions of the Committee over a longer period of time.'

5.3 NSW Department of Planning and Environment

5.3.1 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."*

Based on the information provided in Section 3.27 of the SEPP, the DCP controls do not necessarily apply to the development. However, Council's DCP will be considered in the determination of Project Specific Noise Criteria for the Site.

5.3.2 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 e.g. 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.*

5.4 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.

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 Leq,15min noise level emitted from the use and operation of the child care centre shall not exceed 65 dB(A), from all activities (including outdoor play), when assessed at the most affected point on or within 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.'

5.5 NSW Environment Protection Authority

5.5.1 NSW Road Noise Policy

The NSW Environment Protection Authority in its 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)	Night (10 pm – 7 am)
Local roads	6. Existing residences affected by **additional traffic** on existing local roads generated by land use developments	$L_{Aeq,\ (1\ hour)}$ 55 (external)	$L_{Aeq,\ (1\ hour)}$ 50 (external)

5.6 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:

5.6.1 Residential Receivers

For residential premises at ground floor level:

- (41 + 5 =) **46 dBA** $L_{Aeq,\ 15\ minute}$ for more than 4 hours per day of outdoor play; and
- (41 + 10 =) **51 dBA** $L_{Aeq,\ 15\ minute}$ for outdoor play of up to 4 hours (total) per day; and
- (41 + 5 =) **46 dBA** for all other noise sources including car park, mechanical plant and indoor play areas.

For residential premises at first floor level:

- (46 + 5 =) **51 dBA** $L_{Aeq,\ 15\ minute}$ for more than 4 hours per day of outdoor play; and
- (46 + 10 =) **56 dBA** $L_{Aeq,\ 15\ minute}$ for outdoor play of up to 4 hours (total) per day; and
- (46 + 5 =) **51 dBA** for all other noise sources including car park, mechanical plant and indoor play areas.

The residential criteria apply at the most affected point on or within the residential property boundary. For upper floors, the noise is assessed outside the nearest window.

5.6.2 On-Road Traffic Noise Criterion

The following criterion will be applied at 1 metre from the most affected residential façades for on – road traffic noise:

- **55 dBA** (external) $L_{Aeq,\ 1\ hour}$ between 7 am and 10 pm.

5.6.3 Sleep Disturbance

Consideration has been given to sleep disturbance cause by noise generate from staff arriving prior to 7 am, and parking within the basement level car park.

The following criteria is applied for all residential receptors, during the early morning shoulder period of 6.30 am to 7 am:

Residential Facades – Ground Floor:

- (41 + 15 =) **56 dBA** L_{Amax} at the closest affected façade of a residential premises between 6.30 am and 7 am

Residential Facades – First Floor:

- (46 + 15 =) **61 dBA** L_{Amax} at the closest affected façade of a residential premises between 6.30 am and 7 am

5.6.4 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 proposed Child Care 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 Ultra Design and Engineering, and attached as Appendix C.

6.1 Indoor and Outdoor Play Areas

Day Design Pty Ltd has previously measured and quantified the $L_{Aeq,\ 15\ minute}$ sound levels of children at a number of different Child Care Centres. From this data we have been able to determine the $L_{Aeq,\ 15\ minute}$ sound power level (SWL) per child.

The Association of Australasian Acoustical Consultants has presented a range of A-weighted SWL's per child in its '*Guideline for Child Care Centre Acoustic Assessment*'. The logarithmic average of the full range of A-weighted SWL's for children has been used to represent the noise emission from a typical group of mixed aged children engaged in active play.

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, 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
48 children, 3 to 5 years	**93**	71	77	82	88	90	87	83	79

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 54 cars in 1 hour arriving or leaving the child care centre in the morning peak. This is equivalent to approximately 14 vehicle trips in a 15-minute period.

The Sound Exposure Level (SEL) sound power level and spectra of vehicle noise is shown below in Table 7 and is based on previous measurements by Day Design.

For the assessment of sleep disturbance, we have assumed that two staff vehicles will arrive at the Child Care Centre between 6.30 am and 7.00 am, enter the car park from the driveway on Dudley Street and park within the farthest spaces, as seen in the architectural drawings attached as Appendix C.

For the assessment of vehicular activity from the car park area, we have assumed vehicles will travel at a rate of 10 km/h. For additional noise generated by traffic along Dudley Street, we have assumed vehicles will travel at a rate of 30 km/h as they approach or leave the Centre.

Table 7 SEL Sound Power Levels - Car Park

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 driving uphill at approximately 10 km/h	**88**	96	94	86	85	83	79	76	70
SEL sound power level of car drive-by at approximately 30 km/h	**92**	99	92	90	88	89	82	75	69
SEL of car door slam, ignition and drive away	**91**	104	98	89	87	86	83	81	75
L_{Amax} of typical car door slam	**99**	108	102	100	96	93	92	86	83
L_{Amax} of car turning into driveway	**92**	98	92	90	88	88	83	80	76

6.3 Mechanical Plant

The mechanical plant, including air conditioning condensers kitchen and bathroom exhaust fans and lift motor, 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 ground floor level, along the southern façade of the development. The lift motor for the development is assumed to be located within the top of the proposed lift shaft. These locations can be seen within the architectural drawings prepared by Ultra Design and Engineering, attached as Appendix C, with the assumed placement of the condensers and lift motor shown in Appendix D.

We have assumed that the kitchen and bathroom exhaust fans will be ducted through the façade or the roof of the development. The car park exhaust fan is assumed to be ducted to the ground floor of the development, with an exhaust located along the eastern edge of the development, below the disability access ramp. The assumed locations of these exhaust fans are highlighted within 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**
Car park exhaust fan[2]	**75**	73	72	70	76	70	64	54	46
Medium (double fan) condenser (outdoor unit)	**70**	82	77	74	66	61	60	57	53
3 x Medium condensers	**75**	87	82	79	71	66	65	62	58
Hydraulic lift motor[3]	**66**	59	61	55	59	58	56	52	48
Small kitchen exhaust fan[4]	**60**	61	67	62	54	54	50	45	39
Small exhaust fan (toilet)[5]	**60**	51	47	50	53	59	43	36	31

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

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 child care centre itself. Based on the approved acoustic report prepared by Day Design Pty Ltd (report ref: 7130-1.1R Rev A, dated 6 December 2022), the following barrier heights are approved:

- 1.8-metre-high Colorbond fence along the northern, eastern and southern site boundaries;
- 1.6-metre-high solid glazed fence along the eastern boundary of the upper portion of the ground floor outdoor play area;
- 2.2-metre-high brick wall along part of the northern and southern boundary of the first-floor outdoor play area; and
- 1.2-metre-high glass or polycarbonate balustrade along the eastern boundary of the first-floor play area.

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

A source height of 1 metre above ground level has been used for children of all age groups. As a worst-case scenario, noise emission has been modelled with all 68 children engaged in simultaneous outdoor play.

Noise levels at ground floor level are calculated to the nearest most reasonably affected point 3 metres inside the property boundary within the yards of receptor locations, ‘R1c’, ‘R2a’ and ‘R3a’. Noise levels are also assessed at the nearest most affected windows at the ground floor level, at receptor locations ‘R1a’, ‘R1b’, ‘R3b’, ‘R3c’ and ‘R4’.

Noise level at the first-floor level for receptor ‘R2b’ are calculated at the nearest most reasonably affected window/façade.

Table 9 and Table 10 show the predicted noise levels at the residential receptors from the activities associated with the Child Care Centre 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 determined by spacing the 68 children across the child care centre outdoor play areas as follows:

- Ground Floor Outdoor Play Area = 20 x 2-3 year olds, 20 x 3-5 year olds, and
- First Floor Outdoor Play Area = 28 x 3-5 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.

As recommended in Section 8.2 of the Approved Acoustic Report prepared by Day Design Pty Ltd (report ref: 7130-1.1R Rev A, dated 6 December 2022), outdoor play should be limited to a maximum of 4 hours per day, allowing for the use of the higher criteria as shown in Section 5.6.1.

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

Table 9 Predicted $L_{eq,\ 15\ minute}$ Noise Levels – Outdoor Play (Max. 4 hours)

Receptor Location – First Floor (FF) & Ground Floor (GF)	Predicted Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1a – 14 Dudley Street, Front Façade (GF)	38	51	Yes
R1b – 14 Dudley Street, Middle Window (GF)	48	51	Yes
R1c – 14 Dudley Street, Rear Yard (GF)	49	51	Yes
R2a – 11a Rosemont Street North, Rear Yard (GF)	48	51	Yes
R2b – 11a Rosemont Street North, Rear Façade (FF)	53	56	Yes
R3a – 18 Dudley Street, Rear Yard (GF)	50	51	Yes
R3b – 18 Dudley Street, Middle Window (GF)	47	51	Yes
R3c – 18 Dudley Street, Front Façade (GF)	39	51	Yes
R4 – 15 Dudley Street, Front Façade (GF)	29	51	Yes

As summarised in Table 9, the predicted levels of noise at all receptor locations will comply with the criteria established in Section 5.6 of this report, and are therefore found to be acceptable.

