ACOUSTIC ASSESSMENT REPORT

Proposed Childcare Centre

16 Chapman Street, Werrington NOV 2021

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ACOUSTIC ASSESSMENT REPORT

Proposed Child Care Centre
16 Chapman Street, Werrington NSW

Prepared For:

Shivani Ruikar

ARCHIDROME
ARCHITECTURE & CONSTRUCTION

Prepared By:

NG Child & Associates

16 November 2021

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EXECUTIVE SUMMARY

INTRODUCTION

Archidrome Architects is involved in the planning and prospective development of a new purpose built childcare centre for 116 children at 16 Chapman Street, Werrington NSW. The prospective development involves the construction of a new purpose built two-level childcare centre, with basement level car parking, in accordance with plans and drawings provided for reference in this document. This report presents an acoustic assessment of the proposed development.

The key findings and recommendations of the assessment are summarised below.

OVERALL ACOUSTIC ASSESSMENT

Key Findings:

The following is a summary of the key findings of this assessment:

1. Sound levels of less than 40 dB(A) will be achieved throughout the internal areas of the proposed childcare centre, based on measured background sound levels and proposed layout and design details as described in this report;

2. Sound levels in the range 30-35 dB(A) will be achievable within any sleep or rest areas associated with the proposed facility, based on measured background sound levels; and proposed layout and design details as described in this report;

3. Background noise levels of less than 55 dBA are projected to be achievable within the external play area associated with the proposed childcare centre;

4. The level of noise estimated to be generated by activities within the internal areas of the proposed facility is projected to be essentially contained by the building structure of the childcare centre itself, and accordingly is projected to have no negative or non-compliant impacts on surrounding buildings, activities and individuals;

5. The level of noise estimated to be generated by activities within the external play areas associated with the proposed childcare centre is projected to have no negative or non-compliant impacts on surrounding buildings, activities and individuals, subject to the implementation of the recommendations summarised below;

6. The level of noise associated with motor vehicle activities associated with the proposed childcare centre, including the drop-off and pick-up of children is projected to have no negative or non-compliant impacts on surrounding buildings, activities and individuals, subject to the implementation of the recommendations summarised below; and

7. On this basis, the acoustic performance of the proposed childcare centre will comply fully with the requirements of all relevant acoustic guidelines and requirements.

Recommendations:

The assessment has found that the proposed childcare centre will have no undue or adverse impact on neighbouring properties, activities and individuals, and will comply with the requirements of all relevant acoustic guidelines and regulations, subject to the advice provided generally in this report; adherence to normally accepted design and building practices, and the implementation of the following project specific recommendations:

1. External windows and doors are fitted with 6.38 mm laminated glass, or acoustic equivalent;

2. External window and door frames are fitted to façade openings with a sealant such as "Bostik Fireban One", or equivalent;

3. Full perimeter acoustic seals equal to Schlegel Q-Lon seals to be fitted to all external windows and doors;

4. An 1800 mm solid form metal panel fence (or acoustic equivalent) with a minimum Rw rating or noise reduction potential of 20, is installed along the northern and eastern boundaries of the ground outdoor play area, as indicated in Figure 6.3;

5. Appropriate boundary fencing is installed to the remainder of the site area. While no particular acoustic specification or performance requirement is applicable to this other boundary fencing, a continuation of the 1800 mm solid metal panel fencing recommended for the northern and eastern property boundaries appears sensible;

6. Mineral wool-based ceiling insulation equivalent to Bradford SoundScreen™ 2.5 with a minimum Rw rating of 43 to be fitted where possible in the roof void of the childcare centre building;

7. Validation and certification that any plant & equipment including air conditioning units associated with the proposed childcare centre will not have an acoustic impact greater than 5 dBA above the measured background LA90 RBL, as indicated in this report, should be provided prior to the issue of Construction and/or Occupation Certificates for the development; and

8. A Noise Management Plan consistent with the guidelines provided in Section 6.3.14 of this report is prepared and included in the overall Management Plan for the childcare centre.

OVERALL CONCLUSION

The overall conclusion of this acoustic assessment is that:

- Subject to the implementation of the various recommendations set out in this report, as summarised above, the proposed childcare centre can reasonably be expected to comply with the requirements of all relevant acoustic guidelines and regulations.

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Visiting Fellow, Engineering
University of Technology, Sydney
Principal, NG Child & Associates
16 November 2021

1 INTRODUCTION

1.1 INTRODUCTION

Archidrome Architects is involved in the planning and prospective development of a new purpose built childcare centre for 116 children at 16 Chapman Street, Werrington, NSW.

The proposed development site is described in 1.2 to 1.5 below.

The proposed childcare centre is subject to the regulatory control of Penrith City Council, and relevant NSW Government departments and agencies.

Penrith City Council is the consent authority for the development.

Archidrome Architects has engaged NG Child & Associates to provide the acoustic services and undertake the acoustic assessment required for the project, including but not limited to:

1. Identify, and recommend measures to mitigate, any potential for adverse noise impacts on the neighbouring properties and to the occupants of the proposed centre.

2. Generally provide advice and analysis on the merits of the proposed development against good practice, relevant Australian Standards and the development requirements of Local Council and other relevant Authorities.

3. Prepare an Acoustic & Noise Assessment Report to address the noise levels from the use of the building and outdoor play areas, and suitable for inclusion with a Development Application to the Local Council.

NG Child & Associates has considerable experience in the acoustic and other environmental assessment of childcare centre development.

Noel Child of NG Child & Associates is an appropriately qualified and experienced consultant to undertake the acoustic assessment required.

He is a member of the Institute of Engineers (Australia) and is qualified for admission to the Association of Australian Acoustical Consultants.

His experience and qualifications are summarised in Appendix D.

This document presents the acoustic assessment report prepared for the proposed development.

1.2 PROPOSED DEVELOPMENT LOCATION

Recent (October 17th, 2021) satellite views and street maps showing the location of the proposed development are provided in Figures 1.1 and 1.2 respectively on the following page.

The direction of north is towards the top of both diagrams.

The site area is shown shaded in blue in both diagrams.

Most immediate surrounding land uses are also IN2 Light Industrial.

The Cobham Juvenile Justice Centre (zoned SP2 Infrastructure – Correctional Centre) is located some 90 metres to the west of the subject site.

The Great Western Highway is some 340 metres to the south, and Werrington Road some 330 metres to the east.

The Main Western Rail Corridor is some 550 metres to the north.

Figure 1.1 – Aerial View of the Proposed Development Site (October 17th, 2021)

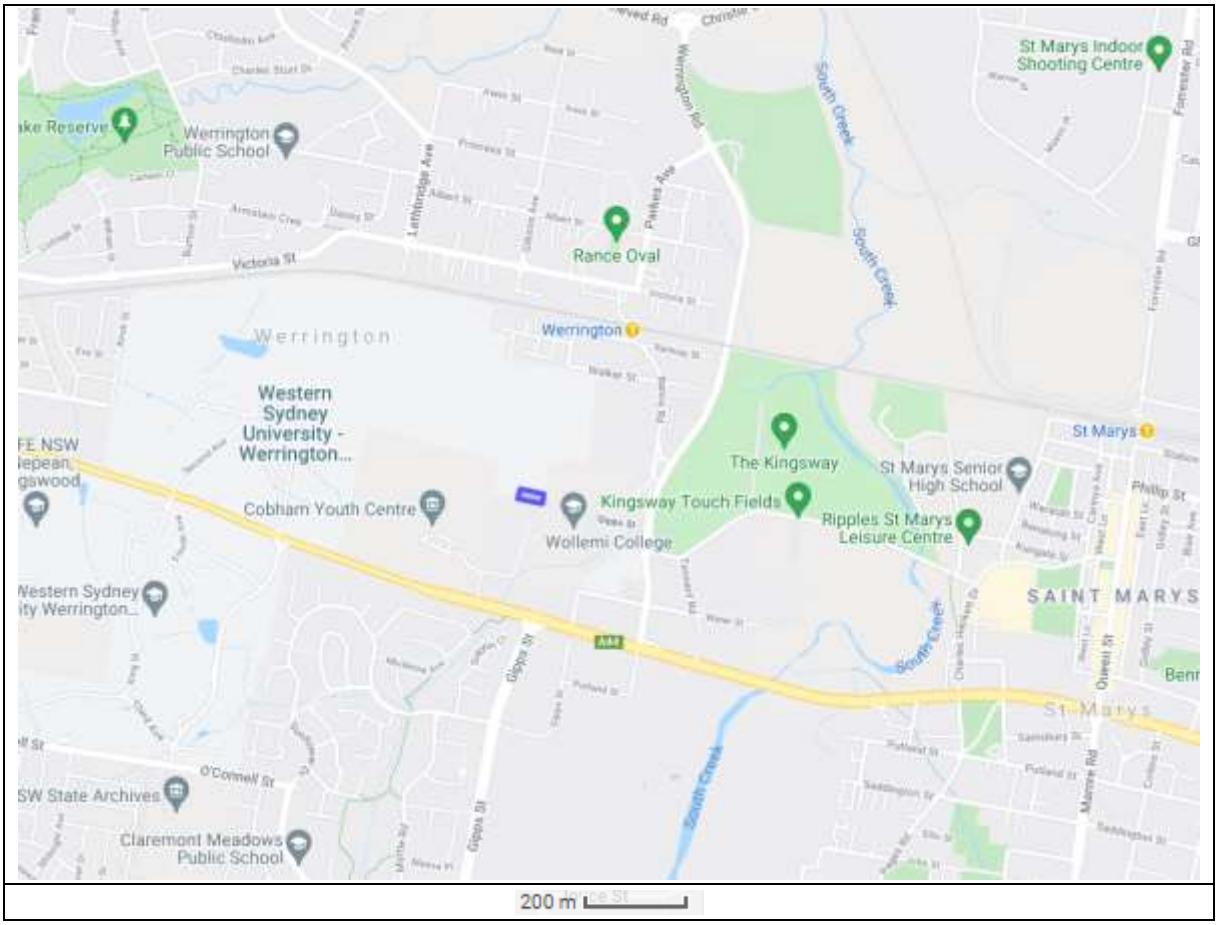


Figure 1.2 – Street Map Showing the Site Location

A view of the site from Werrington Road is provided in Figure 1.3, below.

Figure 1.3 – General Site Area Viewed from Werrington Road

1.3 ZONING

The zoning of the proposed development site, and surrounding properties, is shown in Figure 1.4, below.

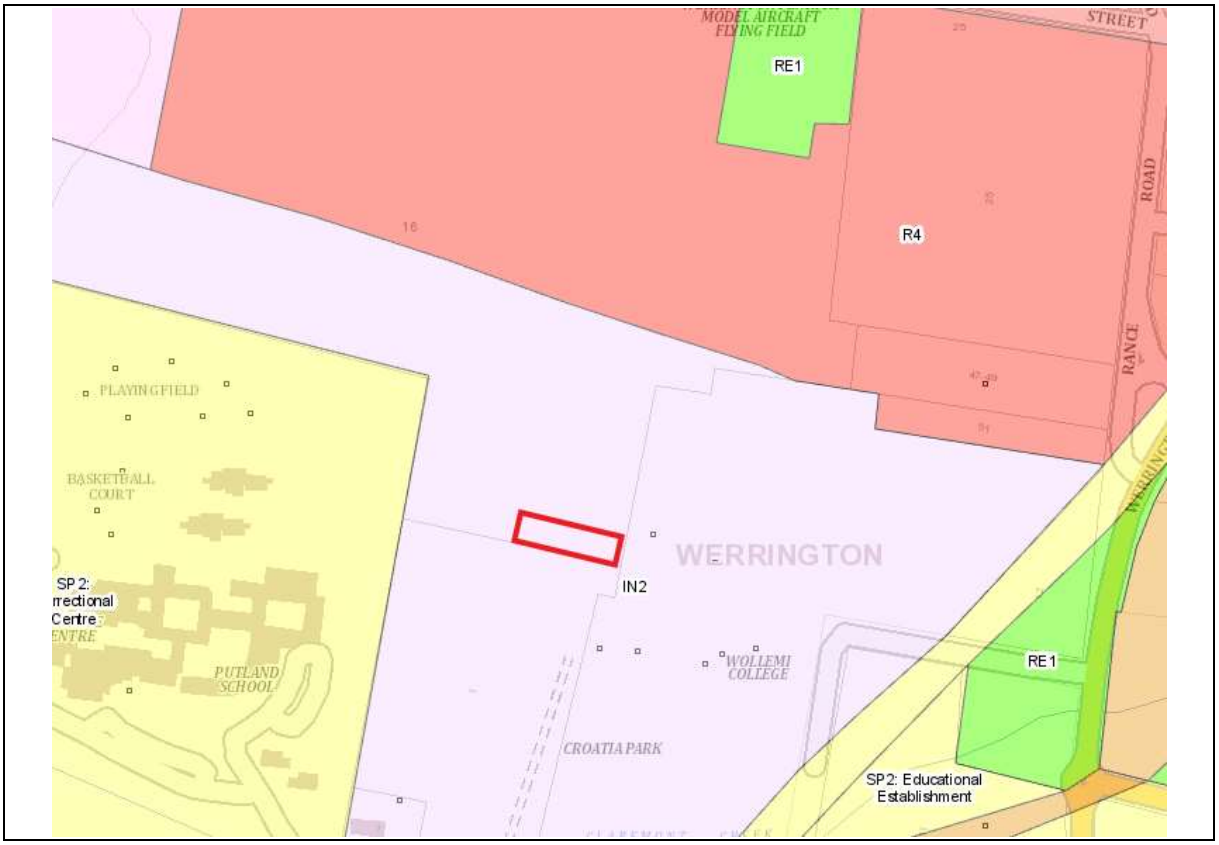


Figure 1.4 – Land Zoning Diagram

The diagram provided in Figure 1.4 is sourced from the current Penrith City Council Local Environment Plan.

The site is shown at the approximate centre of Figure 1.4 (outlined in red) and is zoned IN2 Light Industrial.

Most immediate surrounding land uses are also IN2 Light Industrial.

The Cobham Juvenile Justice Centre (zoned SP2 Infrastructure – Correctional Centre) is located some 90 metres to the west of the subject site.

The Great Western Highway is some 340 metres to the south, and Werrington Road some 330 metres to the east.

The Main Western Rail Corridor is some 550 metres to the north.

1.4 PROJECT DESCRIPTION & PLAN

This proposed development involves the construction of a new purpose-built child-care centre to accommodate 116 children.

Site details are as follows:

Figure 1.5	Cover Page
Figure 1.6	Site Analysis Plan
Figure 1.7	Ground Floor Plan
Figure 1.8	First Floor Plan
Figure 1.9	Site Analysis Section
Figure 1.10	Sections AA & BB
Figure 1.11	Roof Plan
Figure 1.12	East & West Elevations
Figure 1.13	North & South Elevations
Figure 1.14	Materials Schedule
Figure 1.15	Views

