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# Acoustic Assessment

## Proposed Outdoor Open Space with Ancillary Amenities
## Rissalah College
## 55 MacDonald Street, Lakemba, NSW

REPORT No
**7867-1.1R REV A**

DATE ISSUED
**30 May 2024**

**Prepared For:**
Rissalah College
C/- ES Design
Level 1, Suite 10, 1 Cooks Avenue
Canterbury NSW 2193

Attention: Mr Michel Toubia

**Revision History**

| Report | Date | Prepared | Checked | Comment |
|---|---|---|---|---|
| Final | 30/01/2024 | Benjamin Lamont | Stephen Gauld | By Email, For Client Review |
| Rev A | 30/05/2024 | Benjamin Lamont | Stephen Gauld | Updated Drawings |

Document R\7867-1.1R REV A, 21 pages plus attachments

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# TABLES

## 1.0 CONSULTING BRIEF

Day Design Pty Ltd was engaged by ES Design on behalf of Rissalah College to provide an acoustical assessment for the proposed outdoor open space with ancillary amenities at the existing Rissalah College at 54-72 Hampden Road, Lakemba to include the land at 55 MacDonald Street, Lakemba, NSW. The scope of work is as follows:

- Review the architectural drawings
- Prepare a site plan identifying the development and nearby noise sensitive locations
- Measure the ambient noise levels at critical locations and times
- Establish acceptable noise level criteria
- Quantify noise emissions from the proposed outdoor open space
- Calculate the level of noise emission, taking into account building envelope transmission loss, screen walls, ground absorption and distance attenuation
- Provide recommendations for noise emission control (if necessary)
- Prepare an Acoustic Assessment report.

## 2.0 PROJECT DESCRIPTION

Rissalah College is located at 54-72 Hampden Road, Lakemba. The School sits on land zoned *R4 - High Density Residential* under Canterbury-Bankstown Local Environmental Plan 2023.

This acoustic report accompanies a development application to extend the playground to the west to include the property at 55 MacDonald Street, Lakemba.

There is no proposal to alter or modify the existing school buildings.

Existing residences are located around the School site to the north, south and west which share a common boundary. Figure 2 and Table 1 show the assessment locations for residential premises used in this assessment. These residential locations are representative of the nearest affected premises. The residential premises located further away will experience a lower noise impact from the School as a result of distance attenuation.

**Table 1 Noise Sensitive Receptor Locations**

| Location | Address | Direction from Site |
|---|---|---|
| R1 - Residential | 57 MacDonald Street | North |
| R2 - Residential | 53 MacDonald Street | South |
| R3 - Residential | 50 MacDonald Street | West |


**Figure 1 Location Plan – 55 MacDonald Street, Lakemba**


**Figure 2 Site Plan – 55 MacDonald Street, Lakemba**

## 3.0 NOISE SURVEY INSTRUMENTATION

Noise level measurements and analysis were made with instrumentation as follows in Table 2.

**Table 2 Noise Instrumentation**

| Description | Model No | Serial No |
|---|---|---|
| Infobyte Noise Logger (Type 2) | iM4 | 118 |
| Condenser Microphone 0.5" diameter | MK 250 | 118 |
| NTi Audio Noise Logger (Class 1) DD19 | XL2 | A2A-20848-E0 |
| NTi Microphone | MC230A | A22582 |
| NTi Preamplifier | MA220 | 10903 |
| Microphone 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 #118 is a Type 2 precision environmental noise monitor, meeting all the applicable requirements of AS1259 for an integrating-averaging sound level meter.

The NTi XL2 Noise Monitor is a Type 1 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 unattended measurements. No adjustments for instrument drift during the measurement period were warranted.

## 4.0 NOISE EMISSION CRITERIA

### 4.1 Background Noise Level

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

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).

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

The places of worst possible annoyance are the residences identified in Table 1. These potentially affected locations can be seen in Figure 2. The times of greatest annoyance will be during the day time when students are outdoors for breaks. Two environmental noise loggers were placed on the proposed outdoor open space with ancillary amenities site at Location 'A' as shown on Figure 2, from Wednesday 11 November to Tuesday 5 December 2023. The microphone heights at Location 'A' were approximately 1.5 metres and 4.5 metres above ground level.

The measured noise levels are presented in the attached Appendix A and also in Table 3.

**Table 3 Ambient Noise Levels – 55 MacDonald Street, Lakemba**

| Location | Time Period | $L_{90}$ Rating Background Level (dBA) | Existing Ambient $L_{eq}$ Noise Level (dBA) |
|---|---|---|---|
| Location 'A' – 1.5 m above Ground Floor Level | Day (7 am to 6 pm) | **40** | **53** |
| | Evening (6 pm to 10 pm) | **43** | **53** |
| | Night (10 pm to 7 am) | **39** | **47** |
| Location 'A' – 4.5 m above Ground Floor Level | Day (7 am to 6 pm) | **42** | **54** |
| | Evening (6 pm to 10 pm) | **44** | **53** |
| | Night (10 pm to 7 am) | **39** | **47** |

Extraneous noise has been excluded from the measurements. Atmospheric conditions were ideal for noise monitoring. Noise measurements were therefore considered reliable and typical for the receptor area.

### 4.2 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 2 December 2021. 'Schedule 8 Design quality principles in schools' of the SEPP outlines the following:

***'Principle 5. Amenity***

> *Schools should provide pleasant and engaging spaces that are accessible for a wide range of educational, informal and community activities, while also considering the amenity of adjacent development and the local neighbourhood.'*

### 4.3 NSW EPA's Noise Guide for Local Government

The NSW Environment Protection Authority published the Noise Guide for Local Government (NGLG) in January 2023.

The NGLG provides practical guidance to council officers on day-to-day management of common neighbourhood noise problems. The guide focuses on the regulation, assessment and management of neighbourhood noise issues, which generally are managed by councils.

The NGLG is not a statutory document but may help councils determine how to respond to noise issues in their area.

The NGLG refers to intrusive noise in several Sections, but does not provide a definition.

Reference to the *NSW Noise Policy for Industry (EPA 2017)* is provided several times throughout the NGLG. See Section 4.4 below for the description of intrusive noise as provided in the *NSW Noise Policy for Industry*.

### 4.4 NSW Noise Policy for Industry

The NSW Environment Protection Authority (EPA) published the *Noise Policy for Industry* (NPI) in October 2017, superseding the NSW Industrial Noise Policy. The NPI is specifically aimed at assessing noise from industrial noise sources listed in Schedule 1 of the Protection of the Environment Operations Act 1997 (POEO, 1997).

The School is not a 'scheduled premises' under the Protection of the Environment Operations Act 1997 as it is not required to hold a licence under that Act for operations at the site.

The NPI provides a useful framework to assess noise emission from non-scheduled premises, whether that premises produces intrusive or non-intrusive noise.

While the NPI is not strictly applicable to this site, as the site is not scheduled, in the absence of other relevant standards the limits set out in the amenity criteria in the NPI will be used as a guide in determining whether the level of noise is considered acceptable or not.

### 4.5 Amenity Noise Level

Depending on the type of area in which the noise is being made, there is a certain reasonable expectancy for noise amenity. The NPI provides a schedule of recommended $L_{eq}$ industrial noise levels that under normal circumstances should not be exceeded. If successive developments occur near a residential area, each one allowing a criterion of background noise level plus 5 dB, the ambient noise level will gradually creep higher.

The recommended $L_{eq}$ noise levels in Table 4 below are taken from Section 2.2 of the NPI.

**Table 4 Amenity Noise Level**

| Receiver | Noise Amenity Area | Time of Day | $L_{Aeq}$ Noise Level, dBA |
|---|---|---|---|
| | | | **Recommended amenity noise level** |
| Residential | Suburban | Day | 55 |
| | | Evening | 45 |
| | | Night | 40 |

The project specific amenity noise level is then calculated to be the recommended amenity noise level minus 5 dB(A).

The $L_{Aeq}$ is determined over a 15-minute period for the project intrusiveness noise level and over an assessment period (day, evening and night) for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same amount of noise heard by a person for different time periods. To standardise the time periods for the intrusiveness and amenity noise levels, the NPI assumes that the **$L_{Aeq,15min}$** will be taken to be equal to the **$L_{Aeq, period}$ + 3 decibels (dB)**.

The existing $L_{eq}$ noise level at Lakemba is shown in Table 3. Therefore the acceptable $L_{eq}$ amenity noise level for in this area is as shown in Table 5.

**Table 5 Acceptable Amenity Noise Levels – Lakemba**

| Location | Time Period | Existing Ambient $L_{eq}$ Noise Level (dBA) | Acceptable Amenity $L_{eq}$ Noise Level (dBA) |
|---|---|---|---|
| Nearby Ground Floor Residential Receivers | Day (7 am to 6 pm) | **53** | (55 – 5 +3 =) **53** |
| | Evening (6 pm to 10 pm) | **53** | (53 – 5 +3 =) **51** |
| | Night (10 pm to 7 am) | **47** | (40 – 5 +3 =) **38** |
| Nearby First Floor Level Residential Receivers | Day (7 am to 6 pm) | **54** | (55 – 5 +3 =) **53** |
| | Evening (6 pm to 10 pm) | **53** | (53 – 5 +3 =) **51** |
| | Night (10 pm to 7 am) | **47** | (40 – 5 +3 =) **38** |

### 4.6 AAAC Noise Criteria for Outdoor Play Areas

In May 2008, the Association of Australasian Acoustical Consultants (AAAC) first published the *Technical Guideline for Child Care Centre Noise Assessment*. The guideline was updated in 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).