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)
R1a – 14 Dudley Street, Front Façade (GF)			
- Indoor play areas	31		
- Car park	41		
- Mechanical	36		
Cumulative Noise Level	42	46	Yes
R1b – 14 Dudley Street, Middle Window (GF)			
- Indoor play areas	39		
- Car park	35		
- Mechanical	34		
Cumulative Noise Level	42	46	Yes
R1c – 14 Dudley Street, Rear Yard (GF)			
- Indoor play areas	45		
- Car park	<20		
- Mechanical	38		
Cumulative Noise Level	46	46	Yes
R2a – 11a Rosemont Street North, Rear Yard (GF)			
- Indoor play areas	38		
- Car park	<20		
- Mechanical	40		
Cumulative Noise Level	42	46	Yes
R2b – 11a Rosemont Street North, Rear Façade (FF)			
- Indoor play areas	42		
- Car park	<20		
- Mechanical	36		
Cumulative Noise Level	43	51	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)
R3a – 18 Dudley Street, Rear Yard (GF)			
- Indoor play area	44		
- Car park	<20		
- Mechanical	39		
Cumulative Noise Level	45	46	Yes
R3b – 18 Dudley Street, Middle Window (GF)			
- Indoor play area	42		
- Car park	33		
- Mechanical	44		
Cumulative Noise Level	46	46	Yes
R3c – 18 Dudley Street, Front Façade (GF)			
- Indoor play area	37		
- Car park	35		
- Mechanical	39		
Cumulative Noise Level	42	46	Yes
R4 – 15 Dudley Street, Front Façade (GF)			
- Indoor play area	<20		
- Car park	42		
- Mechanical	36		
Cumulative Noise Level	43	46	Yes

As summarised in Table 10, the predicted cumulative levels of noise from indoor play, mechanical plant and the use of the car park will comply with the criteria established in Section 5.6 at all receptor locations, and will therefore be considered acceptable.

6.5 Sleep Disturbance

It is proposed that the Centre will accept children from 7 am. A number of staff will arrive prior to 7 am, to prepare for the arrival of 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 2 staff vehicles will arrive between 6.30 am and 7 am.

As shown in the architectural drawings prepared by Ultra Design and Engineering, attached as Appendix C, entrance to the basement level carpark is to be provided via a driveway located along Dudley Street. In the assessment of sleep disturbance, consideration has been given to noise associated with vehicles pulling into the driveway, as well as car doors slamming within the basement level car park.

Noise emission from staff arriving prior to 7 am has been assessed at the closest affected residential receptors, 'R1a', 'R3c' and 'R4'. As these receptors are the most exposed to L_{max} noise events from the use of the basement level car park, compliance at these receptor locations will ensure compliance at all other residential receptors.

The calculated L_{AFmax} noise levels at the nearest affected residential receptor locations to the driveway are shown in Table 11 below.

Table 11 Calculated L_{AFmax} Noise Levels – Sleep Disturbance

Description	Calculated Noise Level - L_{AFmax} (dBA) at Receptor Locations		
	R1a	R3c	R4
Cars Pulling into Driveway	56	51	56
Car Door Slams in Car Park	53	50	54
Acceptable Noise Limit	**56**	**56**	**56**
Compliance	Yes	Yes	Yes

As seen in Table 11, the predicted maximum L_{AFmax} level of noise from staff arriving at the Child Care Centre between 6.30 am and 7 am meets the sleep disturbance criteria derived in Section 5.6 at the closest affected residential receptors, and is therefore acceptable.

6.6 On-Road Traffic

The external $L_{Aeq,\ 1\ hour}$ traffic noise levels at the most affected residential receptor locations, from noise associated with on-road traffic travelling along Dudley Street throughout the day, are calculated to be as shown in Table 12.

Table 12 Calculated $L_{Aeq,\ 1\ hour}$ Noise Levels - Additional On – Road Traffic

Receptor Location	Calculated Noise Level (dBA)	Noise Criterion (dBA)	Compliance (Yes/No)
R1a – 14 Dudley Street, Front Façade (GF)	47	55	Yes
R1b – 14 Dudley Street, Middle Window (GF)	42	55	Yes
R1c – 14 Dudley Street, Rear Yard (GF)	26	55	Yes
R2a – 11a Rosemont Street North, Rear Yard (GF)	<20	55	Yes
R2b – 11a Rosemont Street North, Rear Façade (FF)	<20	55	Yes
R3a – 18 Dudley Street, Rear Yard (GF)	40	55	Yes
R3b – 18 Dudley Street, Middle Window (GF)	43	55	Yes
R3c – 18 Dudley Street, Front Façade (GF)	47	55	Yes
R4 – 15 Dudley Street, Front Façade (GF)	51	55	Yes

Table 12 shows the calculated external levels of noise from on-road traffic meets the noise criteria at each of the residential receptor locations, as established in Section 5.6, and is therefore acceptable.

7.0 NOISE INTRUSION – ROAD TRAFFIC NOISE

7.1 External Road Traffic Noise Levels – Outdoor Play Area

The existing road traffic noise levels were measured in the rear yard of 16 Dudley Street, Punchbowl, shown as Locations 'A' and 'B' in Figure 1, for the ground and first floor levels respectively. The area is exposed to low amounts of traffic noise from Dudley Street, and moderate amounts of traffic noise from Punchbowl Road to north.

The measured $L_{Aeq, (1\ hour)}$ traffic noise levels at Locations 'A' and 'B' were 54 dBA and 59 dBA respectively, as stated in Section 4.1. Knowing the distance between the noise source and the measured $L_{Aeq, 1\ hour}$ noise level allows for the calculation of predicted levels within the proposed outdoor play areas.

Taking into account the acoustic screening provided by the proposed fences, as seen in the architectural drawings prepared by Ultra Design and Engineering, and summarised in Section 6.4, the calculated equivalent $L_{Aeq, 1\ hour}$ noise levels within the outdoor play areas are 50 dBA and 47 dBA respectively.

The calculated levels for both outdoor play areas are below the RNP external noise limit of $L_{Aeq, 1\ hour}$ 55 dBA for outdoor play areas in Child Care Centre, and are therefore acceptable.

7.2 Road Traffic Noise Intrusion Assessment – Indoor Playrooms

7.2.1 Road Traffic Noise Intrusion – Playroom 1, Ground Floor

The calculated $L_{Aeq, 1\ hour}$ external noise levels at the northern and eastern façades of the proposed Child Care Centre are 54 dBA and 42 dBA, outside the northern windows and eastern sliding door of Playroom 1 respectively.

The proposed construction for Playroom 1 shown in the architectural drawings prepared by Ultra Design and Engineering, is calculated to achieve an 18 dB reduction, with the eastern sliding door open (50% of window area). The glazing shown in the architectural drawings for the northern and eastern facade of Playroom 1 is assumed to be 5 mm glass, with the glazing of the northern façade assumed to be fixed.

Based upon a reduction of 18 dBA, the predicted internal noise within Playroom 1 is calculated to be 36 dBA with the eastern sliding door open (50% of window area).

This calculated level is below the RNP internal noise limit for Child Care Centres of $L_{Aeq, 1\ hour}$ 40 dBA for indoor play areas, and is therefore acceptable.

7.2.2 Road Traffic Noise Intrusion – Playroom 2, Ground Floor

The calculated $L_{Aeq,\ 1\ hour}$ external noise levels at the eastern and southern façades of the proposed Child Care Centre are 42 dBA and 54 dBA, outside the eastern sliding door and southern windows of Playroom 2 respectively.

The proposed construction for Playroom 2 shown in the architectural drawings prepared by Ultra Design and Engineering, is calculated to achieve an 18 dB reduction, with the eastern sliding door open (50% of window area). The glazing shown in the architectural drawings for the eastern and southern façade of Playroom 2 is assumed to be 5 mm glass, with the glazing of the southern façade assumed to be fixed.

Based upon a reduction of 18 dBA, the predicted internal noise within Playroom 2 is calculated to be 36 dBA with the eastern sliding door open (50% of window area).

This calculated level is below the RNP internal noise limit for Child Care Centres of $L_{Aeq,\ 1\ hour}$ 40 dBA for indoor play areas, and is therefore acceptable.

7.2.3 Road Traffic Noise Intrusion – Playroom 3, First Floor

The calculated $L_{Aeq,\ 1\ hour}$ external noise levels at the eastern façade of the proposed Child Care Centre is 45 dBA, outside the eastern sliding door of Playroom 3, taking into account the proposed northern wall and covered terrace of the first floor outdoor play are.

The proposed construction for Playroom 3 shown in the architectural drawings prepared by Ultra Design and Engineering, is calculated to achieve a 26 dB reduction, with the eastern sliding door open (50% of window area). The glazing shown in the architectural drawings for the northern and eastern facade of Playroom 3 is assumed to be 5 mm glass, with the glazing of the northern façade assumed to be fixed.

Based upon a reduction of 26 dBA, the predicted internal noise within Playroom 3 is calculated to be 39 dBA with the eastern sliding door open (50% of window area).

This calculated level is below the RNP internal noise limit for Child Care Centres of $L_{Aeq,\ 1\ hour}$ 40 dBA for indoor play areas, and is therefore acceptable.

8.0 NOISE CONTROLS RECOMMENDATIONS

The noise control recommendations below are taken from the Approved Acoustic Report prepared by Day Design Pty Ltd (report ref: 7130-1.1R Rev A, dated 6 December 2022), and will allow for compliance with the criteria outlined in Section 5.6 of this report.

8.1 Noise Management Plan

We recommend the child care 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.
- Neighbours should be provided with the name and contact details of the Centre's Manager, and an invitation to 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.
- 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.

8.2 Outdoor Play Area

8.2.1 Operation Controls

We recommend the amount of outdoor play time be limited to a maximum of 4 hours per day, to ensure that noise emission from the outdoor play area does not adversely impact adjoining residences.

8.3 Sound Barrier Walls

We recommend that the following sound barrier walls be included in the overall design of the Child Care Centre, to limit the noise emission from the ground floor outdoor play area, and the noise intrusion into the ground floor indoor play areas:

- 1.8 metre Colorbond fence along the northern, eastern and southern site boundaries;
- 1.6 metre-high solid glazed fence along the eastern boundary of the upper portion of the ground floor outdoor play area;
- 1.2 metre-high glass or polycarbonate balustrade along the eastern boundary of the first-floor play area.