PROPOSED CHILDCARE CENTRE
16 CHAPMAN STREET, WERRINGTON

ARCHIDROME
SUITE 206/8, HELP STREET, CHATSWOOD, N.S.W 2067 TARUNCHADHA@ARCHIDROME.NET ARCHITECTS REG. NO. 8777

Figure 1.5 – Cover Page

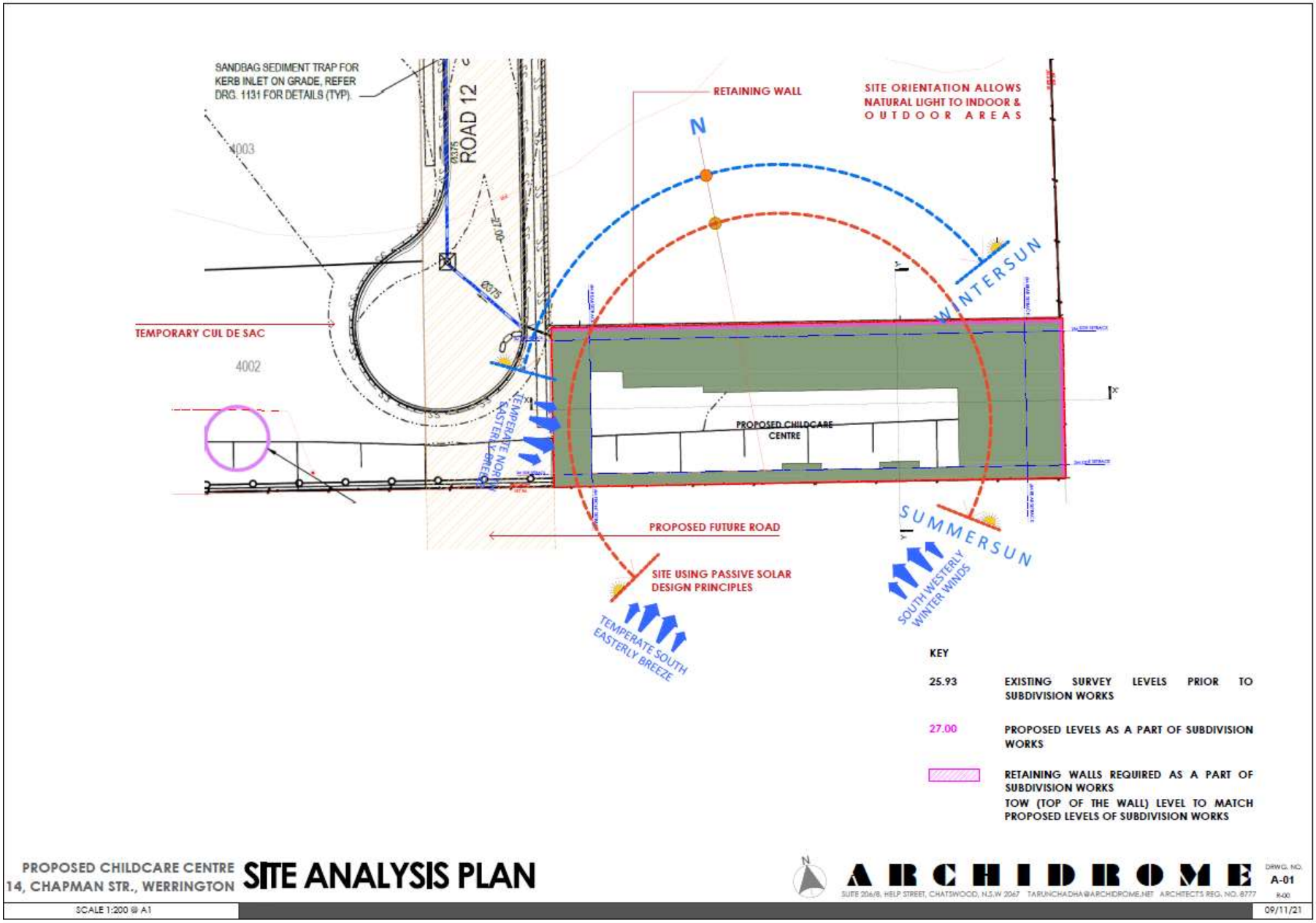


Figure 1.6 – Site Analysis Plan

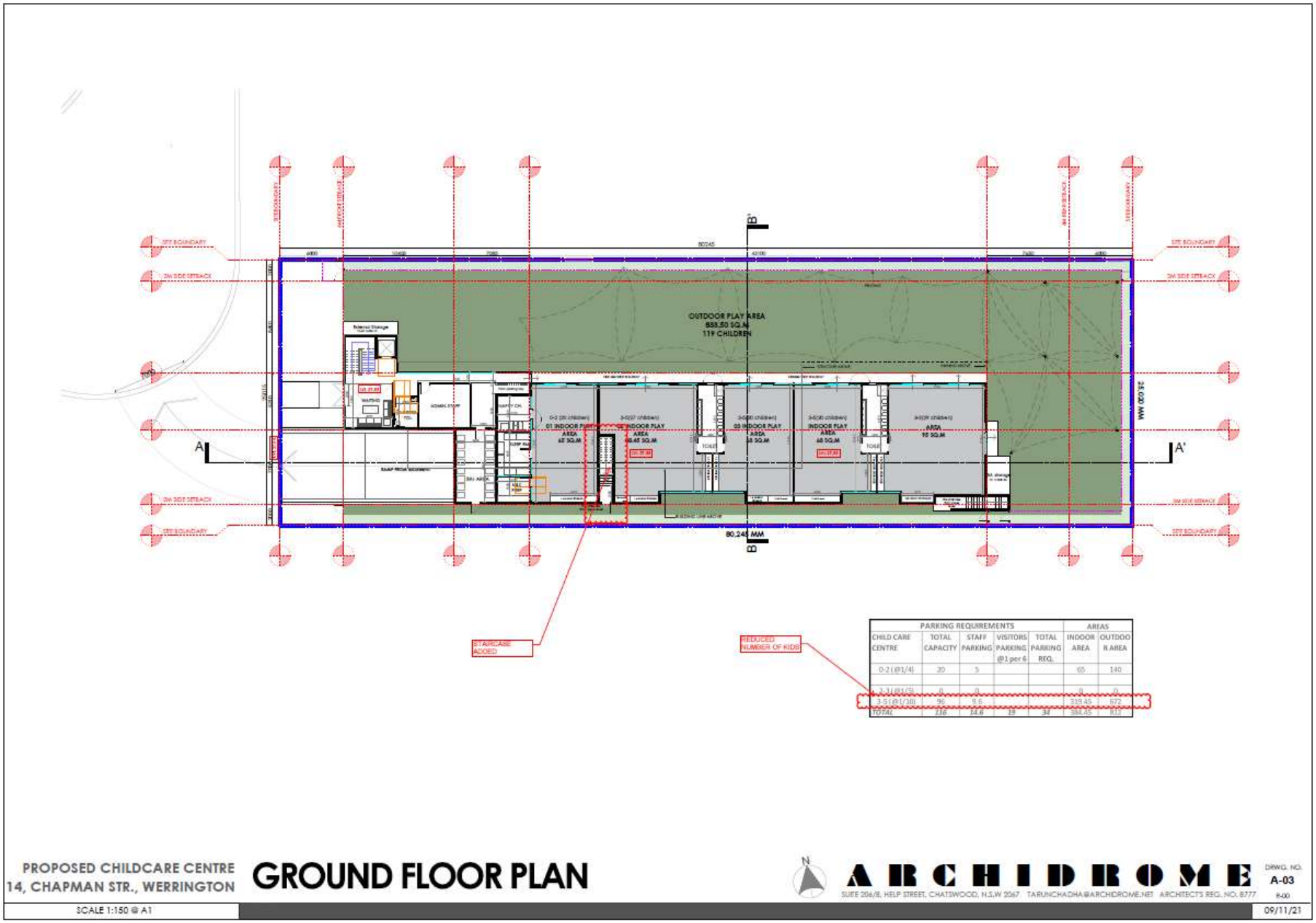


Figure 1.7 – Ground Floor Plan

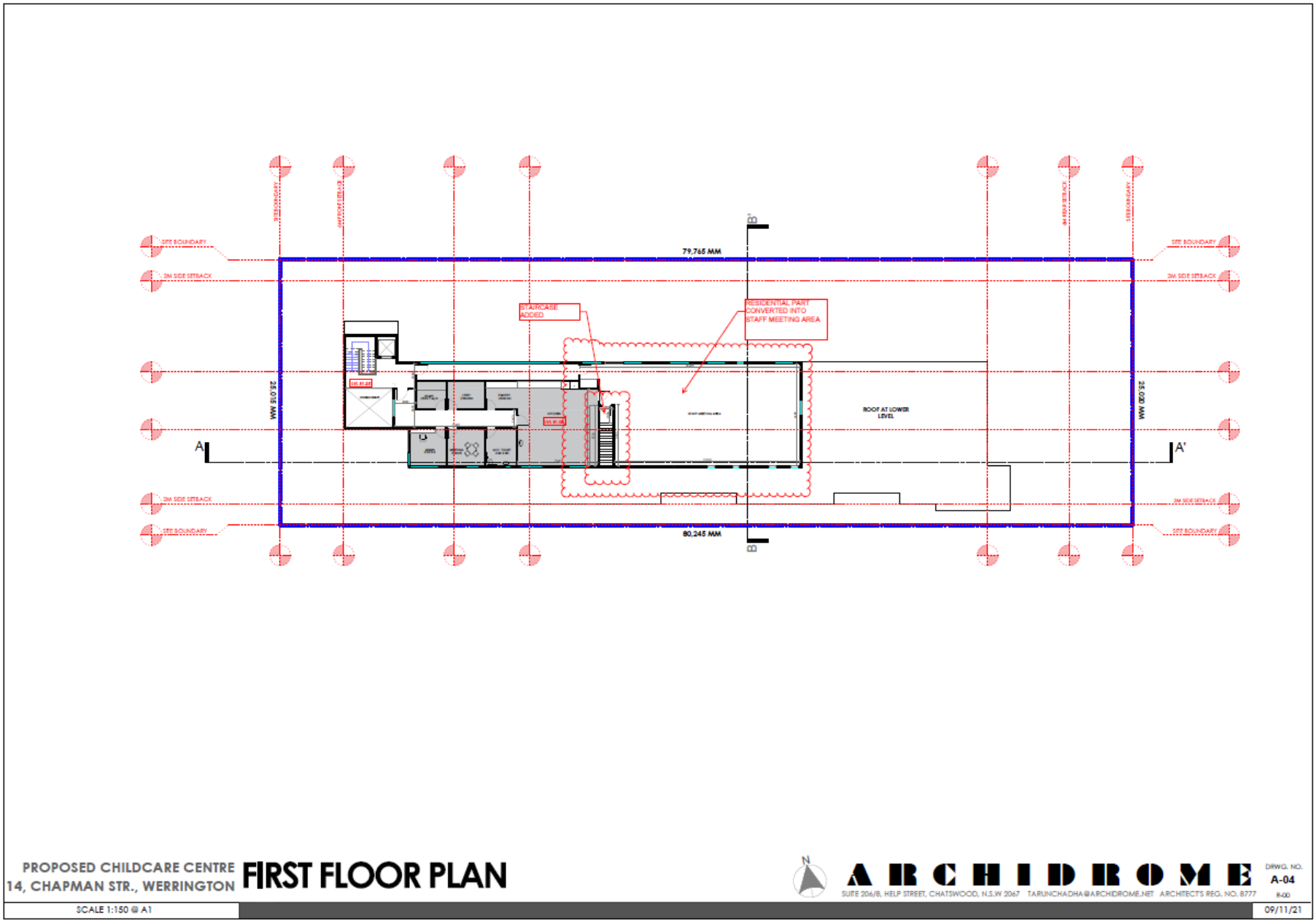


Figure 1.8 – First Floor Plan

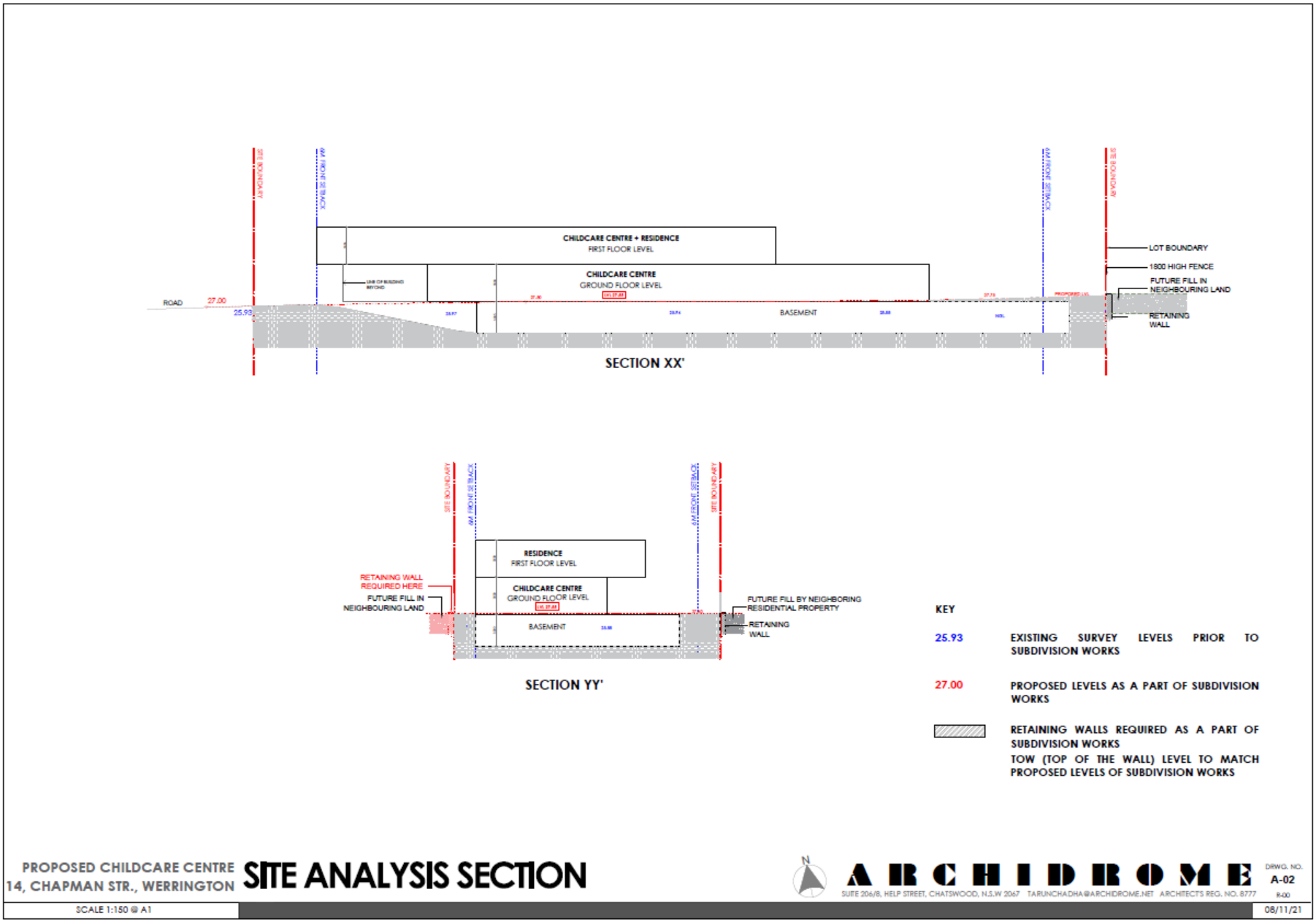


Figure 1.9 – Site Analysis Section

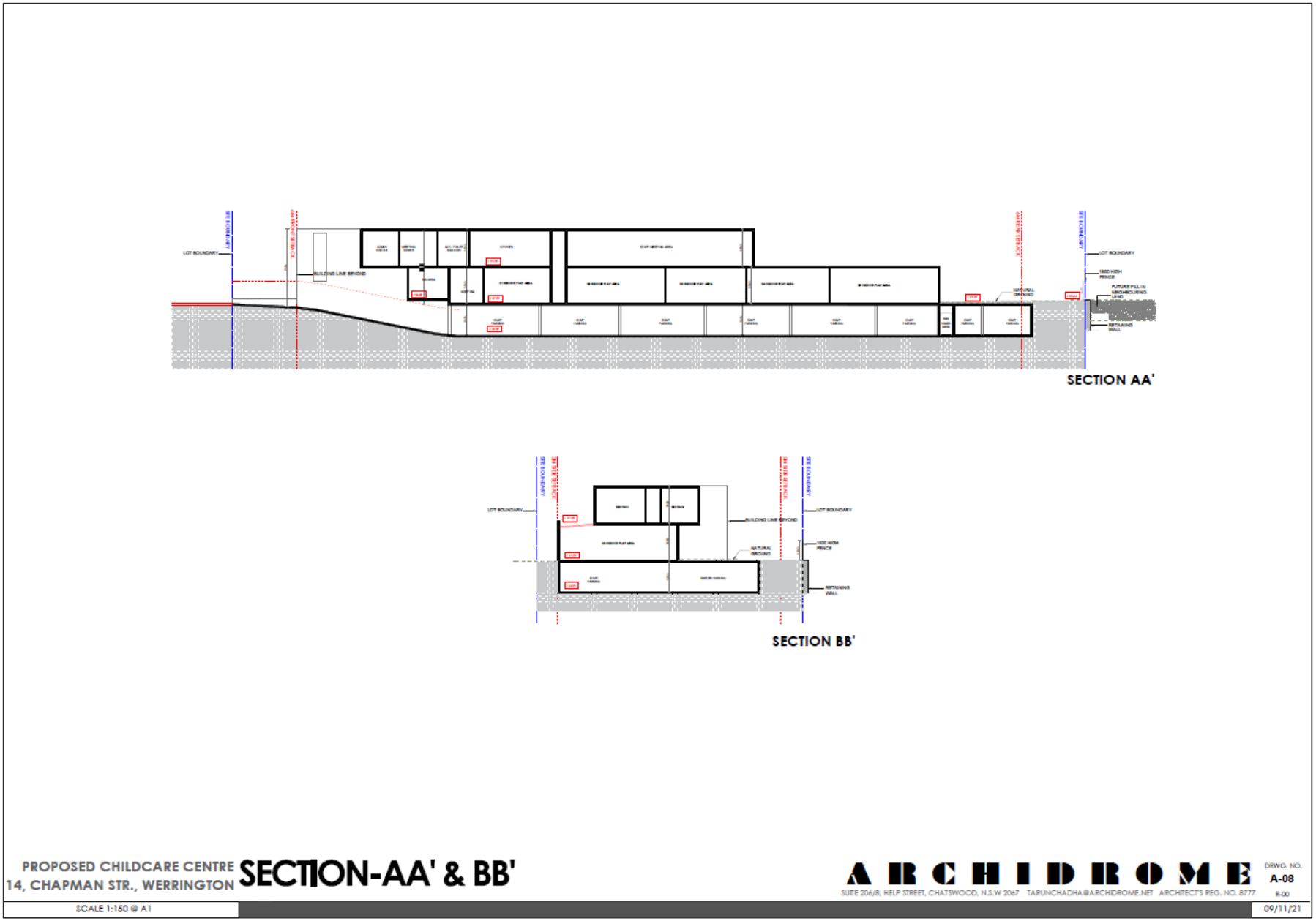


Figure 1.10 – Sections AA & BB

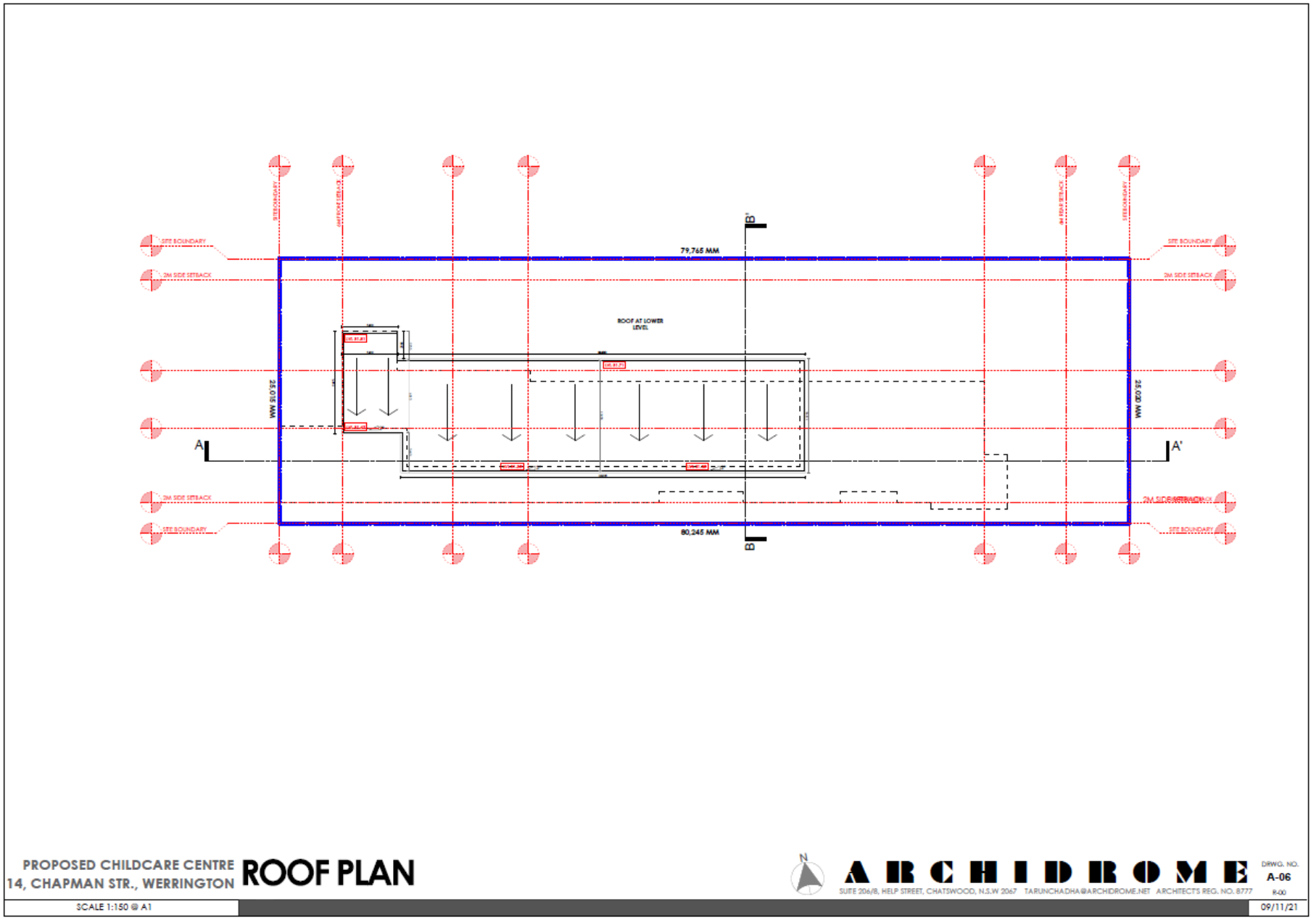


Figure 1.11 – Roof Plan

Figure 1.12 – East & West Elevations

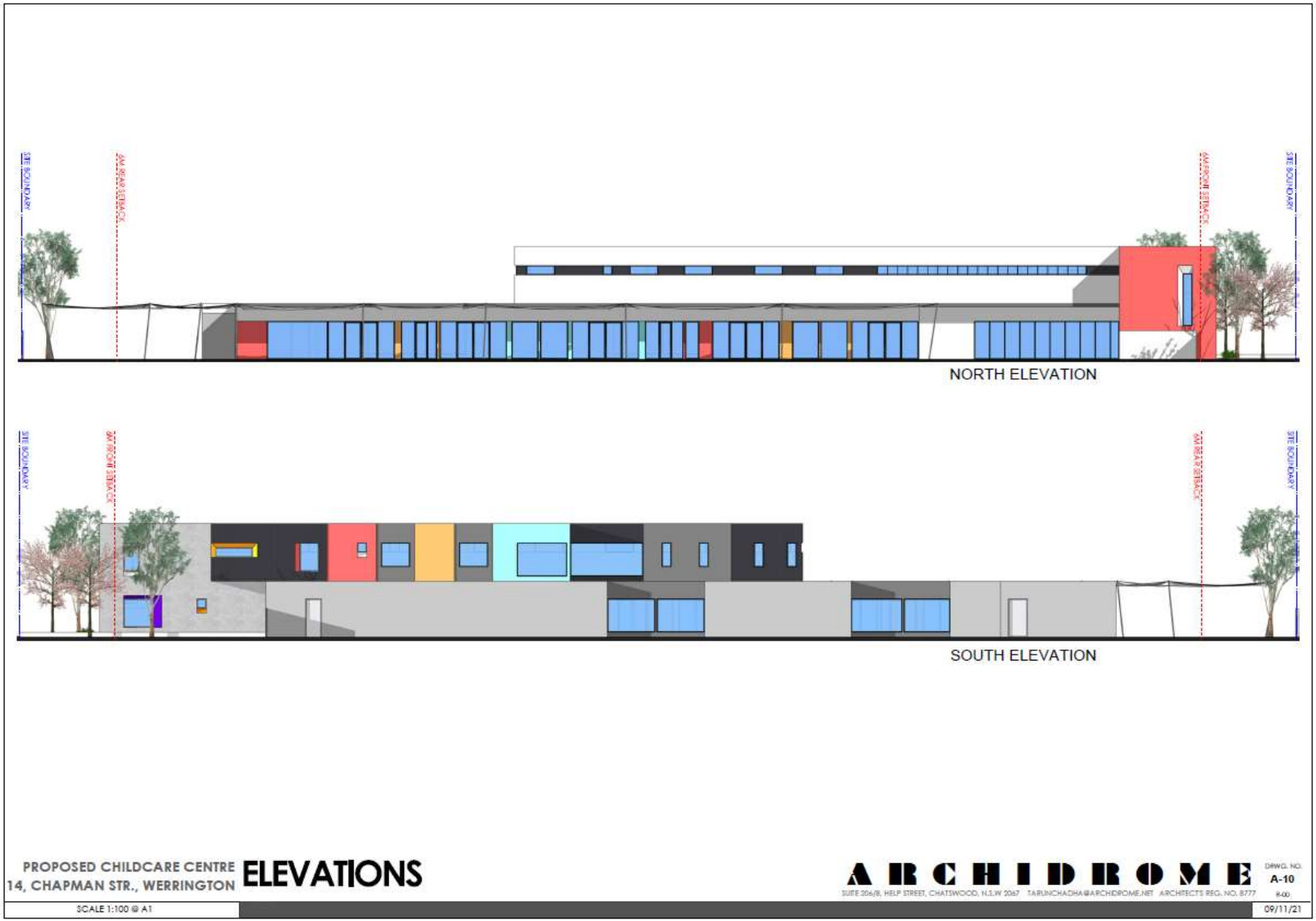


Figure 1.13 – North & South Elevations

Figure 1.14 – Materials Schedule

VIEW 1

VIEW 2

PROPOSED CHILDCARE CENTRE
14, CHAPMAN STR., WERRINGTON
VIEWS

ARCHIDROME
SUITE 206/8, HELP STREET, CHATSWOOD, N.S.W 2067 TARUNCHADHA@ARCHIDROME.NET ARCHITECTS REG. NO. 8777

DRWG. NO. A-13
09/11/21

Figure 1.15 – Views

2 KEY TERMS DEFINITIONS & ABBREVIATIONS

The following terms, definitions and abbreviations have been used in this proposal:

INP	Industrial Noise Policy
dBA	Decibels – a logarithmic unit commonly used to measure sound levels.
ANL	Acceptable Noise Level
ABL	Assessment Background Level - a single figure sound or noise background level representing each assessment period (daytime, evening and nighttime) for each day. It is determined by calculating the 10th percentile (lowest 10th percent) background level (L_{A90}) for each period.
RBL	The Rating Background Level for each period is the median value of the ABL values for the period over all the days measured. There is therefore an RBL value for each period – daytime, evening and nighttime.
L_{Aeq}	The equivalent continuous sound level (L_{Aeq}) is the energy average of the varying noise over the sample period and is equivalent to the level of a constant noise which contains the same energy as the varying noise environment. This measure is the most commonly used measure of environmental noise and road traffic noise.
$L_{Aeq, period}$	The equivalent continuous sound level for a specified period of time.
$L_{A1(1 minute)}$	The L_{A1} level is the noise level which is exceeded for 1% of the sample period. During the sample period, the noise level is below the L_{A1} Level for 99% of the time. The notation “1 minute” means that the sample period was 1 minute.
$L_{A90(15 minute)}$	The L_{A90} level is the noise level which is exceeded for 90% of the sample period. During the sample period, the noise level is below the L_{A90} Level for 10% of the time. This measure is commonly referred to as the “background noise level”. The notation “15 minute” means that the sample period was 15 minutes.
Maximum Noise Level L_{Amax}	The maximum noise level over a sample period is the maximum level, measured on fast response, during the sample period.

3 SOUND & NOISE

3.1 LOUDNESS

In terms of human hearing, sound is caused by vibrations in the air, causing variations in air pressure that are detected by the ear. Noise is often described as unwanted sound.

Sound pressure is measured in units called Pascals (Pa) but is generally expressed as a sound pressure level in decibels (dB).

Sound consists of various frequency components called octaves. A correction factor is generally applied to combine these frequencies into a single number that most closely corresponds to the response of the human ear. When this is done, the sound pressure level is referred to as “A” - weighted, and is expressed as dB(A), or dBA. “A” - weighted units have generally been used in this report.

3.2 OTHER SOUND OR NOISE CHARACTERISTICS

The sound pressure levels discussed above provide a measure of the loudness of a noise. This is an important measure, as the loudness of a sound can be a major contributor to disturbance, or annoyance. There are a number of other aspects of a sound or noise that can also contribute to disturbance or annoyance. These include:

- **Tonal Noise** – containing a prominent frequency and characterized by a definite pitch
- **Low Frequency Noise** – containing major components within the low frequency range (20 -250 Hz) of the frequency spectrum
- **Impulsive Noise** – having a high peak of short duration, or a sequence of such peaks
- **Intermittent Noise** – the level suddenly drops to that of the background noise several times during the assessment period, with a noticeable change in noise level of at least 5 dBA

3.3 ADDING NOISE LEVELS

Sound pressure levels are expressed in decibels, which is a logarithmic scale able to compress the range of sound levels audible to the human ear into manageable numerical units. Because the scale is logarithmic, however, noise levels cannot be added in simple arithmetic terms. For example, 35 dB plus 35 dB does not equal 70 dB. To add two or more noise levels expressed in decibels, if the difference between the highest and next highest noise level is:

0-d1 - add **3 dB** to the higher level to give the total noise level;

2-3 dB - add **2 dB** to the higher level to give the total noise level;

4-9 dB - add **1 dB** to the higher level to give the total noise level; and

10 dB and over - the noise level is **unchanged** (i.e. the higher level is the total level)

3.4 ATTENUATION OR REDUCTION OF NOISE WITH DISTANCE

Noise reduces with increasing distance from the source. In the case of a point source, this attenuation with distance is governed by the following formula:

$$SPL_2 = SPL_1 - 20 \log (d_2/d_1)$$

where:

SPL_2	=	sound level a distance “2” from the source in metres (predicted)
SPL_1	=	sound level a distance “1” from the source in metres (measured)
d_2	=	distance in metres to location 2 from the source
d_1	=	distance in metres to location 1 from the source

4 ASSESSMENT CONSIDERATIONS

4.1 PENRITH CITY COUNCIL

Penrith Council is the local government consent authority at interest.

Development guidelines for childcare and educational facilities are provided in Council's Development Control Plan.

The Guide to the (SEPP) State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017 is also applicable in the Penrith LGA and has been assumed to prevail over Council's Local Environmental Plan and Development Control Plan, in circumstances where an inconsistency may arise.

State Environmental planning Policy (Educational Establishments and Child Care Facilities) 2017 and the Child Care Planning Guideline apply to all development for childcare in NSW. This includes all new and existing childcare facilities.

All Development Applications must demonstrate how the development complies with:

- The National Quality Framework for Early Childhood Education and Care Facilities; and
- The relevant objectives, provisions and considerations in the SEPP and the Child Care Planning Guideline.

Typically, individual local government DCP's do not apply where they are inconsistent with the SEPP or the guideline, except for building height, side and rear setback or car parking provisions. All relevant provisions of the SEPP have been considered in the preparation of this acoustic assessment.

4.2 GENERAL POLICIES & GUIDELINES

The following general policies and guidelines apply to the proposed development:

Sydney Regional Environmental Plan No. 20 – Hawkesbury Nepean River (No. 2 - 1997)
State Environmental Planning Policy No. 55 – Remediation of Land
State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017
State Environmental Planning Policy (Infrastructure) 2007
Penrith Local Environmental Plan 2010
Penrith Development Control Plan 2014
NSW Department of Planning and Environment Child Care Planning Guideline 2017

4.3 NSW CHILD CARE PLANNING GUIDELINE (2017)

The Child Care Planning Guideline : Delivering quality childcare for NSW (August 2017) supports the SEPP described in 4.2 above.

State Environmental Planning Policy (Educational Establishments and Child Care Facilities) 2017 (the SEPP) determines that a consent authority must take into consideration this Guideline when assessing a development application (DA) for a centre based childcare facility ("childcare facility").

It also determines this Guideline will take precedence over a Development Control Plan (DCP), with some exceptions, where the two overlap in relation to a childcare facility.

This Guideline informs state and local government, industry and the community about how good design can maximise the safety, health and overall care of young children.

At the same time, it aims to deliver attractive buildings that are sympathetic to the streetscape and appropriate for the setting while minimising any adverse impacts on surrounding areas.

It will help achieve a high level of design that is practical and aligned with the National Quality Framework.

The Guideline is intended to provide a consistent statewide planning and design framework. In terms of visual and acoustic issues, Sections 3.5 and 3.6 of the Guidelines apply.

4.4 THE AAAC GUIDELINE (VERSION 3; 2020)

The Association of Australasian Acoustical Consultants Guideline for Child Care Centre Acoustic Assessment Version 3.0 (2020) provides a methodology and approach for the acoustic assessment of childcare and educational facilities. The AAAC guidelines includes the following key topics:

Chapter 3 NOISE CRITERIA

- Background Noise Monitoring
- Criteria – Residential Receptors
- Outdoor Play Area
- Mechanical Plant
- Pick-up and Drop-off of children
- Sleep Disturbance
- Commercial Receptors

Chapter 4 SOUND POWER LEVELS

- Children – Outdoor Play
- Mechanical Plant
- Vehicles Within Premises

Chapter 5 EXTERNAL NOISE IMPACT ON CHILDREN

- Road, Rail Traffic and Industry
- Aircraft

Chapter 6 NOISE CONTROL RECOMMENDATIONS

- Building Design
- Outdoor Play Areas
- Indoor Activity Areas
- Buildings and Other Structures
- Boundary Fences / Barriers
- Limiting the Number of Children Outside
- Car Parking
- Noise Management Plan

This assessment has considered the various guidelines provided by the AAAC document.

For convenience, reference to the AAAC guideline has been provided in blue shaded text boxes in relevant sections of the acoustic assessment provided in this report.

4.5 NSW EPA NOISE GUIDE FOR LOCAL GOVERNMENT (2013)

The NSW EPA Noise Guide for Local Government (2013) is relevant to this assessment and has been taken into account.

The Noise Guide provides guidelines on the following matters:

Part 1 Framework for noise control
- Introduction
- Noise complaints
- Responses to noise
- Legal framework for noise control
- Responsible authorities – quick reference guide
- Useful links
- References

Part 2 Noise assessment
- Assessment of offensive noise
- Assessing noise with a sound level meter
- Measuring noise
- Common sources of noise
- References

Part 3 Noise management principles
- Preventing noise impacts through planning
- Managing noise
- Managing specific noise issues
- Other noise management options
- Dealing with the community
- Case studies
- References

Part 4 Regulating noise impacts
- Deciding on a course of action
- The Protection of the Environment Operations Act 1997
- The POEO (Noise Control) Regulation 2008
- Dealing with warnings and offences
- Dealing with offences committed by minors
- References

4.6 NOISE POLICY FOR INDUSTRY (2017)

It has been assumed as a basis for this assessment that appropriate noise criteria for the proposed development are specified in the Noise Policy for Industry (NPI) 2017 (formerly the NSW Industrial Noise Policy 2000). The noise criterion set out in the INP depends on whether existing noise levels in a given area are close to recommended amenity levels for different types of residential receiver, for example whether the receivers in question are urban, rural, near existing roads and so on. In this case, the potential receivers in question appear to be primarily residential in nature. The NPI requires that the following actions or circumstances be taken into account in the acoustic assessment of a development of the type proposed:

- Identify the existing level of noise, or noise background
- Determine what weather conditions should be used when predicting noise background
- Assess noise levels that will be involved with the various aspects of the proposed development
- Assess noise from the proposed development at residential receivers
- Assess noise from the proposed development at industrial/commercial receivers
- Apply the urban/industrial interface amenity category, if required
- Identify the appropriate receiver amenity category
- Apply amenity criteria in high traffic noise areas
- Take into account any cumulative noise from multiple developments
- Identify which of the amenity or intrusive criteria apply

- Take into account maximum noise levels during shoulder periods
- Consider the tonality - sliding scale test
- Apply duration correction, if required
- Sleep disturbance
- Present the results of the acoustic assessment in appropriate report form

Further comments on some of these assessment criteria are included in Sections 4.3.1 to 4.3.4, below.