Although the development is a School and therefore may produce different levels of noise than a childcare centre, there are similarities in noise emission from uses of outdoor play areas for schools and childcare centres. As students do not play outdoors continuously for long periods of time, and as the duration of time for students playing outside is reduced, the overall noise annoyance reduces. Therefore, it is reasonable to allow a higher level of noise impact for a shorter duration.

The AAAC document states that a total time limit of 4 hours of outdoor play per day (eg 2 hours in the morning and 2 hours in the afternoon) should allow an additional 5 dB noise impact.

We recommend that the noise criteria detailed in *Technical Guideline for Child Care Centre Noise Assessment* be applied to outdoor areas of the School.

The relevant criteria is $L_{eq,\ 15min}$ noise level emitted from the outdoor play area shall not exceed the background noise level by more than 10 dB at any residential assessment location.

### 4.7 Offensive Noise

The Protection of the Environment Operations Act 1997 defines "offensive noise" in the Act, as follows:

> *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 is likely to be harmful to) a person who is outside the premises 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.*

### 4.8 Project Specific Noise Emission Criteria

When all the above factors are considered, we find that the most applicable noise criterion at the nearby residential premises is shown in Table 6.

**Table 6 Project Specific Noise Levels – Lakemba**

| Location | Time Period | Acceptable $L_{eq,\ 15\ min}$ Outdoor Play Noise Level (dBA) |
|---|---|---|
| Nearby Ground Floor Level Residential Receivers | Day (7 am to 6 pm) | **50** |
| Nearby First Floor Level and Above Residential Receivers | Day (7 am to 6 pm) | **52** |

These 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.

The proposed outdoor play area should not be used in the evening or at night.

## 5.0 SCHOOL NOISE EMISSION

The main sources of noise from the proposed outdoor open space with ancillary amenities at Rissalah College will be from students playing outside and exhaust fans of the proposed sanitary facility. Calculations are based on the site layout provided by ES Design shown in Appendix B.

The proposed outdoor open space with ancillary amenities is located at the south west corner of the School site. We have assumed solid fencing along the northern and southern boundaries of the proposed outdoor open space with ancillary amenities and is enclosed with chain link fencing at the western boundary adjacent to MacDonald Street.

### 5.1 Students in Outdoor Open Space

Students will be outside for a range of times, including before school, recess, lunch, PE classes and after school, however the outdoor areas are only likely to be at capacity during recess and lunch.

In order to model the worst case scenario of noise emission from students outdoors, we have assessed the school students spread evenly across the courtyard outdoor play area.

#### *5.1.1 Student Noise Levels at Play*

Sound power levels of students at play were previously measured for other similar projects and are presented in Table 7. These levels represent the typical maximum noise levels of students at play and will be used in this noise assessment.

Based on the drawings attached as Appendix C, the outdoor open space has a useable area of approximately 520 square metres. Assuming 10 square metres per student[1], the outdoor open space can be used by at least 52 students. We have also assumed two teachers will be in attendance, one talking normally and another talking with a raised voice.

**Table 7 Students at Play (outside) $L_{eq}$ Sound Power Levels**

| Description | Sound Power Levels (dB) at Octave Band Centre Frequencies (Hz) | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | **dBA** | **63** | **125** | **250** | **500** | **1k** | **2k** | **4k** | **8k** |
| 1 person talking normally | **66** | 57 | 57 | 63 | 66 | 59 | 55 | 51 | 46 |
| 1 person talking with a raised voice | **72** | 61 | 61 | 67 | 72 | 67 | 63 | 58 | 51 |
| 1 student at play | **79** | 54 | 64 | 69 | 73 | 76 | 73 | 68 | 65 |
| 52 students | **97** | 71 | 81 | 86 | 90 | 93 | 90 | 85 | 82 |

[1] NSW Department of Education's *Education Facilities Standards and Guidelines* (*EFSG) Design Framework – Site Selection and development* minimum requirements for open space.

Knowing the sound power level of a noise source, 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.

## 5.2 Mechanical Plant

The mechanical plant, including bathroom exhaust fans of the proposed ancillary amenities 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.

We have assumed that the toilet exhaust fans will be ducted through the roof of the proposed sanitary facility.

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 exhaust fan (toilet)[2] | **59** | 48 | 48 | 56 | 57 | 54 | 53 | 45 | 38 |

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

[2] Spectral sound power level based on Fantech TD-500/150 SIL.

### *5.2.1 Cumulative Noise Level – Outdoor Open Space 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 9.

**Table 9 Predicted Cumulative Leq, 15 minute Noise Levels – Outdoor Open Space & Mechanical Plant**

| Description | Predicted Noise Level (dBA) | Noise Criterion (dBA) | Compliance (Yes/No) |
|---|---|---|---|
| R1 - South Window - 57 MacDonald Street | | | |
| - Students and teachers | 69 | | |
| - Mechanical Plant | 26 | | |
| CUMULATIVE | 69 | 52 | **No (+ 17 dB)** |
| R2 – North Window - 53 MacDonald Street | | | |
| - Students and teachers | 68 | | |
| - Mechanical Plant | 25 | | |
| CUMULATIVE | 68 | 52 | **No (+ 16 dB)** |
| R3 – East Window - 50 MacDonald Street | | | |
| - Students and teachers | 54 | | |
| - Mechanical Plant | 17 | | |
| CUMULATIVE | 54 | 52 | **No (+ 2 dB)** |

The above predicted noise levels exceed the acceptable noise level for all the nearby residential receptors and therefore noise controls as detailed in Section 6.0 will be required.

## 6.0 NOISE CONTROL RECOMMENDATIONS FOR NOISE EMISSION

The predicted level of noise from students actively playing in the proposed outdoor open space with ancillary amenities is in excess of the acceptable noise criteria in Section 4.0 of this report. Therefore noise controls will be required. We recommend the following treatment:

### 6.1 Noise Management Controls

We recommend the following noise management controls be implemented by staff within the proposed outdoor open space with ancillary amenities:

- The outdoor open space shall not be used for active play or physical education classes;
- Staff shall perform roaming supervision of the proposed outdoor open space;
- No amplified music while using the outdoor play area;
- Limit the use of the area to recess and lunch times only.

### 6.2 Table and Bench Seats

We recommend installing outdoor tables and bench seats within the proposed outdoor open space to encourage quiet activities such as conversation, reading and eating.

### 6.3 Landscaping

The proposed outdoor open space should be heavily landscaped to prevent active games from being played in the area.

Landscaping between the noise source and the receptors, in the form of trees and tall shrubs that provide visual screening of the noise source, will not reduce noise levels appreciably. However, they tend to make intrusion of noise psychologically less offensive.

### 6.4 Construction Disclaimer

Recommendations made in this report are intended to resolve acoustical problems only. We make no claims of expertise in other areas of building construction and therefore the recommended noise controls should be implements 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.

## 7.0 PREDICTED NOISE LEVELS - AFTER NOISE CONTROLS

### 7.1 Cumulative Noise Levels – After Noise Controls

Once the noise control recommendations in Section 6.0 are implemented, the calculated sound pressure level at the nearby receptors from the outdoor open space will be as shown in Table 10.

We have modelled the noise emission from the outdoor open space with noise controls as students and teachers talking with a normal voice (50%) and the rest not talking, or listening (50%).

**Table 10 Predicted Cumulative $L_{eq,\ 15\ minute}$ Noise Levels – Outdoor Open Space & Mechanical Plant – After Noise Controls**

| Description | Predicted Noise Level (dBA) | Noise Criterion (dBA) | Compliance (Yes/No) |
|---|---|---|---|
| R1 - South Window - 57 MacDonald Street | | | |
| - Students and teachers | 55 | | |
| - Mechanical Plant | 26 | | |
| CUMULATIVE | 55 | 52 | **No (+ 3 dB)** |
| R2 – North Window - 53 MacDonald Street | | | |
| - Students and teachers | 54 | | |
| - Mechanical Plant | 25 | | |
| CUMULATIVE | 54 | 52 | **No (+ 2 dB)** |
| R3 – East Window - 50 MacDonald Street | | | |
| - Students and teachers | 40 | | |
| - Mechanical Plant | 17 | | |
| CUMULATIVE | 40 | 52 | Yes |

### 7.2 Discussion

When children are not actively playing outside, the ambient $L_{eq}$ noise levels are approximately 53-54 dBA. This is primarily a result of road traffic noise on the surrounding roads.

Noise levels operate on a logarithmic scale. A person with normal hearing is able to perceive a change in noise once the level difference is 3 dB. An increase of 5 dB would be slightly more perceptible. An increase of 10 dB is considered twice as loud.

The duration at which outdoor play would occur at maximum capacity is during recess and lunch periods, typically no longer than 2 hours a day.

The following series of questions are outlined in the 2023 version of Noise Guide for Local Government to assist with assessing "offensive noise".