We recommend the sound barriers be constructed from 3-rail 'solid capped and lapped' timber, 6 mm fibre cement, 6.38 mm thick laminated glass or 10 mm solid polycarbonate. The construction shall be free of visible air gaps to provide an impervious sound barrier. The location of this sound barrier can be seen within Appendix D.

8.4 Mechanical Plant & Equipment – Construction Certificate

The specifications for the mechanical plant have not yet been selected for this development. As seen within Table 10, there is the potential for the mechanical plant serving the site to exceed the project specific noise criteria outlined in Section 5.6.

For typical mechanical plant equipment with sound power levels not exceeding those listed in Table 8, it is reasonable and feasible to acoustically treat the associated ducting or locate the equipment itself so that noise will not impact the neighbouring properties.

Once mechanical plant and its location has been selected, a detailed acoustic assessment should be conducted, prior to the issue of a Construction Certificate (or during the detailed design stage), to ensure the use of the mechanical plant will comply with the project specific noise criteria in Section 5.6 of this report. We recommend that the mechanical services engineers select mechanical plant equipment with the lowest sound power levels available, to reduce the amount of acoustic treatment necessary to achieve the noise criteria at nearby residential receivers.

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

8.5 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.

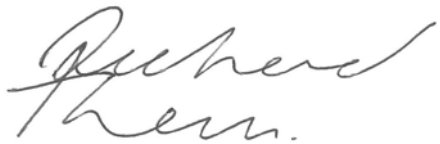
We encourage clients to check with us before using materials or equipment that are alternative to those specified in our Acoustical Report.

9.0 NOISE IMPACT STATEMENT

Day Design Pty Ltd was engaged by Ultra Design and Engineering to assess the potential environmental noise impact from a proposed Child Care Centre to be constructed at 16 Dudley Street, Punchbowl, NSW.

Calculations also show that the intrusive road traffic noise levels will meet the noise level requirements of the NSW Environment Protection Authority's Road Noise Policy and the NSW Department of Planning and Environment's *Child Care Planning Guideline*, and be considered acceptable.

Calculations also show that, provided the noise controls recommended in Section 8.0 are adhered to, the level of noise emission from the proposed child care centre will meet the noise level requirements of Council, the NSW Department of Planning and Environment's *Child Care Planning Guideline* and be considered acceptable.



Ricky Thom, BA, BE(Mech)Hons, MEnvScMgt, 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** – Noise Survey Instrumentation
- **Appendix B** – Ambient Noise Survey
- **Appendix C** – Architectural Drawings dated 8 January 2025
- **Appendix D** – Approximate Noise Source Locations and Noise Control Recommendations Markup
- **AC108-1 to 4** – Glossary of Acoustical Terms

NOISE SURVEY INSTRUMENTATION

Noise level measurements and analysis were made with instrumentation as follows in Table A:

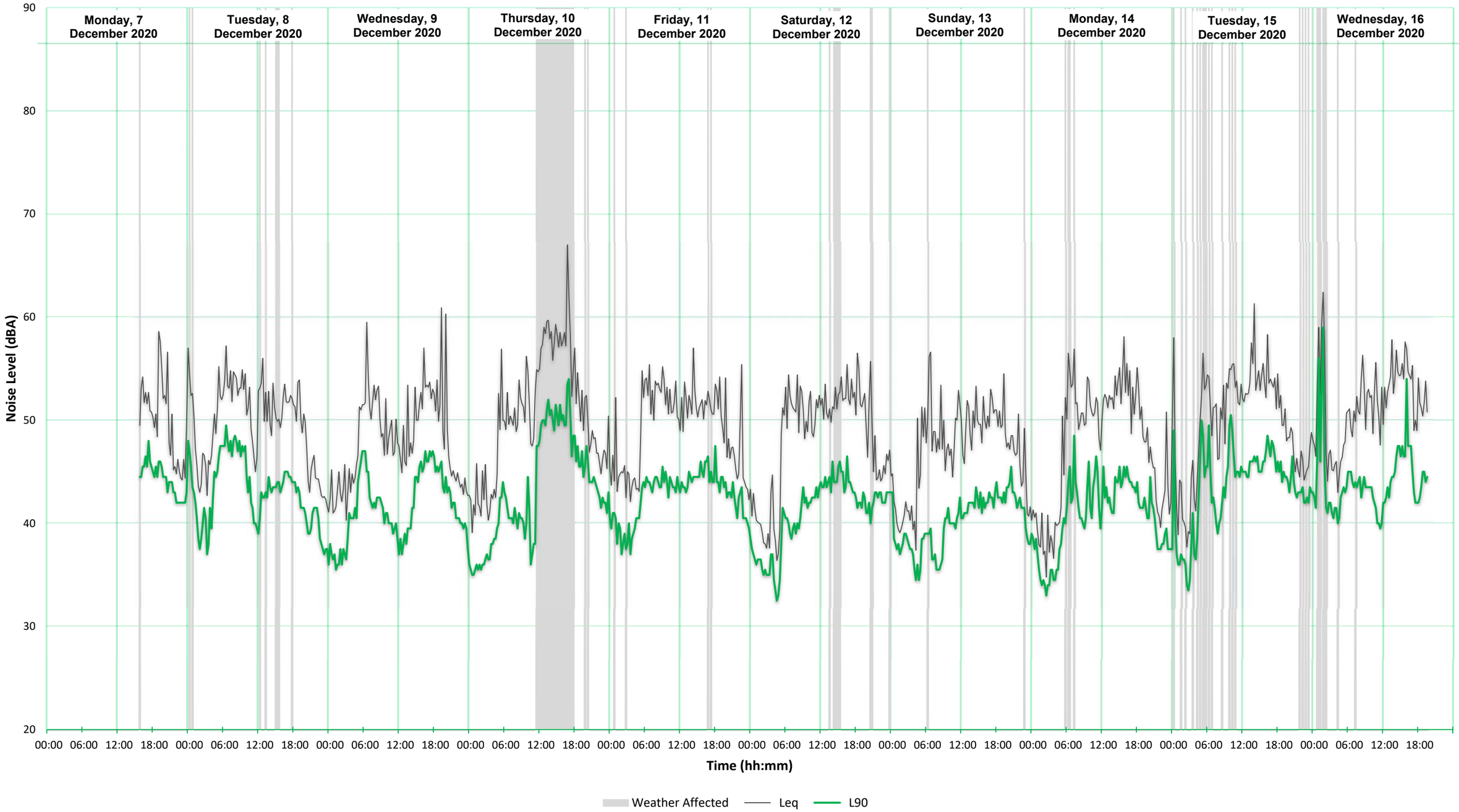
Table A Noise Instrumentation

Description	Model No	Serial No
Infobyte Noise Logger (Type 1) Condenser Microphone 0.5" diameter	iM4 MK 250	107 107
Infobyte Noise Logger (Type 1) Condenser Microphone 0.5" diameter	iM4 MK 250	125 125
Acoustical Calibrator	B&K 4231	3025991

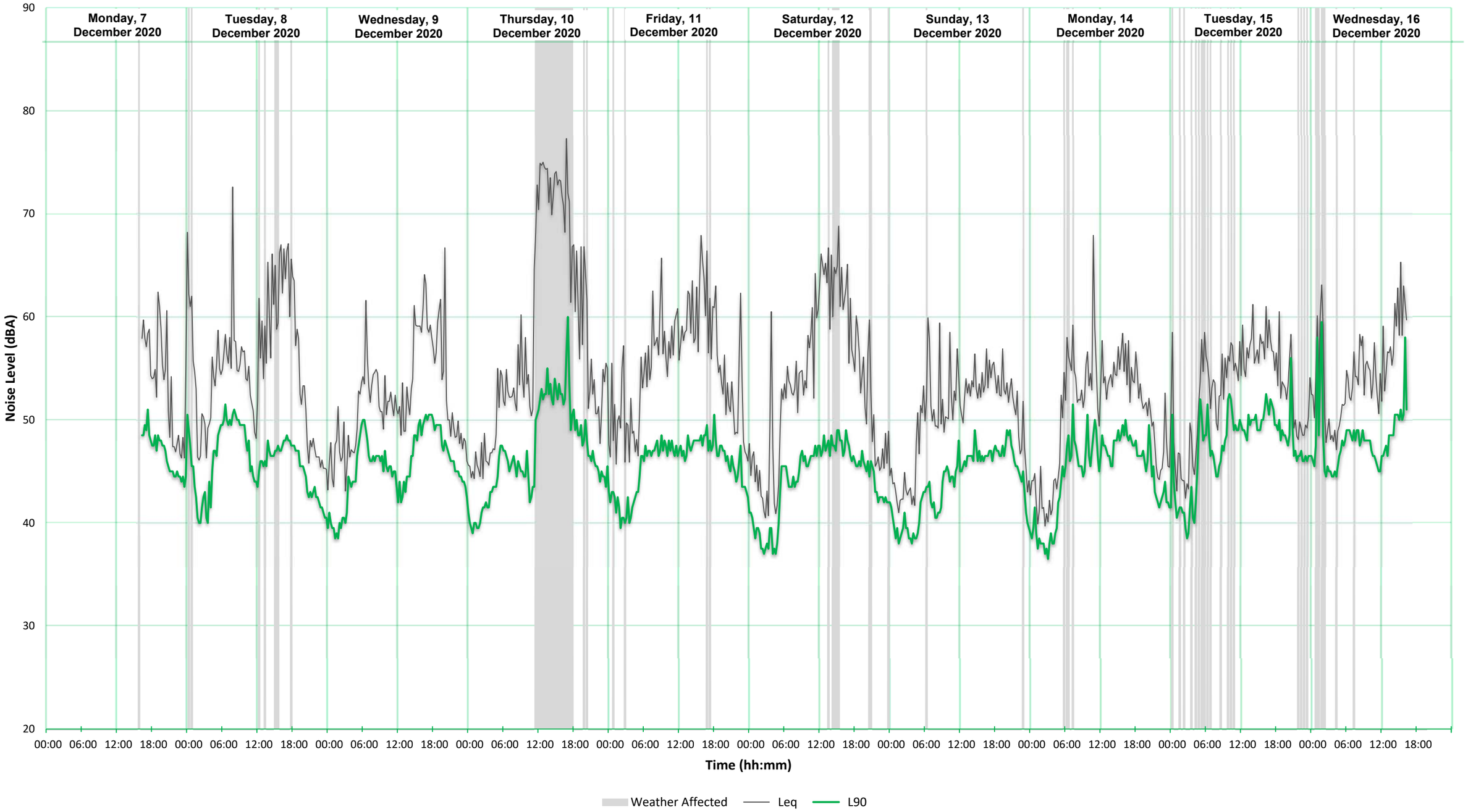
An environmental noise logger is used to continuously monitor ambient noise levels and provide information on the statistical distribution of noise during an extended period of time. The Infobyte Noise Monitor iM4 is a Type 2 precision environmental noise monitor meeting all the applicable requirements of AS1259 for an integrating-averaging sound level meter.