4.6.1 Intrusiveness Criterion

As set out in the various reference guidelines listed above, where existing noise levels are low, noise levels from a proposed new (or changed) operation are limited by the intrusiveness criterion. In such cases, the L_{Aeq} noise level resulting from the impact of any new or substantially changed operation should not exceed the Rating Background Level (RBL) applicable to the residential receivers in question by more than 5 dBA.

4.6.2 Amenity Criterion

The amenity criterion sets an upper limit to control the L_{Aeq} noise level from all industrial sources for daytime, evening and nighttime periods, respectively. In accordance with the relevant acoustic criteria and guidelines listed, “maximum” recommended incremental noise levels for these periods are all 5 dBA higher than the “acceptable” levels mentioned in the various NSW acoustic guidelines.

4.6.3 Interpretation of Criteria

Where noise levels from industrial sources are close to or above the 5 dBA maximum increment over the existing Rating Background Level, as recommended in the NSW Noise Policy for Industry, then the amenity criterion, which incorporates a sliding scale to set limits, becomes relevant.

The sliding scale prevents the overall noise level exceeding the acceptable level as a result of a new noise source.

The amenity criterion also needs to consider the possibility of other developments which may affect aggregate noise levels in any given situation.

4.6.4 Sleep Disturbance

In order to minimise any risk of sleep disturbance to affected residential receivers as a consequence of operations that occur during the nighttime period (10:00 pm – 7:00 am), the NSW Office of Environment & Heritage (OEH) recommends that:

> *Sleep disturbance is assessed as the emergence of the $L_{A\ (1\ minute)}$ level above the $L_{A90\ (15\ minute)}$ level at the time. Appropriate screening criteria for sleep disturbance are determined to be an $LA1_{\ (I\ minute)}$ level 15 dBA above the Rating Background Level (RBL) for the nighttime period.*

This approach to the assessment of sleep disturbance has been discussed with the NSW OEH by the author of this assessment proposal.

The NSW OEH has confirmed that this is the correct and accepted way to undertake the assessment of sleep disturbance.

In this case, the operating hours of the proposed centre will be within the prescribed “daytime” period for acoustic assessment purposes that is between 7:00 am and 6:00 pm Monday to Friday.

4.7 SUMMARY OF ACOUSTIC GUIDELINES & REQUIREMENTS

Taking into account all relevant guidelines, the acoustic conditions that will be required to be demonstrated in relation to the proposed development are as follows:

The effect of noise from external sources on the childcare centre development:

Childcare Centre Location	Noise Level dBA	Applicable Time Period
Internal Areas of the childcare centre	40 [1]	At any time
Outdoor areas of the childcare centre	55 [1]	At any time

[1] Leq 1 hour basis

While childcare guidelines typically require noise levels below 40 dBA in all internal areas, a further objective of 35 dBA for noise levels achievable in any sleep or rest areas associated with the facility has been adopted for this assessment.

While the principal sources of external noise in this case appears to be road traffic on Park Avenue and the nearby western rail corridor, the assessment methodology used ensures that all other potential noise sources have been taken fully into account in the assessment.

The effect of noise from the childcare centre development on nearby receivers:

Type of Receiver	Noise Level dBA	Applicable Time Period
Nearby Residential Properties	+ 5 dBA (max) versus RBL [1]	At any time
Nearby Commercial Properties	65 dBA max [2]	At any time

1 RBL = Rated Background Sound Level
2 NSW Noise Policy for Industry

In this case, surrounding properties are predominantly residential in nature,

The requirement in relation to the impact of noise associated with the proposed childcare centre on nearby residential properties is that such noise is not permitted to result in an increase of more than 5 dBA above existing background LA90 sound levels measured at the boundary between the development and the nearest residential boundary, and also that noise impact complies with any other specific guidelines.

Noise impacts due to activities and operations associated with the development are required to be no greater than 65 dBA at any affected commercial premises.

In this case, the proposed centre is located in a light industrial (IN2) zone, and the closest receivers are anticipated to be existing and future light industrial and light commercial facilities within that zone.

The proposed centre is some considerable distance from the nearest residential receivers (refer 6.3.7).

It is noted that the assessment of noise impacts is required to be based on measurements over a 15-minute period, and this approach has been adopted in the assessment presented in this document.

5 ACOUSTIC BACKGROUND

5.1 INTRODUCTION

Two of the most important considerations in the acoustic assessment of childcare facilities are the effect of surrounding noise sources on the childcare centre and its occupants, and the effect of any noise generated by the facility itself, its occupants and its operations, on nearby residents and any other potentially sensitive receivers. The assessment of acoustic issues in turn requires an understanding and clear definition of the existing acoustic environment at the site under consideration. This section of the report describes the establishment of the acoustic background at the site.

5.2 MEASURES OF LOUDNESS OF SOUND & NOISE

5.2.1 General

In terms of human hearing, sound is caused by vibrations in the air, causing variations in air pressure that are detected by the ear. Noise is often described as unwanted sound. Sound pressure is measured in units called Pascals (Pa) but is generally expressed as a sound pressure level in decibels (dB).

Sound consists of various frequency components called octaves. A correction factor is generally applied to combine these frequencies into a single number that most closely corresponds to the response of the human ear.

When this is done, the sound pressure level is referred to as “A” - weighted, and is expressed as dB (A), or dBA. “A” - weighted units have been used in this report.

5.2.2 Noise Descriptors

The following standard noise descriptors have been used in this assessment:

$L_{Aeq, 15min}$	continuous equivalent sound pressure level over a 15-minute period
$L_{Amax, 15\ min}$	maximum sound pressure level over 15 minutes
$L_{Amin, 15\ min}$	minimum sound pressure level over 15 minutes
$L_{A90, 15min}$	sound pressure level exceeded for 90% of a 15-minute period

Review of AAAC Guidelines

The noise descriptors used in this assessment are consistent with those described in the AAAC (2020) guideline.

5.3 ASSESSMENT

5.3.1 General Approach

The general approach to this assessment has been twofold. Firstly, to estimate the sound levels that would apply within the proposed childcare centre; to determine whether these sound levels are consistent with those required at such a facility, and if relevant to consider any design or noise management measures that might be required to ensure appropriate sound or noise levels throughout the proposed centre.

Secondly, to estimate the levels of sound or noise likely to be generated by activities associated with the proposed childcare centre and assess the prospective acoustic impact of the proposed centre on nearby receivers. The existing acoustic environment at the site is relevant to both considerations.

This section of the report describes the method used to measure the existing or background acoustic environment and presents and explains the results of those measurements.

5.3.2 Adjustment for Distance & Structural Shielding

In this case, the primary external noise sources appear to be the Cobham Youth Centre to the west; Wollemi College to the east,

Maximum external noise from the closest sources, Cobham Youth Centre and Wollemi College, can be expected to be experienced at the eastern end of the site, immediately adjacent to Wollemi College. and that background noise from this source will reduce with distance toward the centre of the site.

In terms of background noise, the higher noise levels (the LAeq background) need to be taken into account regarding impact on the centre, while the lower noise levels (the LA90 background) need to be taken into account when assessing the potential impact of noise emissions from the proposed centre on neighbouring residential properties. In this case, there are no residential receivers in the immediate vicinity of the site.

For these reasons, continuous unattended background noise monitoring has been undertaken at a location in the central area of the site to assess the background LA90 noise level and attended sound level measurements recorded at the eastern site street boundary to provide a basis to assess the higher LAeq measure that can be expected to apply at that location, and which is the measure required to assess the adequacy of structural design to ensure appropriate internal sound levels.

5.3.3 Instrumentation

The sound level measurements used in this assessment were recorded with Brüel & Kjaer 2237A integrating sound level meters. The instruments were calibrated before and after measurements, in accordance with relevant acoustic standards and procedures. Calibration drifts of less than 0.2 dB (A) were recorded. The sound level meters used had been calibrated by a NATA certified laboratory three weeks prior to their use in this assessment. The measurement equipment and methodologies employed in this assessment comply with Australian Standard AS 1259.2-1990 “Acoustics – Sound Level Meters – Integrating – Averaging”, and AS 1055 “Acoustics – Description and measurement of environmental noise”.

Review of AAAC Guidelines

The instrumentation used to measure the background sound levels used in this assessment is consistent with the requirements described in the AAAC (2020) guideline.

5.3.4 Background Sound Level Measurements

The acoustic data necessary to complete the assessment was obtained as follows:

- Reference background sound levels were measured by continuous, unattended noise monitoring conducted at a location (Location “A”) in the central area of the site over a seven-day period between Monday November 8th, and Sunday November 14th, 2021, in accordance with relevant acoustic assessment guidelines and protocols.

- Attended background sound levels were measured at the eastern boundary of the site (Location “B”) over representative 15-minute periods on Monday April 8th, and Friday April 12th, 2021.

- These sound level measurement locations are shown in Figure 5.1, on the following page.

- External background sound level measurements were recorded at an elevation of 1.5 metres above ground level in free field conditions, as required by relevant acoustic assessment guidelines and protocols. Weather conditions during the monitoring period were generally clear and fine, with low prevailing winds, and no excessive rain during the monitoring period. Meteorological conditions were not considered to be such as to distort the background sound level measurements.

Figure 5.1 – Background Sound Level Monitoring Locations

Review of AAAC Guidelines

The method of measuring background sound levels used in this assessment is consistent with the approach described in the AAAC (2020) guideline.

5.3.4 Results

Location A

The logger was set to measure the Lmax, LAmin, LA1, LA10, LA50, LA90, LA99 and LAeq levels of the existing sound or noise environment.

The LAmax measure reflects the highest noise level recorded during each monitoring period and is indicative of maximum noise levels due to individual noise events, including road traffic on Werrington Road, and other local thoroughfares.

The LA90 level is generally adopted as the background noise level, excluding road traffic noise influences. The LAeq level is the Equivalent Continuous Sound Level and has the same sound energy over the sampling period as the actual noise environment with its fluctuating sound levels.

The LAeq is accepted for acoustic assessment purposes as the standard descriptor for environmental noise that is noise including influences such as road traffic.

The LAeq measure has been used for that purpose in this assessment. Weather during the measurement period was generally fine with some light rain, and no adjustments to the measured data (to adjust for extreme meteorological conditions) were considered necessary or applied.

Detailed reports of sound level measurements have been included for reference at Appendix A. Summaries of the key LA90 and LAeq descriptors for the seven days of the monitoring period are shown in Table 5.1, below.

Table 5.1 - Background Sound Level Measurement Results

	Mean logarithmic LA90 Daytime (7:00am to 6:00pm) *	**Mean logarithmic LA90 Evening (6:00pm to 10:00pm)**	**Mean logarithmic LA90 Night-time (10:00pm to 7:00am)**
Mon 8 November 2021	49.2705	49.2313	39.8750
Tue 9 November 2021	50.4500	50.1875	39.5259
Wed 10 November 2021	49.0705	49.0313	39.6750
Thu 11 November 2021	50.2852	48.7000	38.2875
Fri 12 November 2021	50.6917	48.2063	40.0406
5 Working Days	**49.9536**	**49.0713**	**39.4808**
Sat 13 November 2021	49.7667	48.2000	37.7750
Sun 14 November 2021	49.4944	48.0000	37.5500
2 Day Weekend	**49.6306**	**48.1000**	**37.6625**
	Mean logarithmic LAeq Day-time (7:00am to 6:00pm) *	**Mean logarithmic LAeq Evening (6:00pm to 10:00pm)**	**Mean logarithmic LAeq Night-time (10:00pm to 7:00am)**
Mon 8 November 2021	55.5977	54.7313	50.2813
Tue 9 November 2021	55.9341	55.2563	49.8371
Wed 10 November 2021	55.8909	54.6188	49.7389
Thu 11 November 2021	55.9000	55.1313	49.9125
Fri 12 November 2021	56.7063	54.9875	50.2938
5 Working Days	**56.0058**	**54.9450**	**53.6156**
Sat 13 November 2021	55.1352	54.4313	48.9875
Sun 14 November 2021	54.9648	54.2313	48.8875
2 Day Weekend	**55.0500**	**54.3313**	**48.9375**

* Sundays and Public Holidays daytime commences 8:00am

A summary of the LA 90 and LAeq noise measures for the 2-day weekend and 5-day working week periods, as used in this assessment, is presented in Table 5.2, below.

Table 5.2 – Noise Monitoring Summary

	Mean logarithmic LA90 Daytime (7:00am to 6:00pm) *	**Mean logarithmic LA90 Evening (6:00pm to 10:00pm)**	**Mean logarithmic LA90 Night-time (10:00pm to 7:00am)**
5 Working Days	**49.9536**	**49.0713**	**39.4808**
2 Day Weekend	**49.6306**	**48.1000**	**37.6625**
	Mean logarithmic LAeq Day-time (7:00am to 6:00pm) *	**Mean logarithmic LAeq Evening (6:00pm to 10:00pm)**	**Mean logarithmic LAeq Night-time (10:00pm to 7:00am)**
5 Working Days	**56.0058**	**54.9450**	**53.6156**
2 Day Weekend	**55.0500**	**54.3313**	**48.9375**

* Sundays and Public Holidays daytime commences 8:00am

Location B

As indicated in 5.1 above, 15-minute attended sound level measurements were recorded at Location B, close to the eastern property boundary, to establish a differential with sound levels measured toward the centre of the property.

These comparative measurements were carried out on the morning and afternoon of Monday and Friday November 8th and 12th, 2021.

Based on an average of these Location B measurements, the following differential was established between Location A and Location B:

Table 5.3 – Sound Level Difference between Locations "A" and "B"

	Location "A"	Location "B"
LAeq 15-min; Daytime	X	X + 2
L90 15-min, Daytime	Y	Y + 1

In other words, the LAeq measure was found to be 2 dBA higher at Location "B" than at "Location "A", and the LA90 measure 1 dBA higher.

5.4 REFERENCE & DESIGN BACKGROUND SOUND LEVELS (RBL'S)

The proposed childcare centre will operate on an essentially daytime basis, corresponding with the working day "day-time" measurements shown in Tables 5.1 and 5.2 above, that is between 7:00am and 6:00pm working days, Monday to Friday.

Accordingly, the Rated Background Sound Levels (RBL's) adopted for this assessment, in accordance with relevant acoustic assessment guidelines, are as shown in Table 5.3, below.

The higher background LAeq level measured near the eastern site boundary (Location B) has been adopted to assess noise levels within the proposed centre, and the lower LA90 background level measured toward the centre area of the site (Location A) has been adopted to assess noise impacts from the centre on neighbouring receivers.

This approach has been adopted to ensure that potential noise impacts on neighbouring properties are assessed on a conservative basis.

In accordance with standard assessment practice, these RBL's have been rounded to the nearest whole number.

Table 5.4 – Rated Background & Design Sound Levels

Rated Background Sound Levels for Assessment Purposes (dBA)	
LA90	**50**
LAeq	**58**

Review of AAAC Guidelines

The AAAC (2020) guideline provides the following specific comments in relation to the measurement of background noise levels:

> *Background Noise Monitoring*
>
> *Background Noise Level*
>
> *The background noise level should be measured using continuous noise logging for a period of at least five consecutive weekdays. If the childcare centre is proposed to operate on Saturday and/or Sunday, these days should also be included. At least three of those days must not be affected by adverse weather. Meteorological data may be measured on site or accessed from the nearest Bureau of Meteorology weather station.*
>
> *Note: The determination of background is to be as outlined in the Regulation or Guideline for each State or Territory.*
>
> *Logger Location*
>
> *For the assessment of noise emission, the noise logger should be located to measure the background noise environment at a location most representative of the most affected sensitive receiver locations. If monitoring at this location is not possible, the acoustical consultant shall select another suitable and equivalent location. This measured representative noise environment should be used to establish relevant criteria for all sensitive receivers.*
>
> *Additional noise logging may be necessary to assess the impact of noise intrusion into the centre. The acoustical consultant shall select a suitable location for such monitoring.*
>
> *Instrumentation*
>
> *The existing background noise level shall be measured using acoustical instrumentation which conforms to Australian Standard AS/NZS IEC 61672.1:2019 'Electroacoustics – Sound Level Meters – Specifications' as a class 1 or class 2. Acoustical instrumentation that conforms to AS 1259.2-1990 'Acoustics - Sound Level Meters – Integrating – Averaging', Type 1 or 2 may also be used.*

The measurement of background sound levels in this assessment has complied with these criteria.

6 ACOUSTIC ASSESSMENT

6.1 SOUND TRANSMISSION RATINGS

The Building Code of Australia (BCA) requires that building elements have certain levels of insulation from airborne noise and impact sound.

Regulatory guidelines require that certain maximum sound or noise levels be achieved, or achievable, within the internal spaces of childcare centres.

The weighted sound reduction index (Rw) is the measure used to describe the acoustic performance of the various building elements making up a construction system.

Rw is a single number quantity for the airborne sound insulation rating of building elements.

As the acoustic performance of a material or construction improves, the higher the Rw value will be.

Rw ratings are determined by laboratory tests of a specimen of the construction system. The specimen is fixed within a frame to form the wall between two test chambers.

A high noise level is generated in one room and the difference in sound level between the source room and the receiver room represents the transmission loss through the test specimen.

The measurements are conducted over a range of sound frequencies. The Rw rating is then determined by comparing the results with reference curves.

Correction factors (C and Ctr) can be added to Rw to take into account the characteristics of particular sound spectra and indicate the performance drop of the wall in the corresponding sound frequency range.

The correction factor C relates to mainly mid to high frequency noise. The correction factor Ctr relates to lower to medium frequency noise.

The weighted sound reduction index is quoted as Rw(C, Ctr), where C and Ctr are correction factors representing different noise sources.

For example, if a wall is measured as Rw 54(-1,-4) the value of the index when the lower frequency correction factor (Ctr) is applied is:

$$Rw + Ctr = 54 + (-4)$$
$$Rw + Ctr = 50$$

In practice, small gaps and cracks which permit even minor air leakage will provide a means for sound transmission, leading to lower field performance.

This degradation in acoustic performance should be recognised, and an appropriate allowance made when selecting a tested system to achieve a particular Rw rating when installed.

The sound transmission class (STC) was the method that was used previously to measure acoustic performance.

The requirements of the BCA have changed to comply with international regulations and Rw is now used.

The STC was based on different criteria and did not include any correction factors.

6.2 IMPACT OF AMBIENT NOISE ON THE PROPOSED DEVELOPMENT

6.2.1 Indicative Sound Levels

Projected "Internal" Sound Levels – General Indoor Areas

Sound levels within the proposed childcare centre will be influenced by the ambient external sound levels as indicated by the rated background sound levels as summarised in Table 5.4 in the previous section, which will be subject to attenuation or reduction by the external and internal structural features of the development (refer Figures 1.5 - 1.15) and proposed fit-out detail.

The proposed childcare centre will involve both indoor and outdoor activity areas and spaces as shown in Figures 1.5 to 1.15.

Car parking will be provided in a basement car park, with entry and exit to and from new road (a cul-de-sac) to be constructed near the western boundary of the site, as shown in Figure 1.6.

Acoustic protection to the internal spaces of the proposed facility will be provided by the external masonry structural walls and glazed elements of the building, together with internal dividing walls associated with the proposed construction, and the various floor and wall finishes used.

The structure of the childcare centre building will comprise masonry external walls; glazed window and door elements, and a timber or metal framed, and tiled or metal clad roof structure as shown in Figures 1.5 to 1.15.

The proposed development the construction of a new, purpose built two-level childcare centre with basement car parking.

Sound Transmission through Structures

The structural elements of buildings (walls, windows, doors etc) reduce the level of sound. The degree of sound reduction varies from material to material.

The weighted sound reduction index (Rw) is the measure used to describe the acoustic performance of the various building elements making up a construction system, as described in 6.1 above.

The Rw rating indicates the reduction that is achieved when noise passes through a given material.

If the noise outside is 70 dB and inside it is 40 dB, the structural element (wall, window, door etc) is said to have an Rw rating of 30.

As mentioned in 6.1, structural imperfections mean that this nominal level of noise reduction is not always achieved, and a degree of conservatism is required in acoustic assessment.

Acoustic Qualities of Solid Walls

Typically, solid form external wall elements have minimum Rw sound reduction (or attenuation) ratings in excess of 35 dBA, and more typically in excess of 45 dBA.

This means that the maximum rated external sound level in this case, which is 58 dBA (refer Table 5.4), can readily be reduced to the desired maximum indoor sound levels of 40 dBA maximum (general areas) and 35 dBA objective maximum in any required rest or "quiet" by the effect of external walls, and in the case of internal spaces by the combined effect of external walls and internal structural elements.

The sound reduction or Rw ratings of typical external and internal wall structures are shown in Table 6.1, on the following page.

Table 6.1 - Sound Reduction Capabilities of Typical Walls

Wall Type	Rw
Single layer of 1/2″ drywall on each side, wood studs, no insulation (typical interior wall)	33
Single layer of 1/2″ drywall on each side, wood studs, fiberglass insulation	39
External brick veneer (single brick; timber frame, dry wall internal lining) 4″ Hollow CMU (Concrete Masonry Unit)	42 44
6″ Hollow CMU (Concrete Masonry Unit)	46
8″ Hollow CMU (Concrete Masonry Unit)	48
Double brick	>50

Source: Harris CM, "Noise Control in Buildings: A Practical Guide for Architects and Engineers"

Note: Rw ratings for walls exclude the effect of doors and windows, which need to be separately considered

As shown above, the acoustic qualities of the solid façade elements are generally more than adequate to reduce external sound levels to the levels required internally.

The rated external background LAeq sound level in this case, based on continuous and attended monitoring, is 58 dBA.

A conservative estimate of 35 dBA for the sound reduction capability of external walls would reduce this maximum daytime external Rated Background Sound Level of 58 dBA to below the required indoor sound level of 40 dBA (and the objective level of 35 dBA adopted for any rest or “quiet” areas).

External Windows & Doors

The most acoustically “vulnerable” elements of the external building facades are the glazed windows and doors.

Glazed construction elements (windows and doors) provide lower levels of sound attenuation (or reduction) than solid structural elements such as walls.

The indicative acoustic reduction effects provided by various glazing options available for the doors and windows fitted to the facades of the proposed childcare centre are shown in Table 6.2, below.

Table 6.2 – Acoustic Attenuation due to Glazing

Glazing Type	Sound Attenuation *
10.38 mm laminated	35
6.38 mm laminated	31
10 mm float	33
6 mm float	27
4 mm float	22

* Based on specifications provided by Pilkington Glass

The maximum rated external background sound level (RBL) in this case, based on continuous monitoring is 58 dBA (refer Table 5.4, above).

The sound level required to be achieved within the general internal spaces of the proposed centre, with windows and doors closed, is 40 dBA maximum. To achieve these internal sound levels, with a reasonable margin for error and variation, glazing with a minimum effective sound attenuation capability in the range 25 - 30 dBA is considered appropriate.

It is also noted that external glazing will also be required to contain the acoustic impact of any noise generated within the centre on neighbouring properties.

For these reasons 6.38 mm laminated glass will be recommended to ensure that the required internal sound levels cab confidently be achieved.

It is noted that 6.38 mm laminated glass may also be required for safety purposes in any external sliding glass door applications.

Review of AAAC Guidelines

The AAAC (2020) guideline provides the following specific recommendations in relation to noise control:

> *NOISE CONTROL RECOMMENDATIONS*
>
> *Where the predicted level of noise exceeds the criteria at the noise assessment location, noise control measures should be considered to enable compliance with the acoustic criteria to be achieved.*
>
> *The following indicative noise controls may be used to achieve compliance with the noise criteria. Site-specific controls should be recommended in the childcare centre noise assessment.*
>
> *Building Design*
>
> *The design of the childcare centre should aim to locate sleep rooms and outdoor play areas away from external noise sources.*
>
> *Where feasible, building designs could be based on a "U" shaped or "L" shaped layout, with*
>
> *outdoor play areas positioned such that the building structures act as a noise barrier.*
>
> *Orienting the building and outdoor play spaces having regard to impacts on neighbours (for example, locating play areas away from neighbouring sensitive spaces).*
>
> *Maximise the separation between the active outdoor play area (as opposed to passive activities such as painting, drawing etc) and the façade of any neighbouring residential premises.*
>
> *Ensuring operable windows of the childcare centre and external play areas do not have a direct line of sight to neighbouring noise sensitive areas.*
>
> *Locate access ramps away from neighbouring sensitive premises where possible.*
>
> *Include low noise features such as self-closing gates with soft closure hinges, selection of low noise air-conditioning condensers, minimize the use of speed humps and ensure car park surfaces and access ways are smooth.*

In this case, the proposed childcare building design will achieve the interior noise level criteria required as a result of the structure proposed (refer Figures 2.6 to 2.17), and accordingly no further site-specific noise control measures are proposed in relation to design issues.

6.2.2 Forecast Internal Sound Levels

Projected "Internal" Sound Levels – General Areas

On the basis of the external glazing conditions described above, sound levels forecast to apply in the general indoor areas of the proposed centre, as a consequence of external acoustic influences, are summarised in Table 6.3 below.

Table 6.3 – Forecast Sound Levels: General Internal Areas

Projected Sound Level	Typical Daytime
Rated External Sound Level (RBL)	58 L_{Aeq} (dBA $_{Leq, 1 hour}$)
Less 25 (dBA) Attenuation due to Rw of Glazing	-25 (dBA)
Projected Internal Sound Levels	<35 L_{Aeq} (dBA $_{Leq, 1 hour}$)

Internal sound levels below 40 dBA satisfy relevant acoustic amenity requirements and guidelines applicable to childcare centres.

Internal sound levels below 35 dBA satisfy the additional objective of 35 dBA maximum adopted for this assessment for any rest and “quiet” areas that may be associated with the development.

As demonstrated below, the acoustic effect of internal walls will further reduce these already acceptable sound levels in the internal areas associated with the childcare centre.

It is noted that the degree of conservatism built into this acoustic projection also provides protection against any occasional peak external noise events that may occur from time to time.

Projected “Internal” Sound Levels – Indoor “Quiet” and “Rest” Rooms

A background indoor sound level of less than 35 dBA has been projected for the general internal areas of the proposed childcare centre (refer Table 6.3, above).