*Q1: Does the noise level exceed noise level conditions on consents or approvals? Is the noise loud in an absolute sense? Is it loud relative to other noise in the area?*

Provided the noise recommendations are implemented, the noise level from children engaging in quiet activities at the nearby residential receptors is calculated to be 40-55 dBA. This noise level is equivalent to a loud conversation or traffic on busy roads. The surrounding ambient noise from road traffic nearby is 60 dBA. The answer for this question is No.

*Q2: Does the noise include characteristics that make it particular irritating?*

The noise from students does not contain any penalties that are applicable from the Noise Policy for Industry. Noise measurements show no tonal characteristics. The answer for this question is No.

*Q3: Does the noise occur at times when people expect to enjoy peace and quiet?*

The noise level from students will occur during the daytime only. People generally expect peace and quiet during the evening and at night. The answer for this question is No.

*Q4: Is the noise atypical for the area?*

This proposal is seeking to increase the outdoor area from the existing School campus to the east. The School has been in operation since 2011. The answer for this question is No.

*Q5: Does the noise occur often?*

Outdoor play occurs at recess and lunch period each day. The answer for this question is Yes.

*Q6: Are a number of people affected by the noise?*

The School is surrounded by residential properties to the north, south and west. The answer for this question is Yes.

In this case, given the limited duration of noise from outdoor play each day, and expectations of noise from students at a school site in operation since 2011 we are of the opinion that the exceedance of the noise criteria from the proposed outdoor open space would not be considered "offensive noise" and therefore acceptable.

## 8.0 NOISE ASSESSMENT STATEMENT

Day Design Pty Ltd was engaged by ES Design on behalf of Rissalah College to provide an acoustical assessment for the proposed outdoor open space with ancillary amenities at the existing Rissalah College at 54-72 Hampden Road, Lakemba to include 55 MacDonald Street, Lakemba, NSW.

Calculations show that, the level of noise emitted by students will be acceptable provided the recommendations in Section 6.0 to reduce the noise emission to the adjacent residential receptors are implemented.

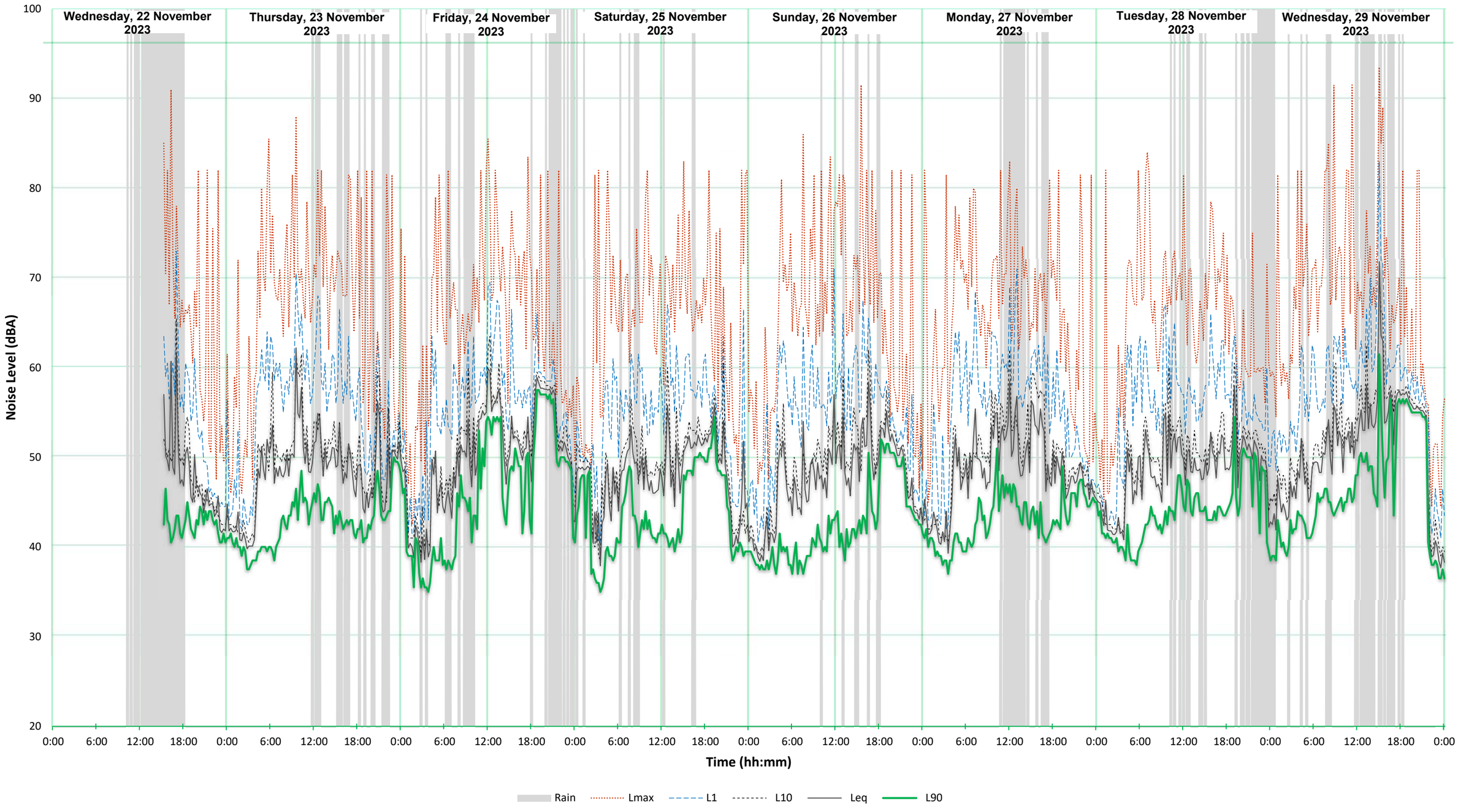
*Benjamin Lamont*

**Benjamin Lamont**, BE (Aero), MEngSc (Mech)
Consulting Acoustical Engineer
for and on behalf of Day Design Pty Ltd

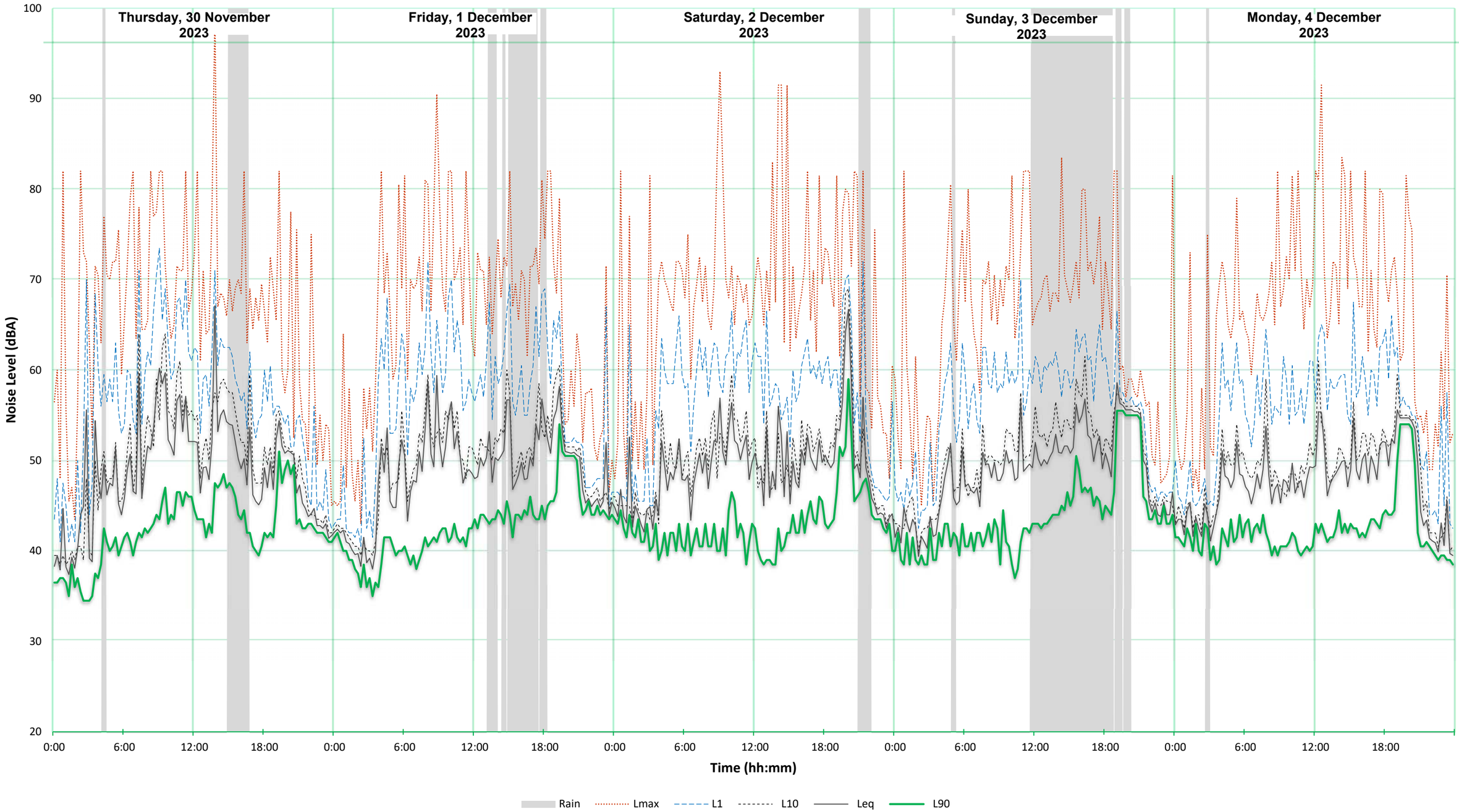
**AAAC MEMBERSHIP**
Day Design Pty Ltd is a member company of the Association of Australasian Acoustical Consultants, and the work herein reported has been performed in accordance with the terms of membership.