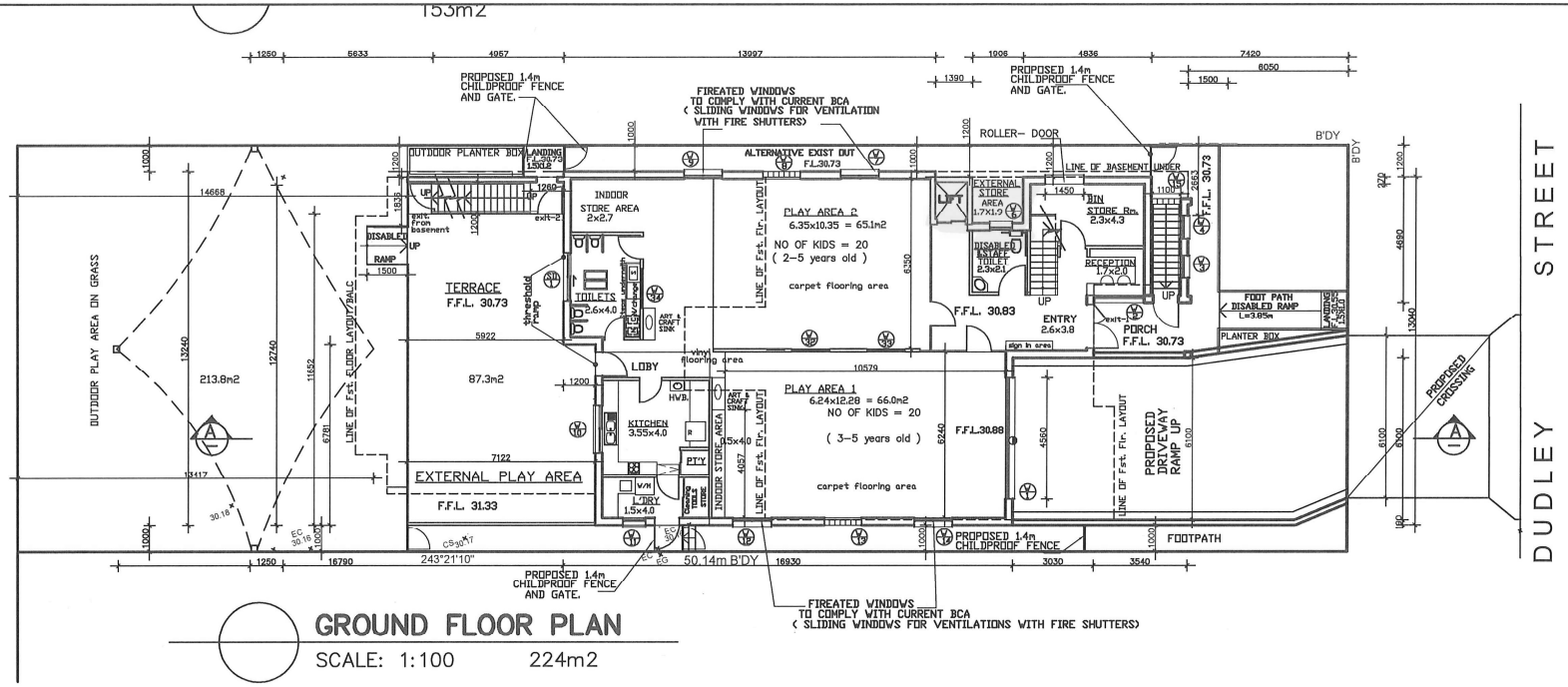
All instrument systems had been laboratory calibrated using instrumentation traceable to Australian National Standards and certified within the last two years thus conforming to Australian Standards. The measurement system was also field calibrated prior to and after noise surveys. Calibration drift was found to be less than 0.5 dB for attended measurements and within 1 dB for long-term measurements. No adjustments for instrument drift during the measurement period were warranted.

Located at Ground Floor, 16 Dudley Street, Punchbowl, NSW



Located at First Floor, 16 Dudley Street, Punchbowl, NSW





GROUND FLOOR PLAN

SCALE: 1:100 224m2

WINDOW SCHEDULE

WINDOW NAME	HEIGHT mm	WIDTH mm	
CHILDCARE			
W1	1800	4560	SLIDING WINDOW
W2-W10-W20	1029	1810	SLIDING WINDOW
W3-W4-W16-W17-W18 W22-W23-W24-W28-W29	1800	850	AWNING WINDOW
-W7-W9-W12-W14 W26-W30-W31	1200	1450	SLIDING WINDOW
W8-W13-W27	1200	1400	GLASS BRICKS
W15	1200	1000	GLASS BRICKS
W6-W25	856	850	SLIDING WINDOW
W11	1029	850	SLIDING WINDOW
W19-W21	1029	610	AWNING WINDOW
W32-W33	1200	1450	FIXED WINDOW
W34	1029	1450	FIXED WINDOW
W35	1200	850	FIXED WINDOW
W36	2600	1810	GLAZING WALLS
W37	2600	2150	GLAZING WALLS
W38	2600	2710	GLAZING WALLS
SD1-SD2-SD4	2100	1810	SLIDING DOOR
SD3	2100	1450	SLIDING DOOR
SD5	2100	1810	SLIDING DOOR

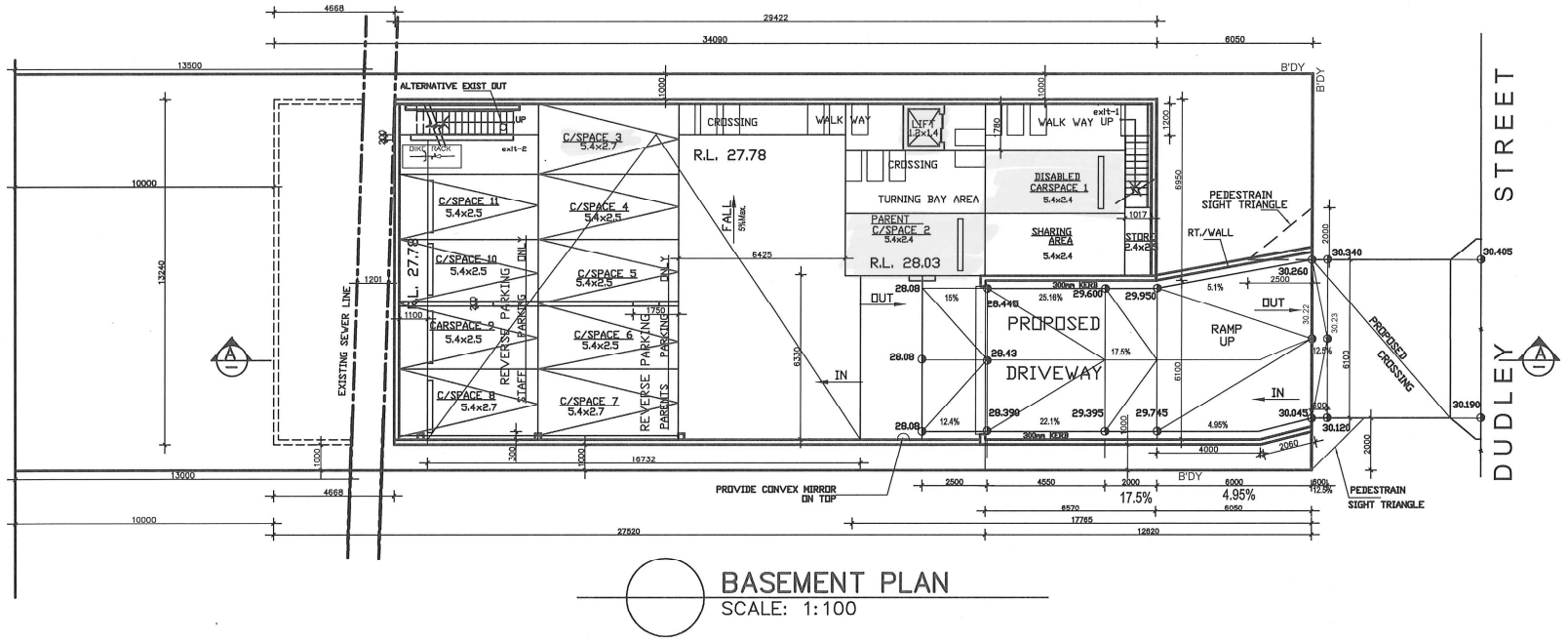
EXTERNAL FINISHES

WALLS TO BE
SELECTED TIMBER FRAMED WALL
& CSR HEBEL POWER PANEL CLADDING .....CREAMY COLOR

SELECTED METAL SHEETS..... MEDIUM COLOR
ALUMINIUM WINDOWS & DOORS.....BLACK COLOR
GUTTERS & DOWN PIPES.....BLACK COLOR

LEGEND

×	EXISTING NATURAL Gnd L.
◑	PROPOSED NATURAL Gnd L.
F.F.L	FINISH FLOOR LEVEL
C.L	CEILING LEVEL
G.F.L	GARAGE LEVEL
SS/A	SMOKE ALARM
SH/S	HOT WATER SYSTEM
oF/W	FLOOR WASTE



BASEMENT PLAN

SCALE: 1:100

ISSUE	AMENDMENT	DATE	CHECKED
-I-	SEC 4.55(1A) - amended plans	08/01/25	S.S.
-H-	amended plans	03/04/24	S.S.
-G-	SEC 4.55(1A) - amended plans	12/10/23	S.S.