Taking variation into account, this projected sound level can conservatively be considered to deliver a minimum background acoustic range of 35–40 dBA for the general interior areas of the proposed centre, under all external circumstances.

Any internal rest or “quiet” areas associated with the development will be subject to further acoustic attenuation from external noise influences due to the internal walls, and the acoustic effect of the internal the fit out proposed, including floor finishes.

Other internal play areas will also be further acoustically shielded from external sound by internal walls associated with the existing building (refer plans and drawings provided in Section 2).

These projected sound levels, which have been calculated on a conservative basis and take into account variation in background sound levels, indicate that background sound levels of less than 40 dBA will be achievable within the general indoor areas of the centre, and background sound levels of less than 35 dBA will be achievable in any rest or “quiet” areas associated with the facility, consistent with relevant and adopted acoustic guidelines.

6.2.3 External Play Areas

It is proposed that external play areas will be located in the northern and eastern areas of the ground level of the site (refer Figure 6.1 on page 37).

As indicated in Figure 5.2, a Rated Background LAeq Sound Level of 56 dBA LAeq has been measured in the central area area of the site (Location A; Figure 5.1), and a higher background of 58 dBA LAeq assessed at the eastern site boundary.

The combined effects of structure, distance, external fences & walls, and play area fit-out (including such elements as soft fall) will readily ensure required to ensure that the required 55 dBA background sound levels are achievable in the external play area.

6.2.4 Road Traffic & Car Park Noise

The measured and adopted LAeq RBL of 58 dBA at the western property boundary includes the effect of existing environmental noise, including noise from Wollemi College, the Cobham Youth Centre, and background traffic noise.

The additional effect of noise generated by vehicles accessing the proposed basement level car park from the proposed new road (cul-de-sac) adjacent to the western site boundary is considered unlikely to significantly change this measured RBL, and subject to sensible and normally anticipated driving behaviour on the part of vehicles (and drivers) entering and leaving the car park, no acoustic impacts on the proposed facility, over and above those considered in 6.2.2 and 6.2.3 above, are anticipated.

6.2.5 Summary: Implications of Estimated Noise Levels

General Indoor Areas

Typical maximum ambient sound levels achievable in the general indoor areas of the proposed centre are estimated to be in the range 35 – 40 dBA.

This assessment demonstrates that sound levels in the general interior spaces of the proposed childcare centre and primary childcare centre will satisfy the typical criterion of 40 dBA applicable to childcare centres.

External Play Areas

Background noise levels in the two proposed external play areas will be less than 55 dBA, based on the measured RBL for the site.

Review of AAAC Guidelines

The effects of ambient external noise levels on the proposed childcare centre have been considered in accordance with the general principles described in the AAAC (2020) guideline.

The proposed centre structure and design has been assessed to comply with relevant internal noise level requirements.

6.3 IMPACT OF SOUND FROM THE CENTRE ON SURROUNDING PREMISES

The potential impact of sound from external sources on activities within the proposed childcare centre has been considered in 6.2 above.

A second important acoustic consideration is that of the potential impact of noise from the proposed childcare centre on nearby individuals and activities.

6.3.1 Measured Sound Pressure Levels of Pre-Childcare Centre Age Children at Play

Measured Data

The assessment of noise impacts from the centre on external and nearby receivers requires an estimate of the sound levels generated by the activities of children within the proposed childcare centre.

The data summarised in Table 6.4, below, was reported by RSA Acoustic in 2015 provides a useful reference.

Table 6.4 – Indicative Sound Pressure Levels of Children at Play

	Octave Band Centre Frequencies Plus A-weighted Level								
	63	**125**	**250**	**500**	**1000**	**2000**	**4000**	**8000**	**A**
Descriptors	**Linear Sound pressure levels plus the Overall A-weighted Sound Level**								
$L_{max,\ 15\ min}$	85	86	85	82	92	95	86	74	98
$L_{01,\ 15mi}$	73	73	71	72	79	79	70	61	83
$L_{10,\ 15min}$	66	66	63	66	71	70	62	52	75
$L_{90,\ 15minutes}$	55	56	55	57	58	56	51	41	62
$L_{min,\ 15\ min}$	49	49	48	48	48	47	42	34	53
$L_{eq,\ 15\ min}$	64	64	62	63	68	68	61	50	73

This data was recorded in the play area of a Sydney CBD childcare centre, at a time when children were permitted to play without close supervision, at distances of between 2 and 5 metres from the recording microphone.

This data is considered to provide a realistic worst-case estimate of the noise generated by children playing within a childcare centre and is considered to provide a conservative estimate of the noise likely to be generated within the outdoor play areas at the proposed childcare centre.

AAAC Guideline Data

However, it is noted that the Association of Australian Acoustical Consultants (AAAC) Guideline includes the following (and higher) sound levels for children at play:

Groups by Age

The AAAC guideline provides the following reference data for noise from children at play:

Table 1 – Effective Sound Power Levels for groups of 10 children playing

10 Children aged 0 to 2 years	77 to 80 dB(A)
10 Children aged 2 to 3 years	83 to 87 dB(A)
10 Children aged 3 to 6 years	84 to 90 dB(A)

Active & Passive Play

The AAAC noise emission data referenced in above relates to “active” play.

The AAAC guideline indicates that “passive” play involves noise levels 6 dBA lower than those applicable to “active” play.

This variation is generally adopted and accepted in the acoustic assessment of childcare centres.

Adopted Noise Emission Criteria

For the purposes of this assessment, and consistent with AAAC guidelines, the following approach has been adopted:

- Sub-groups of 10 children have been assumed for assessment purposes;
- A 50/50 mix of “active” and “passive” play has been assumed in each sub-group, consistent with recent findings of the NSW Land and Environment Court in acoustic cases; and
- The measured data summarised in Table 6.4 has been adopted as indicative of “normal” sound levels, and the AAAC data taken into account as representing “worst case” noise emissions from uncontrolled or unsupervised play

AAAC noise emission levels for children at play have been calculated on the above basis, as summarised in Table 6.5 below.

Table 6.5 – Adjusted AAAC Noise Emission Criteria

Noise Source	Noise Emission
10 children aged 0 to 2 years	74 – 77 dBA
10 children aged 2 to 3 years	80 – 84 dBA
10 children aged 3 to 6 years	81 – 87 dBA

The measured data from table 6.4 indicates a typical LAeq, 15-minute noise level of 73 dBA.

The AAAC data indicates higher noise levels under “worst case” conditions.

For assessment purposes, peak noise emissions in the range 75 – 80 dBA and “typical” noise emissions in the range 70 – 75 dBA have been adopted for children at supervised play.,

Review of AAAC Guidelines for Childcare Centres

Children – Outdoor Play

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

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

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

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

Table 1 provides recommended sound power levels for lots of 10 children, within the different age groupings, along with a recommended source height.

Table 1 – Effective Sound Power Levels (LAeq, 15min) for Groups of 10 Children Playing

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

Notes:

1. *If applicable, an adjustment to the above sound power levels of -6 dB could be applied in each age group for children involved in passive play.*
2. *For simplicity, based upon a review of World Health Organization (WHO) data, a single recommended source height of 1 metre is suggested as the source heights.*

To calculate the effective sound power level for a specific number of children, the following formula shall be used:

Effective Sound Power Level

for 'n' children = Effective Sound Power Level for 10 children + 10 log (n/10)

Notes:

1. *The noise level of boys and girls are assumed to be very similar and therefore are not differentiated in this guideline.*
2. *For every doubling of the number of children, 3 dB is added.*

These guidelines have been considered in relation to the noise levels likely to be generated by children at play, and in particular in relation to activities associated with the outdoor play areas.

6.3.2 Noise Emissions from Indoor Activities

Noise generated within the childcare centre building itself will be reduced or attenuated by the internal and external structural elements of the building. The indoor and outdoor activity areas of the proposed childcare centre are shown for convenient reference in Figures 6.1 and 6.2, below

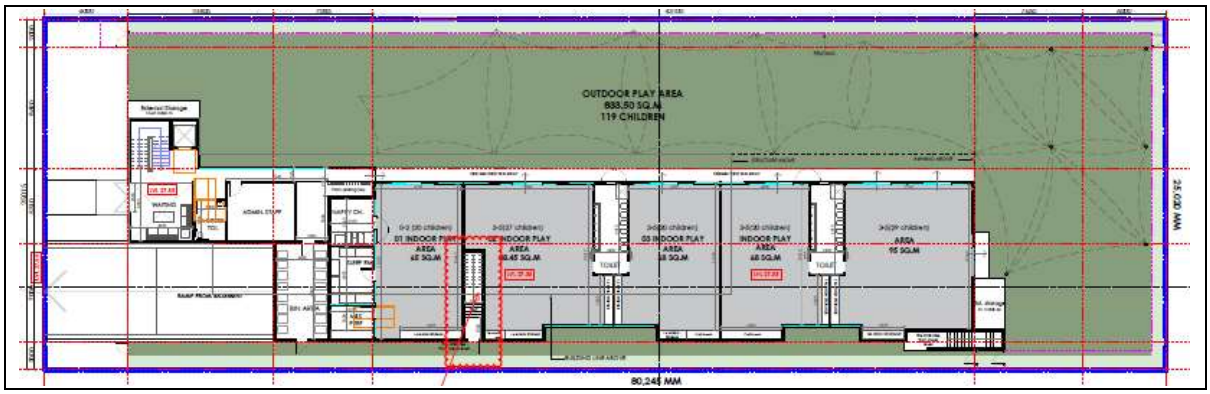


Figure 6.1 – Ground Level External & Indoor Play and Activity Areas

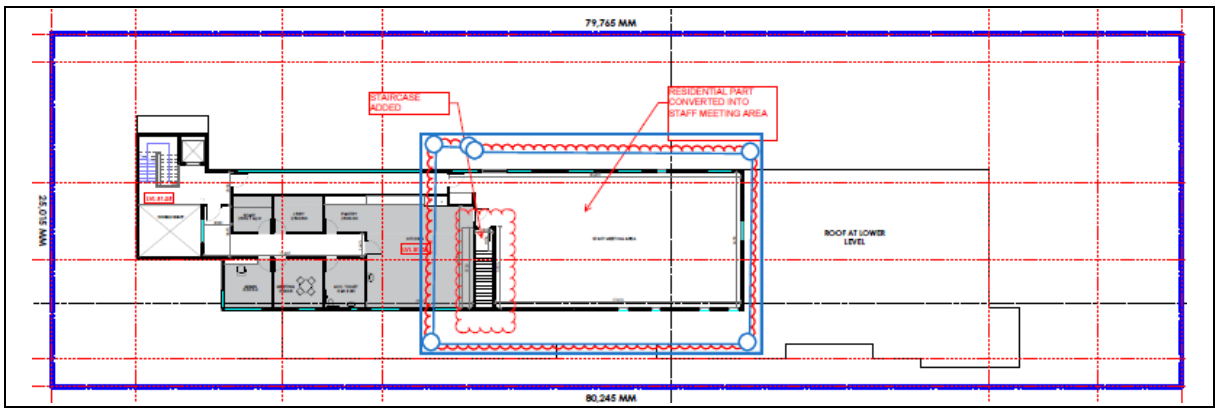


Figure 6.2 – Upper Level Indoor Play and Activity Areas

Section 6.2 above indicates that a conservative minimum noise reduction or attenuation of 35 dBA applies to outside noise passing through the solid external walls of the proposed childcare centre to the general interior spaces of the building, and that a noise reduction or attenuation of 25 dBA applies to outside noise passing through glazed elements in the building façade to the general interior spaces of the building.

These processes also apply in reverse. Noise generated by activities within the centre will also be attenuated or reduced by the effects of internal fittings and layout.

Assuming maximum typical noise levels in the range 70 – 75 dBA during periods of play within the indoor play areas at the proposed centre, (this is conservative – and represents perceived noise levels between two and three times that of typical adult conversation) the maximum acoustic impact of internal noise immediately outside the centre, and at adjoining property boundaries, is indicated in Table 6.6, below.

Table 6.6 – Effect of Internally Generated Noise Outside the Centre

Detail	Projected Noise Level
Worst Case Noise due to Activities within the Centre	70 - 75 dBA
Less 30 dBA Attenuation due to Structure (Conservative)	-30 dBA
Projected Acoustic Impact Outside the Centre	40 - 45 dBA

This projected noise impact of 40 - 45 dBA due to internal activity within the childcare centre complies with the strictest applicable requirement, that is that noise associated with the childcare centre should not result in an increase of greater than 5 dBA over existing background sound levels at any affected residential boundary, as shown in table 6.7, below.

It is noted that in this case, most neighbouring boundaries are anticipated to ne light industrial or commercial in nature, and that in such circumstances a maximum day-time acoustic impact of 65 dBA is permitted.

It is noted that the adopted LA90 background sound level is 48 dBA (refer table 5.4).

Table 6.7 – Acoustic Impact of Internal Play Areas at Adjoining Residential Boundaries

	"Worst Case" Indoor Noise Level (dBA)	Minimum Attenuation due to Structure (dBA)	Maximum Impact at Boundary (dBA)	Allowable Impact * (RBL + 5 dBA)	Comply
Indoor Areas	70 - 75	30	40 - 45	55 *	YES

"Allowable noise impact is the L90 RBL plus 5 dBA, that is 50 + 5 = 55 dBA

This demonstrates that compliance with residential guidelines will be achieved at the external boundaries of the proposed development, including the eastern boundary with Wollemi College.

It is noted that the higher "worst case" noise levels indicated by the AAAC guidelines, which have been assessed in this application to be in the range 75-80 dBA, would also involve compliance at adjoining residential boundaries.

Review of AAAC Guidelines

The AAAC (2020) guideline provides the following specific recommendations in relation to noise control fir indoor activity areas:

NOISE CONTROL RECOMMENDATIONS.

Indoor Activity Areas

The weakest acoustical link from activity areas to the outside is typically through windows or glazed doors. However, with proper design considerations, noise emanating from within a childcare centre, even with windows and doors open, would at the neighbouring receptors normally be significantly less than that received from the children within the outdoor play area. Even so, there may be situations where, due to the orientation or layout of the childcare centre, internal activity spaces are located adjacent or near to neighbouring receptors. In these cases, thicker glazing should be used (e.g. minimum 6.38 mm laminated glazing) in the indoor playroom windows/doors. Additionally, preference should be given to casement or awning type windows, with compressible seals.

Indoor or partially enclosed play areas can be fitted with acoustically absorbent panels to the ceilings (or walls) to minimise the reverberant noise within the internal areas. This will also have a beneficial effect on the acoustical environment for both children and staff and enhance communication and speech intelligibility. A ceiling with a noise reduction coefficient (NRC) of at least 0.7 should be considered.

In this case, the proposed childcare building design will achieve the noise level criteria applicable to the potential impact of noise from internal activities on potentially affected residential receivers, and accordingly no further site-specific noise control measures are proposed in relation to design issues.

6.3.3 Acoustic Impact from Ground and Level 1 Outdoor Play Areas

In terms of acoustic impacts from the proposed facility on external receivers, the key limiting requirement is that the existing background LA90 RBL at any adjoining residential receiver should not be exceeded by more than 5 dBA as a result of noise emissions from the childcare centre.

Relevant guidelines also allow for a maximum period of two hours each day where the measured background may be exceeded by up to 10 dBA.

The outdoor play and activity areas will be situated on both the natural ground and upper level areas of the proposed centre, as indicated in Figures 6.1 and 6.2.

Typical maximum noise levels generated within play areas have been assessed as being 70-75 dBA (refer Section 6.3.1 above).

The measured LA90 RBL is 50 dBA, which must not generally be exceed by more than 5 dBA in the case of residential receivers, or by more than 10 dBA for maximum periods of two hours each day.

This means that a maximum attenuation of (70-75) – 50 dBA, or 15 – 20 dBA maximum, is required in the case of residential receivers subject to acoustic impact.

As noted, this maximum attenuation requirement is reduced by 5 dBA to 10 - 15 dBA for maximum periods of two hours each day.

In addition to the sound reduction provided by the sound absorbing effect of natural and artificial external surfaces, acoustic protection is provided by the types of external fences fitted to the two outdoor play areas, and by distance.

It is again noted that in this case there are no residential boundaries in the immediate vicinity of the proposed development.

It is also noted that for other regulatory reasons, external acoustic fencing around childcare centres is required to be at least 1800 mm high at property boundaries.

Appropriate acoustic performance regarding the outdoor play areas can be delivered by the boundary fences or barriers described above. The types of boundary fencing required for this purpose is described in Section 6.3.5, below.

It is noted that access to and from the proposed basement level car park has does not directly adjoin neighbouring residential properties. For this reason, no particular structural acoustic controls are considered necessary to ensure that any noise associated with car park operations, including the drop off and pick up of children, do not impact neighbouring properties in an undue or non-compliant manner.

Table 6.8 below identifies the acoustic qualities associated with the various external acoustic wall and fence options.

Table 6.8 – Acoustic Qualities of Boundary Structural Elements

Material/Structural Element	Sound Reduction
1800 mm Laminated Glass Acoustic Fence/Barrier (10.38 mmm Glass)	25 – 30 dBA [1]
1800 mm Laminated Glass Acoustic Fence/Barrier (6.38 mmm Glass)	20 - 25 dBA [1]
2100 mm Double Lapped & Capped Timber Fence	27 – 32 dBA [2]
1800 mm Double Lapped & Capped Timber Fence	25 - 30 dBA [2]
2100 mm Solid Form Colorbond Metal Fence	22 - 25 dBA [3]
1800 mm Solid Form Colorbond Metal Fence	20 - 23 dBA [3]

Sources & References:
1 Knauff Australia, as example
2 Screenwood Australia, as example
3 Fencescape Fencing Australia, as example

In this case, commercial, light industrial receivers and Wollemi College to the east will adjoin the childcare centre.

The total noise maximum reduction required to be provided for the immediately adjoining receivers, on the conservative basis that Wollemi College should be treated with residential sensitivity, is identified in Table 6.9, below.

Table 6.9 – Minimum Sound Reduction Required for Outdoor Play Areas

Noise Level	LA90 RBL + 5 or 10	Attenuation Required
70 – 75 dBA	55 - 60 dBA *	15 - 20 dBA

* Allowable noise impact is the L90 RBL plus 5 dBA, that is 50 + 5 = 55 dBA generally, and L90 RBL + 10 dBA, that is 50 + 10 = 60 dBA for a maximum of two hours each day

In our professional opinion, the minimum acoustic protection required to ensure that outdoor play activities associated with the proposed childcare centre will not impact in an undue or non-compliant manner on surrounding and adjoining receivers, in particular residential receivers, will involve the following measures:

- Acoustic fencing with an Rw rating of 20 (minimum) to the northern and eastern boundaries of the ground level outdoor play area;
- The reduction in sound with distance, based on the fact that the average play activities within the outdoor play areas in question will be some distance from the actual external boundaries;
- The acoustic attenuation provided by design elements such as soft fall; and
- The actual and perceived acoustic effects of any landscaping (refer Section 4.3; NSW Child Care Planning Guideline (2017); Condition C25.

6.3.4 Acoustic Fencing to Ground Floor Outdoor Play Area

A conservative estimate of the aggregate acoustic protection provided by the combination of construction elements, distance and landscaping elements is summarised in Table 6.10, below.

Table 6.10 – Sound Reduction due to Landscaping, Distance Elements & Acoustic Fence

Outdoor Area & Structural Element		**Sound Reduction**
Outdoor Play Area		
	Distance (refer Section 3.1.4; assumes minimum average of 5 metres) [1]	0 - 5 dBA
	Structural & Design Elements	2 - 5 dBA
	Landscaping Elements	2 - 4 dBA
	Perimeter Acoustic Fence [2,3,4]	20 - 25 dBA
	Aggregate Effect (Conservative Estimate)	**24 - 39 dBA [5]**

Sources & References:
1 Noise reduction with distance
2 Knauff Australia, as example
3 Screenwood Australia, as example
4 Fencescape Fencing Australia, as example
5 Calculated on additive basis (refer Section 3)

Acoustic performance due to activities within the outdoor play areas, taking into account the aggregate effects of the treatments described above, is summarised in Table 6.11, below.

Table 6.11 – Acoustic Impact of External Play Areas at Adjoining Residential Boundaries

Outdoor Area	**Noise Level (dBA)**	**Attenuation due to Structural Elements (dBA)**	**Maximum Impact at Boundary (dBA)**	**Allowable Impact * (RBL + 5 - 10 dBA)**	**Comply**
Outdoor Play Areas	70 - 75	24 - 39 dBA	46 - 51	55 - 60	YES

* Allowable noise impact is the L90 RBL plus 5 dBA, that is 50 + 5 = 55 dBA generally, and L90 RBL + 10 dBA, that is 50 + 10 = 60 dBA for a maximum of two hours each day

It is noted that this assessment is conservative and allows for variations in noise emission levels that might arise.

As indicated by Tables 6.9 and 6.10 above, an overall acoustic attenuation of 15 - 20 dBA will be required to ensure that noise generated by activities associated within the ground floor outdoor play area will have no undue or non-compliant impacts at the adjoining residential boundary. In this case there are no residential boundaries, and the most potentially acoustically sensitive boundary is that with Wollemi College.

Taking into account the attenuation effect of distance and landscaping elements, and to cover the maximum attenuation requirement anticipated, a minimum contribution of 20 dBA is conservatively estimated to be required from the boundary fences. To achieve this, it is recommended that:

- An 1800 mm solid form metal panel fence (or acoustic equivalent) with a minimum Rw rating or noise reduction potential of 20, is installed along the northern and eastern boundaries of the ground outdoor play area;

- Appropriate boundary fence is installed to the remainder of the site area. No particular acoustic specification or performance requirement is applicable to these other site boundary fences, but a continuation of the 1800 mm solid form metal panel fence (or acoustic equivalent) appears sensible; and

- The fence location is shown in red in Figure 6.3, below.

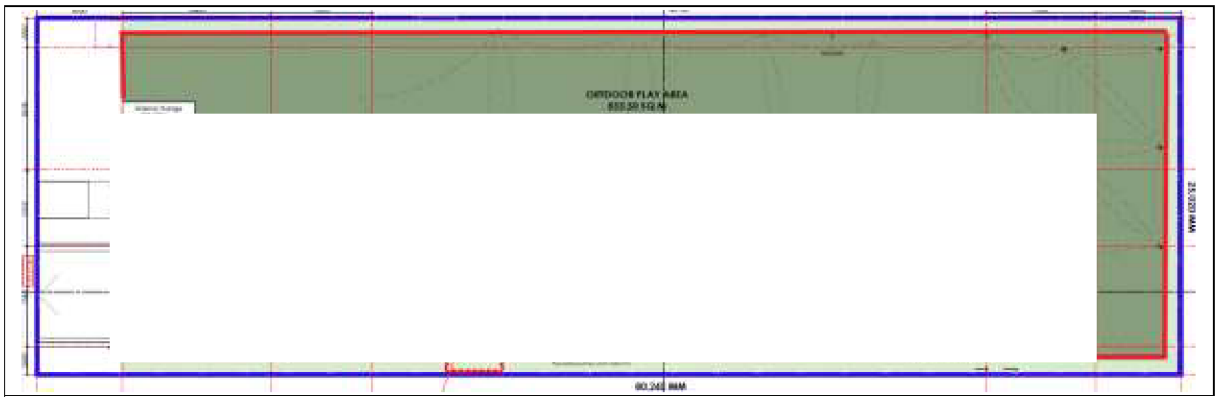


Figure 6.3 – Recommended Acoustic Fencing – Ground Level External Play Area

It is noted that no particular acoustic performance requirement applies to any fencing installed in front of the building line, and that fencing in these areas can be selected and installed in accordance with Council policies and guidelines.

Review of AAAC Guidelines

The AAAC guideline provides the following comment in relation to boundary fencing:

> *The standard height for a boundary fence is 1.8 metres. Higher fences that are solid and free from visible gaps will reduce the noise impact for ground floor receptors. The local council should provide guidance on the allowable height of fences.*
>
> *In some cases where higher fences are required, the fence may consist of a combination of a 'standard height fence' plus a transparent 'top' to allow sunlight to pass through.*
>
> *Alternatively, a standard height fence plus an angled cantilevered top to the total required height may be constructed to reduce the noise impact and overall boundary height.*
>
> *All external pedestrian gates should be fitted with appropriate door closers to provide a slow and regulated closing of the gate to prevent the generation of impact sound.*

These points have been considered in the development of the boundary fencing recommendation provided above.

6.3.6 Acoustic Implications of the Numbers of Children in the External Play Areas

The levels of noise generated by outdoor play activities needs to take into account the numbers of children involved in those play activities.

The plans and drawings provided and included in Figures 1.5 to 1.12 indicate that the outdoor play area has been designed in terms of area to accommodate 116 children.

The reference data provided in Section 6.3.1 above was based on the measurement of peak noise from groups of children playing without close supervision in a Sydney CBD childcare centre.

Data was recorded at distances of between 2 and 5 metres from the playing group, and therefore provides a reasonably immediate and maximum measure of the noise emissions that might be expected to be experienced at a boundary fence as a result of children playing close to that fence or boundary.

The data presented in 6.3.1 related to individual play groups of five to eight children, in an outdoor playground containing approximately 40 children, playing in separate groups of between five and eight children.

This data indicates a maximum typical noise impact of 70 – 75 dBA at any boundary of the outdoor play area, assuming play close to the play area boundaries by some of the total cohort of children in the play area at any given time.

Data (also presented in 6.3.1 above) from the Association of Australian Acoustical Consultants (AAAC) Guideline for Acoustic Assessment (2020) presents slightly higher maximum noise levels from groups of ten children involved in unsupervised play. This data is understood to be based on measurements at two metres from the playing group.

A typical maximum noise level of 75 dBA at a distance of five metres from the source play group has been adopted for this assessment.

AAAC guidelines involve consideration of the numbers of children in the outdoor play area at any time, and whether restrictions on numbers are indicated in order to achieve relevant acoustic performance.