**Attachments:**
- Appendix A – Ambient Noise Surveys
- Appendix B – Architectural Drawings dated 10 August 2023
- AC108-1 to 4 – Glossary of Acoustical Terms

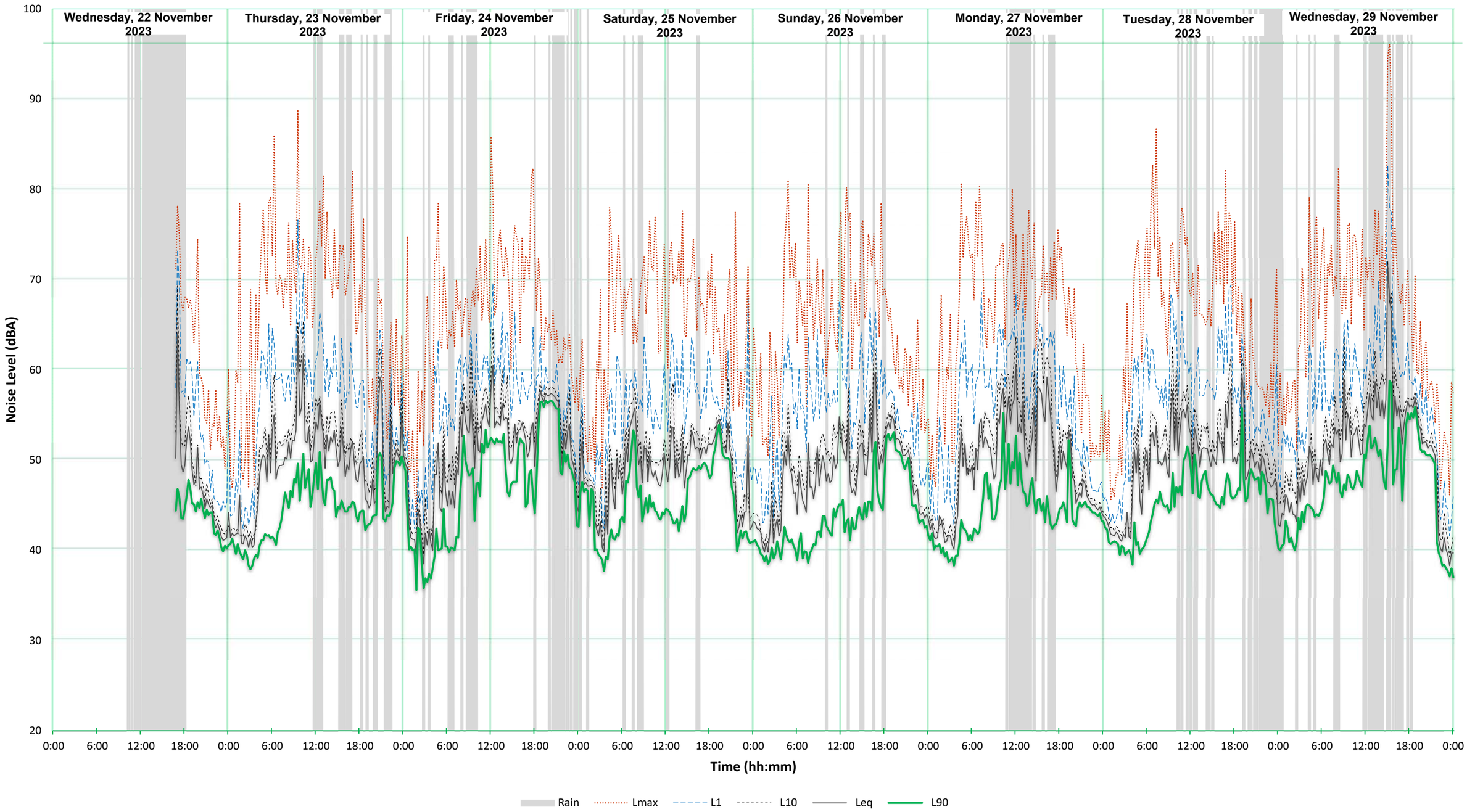
## Located at Ground Floor Level - 55 MacDonald Street, Lakemba, NSW



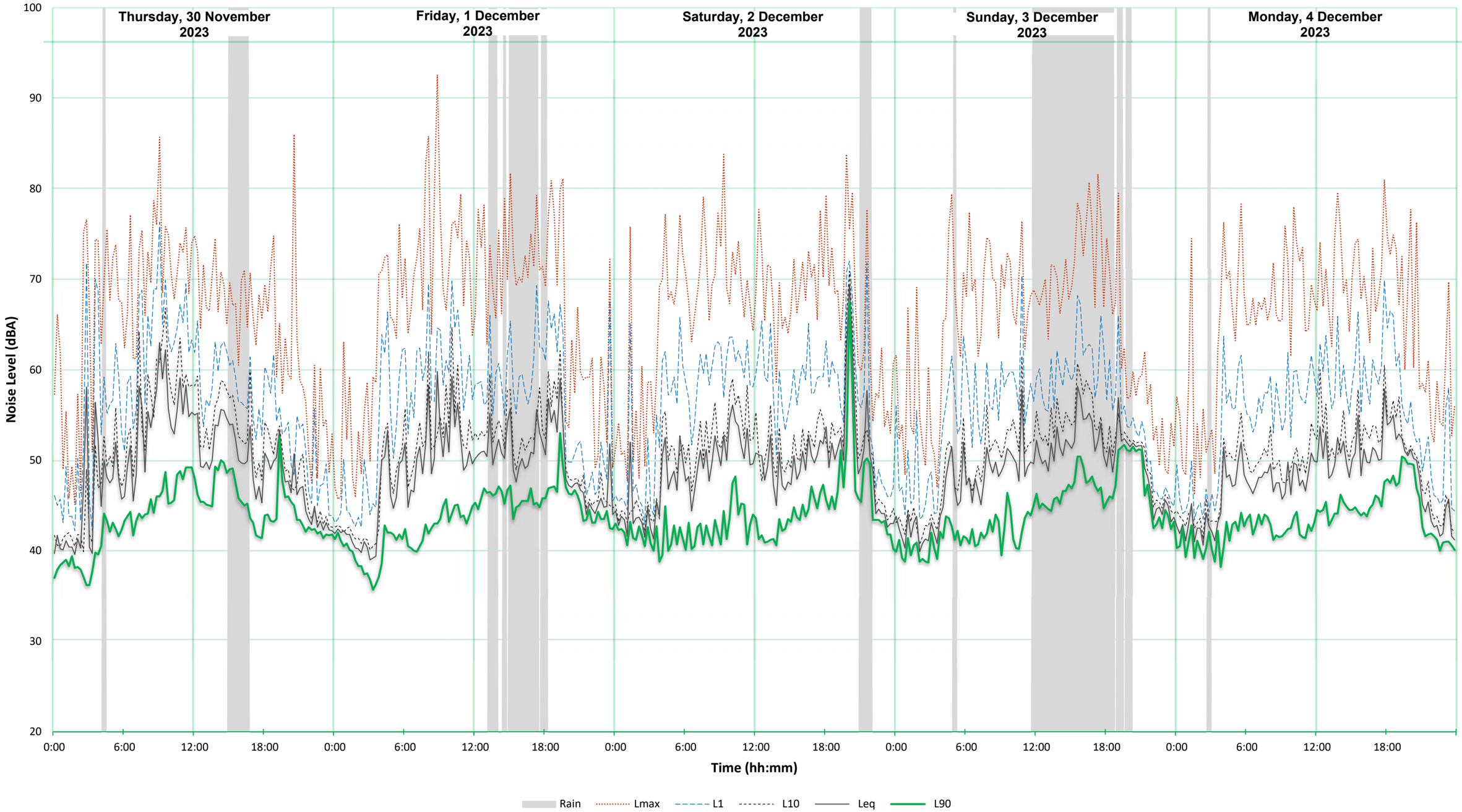
## Located at Ground Floor Level - 55 MacDonald Street, Lakemba, NSW