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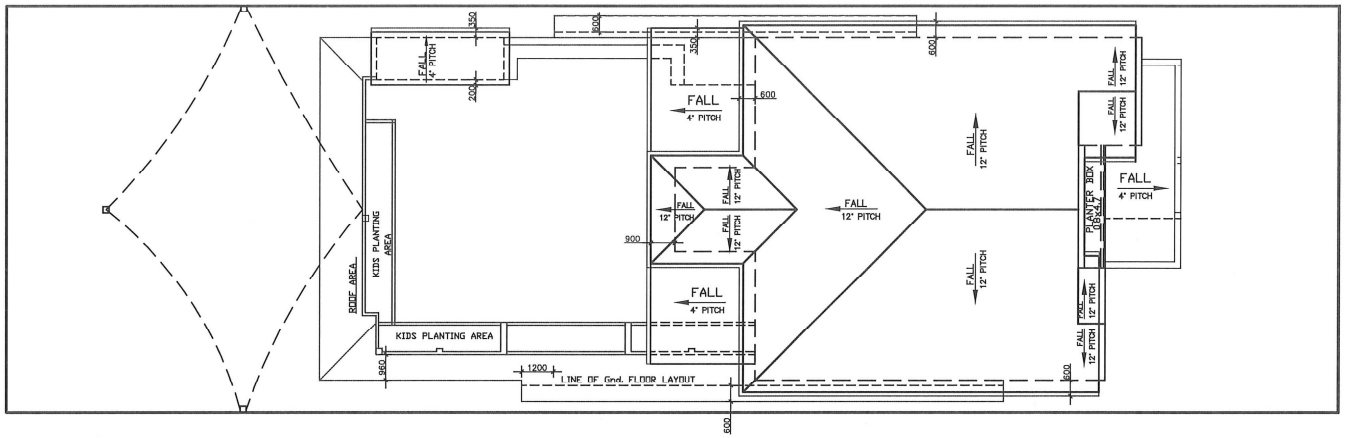
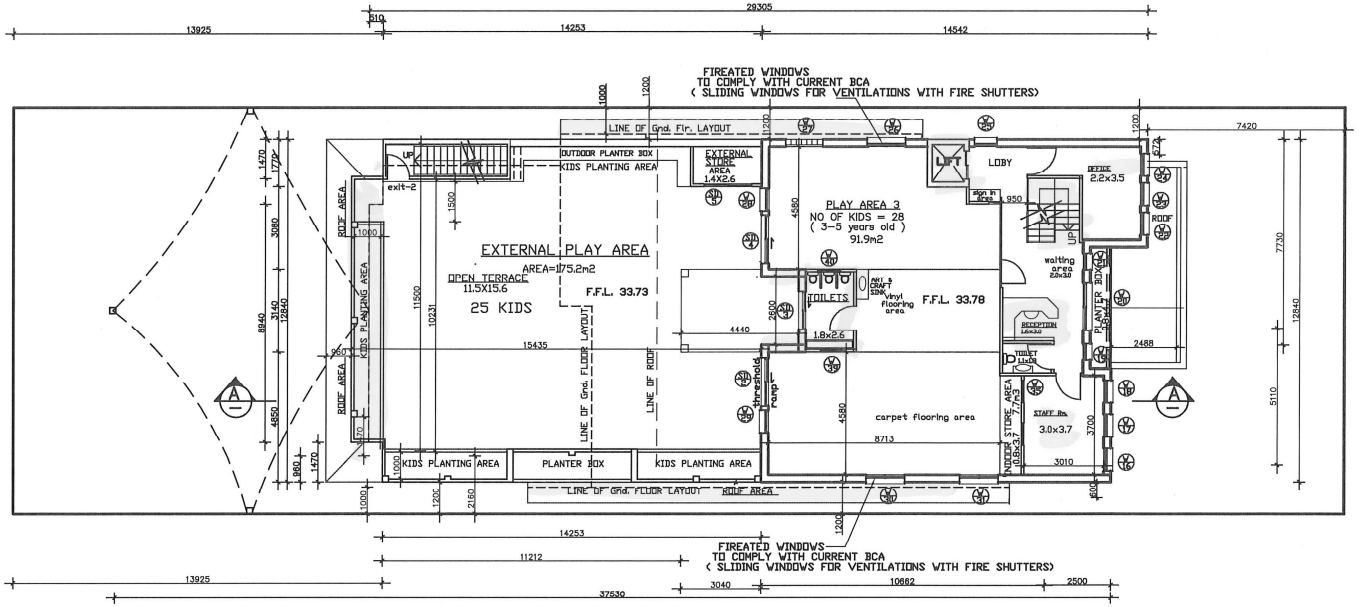
PROJECT:
PROPOSED ALTERAIONS & ADDITIONS FOR AN APPROVED CHILDCARE CENTRE DEVELOPMENT AND ADD EXTRA 8 KIDS TO BE INTOTAL 68 KIDS
No. 16 DUDLEY STREET, PUNCHBOWL.
LOT 39 SEC 7 IN DP 5701, FOR Mrs. Rosie

DRAWING TITLE:
DETAILS
GROUND & LOWER FLOOR PLAN
SHEET: 3/3

DESIGNED BY: SAM SAKR	REV: S.S.
DATE: 09/03/22	SCALE: 1:200
CAD FILE NAME: Z:\2017\ARCO81	DRAWN: A.S.



ROOF PLAN



FIRST FLOOR PLAN

153m2

ISSUE	AMENDMENT	DATE	CHECKED
-I-	SEC 4.55(1A) - amended plans	08/01/25	S.S.
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LOT 39 SEC 7 IN DP 5701, FOR Mrs. Rosie

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DETAILS
ROOF & FIRST FLOOR PLAN
SHEET: 3/3

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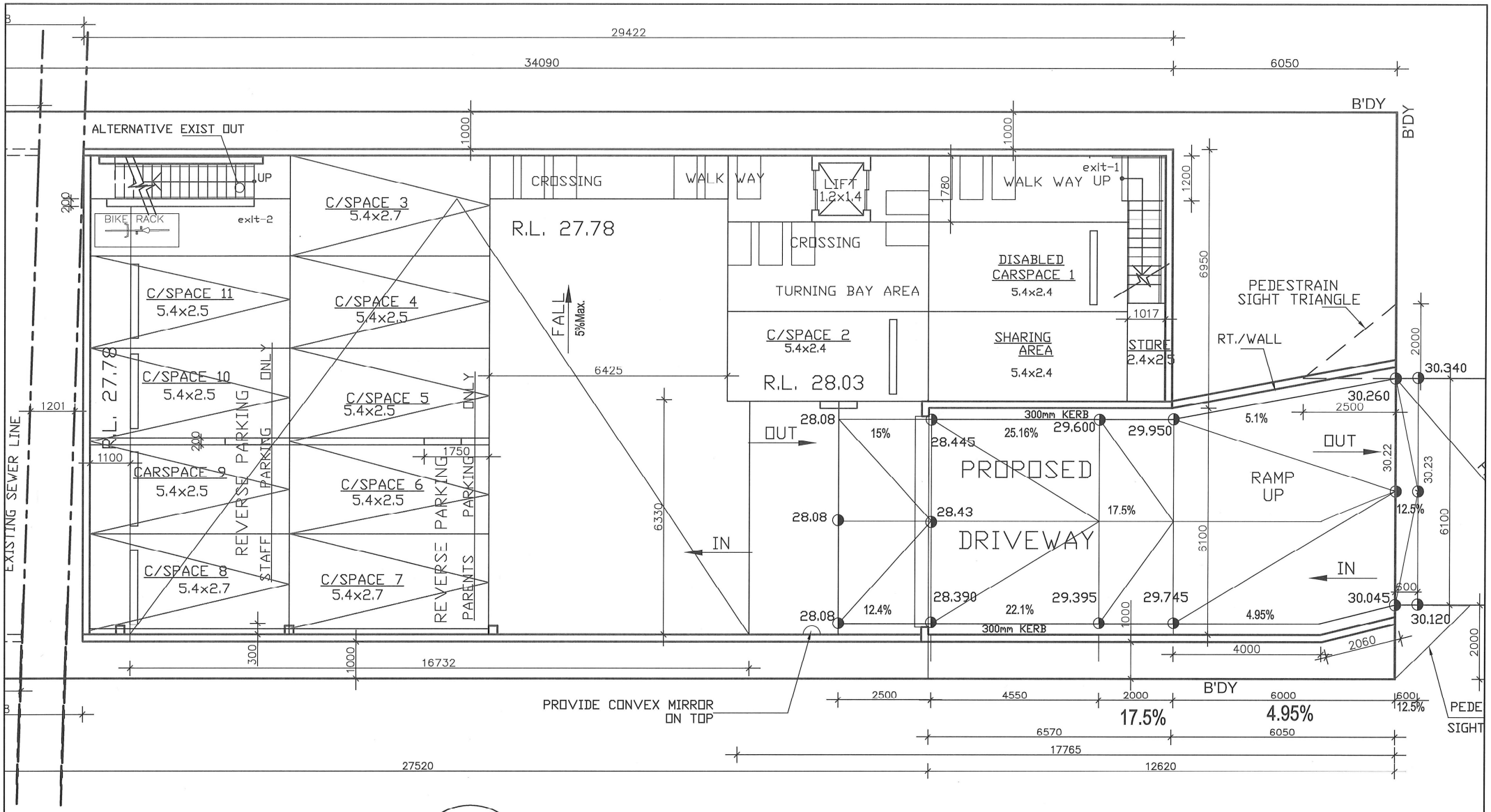