The following key factors are considered to apply to the question of noise generated by activities in the outdoor play area, and to the numbers of children involved:

- Noise emission data from sub-groups of between five and eight children in a total outdoor play group population of forty children (at any one time) has been considered;
- Noise emissions are estimates, and are subject to individual situations and circumstances;
- The effectiveness of supervision and control is very important in managing and minimising noise emissions from outdoor play activities;
- A precautionary approach is appropriate to ensure compliance with reasonable and permissible noise impacts at affected residential receiving boundaries; and
- An appropriate response and control mechanism is required to ensure that appropriate noise levels are maintained.

To ensure that required acoustic performance is achieved and maintained, the following controls and procedures are recommended;

1. That careful supervision of outdoor play is observed, particularly in terms of noisy play and activity, and that staff intervene to control any excessively or unduly noisy activities (consistent with the "*Effect of Management and Supervision*" described in 6.3.13, below);
2. That if undue noise is noted in the outdoor play area, or if complaints are received from neighbours, then appropriate action to rectify the situation is to be taken by teachers and staff . However, it is noted that subject to effective supervision and performance, corrective action in relation to noise is considered unlikely to be necessary; and
3. That these procedures are included in a concise Noise Management Plan, that should in turn be incorporated in the overall Plan of Management to be prepared for the childcare centre (refer 6.3.14, below).

It is noted that acoustic issues associated with the numbers of children in the outdoor play area at any one time are very much subject to individual circumstances. It is also noted that in this case the proposed centre does not have immediate boundaries with residential properties.

Our professional experience has been that facilities of the type and scale addressed in this report can operate without the generation of undue noise levels and with acoustic compliance, in the absence of a specific restriction on the numbers of children at play in outdoor play areas.

In practice it has been our experience that effective supervision and good operating procedures are the key factors in ensuring that undue noise is managed and effectively minimised. In our opinion, the guidelines and procedures summarised above provide an appropriately precautionary approach and will ensure acoustic performance and compliance.

It is noted that the AAAC (2020) guideline indicates that:

> The AAAC (2020) guideline provides the following comments in relation to the potential to reduce noise levels in specific play areas by reducing the number of children in those areas.
>
> *The number of children within the Centre or playing in the outdoor play areas at any one time may be limited to reduce the noise impact.*
>
> *A reduction in the number of children by half will reduce the noise impact by approximately 3 dB.*

6.3.7 Residential Receivers

The position of the proposed childcare centre in relation to residential neighbours is shown in Figure 6.4, below.

Figure 6.5 demonstrates that the closest residential properties are approximately 400 metres from the proposed childcare centre.

- noise generated within the outdoor play and activity areas will be effectively contained and/or attenuated by distance; and
- noise impacts at adjoining residential boundaries will comply with relevant acoustic guidelines.

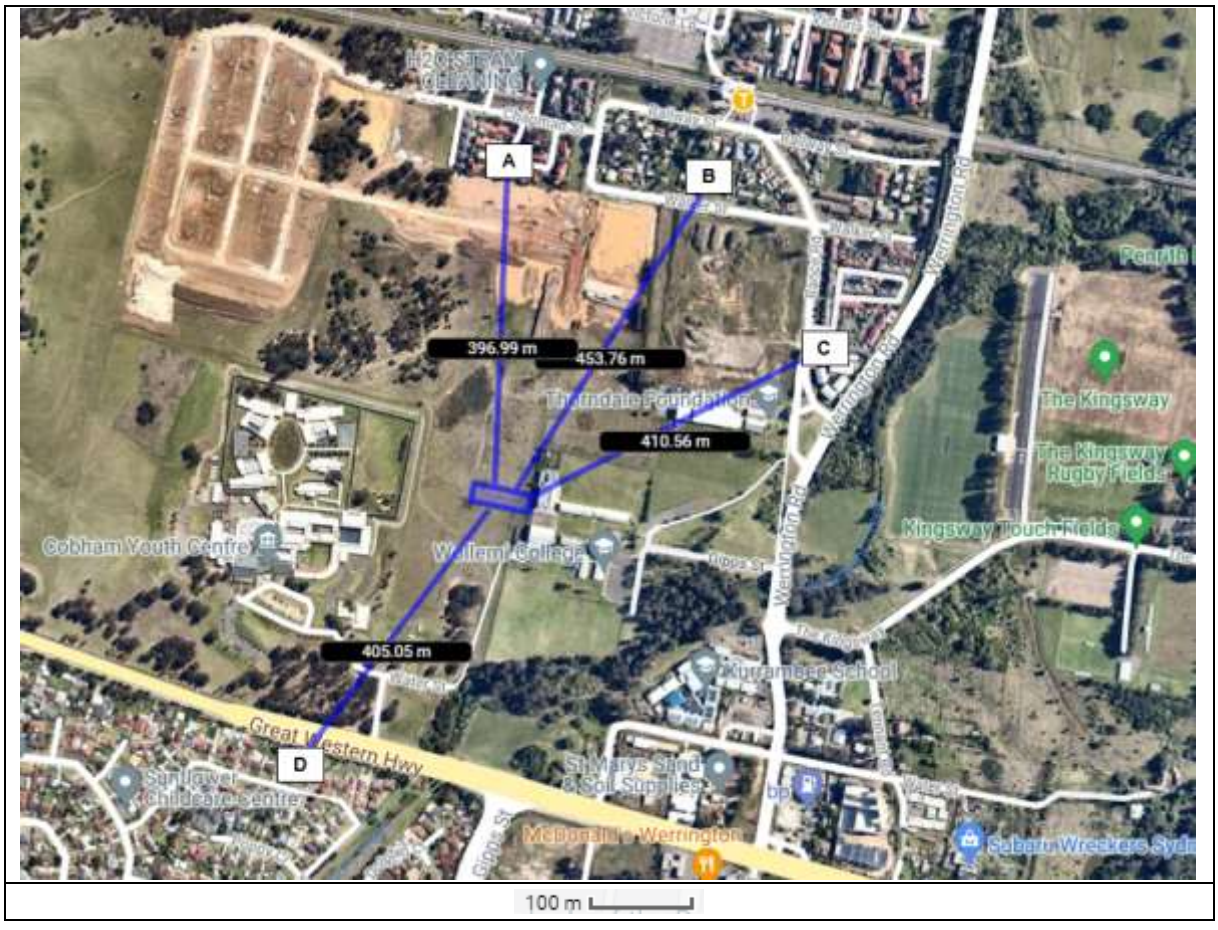


Figure 6.4 – Location of Residential Receivers

Review of AAAC Guidelines

The AAAC (2020) guideline provides the following specific recommendations in relation to noise control fir indoor play areas:

NOISE CONTROL RECOMMENDATIONS.

Outdoor Play Area

The noise impact from children at play in a childcare 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 childcare centres have considerable social and community benefit.

Base Criteria – With the development of childcare centres in residential areas, the background noise level within these areas can at certain times, be low. Thus, a base criterion of a contributed Leq,15min 45 dB(A) for the assessment of outdoor play is recommended in locations where the background noise level is less than 40 dB(A).

Background Greater Than 40 dB(A) – The contributed Leq,15min noise level emitted from an outdoor play and internal activity areas shall not exceed the background noise level by more than 5 or 10 dB at the assessment location, depending on the usage of the outdoor play area. AAAC members regard that a total time limit of approximately 2 hours outdoor play per morning and afternoon period should allow an emergence above the background of 10 dB (ie background +10 dB if outdoor play is limited to 2 hours in the morning and 2 hours in the afternoon).

Up to 4 hours (total) per day – If outdoor play is limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed Leq,15 minute noise level emitted from the outdoor play shall not exceed the background noise level by more than 10 dB at the assessment location.

More than 4 hours (total) per day – If outdoor play is not limited to no more than 2 hours in the morning and 2 hours in the afternoon, the contributed Leq,15 minute noise level emitted from the outdoor play area shall not exceed the background noise level by more than 5 dB at the assessment location.

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.*

Compliance with that requirement has been demonstrated above in relation to the three outdoor play areas proposed for the subject development .

6.3.8 Motor Vehicle Noise

Subject to appropriate driving practices, noise associated with the drop off and pick up of children from the centre is not expected to impose a noise burden of greater than 5 dBA above the measured LA90 RBL background level of 50 dBA at any potentially affected residential boundary.

A Noise Management Plan is also recommended to help ensure that activities associated with the proposed car park involve a minimum of noise generation.

Review of AAAC Guidelines – Motor Vehicle Noise

Chapter 5 of the AAAC (2013) guideline provides the following comment in relation to motor vehicle noise:

> *Traffic noise on local roads generated by vehicles associated with the childcare centre arriving and leaving the site (for example vehicles travelling on public roads) shall comply with $L_{eq,\ 1\text{-}hour}$ 50 dB(A) at the assessment location.*

The acoustic assessment and projected outcomes presented in this report are consistent with the requirements of the AAAC (2013) guideline

Review of AAAC Guidelines – Drop-Off and Pick-Ip of Children

Chapter 8 of the AAAC (2013) guideline provides the following comment in relation to the drop-off and pick-up of children:

> *Noise control measures should be implemented to minimise adverse impacts to neighbours caused by car doors slamming and the sound of parents and children arriving or departing the Centre.*
>
> *Such measures could include the judicious positioning of arrival and departure access points away from residential property boundaries, the appropriate placement of buildings constructed on site to shield the noise or the provision of acoustic fencing or landscaping.*

These requirements have been taken into account in the design of the centre, and the preparation of this acoustic assessment.

6.3.9 Projected Traffic Noise

Traffic Noise

Noise will be generated by cars arriving and departing the proposed ground level car park area. Overall, a typical LAeq, 15-minute noise emission level of 58 - 65 is projected for traffic noise. Access to and from the basement care park will be from a new road (cul-de-sac) to be constructed adjacent to the western property boundary.

As indicated in 6.3.7 above, there are no potentially sensitive boundaries, including residential, in the vicinity of the entry to and exit from the proposed basement car park.

The car park will not have any direct boundaries with potentially impacted residential properties.

Recommended Controls

No specific acoustic controls are assessed as being necessary in relation to the ground level car park, other than the proper and reasonable controls that will be included in the Noise Management Plan recommended for the development (refer 6.2.14 below). Acoustic compliance is demonstrated in Table 6.12, below.

Table 6.12 – Vehicle Noise Noise Compliance

	Estimated Noise Emission Level (LAeq, 15-min dBA)	Attenuation due to Distance (dBA)	Attenuation due to Existing Background Noise (dBA)	Maximum Impact at Residential Boundaries (dBA)	Permissible Impact	Comply
Traffic Noise	58 - 65	10 - 15	5 - 10	43 - 50	65	YES

"Allowable noise impact is 65 dBA for commercial and industrial receivers

Subject to appropriate driving practices, noise associated with the drop off and pick up of children from the centre is not expected to impose an undue or non-compliant impact on neighbouring properties and land uses.

However, a Noise Management Plan is also recommended to help ensure that activities associated with the proposed car park

Review of AAAC Guidelines – Drop-Off and Pick-Ip of Children

The AAAC (2020) guideline provides the following comment in relation to the drop-off and pick-up of children:

> *Pick up and Drop off*
>
> *Depending on the requirements of the state or territory where the centre is located, noise emission from vehicles on site should be considered.* These requirements have been taken into account in the design of the centre, and the preparation of this acoustic assessment.

Review of AAAC Guidelines – Car Parking

The AAAC (2020) guideline provides the following comment in relation to car parking:

> *Noise mitigation measures should be implemented to minimise adverse impact to neighbours caused by car doors slamming and the sounds of parents and children arriving or departing the centre.*
>
> *Such measures could include the judicious positioning of arrival and departure access points and pathways away from residential property boundaries, the appropriate placement of buildings constructed on site to shield the noise or the provision of acoustic fencing or landscaping.*

The acoustic assessment and projected outcomes presented in this report are consistent with the requirements of the AAAC (2020) guideline

6.3.10 Industrial & Commercial Receivers

The NSW Noise Policy for Industry (2017) requires that the impact of any commercially or industrially sourced noise, in this case the noise from the proposed community childcare centre, must not exceed 65 dBA at any existing industrial or commercial boundary.

It has been demonstrated above that the noise impact from the proposed development will be substantially less that the 65 dBA permitted for commercial or industrial receivers.

Review of AAAC Guidelines

The AAAC (2020) guideline provides the following comment in relation to acoustic impacts at industrial & commercial receptors:

> *The cumulative Leq,15min noise level emitted from the use and operation of the childcare centre shall not exceed 65 dB(A), from all activities (including outdoor play), when assessed at the most affected point on or within any commercial property boundary.*

In this case, no such receptors are present, and as indicated above the relevant criterion does not apply.

6.3.11 Mechanical Plant

The impact of typical mechanical plant considered likley to be associated with the proposed childcare centre has been assessed, and it is considered that acoustic impacts of significantly less than 5dBA above the measured background LA90 RBL will be achievable at all property boundaries. However at the time of preparing this assessment no final plan had been developed for the types and locations of plant and equipment to be used. For this reason, it is recommended that the acoustic performance of plant and equipment is validated following final fit-out of the proposed childcare centre, and prior to the issue of an Occupation Certificate for the premises.

Review of AAAC Guidelines

The AAAC (2020) guideline provides the following comment in relation to noise associated with mechanical plant & equipment:

> *Childcare centres may include air-conditioning plant and equipment, kitchen and wet area exhaust fans, car park and garbage room ventilation fans. Depending on the requirements of the state or territory where the centre is located, any such mechanical equipment should be assessed in accordance with this section and should not be audible outside the premises between 6 pm and 7am.*

The acoustic assessment and projected outcomes presented in this report are consistent with the requirements of the AAAC (2020) guideline

6.3.12 Acoustic Impacts Generally

In our professional opinion, due to the relatively low level of sounds projected to be generated by activities associated with the proposed facility, and the various attenuation or noise reduction factors involved, and subject to the recommendations made in this report, there is very little likelihood that the proposed childcare centre will cause any undue acoustic impacts on nearby receivers.

6.3.13 General Acoustic Considerations

Sound generated by the activities of children at the proposed childcare centre will be additional to background, ambient sound levels. However, these incremental sound levels will be subject to the following management and control:

> **Structural Attenuation:** Sound levels generated within the proposed childcare centre will be subject to attenuation by the materials associated with the construction and fit-out of the facility, such as wall and flooring finishes. It is considered reasonable to assume that a measurable reduction in noise impact will be achieved by this means.
>
> **Effect of Management and Supervision:** It is also considered reasonable to assume that sound generated by the activities of children playing in play areas at the proposed childcare centre will be subject to minimisation and control as a result of appropriate management and supervisory protocols.

These factors will provide additional acoustic management and minimisation controls.

Review of AAAC Guidelines

The AAAC guideline provides the following comment in relation to supervision.

> *The Centre should always be properly supervised in order to limit the noise emission.*

The requirement for effective management and supervision has been incorporated into this acoustic assessment.

6.3.14 Noise Management Plan

The proposed facility is adjoined to the immediate north, west and south by existing residential properties. For this reason, it is considered important that the various controls required to ensure the effective management and minimisation of noise impacts on neighboring properties is formalised in the form of a concise, plain language Noise Management Plan.

This Noise Management Plan should be incorporated into the overall Management Plan for the proposed childcare centre, and should include but not be limited to the following issues:

- Separate daily programs for both the warmer and cooler months in order to regulate the total time spent outdoors and indoors. The program should be made publicly available to parents and neighbours;
- Contact phone numbers for the overall facility manager or director should be made available to neighbours to facilitate communication and to resolve any neighbourhood issues that may arise due to operation of the childcare centre;
- Details of the typical number of children anticipated to be present in the outdoor play area;
- Details of any limitations recommended on the total time spent outside in the play area each day in order to meet the noise criteria (refer 6.3.2 above);
- Procedure to ensure that crying children are taken inside the childcare centre building and comforted;
- Details of plans and procedures to ensure that the behaviour of children is monitored and modified as required by adequately trained teachers and childcare workers, to assist in ensuring compliance with overall noise guidelines
- A procedure to ensure that parents and guardians are informed regarding the importance of noise minimisation when entering the site, and dropping off or picking up children;
- Procedures as required to ensure that staff control the level of their voices while outside;
- Minimisation or control of any use of amplified music to ensure compliance with noise management guidelines.

Review of AAAC Guidelines

The AAAC (2020) guideline provides specific recommendations in relation to the inclusion of an appropriate Noise Management Plan in the overall Centre Management Plan. One of the most effective measures that should be implemented in conjunction with the physical noise controls is a noise management plan (NMP). The NMP should be incorporated within the Centre's overall management plan.

The following are examples of management measures that may be incorporated into a Noise Management Plan (NMP).

- *A separate daily program for both the warmer and cooler months should be established to regulate the total time spent outdoors and indoors;*
- *The NMP should be made publicly available to parents and neighbours;*
- *A contact phone number for the Centre's director should be made available to neighbours to facilitate communication and to resolve any neighbourhood issues that may arise due to operation of the Centre;*
- *The number of children playing outside at any one time may need to be limited to meet the noise criteria;*
- *The type of outdoor activities may be programmed to only allow quiet or "passive" activities such as painting, garden exploration, reading, block play or drawing in certain areas of the outdoor play area;*
- *Crying children should be taken inside the centre and comforted;*

- *The behaviour of children should be monitored and modified as required by adequately trained childcare workers;*
- *Parents and guardians should be informed of the importance of noise minimisation when entering the site, dropping off or picking up children;*
- *Carers / staff should be educated to control the level of their voice while outside; and*
- *To meet the noise criteria, amplified music may need to be controlled.*

The recommendations made above are consistent with this requirement.

6.4 RECOMMENDATIONS

Based on the assessment presented above, the proposed childcare centre will comply with all relevant acoustic guidelines and requirements, however, to ensure that acoustic compliance is achieved at all times, it is recommended that:

- ❑ External windows and doors are fitted with 6.38 mm laminated glass, or minimum acoustic equivalent;
- ❑ External window and door frames are fitted to façade openings with a sealant such as “Bostik Fireban One”, or equivalent;
- ❑ Full perimeter acoustic seals equal to Schlegel Q-Lon seals to be fitted to all external windows and doors;
- ❑ An 1800 mm solid form metal panel fence (or acoustic equivalent) with a minimum Rw rating or noise reduction potential of 20, is installed along the northern and eastern boundaries of the ground outdoor play area, as indicated in Figure 6.3;
- ❑ Appropriate boundary fencing is installed to the remainder of the site area. While no particular acoustic specification or performance requirement is applicable to this other boundary fencing, a continuation of the 1800 mm solid metal panel fencing recommended for the northern and eastern property boundaries appears sensible;
- ❑ Mineral wool-based ceiling insulation equivalent to Bradford SoundScreen™ 2.5 with a minimum Rw rating of 43 to be fitted in the roof void of the childcare centre building;
- ❑ Validation that any plant & equipment associated with the proposed childcare centre will not have an impact greater than 5 dBA above the measured background LA90 RBL, as indicated in this report, should be provided prior to the issue of an Occupation Certificate for the development; and
- ❑ A Noise Management Plan consistent with the guidelines provided in Section 6.3.9 above is prepared and included in the overall Management Plan for the childcare centre.

6.5 COMPARISON WITH THE NOISE LEVELS OF COMMON ACTIVITIES

Appendix D provides a comparison of the noise levels projected to apply at the proposed childcare centre with those associated with a range of common activities.

These comparisons suggest that the sound levels forecast to be associated with the proposed facility will be comparable with the sound levels associated with a range of accepted community activities, and subject to implementation of the and recommendations and controls included in this assessment report, are considered extremely unlikely to cause offence, nuisance or harm.

7 OVERALL ACOUSTIC ASSESSMENT

7.1 KEY FINDINGS

This report presents the results of an acoustic assessment undertaken in relation to a childcare centre proposed for development proposed for 16 Chapman Street, Werrington NSW.

The following is a summary of the key findings of this assessment:

1. Sound levels of less than 40 dB(A) will be achieved throughout the internal areas of the proposed childcare centre, based on measured background sound levels and proposed layout and design details as described in this report;

2. Sound levels in the range 30-35 dB(A) will be achievable within any sleep or rest areas associated with the proposed facility, based on measured background sound levels; and proposed layout and design details as described in this report;

3. Background noise levels of less than 55 dBA are projected to be achievable within the external play area associated with the proposed childcare centre;

4. The level of noise estimated to be generated by activities within the internal areas of the proposed facility is projected to be essentially contained by the building structure of the childcare centre itself, and accordingly is projected to have no negative or non-compliant impacts on surrounding buildings, activities and individuals;

5. The level of noise estimated to be generated by activities within the external play areas associated with the proposed childcare centre is projected to have no negative or non-compliant impacts on surrounding buildings, activities and individuals, subject to the implementation of the recommendations summarised below;

6. The level of noise associated with motor vehicle activities associated with the proposed childcare centre, including the drop-off and pick-up of children is projected to have no negative or non-compliant impacts on surrounding buildings, activities and individuals, subject to the implementation of the recommendations summarised below; and

7. On this basis, the acoustic performance of the proposed childcare centre will comply fully with the requirements of all relevant acoustic guidelines and requirements.

7.2 RECOMMENDATIONS

The assessment has found that the proposed childcare centre will have no undue or adverse impact on neighbouring properties, activities and individuals, and will comply with the requirements of all relevant acoustic guidelines and regulations, subject to the advice provided generally in this report; adherence to normally accepted design and building practices, and the implementation of the following project specific recommendations:

1. External windows and doors are fitted with 6.38 mm laminated glass, or acoustic equivalent;

2. External window and door frames are fitted to façade openings with a sealant such as “Bostik Fireban One”, or equivalent;

3. Full perimeter acoustic seals equal to Schlegel Q-Lon seals to be fitted to all external windows and doors;

4. An 1800 mm solid form metal panel fence (or acoustic equivalent) with a minimum Rw rating or noise reduction potential of 20, is installed along the northern and eastern boundaries of the ground outdoor play area, as indicated in Figure 6.3;

5. Appropriate boundary fencing is installed to the remainder of the site area. While no particular acoustic specification or performance requirement is applicable to this other boundary fencing, a continuation of the 1800 mm solid metal panel fencing recommended for the northern and eastern property boundaries appears sensible;

6. Mineral wool-based ceiling insulation equivalent to Bradford SoundScreen™ 2.5 with a minimum Rw rating of 43 to be fitted where possible in the roof void of the childcare centre building;

7. Validation and certification that any plant & equipment including air conditioning units associated with the proposed childcare centre will not have an acoustic impact greater than 5 dBA above the measured background LA90 RBL, as indicated in this report, should be provided prior to the issue of Construction and/or Occupation Certificates for the development; and

8. A Noise Management Plan consistent with the guidelines provided in Section 6.3.14 of this report is prepared and included in the overall Management Plan for the childcare centre.

8 AUTHORISATION & LIMITATIONS

NG Child & Associates has based this report on the data, methods and sources described herein. Subject to the limitations described within the report, it is the professional opinion of NG Child & Associates that this report provides an accurate and reliable measure of background acoustic levels and acoustic performance regarding the childcare centre proposed for development at 16 Chapman Street, Werrington NSW, as described in this report.