## Located at First Foor Level - 55 MacDonald Street, Lakemba, NSW



## Located at First Foor Level - 55 MacDonald Street, Lakemba, NSW



# DEVELOPMENT APPLICATION

## DRAWING SCHEDULE

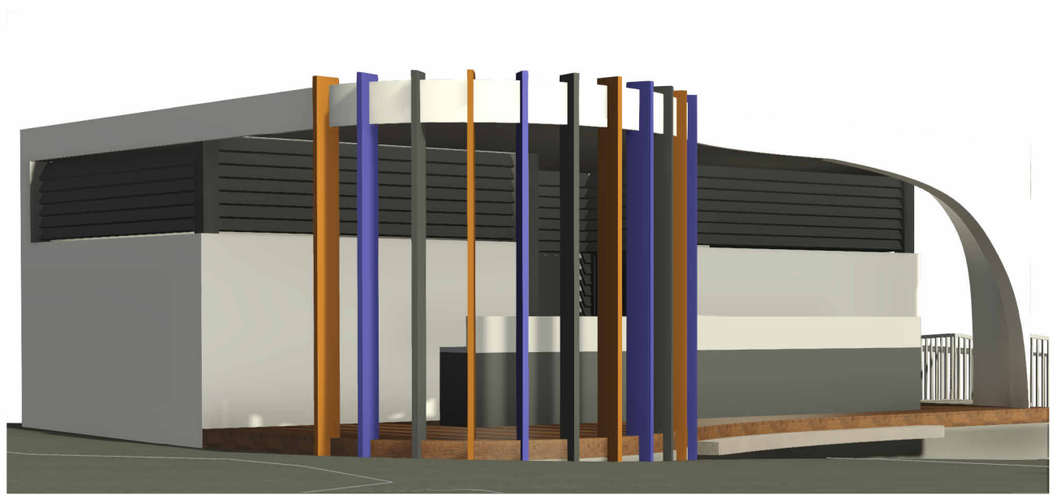


## ISSUE DETAILS

| | | |
|---|---|---|
| A | 10.08.23 | ISSUED TO THE CLIENT |

## ADDITIONAL INFORMATION DA

| | |
|---|---|
| A01 | OWNER'S CONSENT FORM |
| A02 | SURVEY PLAN |
| A03 | SECTION J REPORT |
| A04 | STORMWATER PLAN |
| A05 | LANDSCAPE PLAN |
| A06 | STATEMENT OF ENVIRONMENTAL EFFECTS |
| A07 | WASTE MANAGEMENT PLAN |
| A08 | COST SUMMARY REPORT |
| A09 | QUANTITY SURVEYORS REPORT |



## CHANGE OF USE

55 Macdonald Street,
LAKEMBA NSW 2195

RISSALAH COLLEGE


bdaa ACCREDITED BUILDING DESIGNER

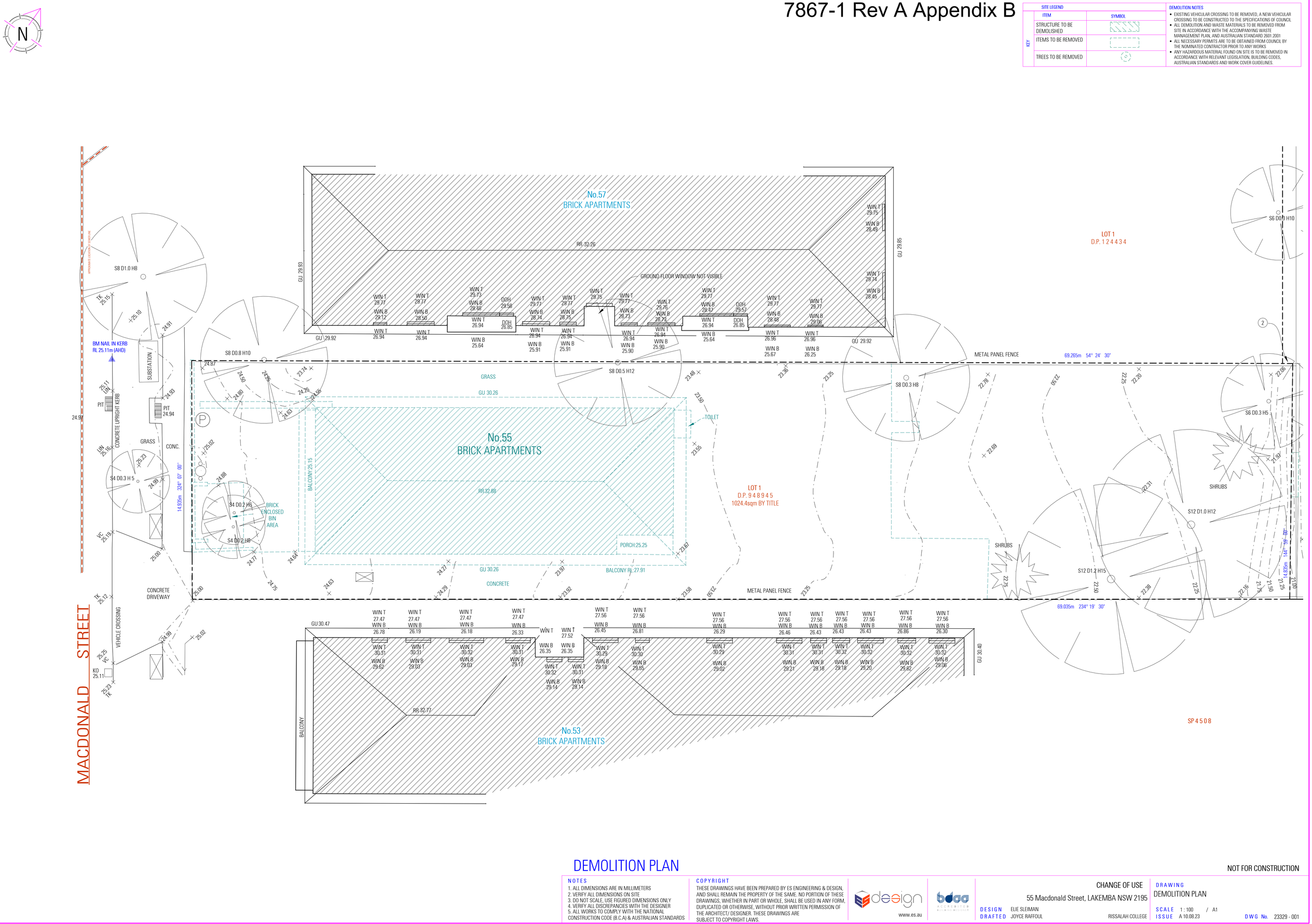
design es.au

# 7867-1 Rev A Appendix B

| KEY | ITEM | SYMBOL |
|---|---|---|
| | STRUCTURE TO BE DEMOLISHED | |
| | ITEMS TO BE REMOVED | |
| | TREES TO BE REMOVED | |

**DEMOLITION NOTES**

- EXISTING VEHICULAR CROSSING TO BE REMOVED, A NEW VEHICULAR CROSSING TO BE CONSTRUCTED TO THE SPECIFICATIONS OF COUNCIL
- ALL DEMOLITION AND WASTE MATERIALS TO BE REMOVED FROM SITE IN ACCORDANCE WITH THE ACCOMPANYING WASTE MANAGEMENT PLAN, AND AUSTRALIAN STANDARD 2601 2001
- ALL NECESSARY PERMITS ARE TO BE OBTAINED FROM COUNCIL BY THE NOMINATED CONTRACTOR PRIOR TO ANY WORKS
- ANY HAZARDOUS MATERIAL FOUND ON SITE IS TO BE REMOVED IN ACCORDANCE WITH RELEVANT LEGISLATION, BUILDING CODES, AUSTRALIAN STANDARDS AND WORK COVER GUIDELINES.




## DEMOLITION PLAN

NOT FOR CONSTRUCTION

**NOTES**

1. ALL DIMENSIONS ARE IN MILLIMETERS
2. VERIFY ALL DIMENSIONS ON SITE
3. DO NOT SCALE, USE FIGURED DIMENSIONS ONLY
4. VERIFY ALL DISCREPANCIES WITH THE DESIGNER
5. ALL WORKS TO COMPLY WITH THE NATIONAL CONSTRUCTION CODE (B.C.A) & AUSTRALIAN STANDARDS