BASEMENT PLAN

SCALE: 1:100

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DRAWING TITLE:
DETAILS
LOWER FLOOR PLAN
SHEET: 3/3

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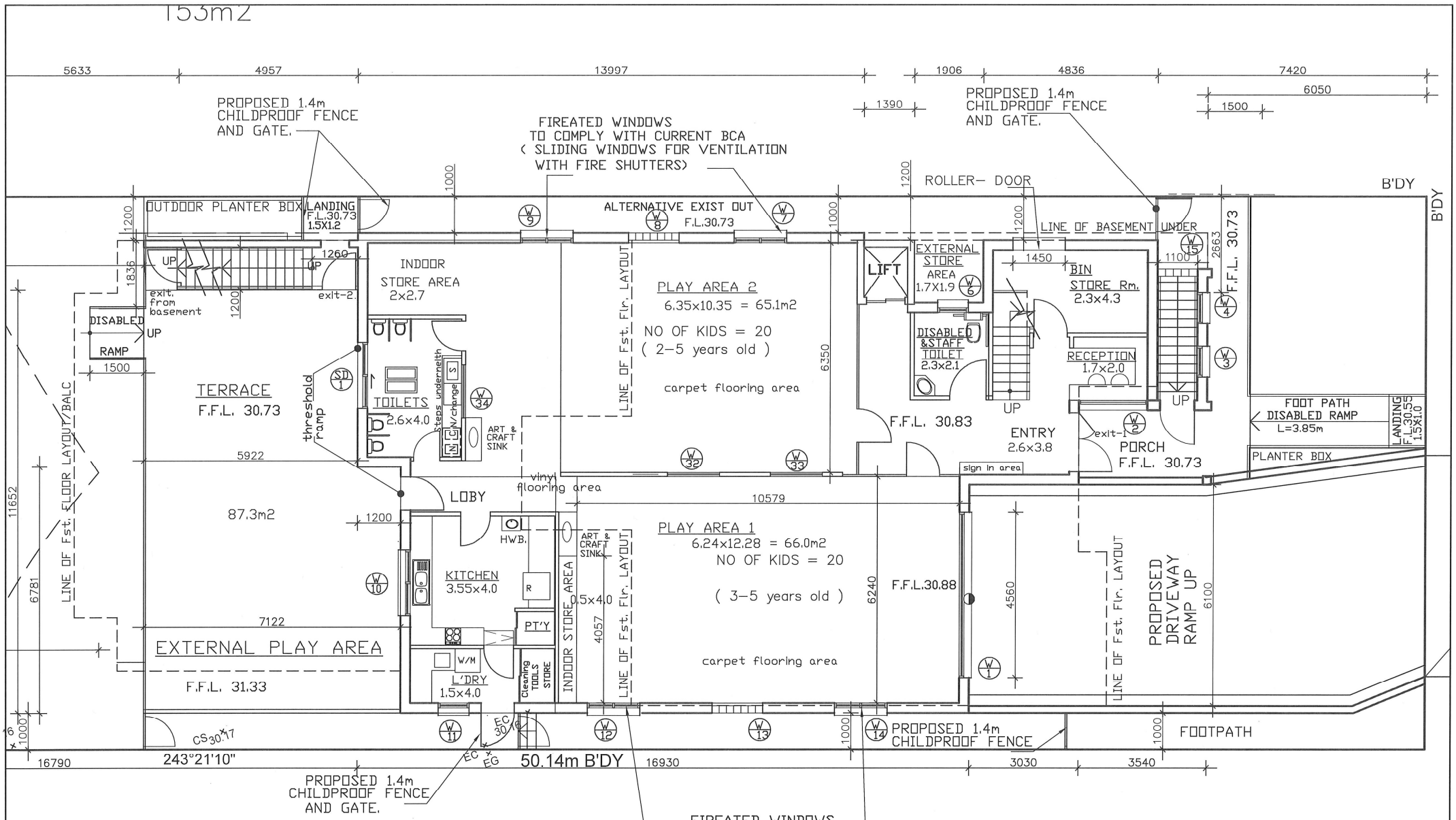

GROUND FLOOR PLAN

SCALE: 1:100 224m2

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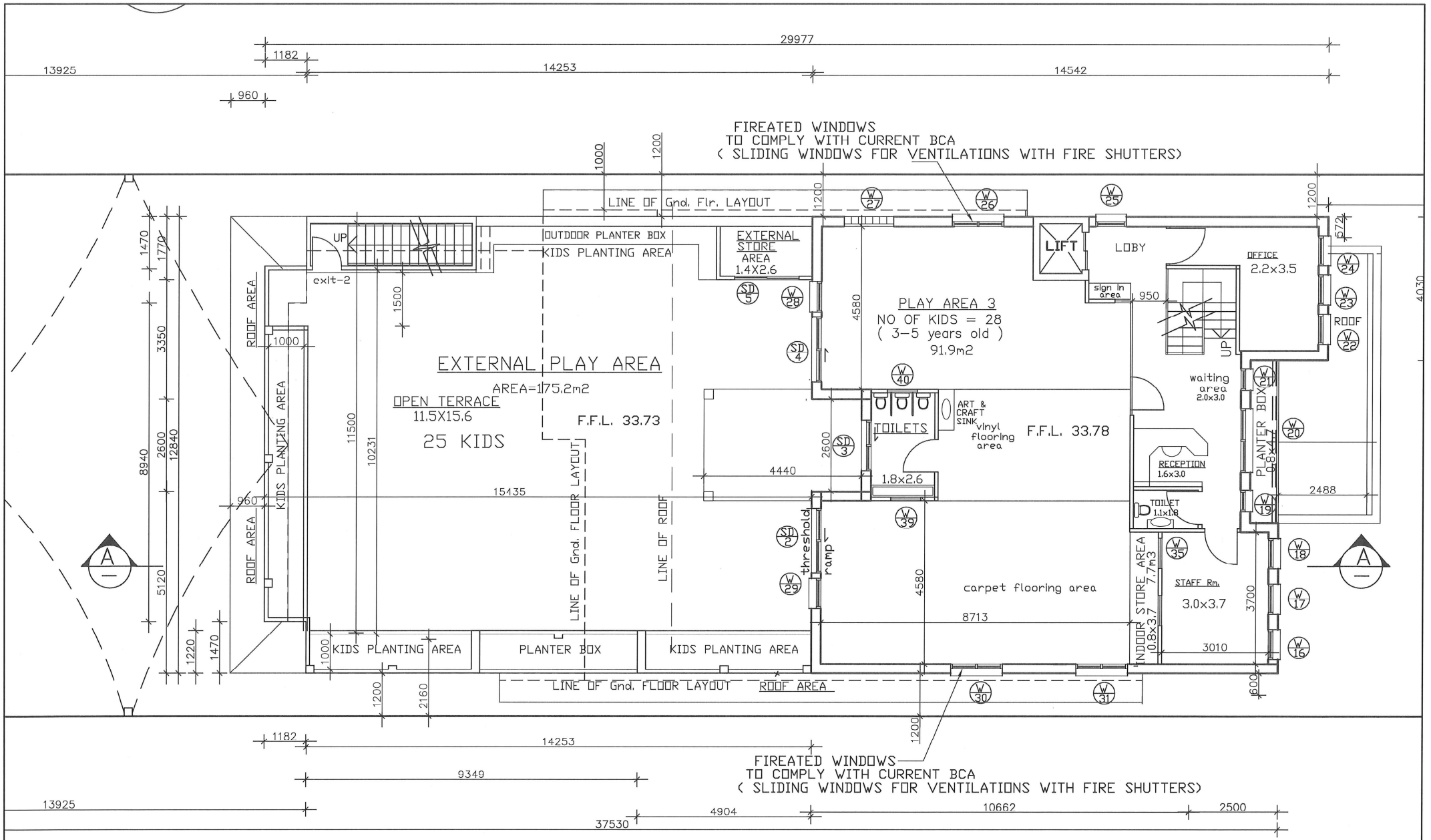