Noel Child BSc (Hons) ME PhD
Visiting Fellow, Engineering
University of Technology, Sydney
Principal, NG Child & Associates

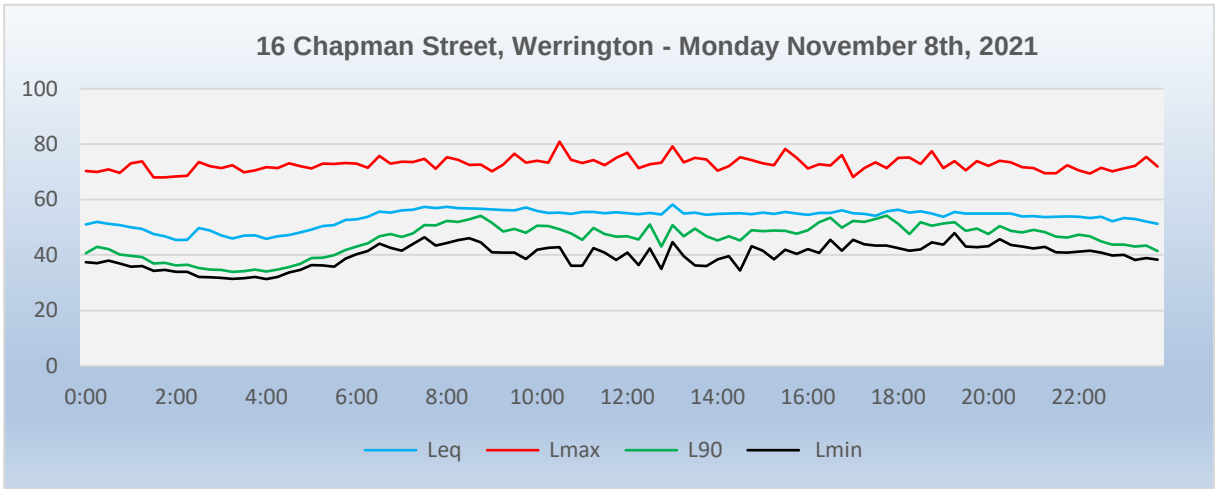
16 November 2021

APPENDIX A

Background Acoustic Measurements

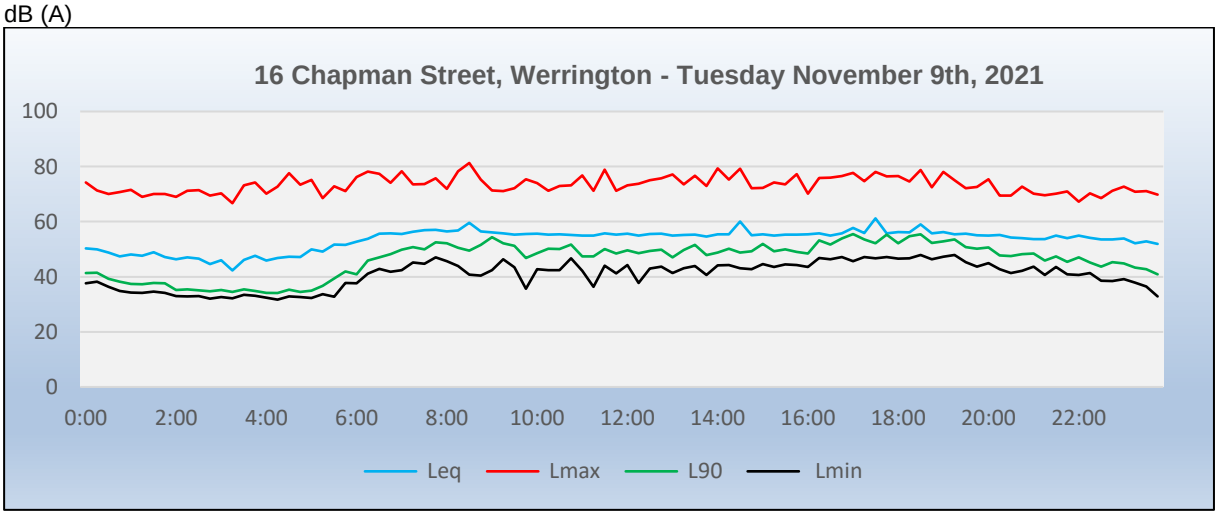
Monday November 8th, 2021

dB (A)



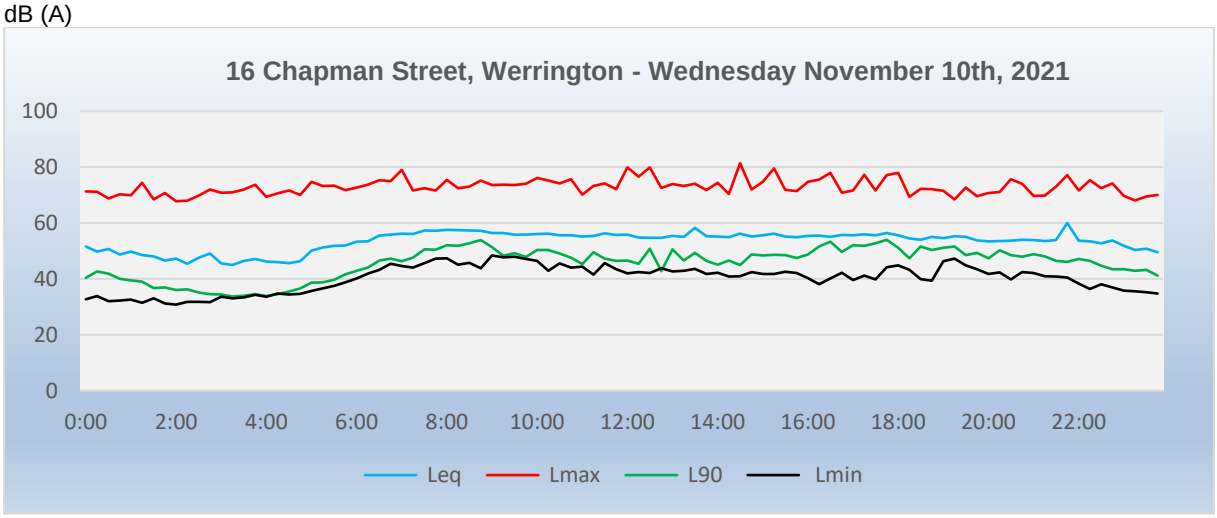
Tuesday November 9th, 2021

dB (A)



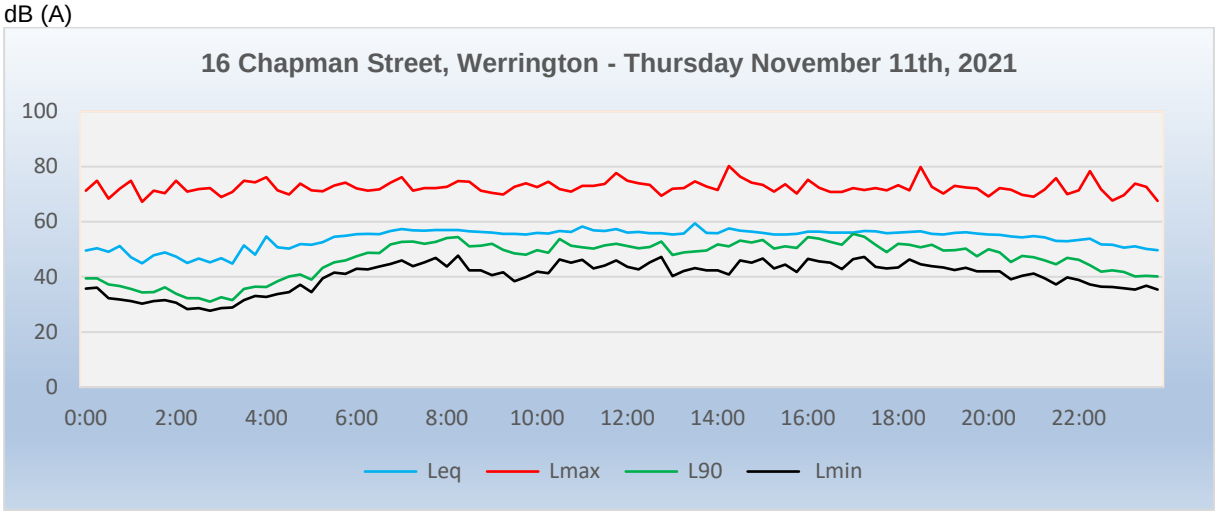
Wednesday November 10th, 2021

dB (A)



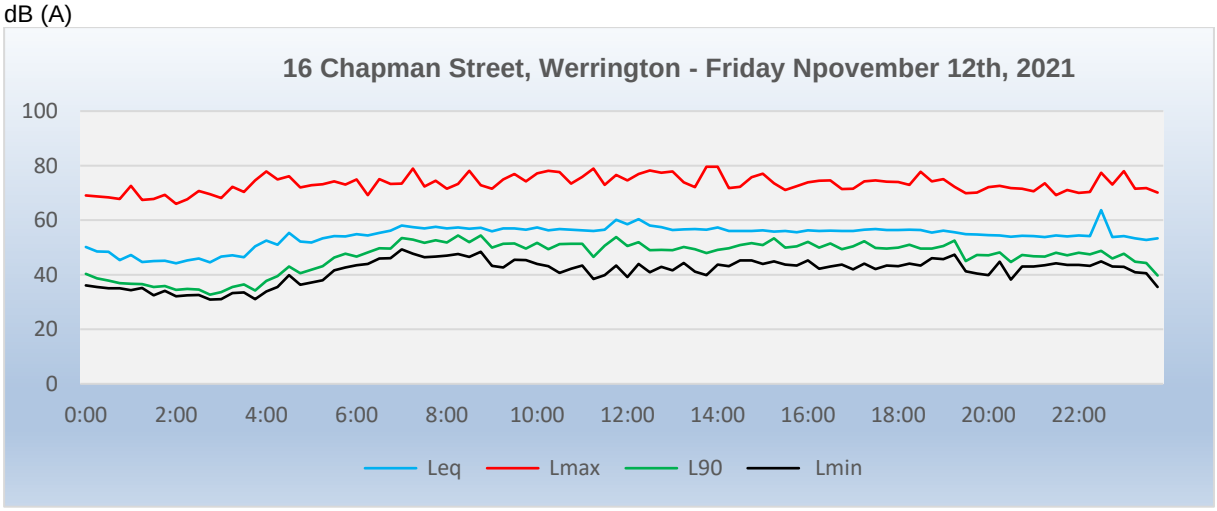
Thursday November 11th, 2021

dB (A)



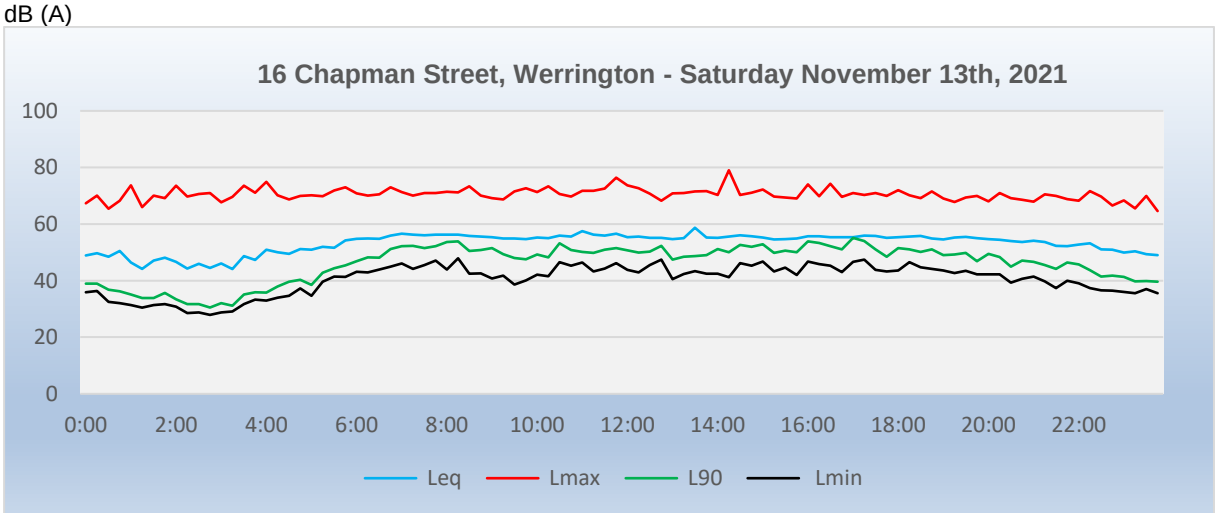
Friday November 12th, 2021

dB (A)



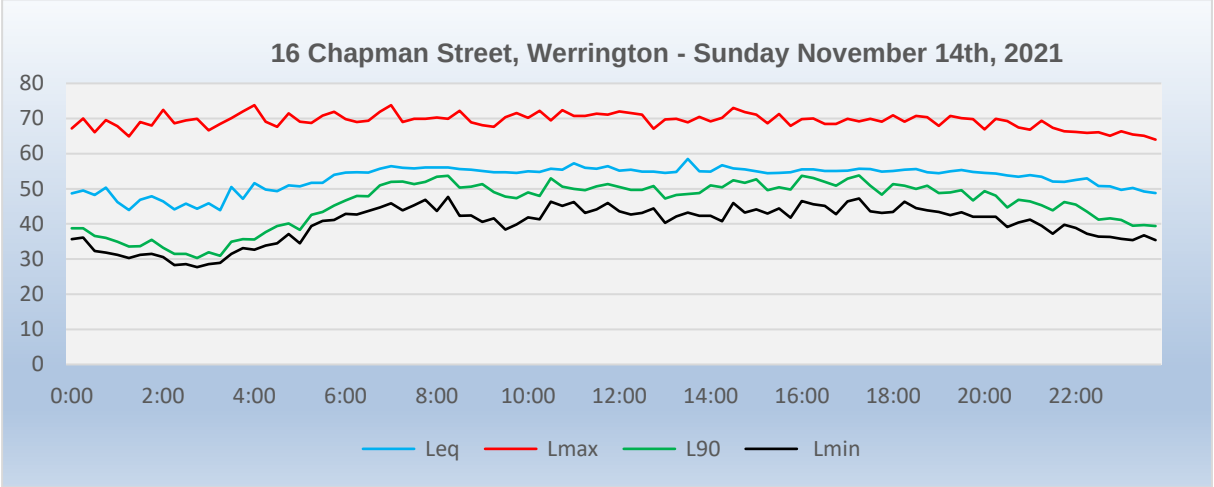
Saturday November 13th, 2021

dB (A)



Sunday November 14th, 2021

dB (A)



16 Chapman Street, Werrington, NSW

Table A1 – Summary of Continuous Noise Monitoring Data

	Leq			Lmax			L90			Lmin		
	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night	Day	Evening	Night
Mon 8 November 2021	55.5977	54.7313	50.2813	73.6750	72.7688	71.5232	49.2705	49.2313	39.8750	41.2068	43.1688	36.6446
Tue 9 November 2021	55.9341	55.2563	49.8371	74.8636	73.0250	71.6580	50.4500	50.1875	39.5259	43.5318	44.4875	35.6929
Wed 10 November 2021	55.8909	54.6188	49.7389	74.3432	72.1875	71.4611	49.0705	49.0313	39.6750	43.4114	42.5000	35.2083
Thu 11 November 2021	55.9000	55.1313	49.9125	72.8019	72.1375	71.9438	50.2852	48.7000	38.2875	43.1796	41.9063	33.8813
Fri 12 November 2021	56.7063	54.9875	50.2938	74.7771	72.4313	71.4688	50.6917	48.2063	40.0406	43.8208	43.2250	36.6875
Weekday Average	56.0058	54.9450	53.6156	74.0922	72.5100	71.6110	49.9536	49.0713	39.4808	43.0301	43.0575	35.6229
Sat 13 November 2021	55.1352	54.4313	48.9875	71.2556	69.5563	69.6813	49.7667	48.2000	37.7750	43.3778	42.1063	34.0719
Sun 14 November 2021	54.9648	54.2313	48.8875	70.1537	68.9500	68.3469	49.4944	48.0000	37.5500	42.9944	41.9063	33.8625
Weekday Average	55.0500	54.3313	48.9375	70.7046	69.2531	69.0141	49.6306	48.1000	37.6625	43.1861	42.0063	33.9672

APPENDIX B

Background Sound Level Monitoring: Raw Data

Table B1 – Raw Noise Monitoring Data (8 – 14 November 2021)

Date	Time	Leq	Lmax	L1	L10	L50	L90	L99	Lmin
8/11/2021	0:00	41.2	58.5	47.9	43.3	39.4	37	35.9	35.2
		41.4	58.3	46.9	43.6	40.5	38	37	36
		40	54.7	48.2	42.1	38.6	36	34.8	34.1
		37.9	49.7	43.7	40.2	36.7	35.2	34.2	33.3
		39.1	49.6	46.5	42.1	37.6	35.3	34.2	33.5
		37.1	49.4	43.4	39.3	36	34.2	33.3	32.5
		39.9	52.5	46.3	42.4	38.7	36	35	34.1
		37.3	48.8	44.5	39.6	36.2	33.8	32.7	31.7
	2:00	37.8	48.3	44.6	40.2	36.6	34.6	33.4	32.6
		38.8	48	44.7	41.3	37.9	35.2	34.1	33
		41	55	47.1	43.4	39.8	37.4	36.5	35.7
		41.7	59.7	49.8	43.6	39.9	37.8	37	35.9
		40.8	56.5	49.4	42.8	39	37.3	36.3	35.3
		39.2	60.9	45.4	40.7	38.4	37	36.1	35.2
		38.7	46.7	44	40.7	38	36.1	35.3	34.4
		38.1	47.8	43.6	40.1	37.3	35.2	34.2	33.5
	4:00	36.9	51.3	44.5	39.1	35.5	33.6	32.6	31.5
		39.2	54.2	49.3	41.5	36.1	33.6	32.7	31.6
		40.3	56.8	50.2	42.2	37.8	36	35	33.7
		41.5	60.8	49.2	43.9	39.9	38	36.6	35.6
		42.9	64.8	50.8	44.5	40.7	38.5	37.6	36.9
		43	62.4	49.2	45	42	39.7	37.7	36.7
		45.5	56.9	49.7	47.4	45	43.1	41.8	40
		46.7	64.9	52.1	48.3	45.9	43.7	42.6	41.5
	6:00	47.2	59.4	51.9	49.2	46.6	44.3	43.2	42
		50.2	69.1	57.7	51.8	48.9	46.6	45.5	44.6
		53.1	74.8	62.3	53.1	50.2	48.1	46.9	46.3
		53.2	79	62.3	52.9	50.3	48.5	47.5	46.6
		50.7	66.5	55.5	51.8	50.4	48.7	47	45.5
		51.5	72.5	55.9	53.1	50.8	49	47.7	46.5
		52.4	72.6	61.6	53.7	50.7	48.7	47.5	46.1
		52	77.6	59.9	52.8	50	48	46.4	45.3
	8:00	49.5	67.1	56	51.1	48.6	46.7	45.2	44.2
		50.1	68.1	58.2	51.6	48.5	45.7	43.9	42.8
		50.6	76.2	58.4	52	47.8	44.9	43.3	41.1
		49.6	70.9	56.7	51.8	48.4	44.5	42.4	40.7
		49.7	66.3	57.4	51.8	48	44.8	42.9	41.7
		49.4	64.5	58.5	51.9	47.7	43.6	41.7	40.1
		49.6	66	57.5	51.7	48	44.9	41.3	38.7
		49.8	74.5	58.8	50.7	46.9	43.1	41.3	39.7
	10:00	48.6	67.8	56.5	50.4	46.6	43.4	41.7	40.2
		55.7	81.2	69.6	53.1	47.7	44.3	42.6	40.8
		48.8	70.1	55.9	50.3	47.1	44.3	42.9	41.9
		51	75.8	58.1	50.2	46.7	43.5	41.3	40.2
		50.2	72.9	61.5	50.5	46.2	42.9	41.3	40
		48.2	68.4	55.5	49.4	46.2	43.6	42.1	40.6
		53.9	75.1	67.6	51.4	46.8	43.6	42	41.1
		47	64.5	53.8	49.2	45.9	43	40.4	39.2
	12:00	49.2	73.4	57.6	50.8	46.7	43.1	40.9	39.3
		48.6	64.8	57.4	50.5	46.9	44.3	42.8	40.8
		47.1	61.9	53.7	49.4	46.1	43.1	41.1	39.7
		47.3	59.4	52.7	49.5	46.7	43.7	42.3	41

		49.2	73.3	58.3	49.4	46.5	43.8	42.1	40.8
		49.3	74.2	54.3	49.1	46.4	43.3	41.9	39.9
		46.9	61.5	52.9	48.8	46.3	43.6	42.2	41.1
		57.4	80.1	72.2	52	46.1	43.1	41	39.2
	14:00	47.9	71.8	55	48.8	45.8	43.1	40.9	39
		49.9	68.4	60.5	52.5	46.1	43	41.6	40.5
		47.1	59.7	54.9	49.7	45.7	42.2	40.1	37.9
		48.1	71.7	58	49.9	45	41	38	36.5
		57.6	79.1	72.9	50.5	46	42.2	39.7	38.4
		47.8	64.8	56.4	49.7	45.9	42.8	41.2	39.8
		47.3	64.7	54.8	49.1	46.3	43.7	41	38.7
		47.9	59.2	55	50	47.1	43.6	42.1	40.7
	16:00	49.1	60.2	57.9	52.4	46.4	43.8	42.5	41.6
		50.1	70.5	60.8	50.2	47.1	44	42.6	41.2
		49.3	65.9	59	51.3	47	44.5	42.9	41.5
		52.7	75.7	65.5	51.7	47.1	44.1	42.2	41
		51	72.7	61.9	52	47.2	44	42.4	40.9
		53.1	70.6	66.2	53.2	47.6	44.7	42.6	40.3
		47.7	62.8	53.8	49.7	46.8	44.7	43.8	42.8
		47.9	57.4	53.5	50.2	47.3	44.5	43	41.7
	18:00	53.2	80.6	62.3	50.1	47	44.1	42.3	40.6
		48.7	67.3	55.9	50.7	47.7	44.6	42.7	41.4
		49.4	66.6	56.2	51.9	47.3	44.4	42.3	39.7
		49.9	63.7	58.3	52.8	47.9	45.2	42.4	40.6
		49.4	69.8	58.3	51.4	47.6	44.9	43.6	42.5
		51.5	67.7	60.2	54	49.1	46.6	44.9	43
		49.4	63.6	57.4	51.8	47.9	45.3	43.7	42.4
		51.2	67.3	60.9	54.4	47.5	45.1	43.8	42.7
	20:00	49.1	72.9	56.3	51.1	47.2	44.8	43.3	42
		48.5	70.8	54.7	50.6	47.1	44.9	43.4	42.1
		50	66.1	57.5	52.6	48.3	45.9	44.4	42.6
		49.9	63.3	57.4	52.6	48.2	45.3	43.6	42.2
		50.5	74.5	59	52.6	48	45.1	43	41
		52.9	72	63.9	55.2	49	45.1	43.1	40.4
		54.9	76.4	64.6	58.2	51.1	46.2	44	41.3
		55.6	72.8	66.6	58.8	50.9	45.7	42.9	40.9
	22:00	51	71.6	60.9	53.7	47.3	44.1	42.2	40.7
		49.3	71.8	59.7	51	45.9	42.6	40.9	39.9
		45.5	67	52.6	47.1	44.3	41.8	40	38.1
		46.8	72.9	55	48.1	44.3	41.4	38.9	38
		47.6	62.6	56.9	50.9	44.7	40.7	37.9	36.5
		59.4	78.3	74.6	52.5	44.1	41	39.1	37.9
		44	62.4	51.9	46	42.5	39.8	37.9	36.4
		47.8	69.4	58.4	49.9	43.5	40.9	39.2	37.8
9/11/2021	0:00	49.9	76.6	59.1	46.7	42.3	38.7	37.2	36.3
		54.2	72.9	69.7	50.4	42.5	38.2	36.5	35.7
		42.1	54.8	50.6	44.6	40.4	37.4	36	34.7
		40	49.5	46	42.8	38.9	36.8	35.7	34.6
		39.2	54.1	45.6	42.1	37.5	35.3	33.9	32.2
		40	54.1	48.2	43	37.9	35.5	34.4	33.6
		39.4	48.3	45.3	42.1	38.3	36.1	35	34.1
		39.7	61.1	48.4	40.9	36.8	34.1	32.7	31.7
	2:00	37	48.5	43.4	39.1	35.9	33.9	32.6	31.3
		38.3	52.1	45.7	41	36.6	34.3	33.2	32
		37.3	53.8	44.2	40.1	35.5	33.3	32.3	30.9
		38.4	47.8	44.2	41.3	37	34.8	33.7	32.4

		37.2	50.1	44.2	39.6	35.8	33.6	32.8	31.8
		37.6	62.8	45.9	39.4	35.5	33.6	32.8	31.8
		37.2	53.3	44.5	39.9	35.6	33.8	32.8	31.9
		37.3	51.3	44.7	39.6	35.8	33.8	32.6	31.6
	4:00	37.4	54.2	43.5	39.8	36.4	34	32.7	31.7
		40	54.6	47.1	42.2	38.8	36.3	35.2	34.2
		40.2	59.2	50.6	40.9	37.8	36.3	35.4	34.6
		38.7	50.2	45.7	40.7	37.6	36	35	33.9
		39.9	50.7	45.8	42	39	37.2	36.3	35.2
		41.9	56.5	48.5	43.5	41	39.1	37.9	36.5
		43.8	63.7	48.8	45.2	42.9	41	39.9	38.8
		44.8	59.8	49.3	46.7	44	42	40.9	39.8
	6:00	45.3	59.3	50.8	47.3	44.4	42.9	41.8	40.7
		47	69.1	54.1	48.3	45.6	43.4	42.6	41.8
		50	74.1	58.3	49.9	47	45.4	44.4	43.4
		48.9	65.6	57.8	49.9	47.4	45.4	44.4	43.1
		49	69.8	55.1	50.2	48	46.3	44.9	43.8
		50	74.2	57.2	50.5	48.6	46.8	45.9	44.4
		49.4	70.9	55.5	49.9	48.3	46.9	45.5	44.5
		49.1	66.1	55.3	50.6	48.4	46.4	45.5	44.2
	8:00	50.3	70.1	59.5	50.6	48.4	46.7	45.4	44.2
		49.3	67.7	56	50.5	48.1	46.4	45.1	44.3
		50.4	67.6	59.9	52.6	47.9	45.5	44.3	43.4
		48.6	65.4	58.5	49.7	46.9	44.6	43.6	42.8
		48.9	67.5	58.8	50	47.4	45.1	44	43.1
		48.4	62.5	56.3	50.8	46.9	44.3	42.7	40.6
		47.2	59.1	54.4	49.3	46.1	43.2	40.9	39.3
		54	83.4	59	49.9	46.2	42.9	41.3	40
	10:00	47.3	70.4	55	47.9	45.3	41.9	39.7	38.8
		50	73.5	60.8	51.8	46.3	43	41.2	39.9
		52.5	75.9	62.9	51.6	46.1	43.1	41.3	40
		45.7	64.9	51.3	47.7	44.7	42	40.3	38
		45.1	65.3	53.9	46	43.9	41.4	39.7	38.7
		45.7	63.5	52.9	47.1	44.6	42.4	41.2	40
		48	67.8	59.4	48.6	44.6	41.9	40.2	38.6
		46.2	68.4	55.6	47.5	44.1	41.9	39.9	37.8
	12:00	48.1	69.6	60.5	47.4	44.3	41.8	39.9	37.7
		47	64.5	58.2	48.3	44.4	42	39.7	37.8
		53.3	74.5	69.3	48.3	44.6	41.7	39.7	38.1
		45.6	65.8	51.7	46.9	44.8	41.7	39.5	37.8
		46.1	66.7	54.2	47.3	44.3	40.9	38.5	36.2
		45.6	69.2	52.6	47.4	44.5	41.1	38.3	35.8
		49.5	68.6	64.1	47.6	44.3	41.5	38.5	36.9
		54.7	78.4	69.2	48.2	43.9	40.7	38.7	37.3
	14:00	60.3	86.8	73.1	51.7	44.5	41	37.7	33.1
		48	68.3	61.4	47.3	44	41	39.2	37.7
		46.6	69.6	55.6	48.2	44.4	41.2	38.4	35.7
		43.6	68.6	57.1	46.5	51.4	42.3	39.6	38
		44.3	67.3	56.9	46.5	46.4	43	39.5	37.7
		45.1	60.2	53.4	46.9	44.2	41.4	39.8	38.5
		46.3	67.3	54.9	47.7	44.5	41.7	39.4	37.7
		46.9	71.5	54.8	48.3	44.9	42.5	40.6	39.1
	16:00	46.2	66.9	54.4	47.9	44.6	42.1	39.7	37.6
		47.1	63.5	55	49.9	45.3	42.3	39.6	38
		46.2	67.7	53	47.6	45.1	42.4	40.5	39.1
		51.4	70.3	65.2	48.6	45.9	43.6	41.4	39.1