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CHANGE OF USE

55 Macdonald Street, LAKEMBA NSW 2195

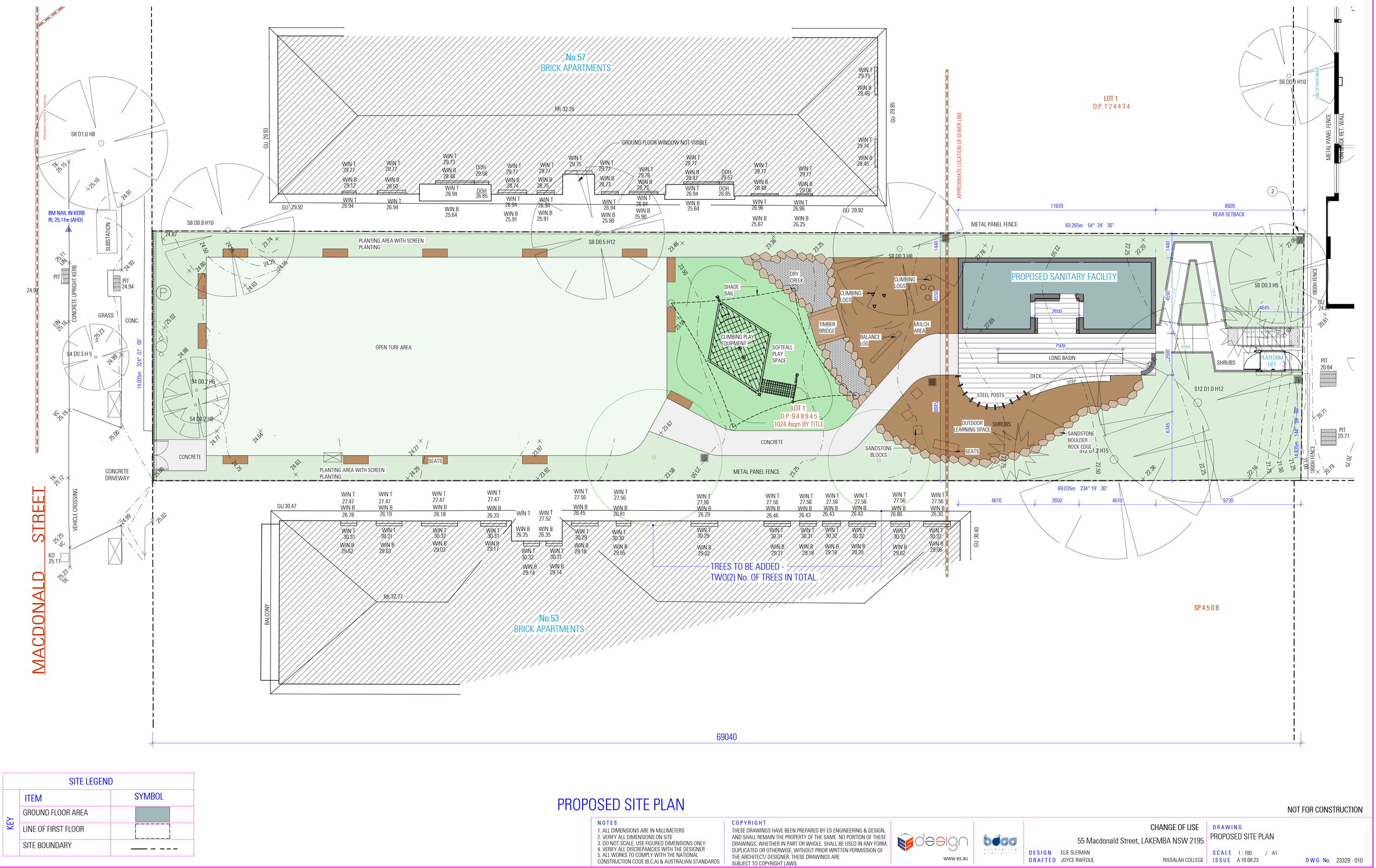
DESIGN ELIE SLEIMAN
DRAFTED JOYCE RAFFOUL

RISSALAH COLLEGE

DRAWING
DEMOLITION PLAN

SCALE 1 : 100 / A1
ISSUE A 10.08.23

DWG No. 23329 - 001




| SITE LEGEND | | |
|---|---|---|
| KEY | ITEM | SYMBOL |
| | GROUND FLOOR AREA | |
| | LINE OF FIRST FLOOR | |
| | SITE BOUNDARY | |

# PROPOSED SITE PLAN

NOT FOR CONSTRUCTION

**NOTES**
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DESIGN ELIE SLEIMAN
DRAFTED JOYCE RAFFOUL
RISSALAH COLLEGE

DRAWING
PROPOSED SITE PLAN

SCALE 1 : 100 / A1
ISSUE A 10.08.23
DWG No. 23329 - 010

N

No.57
BRICK APARTMENTS

RR 32.26

GROUND FLOOR WINDOW NOT VISIBLE

GU 29.93

GU 29.85

GU 29.92

GU 29.92

LOT 1
D.P. 1 2 4 4 3 4

S8 D1.0 H8

S8 D0.8 H10

S8 D0.5 H12

S8 D0.3 H8

S6 D0.3 H10

S6 D0.3 H5

S4 D0.3 H 5

S4 D0.2 H6

S4 D0.2 H6

S12 D1.0 H12

S12 D1.2 H15

METAL PANEL FENCE

LINE OF ROOF ABOVE

LINE OF WALL ABOVE

69.265m 54° 24' 30"

69.035m 234° 19' 30"

14.955m 324° 07' 00"

14.835m 144° 19' 30"

BM NAIL IN KERB
RL 25.11m (AHD)

SUBSTATION

PLANTING AREA WITH SCREEN PLANTING

OPEN TURF AREA

1200M HIGH FENCE

1750W GATE
CONCRETE

CONCRETE DRIVEWAY

VEHICLE CROSSING

CONCRETE UPRIGHT KERB

GRASS

CONC.

PIT

PIT 24.94

PIT 20.64

PIT 20.71

LIN

VC

TK

KO 25.11

SEATS

CONCRETE PATH

LOT 1
D.P. 948945
1024.4sqm BY TITLE

SOFTFALL PLAY SPACE

CLIMBING PLAY EQUIPMENT

SHADE SAIL

DRY CREEK

TIMBER BRIDGE

CLIMBING LOGS

BALANCE LOG

MULCH AREA

FEMALE W/C

DISABLED W/C

MALE W/C

BENCH

LOUVERS

LONG BASIN

STEPS

STEEL POSTS

SANDSTONE BLOCKS

OUTDOOR LEARNING SPACE

SHRUBS

SANDSTONE BOULDER ROCK EDGE

PLATFORM LIFT

180OH FENCE

MACDONALD STREET

SP 4 5 0 8

BALCONY

No.53
BRICK APARTMENTS

TREES TO BE ADDED -
TWO(2) No. OF TREES IN TOTAL.

# PROPOSED GROUND FLOOR PLAN

NOT FOR CONSTRUCTION

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DESIGN ELIE SLEIMAN
DRAFTED JOYCE RAFFOUL

RISSALAH COLLEGE

DRAWING
PROPOSED GROUND FLOOR PLAN

SCALE 1 : 100 / A1
ISSUE A 10.08.23

DWG No. 23329 - 100

N

MACDONALD STREET

No.57
BRICK APARTMENTS

No.53
BRICK APARTMENTS

LOT 1
D.P. 1 2 4 4 3 4

SP 4 5 0 8

BM NAIL IN KERB
RL 25.11m (AHD)

METAL PANEL FENCE

SUBSTATION

CONCRETE DRIVEWAY

VEHICLE CROSSING

BALCONY

SHRUBS

GROUND FLOOR WINDOW NOT VISIBLE

69.265m 54° 24' 30"

69.035m 234° 19' 30"

14.355m 324° 07' 00"

14.835m 144° 59' 00"

# PROPOSED ROOF PLAN

NOT FOR CONSTRUCTION

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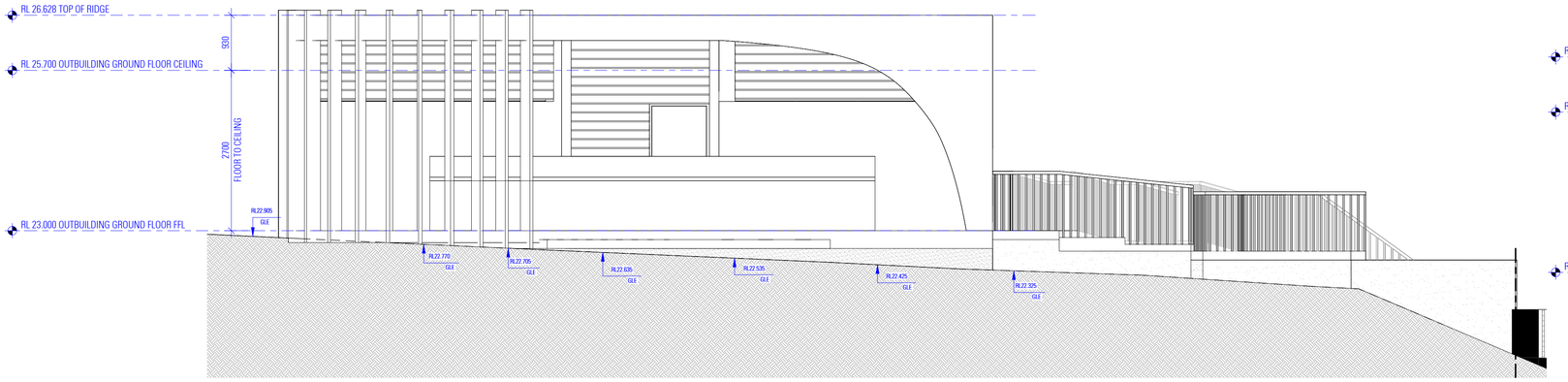
DESIGN ELIE SLEIMAN
DRAFTED JOYCE RAFFOUL
RISSALAH COLLEGE