FIRST FLOOR PLAN

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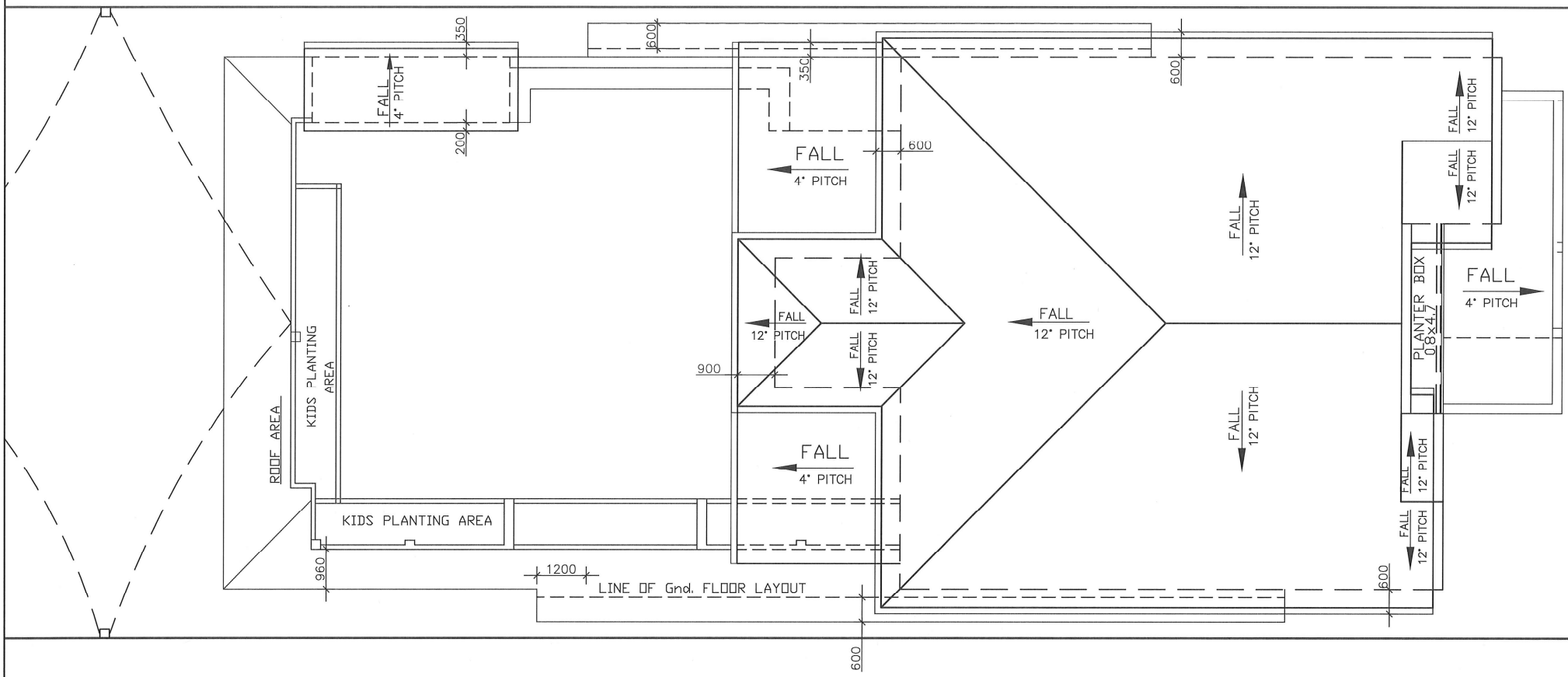

ROOF PLAN

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SHEET: 3/3

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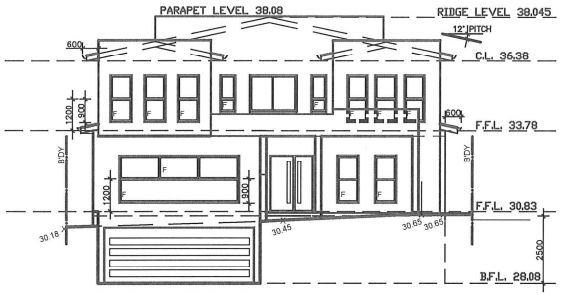

WESTERN ELEVATION
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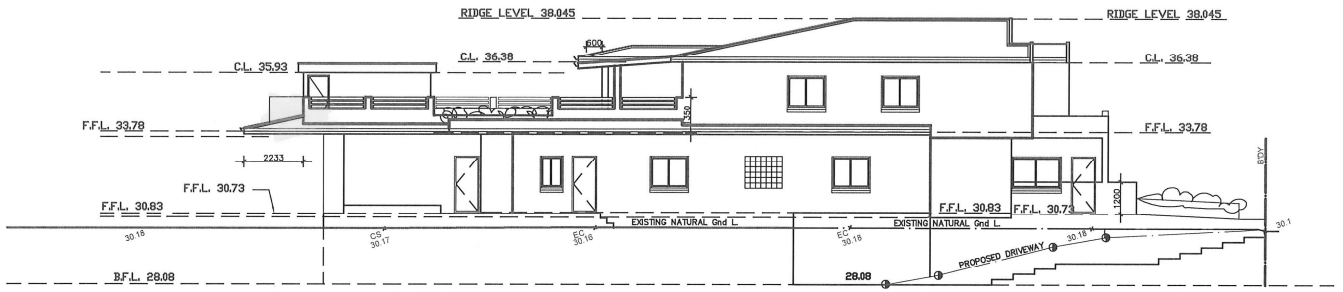

PROPOSED NATURAL Gnd L.

NORTHERN ELEVATION
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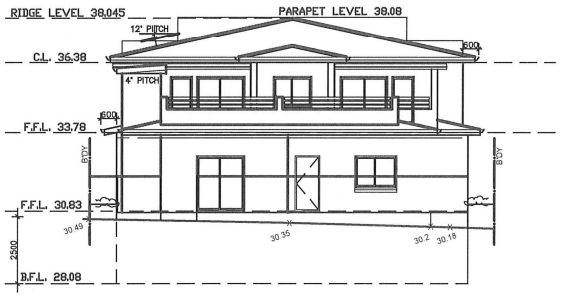
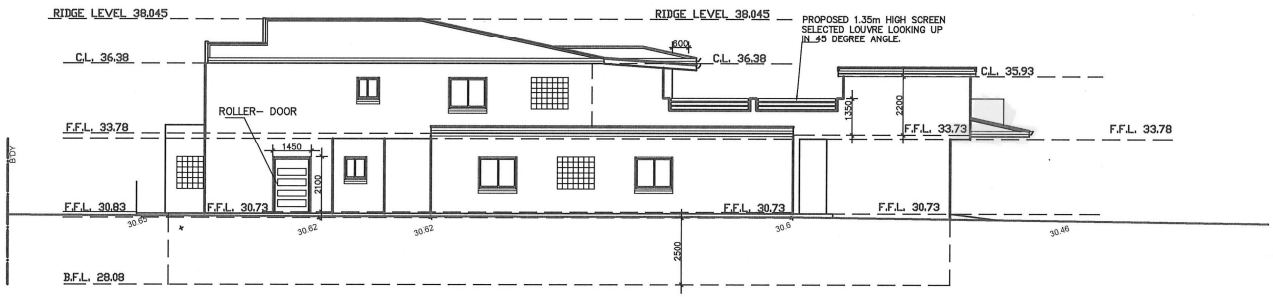


EASTERN ELEVATION
SCALE: 1:200



SOUTHERN ELEVATION
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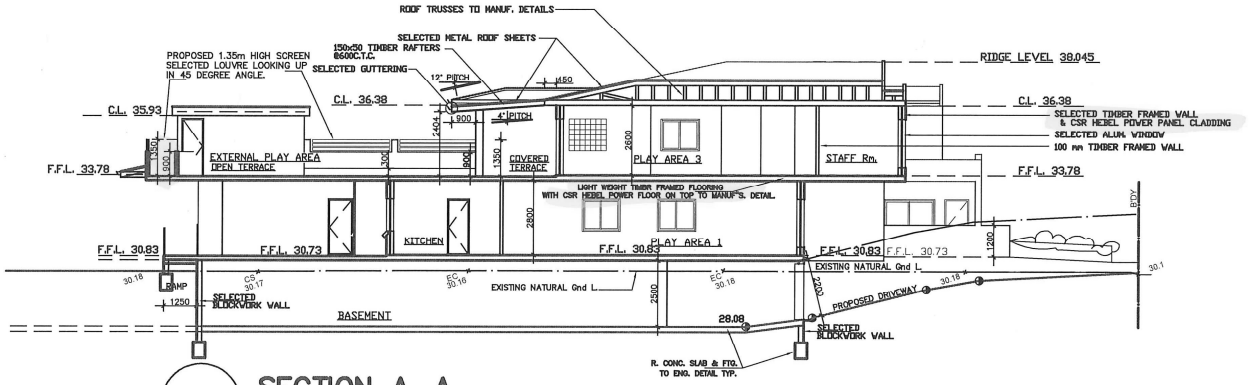

SECTION A–A
SCALE: 1:200

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LOT 39 SEC 7 IN DP 5701, FOR Mrs. Rosie