		50.5	80.4	61.5	48.8	45.8	43.8	41.9	40.1
		50.9	70.4	60.9	52.8	48.2	44.9	43.5	41.6
		51	70.4	59.3	52.6	50.2	46.6	44.8	42.5
		47.9	62	53	49.7	47.4	45.5	43.8	42.4
	18:00	48.5	64.4	55.1	50.5	47.6	45.4	43.3	41.4
		49.5	64.9	55.4	51.5	48.7	46.7	45.3	43.5
		49.8	70.6	56.6	51.5	48.5	46.4	45.1	43.2
		53.1	75.2	64.9	53.9	49.8	47	45	43.3
		51.4	73.6	57.8	52.7	49.6	47.5	46.1	43.6
		51	71.9	57.1	52.7	49.6	47.4	45.6	43.6
		51.3	70.3	59.9	53.4	49.2	46.6	44.5	42.2
		50.6	66.1	58.8	52.9	49	46.5	44.5	42.5
	20:00	49.5	63.6	58.1	51.9	47.7	45.3	43.8	42
		48.7	67.3	55.2	50.8	47.6	45.3	43.6	42
		48.8	66.3	55.2	51	47.8	45.4	43.4	41.5
		48.1	68.2	54.2	49.9	47	44.9	43.2	40.6
		49.4	67.1	55.5	51.6	48.1	45.1	42.8	41.2
		48.7	68.4	57.8	51.4	46.1	43	41.1	39
		54.8	81.4	65.6	46.7	44.1	41.4	39.5	38.2
		46	66.9	53.9	46.5	44	41.6	39.2	37.9
	22:00	44	60.8	48.1	45.8	43.7	41.3	39.6	38.4
		47.7	74.6	54.4	46.6	44	41.3	39.5	38.1
		44	54.3	50.7	45.6	43.5	41	38.5	37.2
		43.2	51.2	46.9	45.5	43	39.8	37.7	36.5
		42.6	48.7	46.5	44.8	42.3	39.6	37.1	35.9
		43.8	56.9	50.1	45.8	43.1	39.3	37.1	36
		42.7	52.5	48	45.1	41.9	38.8	37.3	36
		42.1	60.7	46.5	44	41.7	39	37.6	36.3
10/11/2021	0:00	44.1	59.6	52.3	45.9	42.7	39.5	37.3	36
		43.9	57.3	50.8	46.1	43	39.9	38	36.4
		42.1	54	49.3	44.2	41	38.4	36.1	34.4
		40.6	51.3	46.6	43	39.7	36.9	34.9	33.7
		43	63.4	52.7	44.1	40.1	37.4	36.1	35
		41	61	49	43	39	36.5	35.4	34.5
		38.6	54.7	43.6	41.3	37.6	35.3	34.1	32.6
		37.5	46.4	42.7	40.1	36.7	34.5	33.1	32.1
	2:00	37.9	54.4	44	40.3	36.8	34.2	32.8	31.7
		47.4	62.9	58.2	51.1	41.8	36.9	34.3	32.7
		52.4	75.8	63.2	55.4	47.1	40.9	36.6	32.9
		59.1	83.6	69.6	61.7	52.2	45.6	41	36.8
		61.8	83.3	74.4	63.5	53.6	46.4	40.9	36.5
		63.9	85.6	74.9	66.4	58.3	51.1	47	40.3
		61.7	79.2	71.3	65.6	57.7	49.6	43	38.9
		63.4	83.1	74.7	66.1	57.8	51.4	47.9	44.5
	4:00	60	83.5	70.5	63.1	54.3	48.1	43.7	37.6
		60.7	88	69.8	62.8	55.2	50.1	45.4	38.5
		57	81.4	68.9	57.9	50.9	44.3	37.4	33.5
		47.5	65.1	56.8	50.7	44.3	37.6	32.5	29
		43.8	60.5	51.5	47.3	41.7	35.6	32.3	30.2
		51.6	72.3	64	53	41.1	35.4	33.3	31.5
		43	65.5	53.3	44.6	39.4	35.9	33.9	31.8
		40.7	53.8	47.2	43.7	39.4	35.7	34.3	32.9
	6:00	40.5	58.2	46	43.3	39.4	35.1	33.1	31.2
		43.5	68.5	50.9	44.6	40.9	37.2	35	33.2
		46.9	75.7	55.8	46.6	40.7	37.3	35.1	33.7
		43.8	62.6	54.2	45	41.4	38.6	37	35.6

		43.2	62.1	50.4	45.1	41.8	39.2	37.8	36.8
		44.2	69.7	50.7	45.5	41.6	38.7	37.4	36.2
		46	71.6	54.8	46.5	42.2	39.2	37.5	36
		45.7	67.8	55.3	47.7	43.1	40.1	38.5	37.2
	8:00	47.8	76.8	55.8	46.8	43.4	40.1	37.6	36.7
		45.4	64.5	54.9	47.3	42.8	39.7	37.4	36.3
		45.1	65.2	55.1	46.1	42.7	40.2	38.7	37.3
		45.8	70.7	52.4	46.2	43.1	40.5	38.2	37.1
		46.5	69.7	53.9	47.1	43.8	41.3	40.3	38.7
		50.3	78.5	57	46.8	44	41.7	39.7	38.4
		44.8	56.3	50	47	44.2	40.8	39.4	38.3
		47.4	66.1	57.2	48.7	44.9	41.9	40.2	38.7
	10:00	46.3	68.1	53.8	47.8	44.2	41.5	39.3	38.1
		45.9	62.7	55.2	47.5	44.2	41.2	39.2	37.4
		45.8	67.9	54.2	47.6	44.1	40.9	39	37.4
		44.8	64.6	52.3	46.8	43.6	40.4	36.8	34.4
		46.7	72.7	57.6	48	43.5	40.6	37.6	35.2
		46.2	67.1	55.3	48.1	44.1	40.5	36.5	33.9
		59.8	80.9	76.4	51.7	44.2	40.1	37.9	36.8
		49.7	67.7	62.1	49.9	44.6	42.4	40.6	39.2
	12:00	56.9	81.8	70.9	49.4	44.3	41.1	38.8	37
		46.5	71.5	54.3	48.4	44.9	42.1	38.9	37.3
		56.2	78.9	67	60.3	46.4	42.9	39.8	36.9
		45.9	59.9	53.7	47.8	44.7	41.6	39.8	38.7
		55.8	78	71	49.3	44.9	42.2	39.4	37.3
		46.3	67.1	54.2	47.6	44.9	41.6	38.9	37.5
		45.9	60.2	54.4	48.3	44.2	41.2	39.2	37.9
		48.4	71.4	58.6	47.5	44	41.1	39.2	38.3
	14:00	46.6	60.1	56.1	48.2	45	42	40.4	39.4
		47	65.9	56.5	48.4	45	41.9	40.2	38.6
		47	67.6	56	49	45	41.9	38.8	36.3
		46.7	70.2	55.6	48.1	44.5	41.8	38.8	36
		47.6	70.3	56.7	49.4	45	42.6	40.7	39.4
		49.8	69.7	63.4	48.8	44.8	41.5	39.6	37.9
		47.9	68.9	58.9	48.5	45	42.3	40	39
		46.9	72.3	53	48.4	44.9	42.3	40.5	39.5
	16:00	48.7	63.7	57.4	51.7	46.5	41.9	39.2	37.4
		51.6	72.4	60.7	54	49	43.6	40.8	39.6
		49.9	66.5	60.9	51.9	46.1	43.6	42.2	41.3
		48.4	69.8	59.1	48.5	45.5	43	41.5	40.7
		48.2	60.6	56.8	50.7	46.2	43.2	39.2	37.8
		49.3	77.3	57.1	50.8	45.9	43.5	41.4	40.4
		46.3	58.3	52.7	48.3	45.7	42.6	40	38.4
		46.4	62.2	53.3	49.1	45.1	42	39.8	38.2
	18:00	46.3	64.7	52.3	48.3	45.3	42.4	40.3	39.2
		47.4	75.2	51.2	47.5	44.9	42.1	40.1	38.9
		45.6	59.6	53.6	47.2	44.6	41.7	38.9	37.8
		46.5	62.4	55.4	49	44.6	42.2	41.1	39.9
		44	55.1	48.7	46.1	43.4	40.9	39.7	38.9
		45.4	58.3	54.3	47.5	43.5	41	39	37.7
		48.9	67.9	59.1	51.4	45.2	41.9	40	38.8
		45.6	59.8	53.5	47.8	44	42	40.6	39.5
	20:00	44.2	57.1	48.7	46.1	43.5	41.7	40.2	38.9
		45.4	65.8	56.8	46	43.1	40.9	39.6	38.4
		43.8	59.6	49.4	45.7	42.9	40.8	38.9	37.7
		44.2	63.3	51.6	45.5	42.6	39.7	38.3	37.3

		41.9	56.7	46.5	44.5	41.2	38.2	36.8	35.9
		42.8	53.1	47.9	45.2	42.1	39.3	38.2	37.2
		43.3	60	49.1	45.2	42.2	40.2	39	37.8
		44.4	74.7	47.6	44.8	41.9	39.8	37.8	36.6
	22:00	42.5	55.4	47.6	44.7	41.8	39	37.7	36.3
		41.3	56.4	48.1	43.6	39.9	37.3	35.9	34.7
		40.3	46.9	45.3	42.7	39.7	37.2	36.1	35.3
		40.3	49.2	46.2	43	39.3	36.6	35.3	34.2
		40.4	51.3	45.9	43	39.4	37	36.1	34.3
		40	56.9	45.3	42.7	39.2	36.1	34.5	33.5
		40.9	61.3	50.6	42.4	37.7	33.5	31.3	30.2
		39.1	54.9	47.9	42.1	36.5	32	30.4	29.5
11/11/2021	0:00	38.1	53.4	45.8	41.1	36.3	33	30.8	29.3
		37.9	51.9	46.1	41	35.5	32.3	30.6	29.2
		35.5	53.3	44.7	38.6	32.8	30.5	29.8	28.9
		35	54.3	42.5	38.1	33	30.6	29.4	28.5
		34.1	48.4	41.7	36.7	32.6	30.4	29.3	28.3
		35.7	50.4	44.3	39.1	32.8	29.9	29.1	28.3
		37	54.1	43.9	39.6	35	31.5	29.7	28.7
		35.3	50.9	42.4	37.4	34.2	32.6	32	31
	2:00	36	51.4	44.2	37.9	34.3	32.6	31.6	30.4
		36.6	55.6	46.1	38.5	34.4	32.2	31.3	30.5
		39.1	59.6	46.7	40.8	36.1	33.6	32.5	31.4
		35.6	48.2	43.7	37.9	34.4	31.5	30.3	29.5
		36.2	55.6	43.9	38.2	34.7	33	32.2	31.1
		35.4	48	43.3	37	34	32.6	31.8	30.9
		36.1	45.9	42.3	38.1	35.2	33.6	32.6	31.8
		38.1	50.3	45.1	40.8	36.6	33.8	32.5	31.2
	4:00	41.8	67.3	51.3	40.6	35.6	33.6	32.6	31.2
		39.5	59.1	48.3	41.1	36	34.1	32.8	32
		43.1	65.3	52.6	43.8	39.2	35.9	34.2	33.2
		41.2	54.2	48	44	39.9	36.6	35.3	34.3
		42.8	52.8	49.6	45.5	41.7	39.3	37.9	37.1
		44.5	54	49.8	47.2	43.6	40.8	39.3	38.2
		46.7	66.7	53.1	48	45.3	43.1	41.8	40.8
		47.6	68.9	52.5	49.1	46.3	44.4	43.4	42.5
	6:00	48	60	53.2	49.9	47.5	45	42.8	41.4
		51.6	75.3	60.5	51.6	49.2	46.8	45.7	44.5
		50.7	72.6	56.5	52.3	49.9	47.5	46.6	45.7
		51.4	65.3	58	52.7	50.7	48.8	47.9	46.8
		51	61.7	56.5	52.5	50.5	48.8	47.5	46.6
		51	69.2	55.9	52.2	50.5	48.4	47.3	46.4
		50.5	66.7	55.3	51.9	50	48.2	46.9	45.6
		50.1	62.7	56	51.6	49.5	47.9	46.8	45.8
	8:00	50.4	67.7	56.6	52.2	49.1	47.3	46.1	44.8
		49.4	63.5	55.5	51	48.7	46.5	44.7	43.4
		49.1	66.9	56.1	50.9	48	45.1	42.9	42
		48.5	68.9	54.9	50.3	47.4	44.4	42.5	41.2
		49.3	64.8	56.6	52.3	47.6	43.7	40.8	38.7
		49.1	67.5	56.4	52	47.5	43.6	41.2	39.6
		49.6	76.2	56.6	50	46.9	43.4	40.4	38.3
		59.9	86.8	71.4	50.2	46.4	41.8	39.8	38.6
	10:00	46.3	64.4	53	48.8	45.1	40.9	37.3	34.9
		47.8	62.9	56.2	50.6	46	42.2	39.4	37.6
		47.2	63.6	55.5	50.1	45.3	41.1	38.9	36.9
		47.4	71	56	49.8	44.8	40.7	36.8	34.9

		45.9	63	53.7	48.6	44.3	40.1	37.1	35.7
		55.8	82.7	69.6	49.4	45.1	41	37.6	36.2
		44.7	56.4	51.3	47	43.8	40.4	37.3	35.2
		46.5	59.9	54.8	49	45	41.6	38	36.4
	12:00	50.2	68.9	63	50.1	45.2	41.8	38.8	37
		46.8	61.8	56.1	49.4	44.6	41.7	39.7	37.5
		48.7	70	60.3	49.1	44.9	41.9	40.1	38.7
		50.8	70.6	57.9	53.2	48.7	44.4	42.6	41.5
		54.9	75.6	64.4	57.2	52	45.1	43.1	41.9
		51.5	68.3	62.2	55.6	46.8	44.3	42.3	40.6
		53.2	73	66.3	52.1	46.5	44.2	42.7	40.7
		47.3	65.7	54.7	49.1	46.1	43.8	41.9	39.7
	14:00	47.1	60.9	54.4	49.3	45.9	43.3	41.8	40.2
		48.9	68.3	57.2	50.3	46.3	43.9	41.7	40.5
		50.5	78	59.5	51.1	46.7	44.5	43.2	41.3
		49.9	74.6	59.8	51.3	46.6	44.1	42	39.9
		47.6	64.4	55.4	49.4	46.1	44	42.5	41.5
		50.9	73.3	60.1	52.9	47.6	44.7	43.2	41.3
		48.4	70.6	56.3	49.7	46.8	44.2	42.3	40.6
		48.5	68.6	56.5	50.3	47.1	44.1	42.6	41.1
	16:00	51.3	73.7	61.1	53.6	47.4	44.4	42.4	41.2
		50.4	74.8	60.1	51.4	47	43.9	40.8	39.5
		47.7	65.1	54.1	49.8	46.5	44.3	42.7	41.3
		49.8	65.6	60.5	51.4	47.3	44.8	42.1	39.9
		50.9	68.4	60.7	53.7	47.7	44.2	42.7	41.5
		55.2	75.5	67.2	57.6	49	45.9	44.4	42.5
		48.5	62.3	56.8	50.6	47.2	44.5	43.2	41.3
		48.3	64.8	56.3	50.1	46.9	44.6	42.1	40.7
	18:00	48.6	69.3	58.1	50.3	46.2	43.2	38.8	36.9
		48.6	62.7	56.1	51.6	46.9	43.8	42.3	41.4
		47.8	67.8	55.1	49.5	46.2	43.8	41	40
		48	67	58.4	49.8	45.8	43.6	40.8	39.2
		48.2	63.3	57.5	51.1	45.4	42.8	38.9	36.5
		45.8	66.8	52.9	47.5	44.8	41.7	39	37.8
		48.1	61.6	58	50.9	45.2	42.1	38.9	36.5
		47.9	69.3	59.5	47.8	44.1	39.2	37.2	36
	20:00	43.7	52.8	49.6	46.3	43	39	36.1	34.8
		44.9	67.4	52.3	46.5	43.1	38.9	36.7	35.4
		43.9	56.9	51.6	46.6	42.4	37.9	35.4	33.7
		43.9	62.7	52.6	46	42.4	37.8	34.9	33.7
		42.9	54.8	50.6	45.3	41.7	37.9	34.6	33.6
		43.3	61.1	50.5	45.8	41.7	38.2	36.2	35
		44.5	60.9	54.4	46.3	42.3	37.9	34.8	33.5
		42.2	61.4	48.3	44.2	40.8	36.9	35.5	34.6
	22:00	43.6	59.3	54.9	44.7	41.3	37.9	36.3	35.1
		42.9	60.2	50.4	45	41.3	37.7	36.4	35.5
		44.3	57.2	54.3	46.9	41.6	37.8	36.3	35.3
		42.8	59.7	53.6	44.3	40.1	37	35.6	34.3
		39.8	67.4	45	42.2	38.2	35.2	33.6	31.9
		39.4	65.6	46.6	42.2	37.5	34.6	33.5	32.5
		39.6	60.9	46.6	42	37.2	33.8	32.5	31.1
		39.1	57.3	47.2	41.5	37.3	34.6	32.9	31.8
12/11/2021	0:00	38	56	45	40.8	36.1	33.2	32.1	31.1
		37.3	47.7	44.7	41	34.9	32.9	31.7	30.3
		36.5	49.4	44.9	39.1	34.5	32.5	31.5	30.5
		36.9	49.4	43.3	39.2	35.8	33.2	31.9	30.8

		36.2	52.5	43.6	38.4	34.5	32.8	32	31
		34.4	45.7	41.6	36.3	33.2	31.2	29.8	28.8
		36.5	60.4	46.3	37	32.7	30.8	29.6	28.3
		33.6	48.4	42.9	37.1	30.1	27.9	26.9	25.9
	2:00	34.4	60.8	40.3	36.5	32.8	29.9	28.5	27.6
		32.5	44	39.9	34.7	31.3	29.3	27.9	26.7
		32.9	47.9	43	34.6	30.8	28.9	27.5	26.3
		35	50.3	44.4	38.1	31.5	29.6	28.2	26.7
		35	50.1	45.5	36.4	33	31.3	30.2	28.8
		33	44.3	41	35.6	31.3	29.3	28.5	27.6
		35.1	47.7	44.1	38.4	32.2	29.5	28.3	26.8
		38.7	64.1	50	37.8	31.9	27.9	26.9	25.3
	4:00	36.8	55.5	48	38.8	32.1	29.9	28.3	27.4
		37.8	48.4	44.6	40.5	36.4	33.5	31.9	30.6
		45	70.6	54.7	46.5	41	35.7	33	31.7
		40.5	60.7	50.5	43.8	36.7	33	31.8	31
		41.6	56	50.1	44.5	39.7	36.6	34.6	33.5
		43.4	60.4	49.4	46.4	42	38.4	36.6	35
		43.8	59.2	49.9	46.4	42.8	39.3	38	37.2
		46.3	70.2	52.7	48.4	44.8	41.1	38.6	37.6
	6:00	47.4	63.5	54.9	49.5	46.3	42.8	40.5	39.2
		49.2	68.7	57.3	50.3	47.6	44.4	42.7	41.3
		48.9	62.2	55.3	51.1	48	44.7	42.8	41.5
		50.1	73.8	57	51	48.7	45.7	43.9	42.9
		49.6	62.6	55.4	51.3	49	46.7	45.1	43.9
		51	72.1	58	52.3	49.5	47.6	46.2	45
		51.9	73.4	61.1	52.5	49.2	46.7	45	43.6
		51.6	80	61	51.5	48.8	46.4	45.1	44.3
	8:00	49.6	65.3	57	51	48.8	46.5	45.3	44.5
		50.6	67.8	59.6	52.4	48.8	46.9	45.7	44.5
		50.3	73.9	57.3	51.4	48.7	46.8	45.2	44.5
		49.9	66.5	58.2	52.5	48.1	45.8	44.3	43.2
		50.5	67	57.7	53.1	48.9	46.6	45	43.8
		49.2	63.2	56.1	51.7	48.2	45	43.4	42.4
		52	77.7	61.8	53.2	47.9	44.4	42.2	41
		47.9	63	57.2	49.8	46	42.7	40	38.5
	10:00	50.9	74.1	62.5	51.9	46.1	42.5	38.8	36.3
		50.6	73	61.9	52.6	46	42.4	39.9	39
		48.9	75.5	58.9	50.2	46	42.7	40.9	39.3
		58.8	80.6	73.9	52.3	46.4	42.4	39.1	36.7
		46.4	61.5	53.1	48.9	45.2	41.8	39.8	37.7
		47.9	69.6	54.8	50	46.5	43.5	41.7	40.2
		48.3	70.7	54.5	50.1	46.3	43.1	41.4	39.2
		48	65.3	55.6	50.3	46.5	43.1	41.1	39.3
	12:00	46.2	61.1	53.7	48.2	45.1	42.5	40.9	39.2
		47.8	65.8	58.5	49.2	45.5	42.5	40.9	39.2
		46.9	60.9	55.3	49.3	45.1	41.7	39.7	38.8
		53.8	75.4	68.6	50.3	45.6	42.2	40.5	38.6
		47.1	68.6	54.4	48.9	45.2	42	38.9	35.9
		49.7	68.5	60.6	51.8	46	42.7	40.2	36.9
		47.9	71.9	57.6	49.4	45.1	42.2	39.2	37.3
		46.3	60.3	55.4	48.3	44.7	41.7	38.7	37.3
	14:00	47.8	68.8	57.4	50	44.8	40.9	39.1	37.1
		46.8	62.7	56.2	49	44.3	41.2	39.2	37.6
		47.4	65.2	56.2	49.6	45.4	42.2	40.7	39.6
		47.8	64.1	56.3	50.1	46.2	43.6	42.1	40.9

		51.4	68.5	63.5	53.3	46.7	43.1	41.2	39.8
		48.6	64.2	59.9	50.2	46.2	43.7	41.6	39.6
		50.5	75.3	60.8	50.3	47	44.5	42.6	41.2
		49.5	66.1	56.6	51.9	48.2	45.8	44.4	43.5
	16:00	50.1	76.2	57	51.1	47.1	44.5	43	41.7
		50.6	64.5	60.5	53.2	48.4	45	43.6	42.3
		53.5	76.5	66.2	52.6	47.1	44.5	42.9	40.9
		48.8	67.1	57	50.3	47.2	45.2	43.7	42.7
		49.9	71.7	57.5	51.8	48.2	45.3	44.1	42.9
		50.9	74.3	59.9	51.9	48.8	46.7	45.3	43.3
		49	62.2	55.7	51.2	48	46.1	44.7	43.8
		49.5	61.8	57.8	51.4	47.9	46.1	45	43.9
	18:00	49.2	64.1	59.3	50.6	47.4	45.3	43.8	42.7
		48.2	62.8	54.1	50.1	47.3	45.6	44.7	43.9
		48.2	70.5	53.9	48.8	46.5	45	44.1	43.4
		49.6	63.9	59.9	51.7	47.1	44	42.6	41.5
		48	62.9	54.9	49.9	47.1	44.8	43.5	42.3
		49.5	73.7	57.7	51.1	47	44.6	43	42.2
		47.9	67.1	57	50.4	45.1	42.5	41.2	40.1
		45.7	59.6	50.7	47.6	45.1	42.5	40.9	39.6
	20:00	46.1	62.8	51.3	48.2	45.4	43.2	41.9	40.3
		45.7	63.7	51.9	47.1	44.8	42.7	41.4	40.6
		44.8	59.5	49.6	46.8	44.2	41.8	40.8	39.9
		46.2	70	53.1	46.4	44.2	42.2	41.1	40.1
		47	66	56.3	48.4	45.2	43.2	42.1	40.8
		45.4	64.4	50.3	46.9	44.5	42.5	41.3	40.4
		45.2	54.5	48.8	47.1	45	42.4	41.2	40.4
		44.9	58	50.6	46.9	44	41.9	40.7	39.5
	22:00	44.7	57.3	49.5	46.4	44.2	42.5	41.5	40.8
		45.4	64.2	56	46.5	42.8	40.4	39.3	38.5
		43.2	64.7	48.1	45	41.8	39.4	38.6	37.7
		42.8	58.6	49.4	45.1	41.6	39	37.5	36.4
		41.9	56.8	48	43.8	41.1	38.9	37.3	35.9
		42.5	52.7	47.3	44.8	41.8	39.5	37.7	36.5
		41.7	56.7	49.5	44	40	37.4	36.2	35.4
		41	53.6	49.4	43.6	39.4	36.3	35.2	33.6
13/11/2021	0:00	39.7	58.1	48.5	42.2	37.4	34.4	32.9	31.5
		37.1	50.7	43.2	39.6	35.9	33.9	32.7	31.5
		38.5	50.6	46.3	41.7	36.3	33.8	32.7	31.8
		37.2	50.4	44.3	39.9	35.7	32.7	31.2	30.3
		36.5	53.4	44.5	39.8	34.2	32.2	31.2	30.1
		36.4	50	43.7	39.1	34.8	32.5	31.3	30
		36.3	44.4	42.8	39.2	35	32.9	31.8	30.6
		35.8	53.3	44.1	38.1	34.1	31.6	30	28.5
	2:00	34.7	52.3	42.2	37.3	33.3	31.1	30.1	28.7
		35.7	48.7	43.6	37.6	34.4	32.7	31.5	30.3
		40.4	52.5	47.8	39.9	35.6	32.6	31.3	30.4
		40.5	55	50.8	43.1	36.2	33.3	31.6	30.7
		37.8	50.7	45	40.3	36.5	33.7	32.2	30.6
		39.3	54	48.6	42.5	36.3	34.4	33	31.3
		41.3	59.1	50.6	44.9	37.3	34	32.9	31.8
		36.5	49	45	38.8	34.9	32	30.1	29
	4:00	38.3	55.5	47.8	40.3	35.9	33.6	32.5	31.3
		39.8	58.9	49.2	41.6	37.3	34.9	33.8	32.8
		40.8	55.2	50.1	43.2	38.8	35.2	33.9	32.1
		43.1	64.7	52.7	43.9	39.6	36.9	35.2	33.6