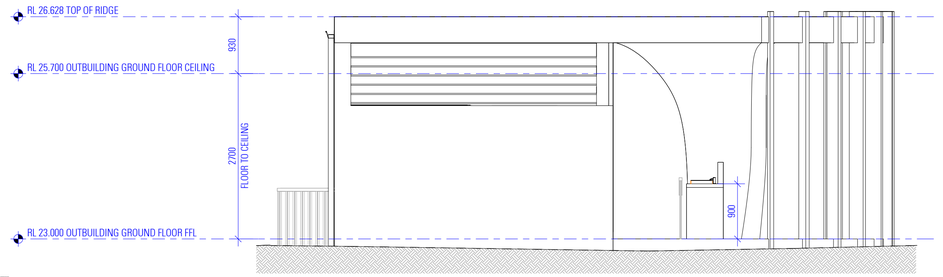
DRAWING
PROPOSED ROOF PLAN

SCALE 1 : 100 / A1
ISSUE A 10.08.23
DWG No. 23329 - 101

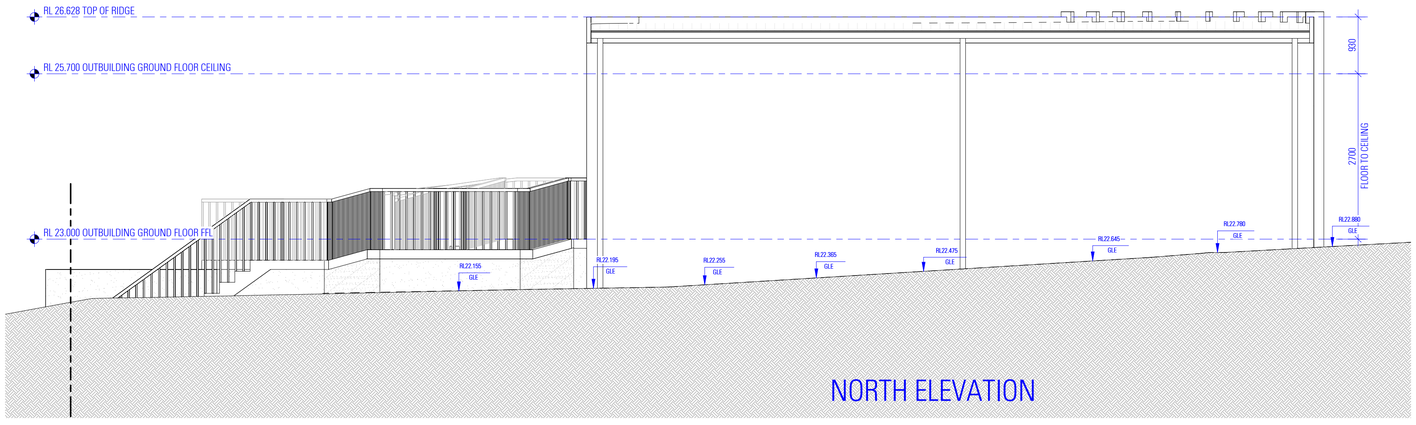
# ELEVATIONS



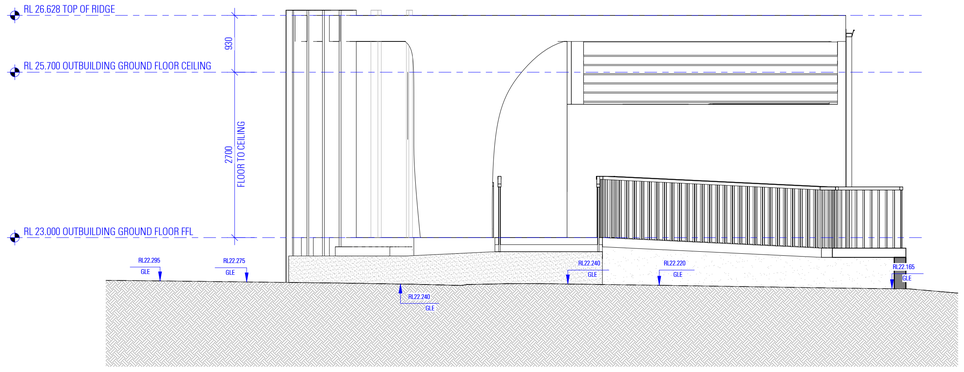

## SOUTH ELEVATION




## WEST ELEVATION




## NORTH ELEVATION




## EAST ELEVATION

NOT FOR CONSTRUCTION

**NOTES**

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CHANGE OF USE

55 Macdonald Street, LAKEMBA NSW 2195

DESIGN ELIE SLEIMAN
DRAFTED JOYCE RAFFOUL

RISSALAH COLLEGE

DRAWING
ELEVATIONS

SCALE 1 : 50 / A1
ISSUE A 10.08.23

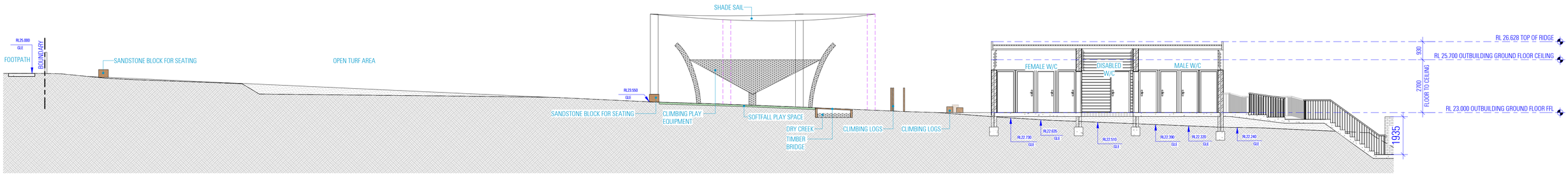
DWG No. 23329 - 150

# SECTION VIEWS

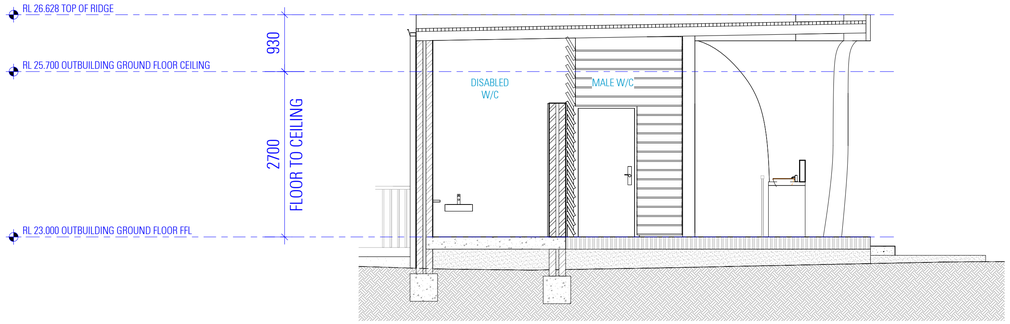
## WALL SCHEDULE

| 270mm CAVITY BRICK | 50mm JOINERY |
|---|---|
|  |  |
| 110mm BRICK SKIN<br>50mm CAVITY<br>110mm BRICK SKIN | 50mm VENEER |

NOTES
1. THIS SCHEDULE DETAILS MAIN WALL COMPONENTS ONLY AND THE MEASUREMENTS GIVEN DO NOT INCLUDE RENDER, PLASTER OR THE LIKE. THEY ARE PROVIDED FOR 'CONSTRUCTION' PURPOSES AND SUCH DO NOT REPRESENT THE FINAL WALL THICKNESS.
2. EXISTING WALLS SHOWN SOLID HATCHED.
3. THE ITEMS PROVIDED ABOVE ARE A GENERAL LIST OF WALL TYPES. VERIFY ALL DISCREPANCIES WITH THE DESIGNER BEFORE COMMENCING CONSTRUCTION.
4. REFER TO BASIX CERTIFICATE FOR INSULATION REQUIREMENTS.




## SECTION A
1 : 100
**800




## SECTION B
1 : 50
100

GENERAL REQUIREMENTS/SPECIFICATIONS
BUILDING TO BE CONSTRUCTED IN ACCORDANCE WITH THE FOLLOWING WHERE RELEVANT

**EARTHWORKS**
**NATIONAL CONSTRUCTION CODE (NCC)**
- EARTHWORKS AND EXCAVATIONS ARE TO BE CARRIED OUT IN ACCORDANCE WITH BCA 2022 H103 AND HOUSING PROVISIONS PART 3.2

**STORM WATER**
- POWDER COATED ALUMINIUM GUTTERS & DOWNPIPES.
- REFER TO STORMWATER PLAN FOR ALL SITE DRAINAGE DETAILS AND CALCULATIONS.