DRAWING TITLE:
DETAILS
ELEVATIONS & SECTION.
SHEET: 3/3

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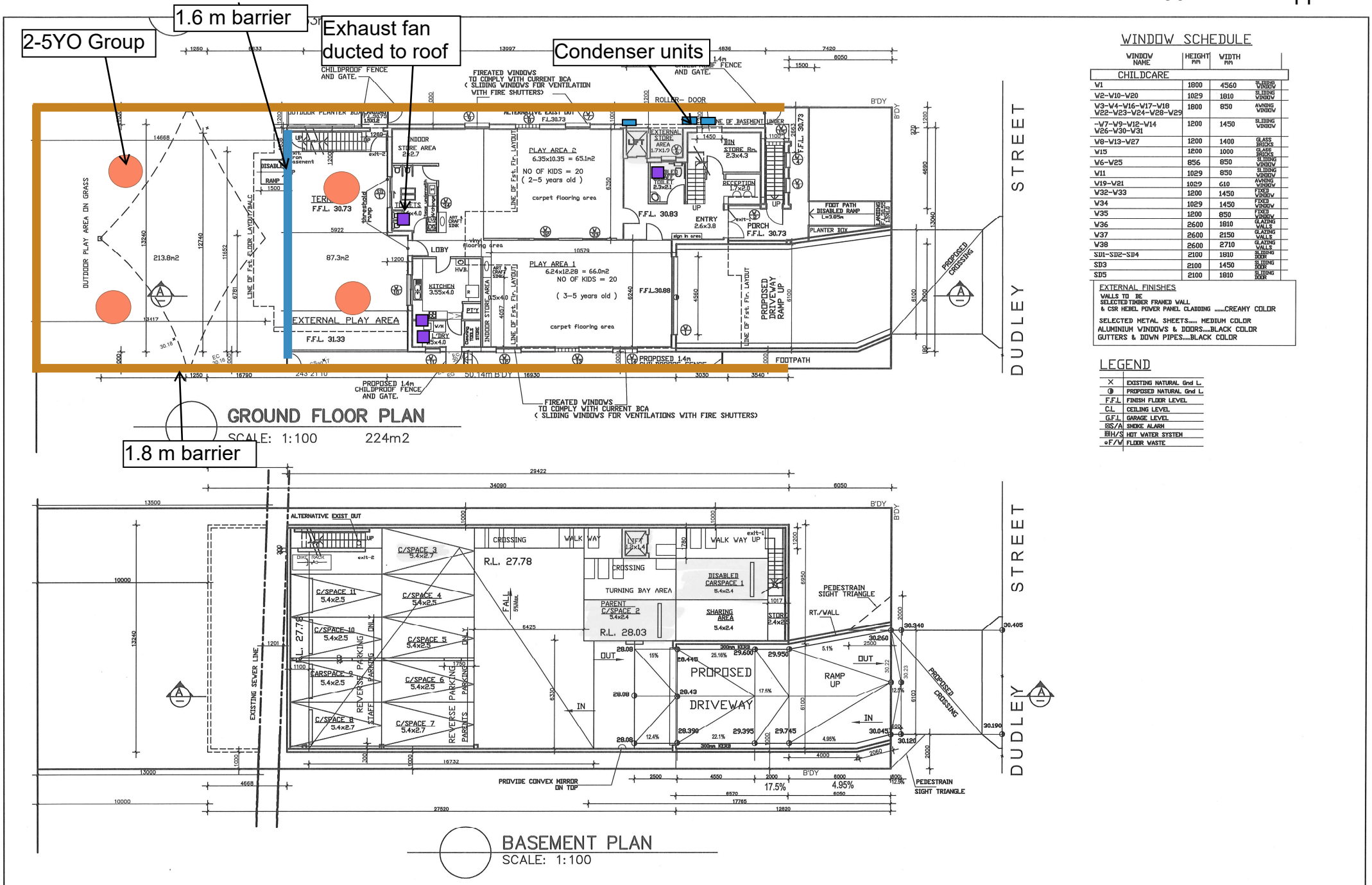

WINDOW SCHEDULE

WINDOW NAME	HEIGHT mm	WIDTH mm	
CHILDCARE			
W1	1800	4560	SLIDING WINDOW
W2-W10-W20	1029	1810	SLIDING WINDOW
W3-W4-W16-W17-W18 W22-W23-W24-W28-W29	1800	850	AWNING WINDOW
-W7-W9-W12-W14 W26-W30-W31	1200	1450	SLIDING WINDOW
W8-W13-W27	1200	1400	GLASS BRICKS
W15	1200	1000	GLASS BRICKS
W6-W25	856	850	SLIDING WINDOW
W11	1029	850	SLIDING WINDOW
W19-W21	1029	610	AWNING WINDOW
W32-W33	1200	1450	FIXED WINDOW
W34	1029	1450	FIXED WINDOW
W35	1200	850	FIXED WINDOW
W36	2600	1810	GLAZING WALLS
W37	2600	2150	GLAZING WALLS
W38	2600	2710	GLAZING WALLS
SD1-SD2-SD4	2100	1810	SLIDING DOOR
SD3	2100	1450	SLIDING DOOR
SD5	2100	1810	SLIDING DOOR

EXTERNAL FINISHES

WALLS TO BE
SELECTED TIMBER FRAMED WALL
& CSR MEDEL POWER PANEL CLADDING .....CREAMY COLOR

SELECTED METAL SHEETS..... MEDIUM COLOR
ALUMINIUM WINDOWS & DOORS.....BLACK COLOR
GUTTERS & DOWN PIPES.....BLACK COLOR

LEGEND

×	EXISTING NATURAL Gnd L.
◑	PROPOSED NATURAL Gnd L.
F.F.L	FINISH FLOOR LEVEL
C.L	CEILING LEVEL
G.F.L	GARAGE LEVEL
SS/A	SMOKE ALARM
H/S	HOT WATER SYSTEM
F/W	FLOOR WASTE

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GROUND & LOWER FLOOR PLAN
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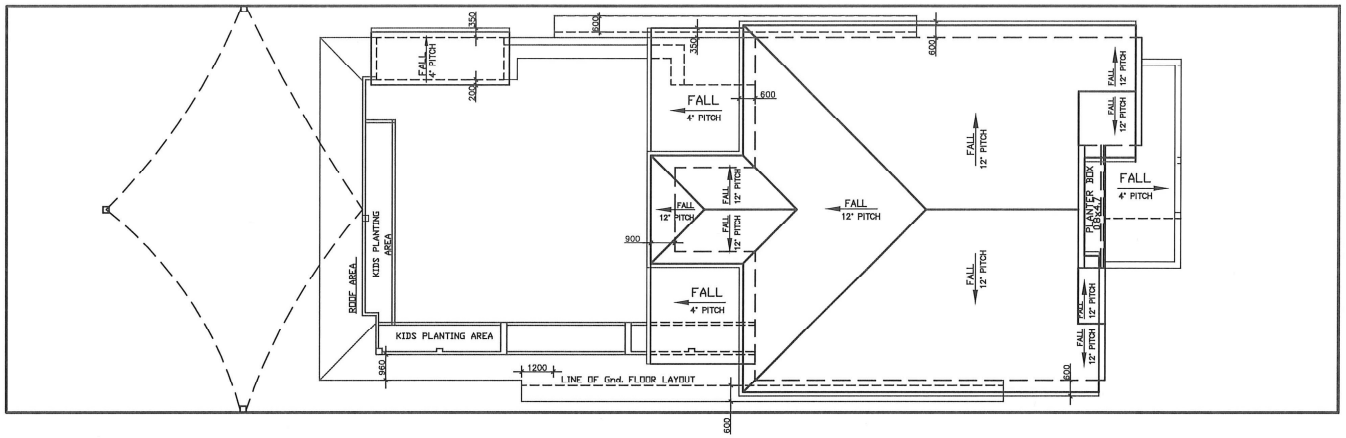
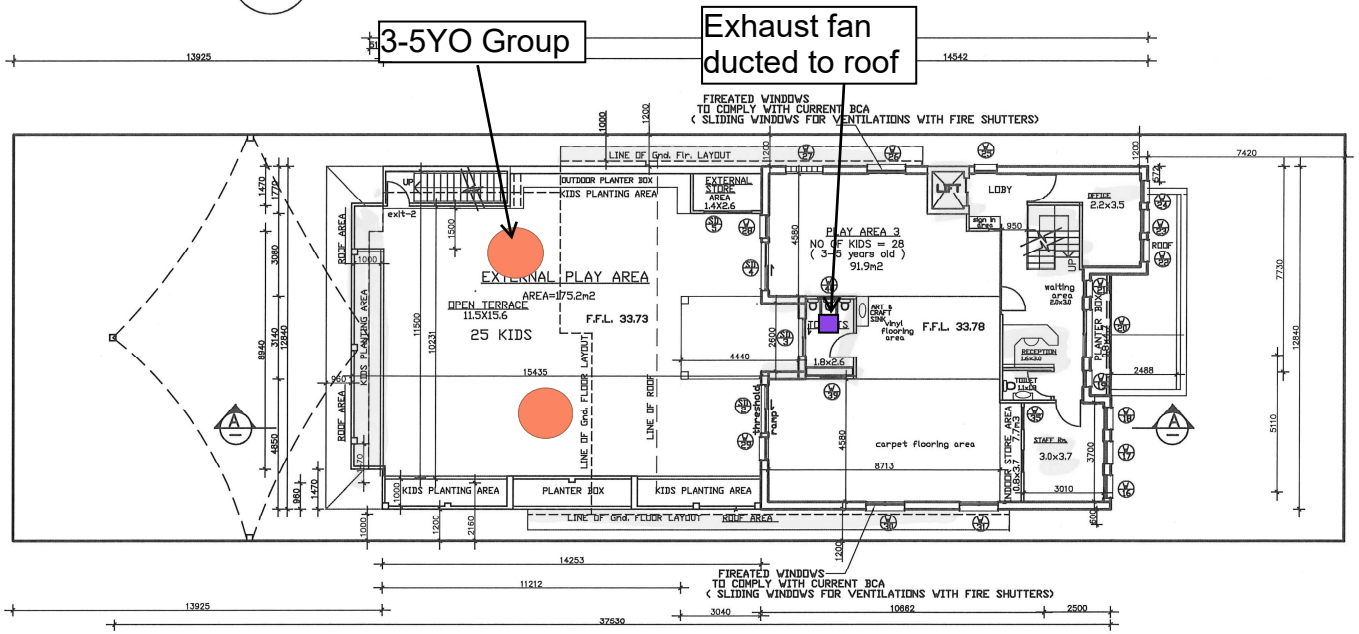


ROOF PLAN



FIRST FLOOR PLAN

153m2

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DRAWING TITLE:
DETAILS
ROOF & FIRST FLOOR PLAN

SHEET: 3/3

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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.