**NATIONAL CONSTRUCTION CODE (NCC)**
- DRAINAGE IS TO BE IN ACCORDANCE WITH BCA 2022 H202
- ROOF, WALL CLADDING, GUTTERS & DOWNPIPES ARE TO COMPLY WITH BCA 2022 H107 AND H206

**TERMITE PROTECTION**
**NATIONAL CONSTRUCTION CODE (NCC)**
- PROTECTION MUST BE IN ACCORDANCE WITH BCA 2022 H103 AND ABCB HOUSING PROVISIONS PART 3.4

**FOOTINGS AND SLABS**
- PROPOSED FOOTINGS TO THE SPECIFICATIONS OF A QUALIFIED PRACTISING ENGINEER

**NATIONAL CONSTRUCTION CODE (NCC)**
- FOOTINGS AND SLABS ARE TO BE DESIGNED AND CONSTRUCTED IN ACCORDANCE WITH BCA 2022 H104 AND H203

**AUSTRALIAN STANDARD (AS)**
- PILED FOOTINGS ARE TO COMPLY WITH AS 2159-2009

**FLOORING**
- PROPOSED FLOOR CONSTRUCTION TO THE SPECIFICATIONS OF A QUALIFIED PRACTISING ENGINEER.

ALL PORCHES, VERANDAHS & THE LIKE TO HAVE A 85mm STEPDOWN FROM INTERNAL AREAS UNLESS NOTED OTHERWISE
- FOR ALL REDUCED LEVELS REFER TO FLOOR PLANS (ENGINEERS DETAILS TO SUPERSEDE) CONFIRM WITH DESIGNER)
- SUB FLOOR VENTILATION IS TO COMPLY WITH BCA 2022 H205

**WALLS**
**NATIONAL CONSTRUCTION CODE (NCC)**
- STEEL AND TIMBER FRAMING AND STRUCTURAL STEEL SECTIONS ARE TO COMPLY WITH BCA 2022 H106
- MASONRY, MASONRY COMPONENTS AND ACCESSORIES, AND WEATHERPROOFING OF MASONRY ARE TO COMPLY WITH BCA 2022 H105 AND H204
- SOUND INSULATION IS TO BE IN ACCORDANCE WITH BCA 2022 H409
- REINFORCED AUTOCLAVED AERATED CONCRETE IS TO COMPLY WITH AS 5146.1-2015
- CONCRETE - POST-INSTALLED AND CAST-IN-FASTENINGS IS TO COMPLY WITH SA TA 101
- ROOF AND WALL CLADDING ARE TO COMPLY WITH BCA 2022 H206

**STRUCTURE**
**NATIONAL CONSTRUCTION CODE (NCC)**
- STAIR CONSTRUCTION IS TO COMPLY WITH PART 3.9.1
- STRUCTURAL DESIGN TO BE IN ACCORDANCE WITH ACCEPTABLE CONSTRUCTION MANUALS AS LISTED IN PART 3.11
- ATTACHMENT OF FRAMED DECKS AND BALCONIES TO EXTERNAL WALLS OF BUILDINGS USING A WALING PLATE IS TO COMPLY WITH BCA 2022 H101

**EXTERNAL WATERPROOFING**
**NATIONAL CONSTRUCTION CODE (NCC)**
- EXTERNAL WATERPROOFING IS TO COMPLY WITH BCA 2022 H208

**GLAZING**
- POWDER COATED ALUMINIUM FRAMED GLASS WINDOWS & DOORS UNLESS NOTED OTHERWISE.

**NATIONAL CONSTRUCTION CODE (NCC)**
- ALL GLAZING IS TO BE IN ACCORDANCE WITH BCA 2022 H108 AND H207

**ROOFING**
**NATIONAL CONSTRUCTION CODE (NCC)**
- ROOF CLADDING SHALL BE CARRIED OUT IN ACCORDANCE WITH PART 3.5.1

**AUSTRALIAN STANDARD (AS)**
- INSTALLATION OF ROOF TILES - AS 2050
- DESIGN & INSTALLATION OF SHEET ROOF & WALL CLADDING - AS 1562.1

**FIRE**
**NATIONAL CONSTRUCTION CODE (NCC)**
- THE FIRE HAZARD PROPERTIES OF MATERIALS ARE TO COMPLY WITH BCA 2022 H307
- FIRE SEPARATION OF EXTERNAL WALLS IS TO COMPLY WITH BCA 2022 H303
- FIRE PROTECTION OF SEPARATING WALLS AND FLOORS IS TO COMPLY WITH BCA 2022 H304
- FIRE SEPARATION OF GARAGE-TOP DWELLINGS IS TO COMPLY WITH BCA 2022 H305
- SMOKE ALARMS AND EVACUATION LIGHTING ARE TO COMPLY WITH BCA 2022 H306

**HEALTH & AMENITY**
- ALL BATHROOM, ENSUITES AND LAUNDRIES TO HAVE FLOOR WASTES AND BE SETDOWN AND WATERPROOFED.

**NATIONAL CONSTRUCTION CODE (NCC)**
- WET AREAS ARE TO COMPLY WITH BCA 2022 H402
- MATERIALS AND INSTALLATION OF WET AREA COMPONENTS AND SYSTEMS ARE TO COMPLY WITH BCA 2022 H403
- ROOM HEIGHTS ARE TO COMPLY WITH BCA 2022 H404
- PROVISION OF LIGHT IS TO COMPLY WITH BCA 2022 H406
- PROVISION OF VENTILATION IS TO COMPLY WITH BCA 2022 H407
- SOUND INSULEATION IS TO COMPLY WITH BCA 2022 H408
- CONDENSATION MANAGEMENT IS TO COMPLY WITH BCA 2022 H409

**SAFE MOVEMENT & ACCESS**
**NATIONAL CONSTRUCTION CODE (NCC)**
- STAIRWAY AND RAMP CONSTRUCTION ARE TO COMPLY WITH BCA 2022 H502
- BARRIERS AND HANDRAILS ARE TO COMPLY WITH BCA 2022 H503
- THE WINDOW IS TO BE FITTED WITH EITHER A DEVICE TO RESTRICT THE WINDOW OPENING, OR A SUITABLE SCREEN, SO A 125mm SPHERE CANNOT PASS THROUGH
- THE DEVICE OR SCREEN CAN HAVE A CHILD RESISTANT RELEASE MECHANISM IE; A KEY LOCK) WHICH CAN ENABLE THE DEVICE OR SCREEN TO BE REMOVED, UNLOCKED OR OVERRIDDEN. (SO FOR EXAMPLE, THE WINDOW CAN BE CLEANED)
- A BARRIER IS NOT REQUIRED FOR WINDOWS 1.7m OR MORE ABOVE THE FLOOR LEVEL.

**EXTERNAL FINISHES**
- REFER TO SCHEDULE OF EXTERNAL MATERIALS, COLOURS AND FINISHES FOR MORE DETAILS.

**ANCILLARY PROVISIONS AND ADDITIONAL CONSTRUCTION REQUIREMENTS**
**NATIONAL CONSTRUCTION CODE (NCC)**
- SWIMMING POOLS ARE TO COMPLY WITH BCA 2022 NSW H102
- CONSTRUCTION IN BUSHFIRE PRONE AREAS IS TO COMPLY WITH BCA 2022 NSW H104
- HEATING APPLIANCES, FIREPLACES, CHIMNEYS AND FLUES ARE TO COMPLY WITH BCA 2022 H105

**LANDSCAPE**
- REFER TO LANDSCAPE PLAN FOR ALL PLANTING AND OUTDOOR SURFACE TREATMENTS

**BUSHFIRE**
- THE RECOMMENDATIONS PROVIDED WITHIN THE BUSHFIRE ASSESSMENT REPORT ARE TO BE ADHERED TO. IN THE EVENT THAT THERE ARE INCONSISTENCIES, THE BUSHFIRE REPORT RECOMMENDATIONS ARE TO TAKE PRECEDENCE

**NATIONAL CONSTRUCTION CODE (NCC)**
- BUSHFIRE AREAS ARE TO BE IN ACCORDANCE WITH BCA 2022 H704

STRUCTURAL SOFTWARE USED IN COMPUTER AIDED DESIGN OF A BUILDING OR STRUCTURE THAT USES DESIGN CRITERIA BASED ON THE DEEMED-TO-SATISFY PROVISIONS OF NCC VOLUME TWO AND THE ABCB HOUSING PROVISIONS, INCLUDING ITS REFERENCED DOCUMENTS, FOR THE DESIGN OF STEEL OR TIMBER TRUSSED ROOF AND FLOOR SYSTEMS AND FRAMED BUILDING SYSTEMS, MUST COMPLY WITH THE ABCB PROTOCOL FOR STRUCTURAL SOFTWARE WHERE RELEVANT, AS REFERRED TO IN ABCB HOUSING PROVISIONS PART 2.2.5

THE DEVELOPMENT HAS BEEN DESIGNED TO BEST MEET THE GUIDELINES OF COUNCIL & THE NATIONAL CONSTRUCTION CODE
(ALL WORK ON SITE SHALL BE CARRIED OUT IN A SIMILAR MANNER TO ADHERE TO THE REQUIREMENTS OF COUNCIL AND THE NCC).

MINOR CHANGES TO BUILDING FORM AND CONFIGURATION MAY BE REQUIRED WHEN DRAWINGS ARE SUBSEQUENTLY PREPARED FOR CONSTRUCTION PURPOSES AFTER THE GRANT OF DEVELOPMENT CONSENT

NOT FOR CONSTRUCTION

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CHANGE OF USE
55 Macdonald Street, LAKEMBA NSW 2195

DESIGN ELIE SLEIMAN
DRAFTED JOYCE RAFFOUL
RISSALAH COLLEGE

DRAWING
SECTION VIEWS

SCALE As indicated / A1
ISSUE A 10.08.23

DWG No. 23329 - 200

**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, $\alpha$** – $\alpha$ 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, $\alpha$. An absorption coefficient of 0.9 indicates that 90 % of the incident sound energy is absorbed. The average $\alpha$ 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.