		41.7	52.2	48.5	44.4	40.6	37.8	36.3	35.1
		42.8	51.2	48.4	45.6	41.8	39	37.9	36.9
		46.1	66.7	51.3	48	44.7	42.1	40.3	38.9
		46.5	56.4	51.1	48.3	46	43.6	42.5	41.6
	6:00	48.3	63.9	55.1	49.8	47.5	44.9	42.7	41.4
		49.4	64.9	57.2	50.6	48.5	46	44.4	43.4
		51.6	71.3	60.6	52.6	50	47.6	46.2	44.9
		51.4	72.8	58.8	52.5	50.3	48	47	45.4
		51.2	72.7	56.6	52.3	50.5	48.9	48	47.3
		52.1	69	60.9	53.1	50.5	48.9	47.7	46.7
		51.9	75	59.7	52.8	50.3	48.9	48.1	47.1
		51	64.2	56	52.3	50.6	49.2	48.3	47.5
	8:00	53.1	70	64.5	53.8	50.6	49.1	48.1	47.1
		51	69.1	56.6	52.5	50.1	48.4	47.5	46.7
		50.4	61.5	54.5	51.9	50	48.4	47.4	46.3
		51.5	69.5	58.9	53.3	49.9	48.2	46.9	46.1
		55	68.5	61.3	58.2	53.9	47.8	46	44.8
		49.6	62.1	56.9	51.5	48.8	46.1	45.1	44
		50.6	71.9	59.6	52.1	48.7	46.1	44.8	43.6
		48.1	64.2	53.1	50	47.6	45	43.3	41.6
	10:00	47.5	64.6	53.9	49.5	46.8	43.8	42.6	41.8
		56.7	75.8	71.1	52.6	46.8	44.1	42.4	40.7
		49.8	71.8	62	50	45.7	42.7	41.2	39.7
		51.3	77.9	62.1	49.5	45.9	42	39.7	38.1
		48.2	67.3	59.5	49	44.9	41.3	38.9	37
		47.2	64.6	55.5	49.4	45.6	41.8	39	37.6
		48.3	70.1	57.5	49.8	45.3	41.3	37.8	36.1
		46	66.6	54.1	48.4	44.2	40.2	37.8	35.6
	12:00	49.2	76.6	60.1	49.8	44.3	40	37.8	35.6
		48.6	70.4	59.5	49.2	45	41.3	38.7	36.7
		46.2	64.1	55	48.1	44.5	41.3	38.5	35.2
		52.3	68.7	58.6	56.8	46.9	42.1	39.3	37.1
		56.5	75.9	62.4	60.2	54.6	51.4	44.9	43.6
		60.4	69.2	67.6	64.4	58.9	43.1	39.1	37.1
		59.5	76.7	65.6	63.7	56.7	46.9	41.5	39.2
		56.3	70.9	63.9	59.5	55.4	45.5	40.8	38.2
	14:00	53.8	72.6	61.9	57.9	47.2	42.8	39.7	38.2
		48	69.7	58.4	50	44.8	41.9	37.5	34.3
		49.5	71.3	60.3	52	45.7	41.5	38.4	36.1
		49.8	74.1	60.2	50.4	45.4	42.2	40.1	38.3
		53.8	78.4	67.5	52	46	43.2	38.9	36.8
		48.1	65.4	57.6	50.7	45.5	42.7	38.4	34.4
		47.6	69.4	55.6	48.3	45.5	42.8	39.2	36.6
		49.8	69.4	61.3	51.4	46.1	41.6	37.7	35.7
	16:00	47.8	70	54.8	49.9	45.3	42.1	38.5	36.6
		49.1	66.9	59	51.6	46.5	42.6	37.2	35.5
		48.2	63.9	56.6	50.7	46.3	43.4	41.7	40.2
		51.9	74.1	64.6	51.7	47.4	44.1	42.2	40
		54.9	77.5	67.5	55.3	46.9	44.5	42.8	41.7
		50	77.1	58	50.8	46.7	43.7	42.3	40.2
		47.4	59.2	55.7	50	45.4	43	41.8	40.9
		47.9	62.6	55.9	49.8	46.6	43.9	41.5	40.1
	18:00	48.3	63.6	56.2	50.5	46.8	44.4	42	38.9
		49.2	74	57.8	49.3	46.5	44.3	42.6	41.2
		46.8	62.8	52.9	49.3	45.7	43.3	41	39.5
		47.9	66.6	56	49.5	46.4	44.4	42.8	41

		48.7	62.3	57.3	51.2	46.9	44.2	42.6	41.6
		48.7	59.8	57	51.5	46.9	44.2	42.7	41.4
		47.6	59.6	56.2	48.9	46	43.7	41.2	39.9
		46.8	59.7	50.9	48.8	46.4	43.4	41.6	40.5
	20:00	45.4	55.8	49.6	47.4	45.1	42.2	40.8	39.3
		46.4	63.1	54.2	47.9	45.3	42.9	41.5	40.6
		45.9	57.3	51	48	45.3	43.1	42.1	41.2
		48	75.7	56.5	48.4	45.9	44.1	43	42.2
		46.4	69.5	49.6	47.9	46.1	44.2	43	42
		46.7	57.1	50.8	48.8	46.1	44.1	42.7	41.6
		47.8	65.7	55.8	49.4	46.3	43.8	42.5	41.2
		46.8	69.7	52.9	48.2	45.4	43.5	42.5	41.7
	22:00	45.1	59.7	49.3	47.2	44.6	42.6	41.1	39
		45.4	57.2	51.6	47.6	44.5	42	41	40.1
		44.1	49.6	47.9	46.2	43.5	41.6	40.4	39.5
		44.3	51.5	48.6	46.7	43.6	41.3	39.8	38.6
		44.9	59.6	52.8	46.9	43.5	41.3	40	39
		42.7	59.3	48	45.5	41.6	39.3	38.1	37.4
		41.7	63.6	47.1	44	40.7	38.4	36.6	35.7
		41.3	55	47.8	43.8	40.1	37.7	35.7	34.9
14/11/2021	0:00	40.3	47.9	45.6	42.9	39.2	36.9	35.5	34.4
		38.7	53.6	44.4	40.9	37.6	35.9	34.9	33.9
		38.3	48.1	44.7	41.2	36.9	34.5	33.5	32.5
		38	49.6	44.8	40.5	36.6	34.6	33.7	32.8
		37	51.6	43.3	39	35.8	33.9	33	31.7
		37.2	50.8	45.5	39.5	35.3	33.3	32.4	30.9
		36.8	48.2	43.2	38.9	35.8	33.7	32.5	31.3
		36.9	46.3	43.1	39.3	35.8	34.1	33	31.9
	2:00	37.4	55.6	43.6	39.3	36.4	35	34.3	33.7
		37.4	45.3	43	39.2	36.7	34.8	33.8	32.9
		38.2	47.8	42.6	40.2	37.6	35.6	34.5	33.7
		39.8	49.5	45.2	42.2	38.9	37.4	36.5	35.5
		39.8	48.6	44.8	41.9	39	37.3	36.4	35.1
		38.7	48.7	44.2	40.2	38.1	36.6	35.5	34.8
		39.5	62.4	45.7	41.4	38.4	36.9	35.8	34.7
		39.3	52.4	43.8	41	38.6	37.2	36.3	35.4
	4:00	40.8	52.4	47.7	42.9	39.7	37.9	36.9	35.9
		40.9	52.8	47.1	43.1	39.8	38.2	37.1	36.3
		42.4	58.4	50.2	44.3	40.8	39.1	38	36.8
		44.5	60.6	53.3	46.9	42.3	40.2	38.8	37.5
		42.7	52.4	48.1	44.9	41.9	40.3	39.4	38.3
		45.5	65	51.8	47.5	44	42.3	41.4	40.3
		46.6	63.3	52.4	48.4	45.7	43.2	42	41
		46.6	62.9	52.2	48.5	45.3	42.9	41.9	41.2
	6:00	47.6	65.1	54.2	49.6	46.3	43.6	42	40.8
		49.4	73	57.6	50.8	47.8	45.1	43.2	41.3
		51.7	76.5	58.7	51.3	48.6	46.1	44.9	44.1
		51	73.4	59.2	51.4	49.1	46.7	45.5	43.9
		49.6	70.7	57.5	50.8	48.5	45.9	44.1	43
		49.8	66.6	56.3	51.7	48.9	46.1	44.7	43.6
		51.6	76.2	59.8	51.5	48.6	46.2	45.2	43.8
		51.4	71.2	63.5	51	48	46	44.7	43.4
	8:00	48.9	64	57.1	50.5	47.6	45.1	43.2	41.8
		48.2	60.6	55.3	50.1	47.2	44.6	43.4	42.2
		48.8	66	57	50.1	47.7	45.2	43.1	42.2
		50.3	69.6	59.7	52.7	47.9	45	42.9	42

		50.4	77.1	57.1	51.9	47.8	45.1	43.1	41.7
		50.1	71.4	60.1	51.6	47.9	43.7	41.5	39.5
		53.1	81.1	61.2	51.2	47.5	44.4	42.5	40.7
		48.5	72.2	54.5	49.7	46.9	44.1	42.8	41.6
	10:00	48	64.7	55.3	50	46.9	43.8	42.5	41.1
		52	69.8	63.9	53.6	47.4	43.7	40.9	39.9
		52.2	80	63.1	51.6	47.6	43.7	41.5	39.2
		47.2	56.2	52.1	49.5	46.6	43.6	42.1	41.3
		50.2	77.5	57.4	50.2	45.8	42.2	40.4	38.9
		47.7	60.6	54.4	50.2	46.5	43.2	41.1	39.8
		47.2	61.3	54.9	49.4	46	43.2	41.8	40.8
		47.2	64.9	53.7	49.5	46.1	42.7	40.3	39.3
	12:00	48.6	66.9	57.5	50.1	46.4	43.9	41.8	40.9
		48.2	72.4	55.5	50.4	46.7	43.4	40.8	39.3
		48.1	66.6	56.4	50.7	46	43	40.7	39.4
		46.7	63.7	54.8	48.4	45.6	43	41.1	39.7
		47.5	66.5	56.7	49	45.5	42.6	41	39.6
		50.1	70.7	62.2	49.9	46.2	43.5	41.2	40.2
		56.4	78.5	70.8	51.1	46.1	44.1	42.3	41.2
		47.7	61.1	55.9	49.7	46.5	43.4	41.6	40.2
	14:00	49.3	72.9	58.4	51.7	46.5	43.4	41.4	40.6
		48.7	72.1	55.9	49.4	46.1	43.2	41.6	40.7
		48.9	68.2	57	50.3	47.4	44.9	43.1	41.9
		48.2	61.4	56.5	50.4	46.5	44.8	43.2	41.9
		58.5	72.6	66.4	64.3	48	43.8	41.8	40.2
		63.8	77.3	68.3	66.2	63.3	59.9	48.5	44.6
		62.8	71.3	66.3	64.8	62.5	56.2	44.8	43.1
		62.6	69.5	67	65.3	62.1	55.1	45.6	43.2
	16:00	64.7	72.7	68.2	66.6	64.6	62.1	46	42.9
		57.4	78.4	68.9	66.6	63.5	58.2	44.4	42.9
		55.6	75.2	61.1	59.4	55.9	47.7	44.4	43
		58.8	79.1	63.7	60.8	57.2	60.7	50	46.9
		61.4	78.2	64.8	62	59	48.9	45.6	43.9
		61.5	77.5	64.1	61.1	57.5	46.3	44.6	43.3
		49.7	64.2	58.1	51.9	48.2	45.7	44.2	43.1
		49.5	66	57.1	51.8	48.1	45.7	44.5	43.6
	18:00	50.1	61.7	57.4	52.1	49	46.9	45.4	44.4
		49	61.4	55.5	51.2	48	45.8	44.4	42.5
		51.8	68.3	58.6	55.6	48.8	45.5	43.2	41.9
		54.9	74.7	65.1	57.9	51.6	47.4	44.9	43.4
		55.9	75.9	67.3	58.6	51	47.1	44.5	41.9
		48.1	67	55.8	50.2	46.8	44	41.9	40.6
		47.8	65.6	57.2	48.9	46.4	43.8	41.2	40.1
		48.6	61.5	57.1	51.2	47.1	43.7	42	40.6
	20:00	48.3	70	59.1	48.4	45.5	42.8	41.4	40.1
		47.9	64.4	57.4	50.1	45.7	42.7	41.2	39.8
		45.7	57.1	53.3	47.7	44.6	41.6	40.4	39.4
		46.5	63.2	54.6	48.4	45.2	42.5	40.3	39
		46.5	60.2	55.5	48.3	44.8	42.3	40.8	39.5
		45.9	60.8	54.2	47.6	44.8	42.3	40.6	39.6
		47	62.3	57.3	48.9	44.6	41.9	40.2	39.2
		47.1	68.9	55.9	47.9	44.8	41.7	39.3	37.9
	22:00	46.4	63.6	57.7	47.1	43.8	41.3	40	39.1
		45.5	61	55.6	47.3	43.4	41	39.5	38.3
		44.1	56.5	49.3	46.4	43.3	41	38.1	36.7
		43.8	56.4	50.3	46.7	42.5	39.5	37.6	36.8

		42.9	57.3	50.7	45.2	41.3	38.9	37	35.5
		42.1	59.8	49	44.6	41.1	37	35.3	33.9
		40.9	59.3	46.4	43.6	39.3	37	35.2	34.5
		42.4	61.3	51.2	44.2	40.2	37.1	35.9	34.7

APPENDIX C

Acoustic Comparisons

16 Chapman Street, Werrington NSW

Sound Levels Projected at the Child Care Centre Compared to Common Noise Events

NOISE LEVEL (dB)		THE LEVEL OF COMMON SOUNDS	PROJECTED SITE NOISE	
			OUTDOOR	INDOOR
	Threshold of Pain			
140		Jet Engine (25 metre distance) – 140 dB		
130				
120		Jet Take-Off (100 metre distance) – 120 dB		
	Extreme			
110		Rock Band		
		Chainsaws at 25 metres (104dB – 107dB) Jet Flyover at 400 metres - 105dB		
100				
	Very Noisy			
90		Pneumatic Drill		
		Heavy Truck, 40km/h, 7m distance (87dB - 90 dB)		
80		Motor Car at 7 (80dB) Motor Bikes (2-Wheel) 70dB – 92dB)		
	Noisy	Average Street Traffic (40km/h, 7 metre distance)		
70				
		Lawn Mower at 30 metres 70dB Vacuum Cleaner at 3 metres - 67dB Normal Speech at 1 metre - 65dB Business Office (60dB – 65dB)		
60		Inside an Average Residence- 60dB		
	Moderate	Large Business Office 60dB (55dB – 65dB)		
50		Dishwasher – Next Room 50dB		
		Typical Living Room at Night (40dB – 45dB)		
40				
	Quiet			
		Library (30dB – 34dB)		
30		Soft Whisper at 2 metres 30dB		
		Typical Bedroom at Night (25dB – 30dB) Concert Hall Background 24dB		
20		Slight Rustling of Leaves 20dB		
	Almost Silent	Broadcast & recording Studio 16 dB		
10				
0	***Silent***	Threshold of Human Hearing		

External Sound Levels (dBA, LAeq) | Internal Sound Levels (dBA, LAeq)

(Source: Australian Acoustic Association; NG Child & Associates)

APPENDIX D

Noel Child
Summary of Qualifications, Capability & Experience

1 PERSONAL DETAILS

Full Name: Noel George CHILD
Profession: Consultant in Environmental Assessment and Management
Date of Birth: 6th December 1946
Nationality: Australian
Experience: > 30 Years
Address: 22 Britannia Road, Castle Hill, NSW, 2154
Contact: **Phone**: 61 2 9899 1968 **Fax**: 61 2 9899 1797 **Mobile:** 0409 393024

2 CAPABILITY AND EXPERIENCE - SHORT SUMMARY

Noel Child is a successful and experienced commercial and technical professional with over 30 years' experience in a variety of senior level appointments and assignments, within both the corporate and private sectors, with a particular focus on strategic, infrastructure and environmental applications.

Noel's experience includes senior management at both the State and National levels in the Australian petroleum industry, and a number of senior consultancies for both government and corporate clients. His record reflects the ability to develop and achieve positive commercial outcomes through effective planning and communication; critical and objective analysis; and quality task completion and delivery at both the personal and team level.

His management responsibilities have included transport, environmental, safety, and general operational activities at a national level, while his formal professional training includes strategic management, environmental, engineering and business disciplines. He has undertaken a number of senior corporate appointments with distinction and been successfully involved in the ownership and operation of a major petroleum distribution and marketing company in regional Australia. More recently, working through his own businesses Environment Australia and NG Child & Associates, he has applied his knowledge and experience in the areas of strategic management, infrastructure development, energy and the environment on a consultancy and contractual basis to a number of private and public-sector clients, both nationally and internationally.

Noel has had post-graduate training in several technical and commercial disciplines, and provides specialised teaching input, by invitation, to post graduate engineering and business management courses conducted by the Faculties of Business and Engineering at Sydney's University of Technology. He has strong affiliations with a number of international corporations and agencies and has worked closely with both the regulators and the regulated in a number of aspects of environmental management, assessment and performance. He has also been recognised as an independent expert on engineering, and environmental issues by the Land and Environment Court of NSW.

Noel has a detailed understanding of environmental engineering and associated processes and has specific experience and expertise in the fields of acoustics, air quality, electromagnetic field assessment, electrolysis and stray current assessment, contaminated site assessment, and liquid and solid waste management. He also provides post graduate teaching input on environmental engineering issues to post graduate courses at the University of Technology, Sydney, and La Trobe and Monash Universities in Melbourne.

3 EDUCATION, QUALIFICATIONS AND AFFILIATIONS

BE, PhD (Chemical Engineering), UNSW, Sydney
Master of Business Studies, University of New South Wales, Sydney
B.Sc. (Hons) Applied Chemistry (Environmental), University of Technology, Sydney
Graduate Diploma (Environmental Engineering and Management), UNSW, Sydney
Qualified Environmental Auditor, Standards Australia
Member, Royal Australian Chemical Institute, 1972/2021
Member, Institution of Engineers, Australia, 1972/2021
Member, Clean Air Society of Australia and New Zealand, 1992/2021
Member, Australian Natural Gas Vehicle Council, 1996/2004
Executive Director, Australasian Natural Gas Vehicles Council, 2003/2004
Visiting Fellow, Institute for Sustainable Futures, UTS, 1995/2002
Research Fellow, Faculty of Civil & Environmental Engineering, UTS, 1996/2021
Research Associate, New York Academy of Sciences, 2000/2021

4 RECENT ASSIGNMENTS & EXPERIENCE

Mostyn Copper (2016 – Current) – Assessment of air quality, acoustic, electromagnetic field and site contamination issues associated with a number of childcare centre projects undertaken by the Mostyn Copper Group and clients throughout the Sydney metropolitan area.

Mostyn Copper & the ATC (2017 – Current) – Environmental assessment of various aspects of the Coopers Paddock site near the ATC racecourse at Warwick Farm.

Boskovitz Lawyers & Ceerose Construction (2019 - Current) – Independent assessment of acoustic, air quality and electromagnetic field issues associated with a proposed childcare centre development at Willoughby Road Willoughby for submission to the NSW Land and Environment Court,

Lodestone HQ (1998 - Current) – Environmental assessment of proposed childcare centre development at the Princes Highway Kirrawee NSW, and several previous childcare centre developments over a twenty year period, including acoustic, electromagnetic field, air quality and site contamination considerations.

Government of the PRC & Thyssen Transrapid Australia (2004 - Current) – Adviser on technical and operational issues associated with the development and construction of a high-speed magnetic levitation train systems within the People's Republic of China, and elsewhere, including electrolysis, electromagnetic and stray field effects.

The Bathla Group (2014 - Current) – Environmental assessment of a number of residential development projects for submission to local government consent authorities, or the NSW Land and Environment Court, including acoustic, air quality, site contamination and environmental management issues.

Trumen Corporation (2006 - Current) – Environmental assessment, including electromagnetic field, acoustic and contamination assessment and certification, of mixed use, childcare centre and industrial unit and self-storage development projects throughout the Sydney metropolitan area.

Montessori Academy (2012 - Current) – Independent audit and assessment of acoustic, air quality and electromagnetic field issues associated with a range of childcare centre and early learning developments throughout the Sydney area, and in the ACT.

Archidrome Architects (2003 - Current) – Environmental assessment of a range of proposed childcare centre developments throughout NSW, including general environmental, acoustic assessment, air quality and electromagnetic field assessment.

Dr James Smith SC (2018 – Current) – Provision of specialist advice and delivery of expert evidence regarding a number of cases, including acoustic, electromagnetic and site contamination issues.

Australian Consulting Architects (2010 – 2019) – Acoustic, electromagnetic, stray current and electrolysis assessments of development projects a Field Place Telopea; Windsor Road Vineyard; Camden Valley way Horningsea Park and others.

Futurespace/Renascent (2008 - 2018) – Environmental assessment of proposed childcare centre developments at Waterloo Road Macquarie Park and Cleveland Street Strawberry Hills, including general environmental, acoustic assessment, air quality and electromagnetic field assessment.

Commonwealth Bank (2016 – Current) – Environmental assessment, including general, acoustic, air quality, electromagnetic field and wind impact assessment, of a childcare centre development to be located on Level 2 of Darling Park Power 2, Sussex Street, Sydney.

LEDA Holdings – Environmental Assessment of a proposed childcare centre at 32 Cawarra Road Caringbah NSW, including general environmental, acoustic, air quality and electromagnetic field assessments.

Universal Property Group (Current) – Environmental assessment of a proposed multi building, multi-level residential development at Garfield Street, Wentworthville NSW, including general environmental, acoustic, site and soil contamination and preliminary geotechnical assessments.

Gundagai Meat Processors (Current) – Review and enhancement of solid and liquid waste processing and management systems at GMP's Gundagai abattoir, including the on-site treatment of waste streams from meat processing and other operations.

Campbelltown City Council (Current) – Peer review of acoustic assessments submitted to Campbelltown City Council regarding assessment of the acoustic impacts of developments including a major truck maintenance facility and the expansion of Macarthur Square shopping centre, including the conduct of noise measurements.

Brenchley Architects (2009 - Current) – Acoustic assessments of proposed residential and commercial developments at Elizabeth Street Sydney; Spit Road Mosman, Botany Road Waterloo, Cranbrook Street, Botany and Bellevue Hill Road, Bellevue Hill NSW.

Bovis Lend Lease (20010 -2017) – Environmental assessment of a major development site at Darling Walk, Darling Harbour NSW, including a detailed review of air quality, electromagnetic field and acoustic issues for review by the NSW Department of Planning.

Penrith City Council (2012 - 2016) – Preparation of the ongoing Penrith City Council response to the NSW Government Long Term Transport Plan, including consideration of transport and associated environmental issues affecting the Penrith Local Government Area.

Western Sydney Mayoral Forum (1998- 2015) – Environmental assessment and review of the development of a second Sydney airport at Badgerys Creek, including assessment of acoustic and electromagnetic field impacts.

Michael Bell Architects & Clients (2004 to Current) – Assessment of the environmental impacts, including acoustic impacts, associated with various childcare centre applications in suburban Sydney, and the Sydney CBD, including the development of plans for the management and control of such impacts.

NSW Roads & Traffic Authority (2004 to 2018) – Review of international technologies, systems & applications in relation to the treatment of motor vehicle exhaust emissions and associated air pollution within and discharged from road tunnels, in accordance with the conditions of approval for the M5 East Motorway

Federal Airports Corporation (1995 - 2017) – Environmental studies for the Sydney West Airport, including consideration of air quality, acoustic and electromagnetic and radio-frequency issues.

Isuzu-GM (2003 to 2018) – Representations to Environment Australia and the Department of Transport and regional Services regarding the emission performance standards of Japanese sourced medium and heavy natural gas trucks, with the aim of having the current Japanese emission standard accepted within the Australian design Rule 80 series of vehicle emission standards.

City of Sydney (2005 - 2007) – Assessment of air quality and odour issues associated with a proposed redevelopment of craft studios and associated facilities at Fox Studios, Moore Park, Sydney, and review of air quality monitoring stations in the Sydney CBD area, in part as a basis for monitoring the air quality and potential health cost impacts of transport congestion and modes.

Warren Centre for Advanced Engineering, University of Sydney (2000 to 2003) – Contribution to the report "Sustainable Transport for Sustainable Cities", a major government and private enterprise funded study into the future sustainability of transport in Sydney and adjoining regions, including in particular a review of associated environmental issues. Study received the 2003 Bradfield Award for Engineering Excellence from the Australian Institute of Engineers.

United Kingdom Department of the Environment (1994) – Contribution to the development of revised environmental guidelines for air, soil and groundwater water quality.

United States Environmental Protection Agency (1994) - Contribution to an international team developing strategies for the control and management of air pollution in seven major US cities.

5 CORPORATE EXPERIENCE

NG Child & Associates

- **1992--Present**, Managing Principal - Responsible for all aspects of the conduct of a specialist private engineering and environmental consultancy, including administration, marketing, team coordination and technical and professional delivery.

Western Fuel Distributions Pty Limited, Australia

- **1984-92** Managing Principal. - Responsible for all aspects of the management and development of one of the largest private petroleum distributorships then operating in Australia, with a peak annual sales volume of 70 million litres, turnover of $30 million per annum, a direct staff of thirty, and a network of some 40 retail and wholesale agency outlets. This position included direct personal accountabilities for all aspects of storage, distribution and environmental performance.

Caltex Oil Australia Limited

- **1982-84** General Manager, Marketing and Operations. Responsible for the management and operation of Caltex Australia's marketing, storage, warehousing, distribution, environmental and safety functions, including seaboard terminal and marine operations.
- **1980-82** National Consumer Marketing Manager. Responsible for Caltex Australia's national consumer, industrial and distributor marketing activities.

Golden Fleece Petroleum Limited

- **1977 - 1980** Manager Operations, NSW. Responsible for the overall management of the distribution, warehousing, seaboard terminal and lubricant production activities of Golden Fleece Petroleum in New South Wales, including environmental, occupational health and safety matters.

Esso Australia Limited

- **1976-77** SA Manager, Marketing and Operations. Responsible for all aspects of the management of Esso's petroleum, lubricant and LPG storage, distribution and marketing throughout South Australia.
- **1975-76** Refinery Manager. Responsible for all engineering, operational and environmental aspects of the joint Esso/Mobil refinery at Port Stanvac in South Australia.
- **1975** Manager, Process Operations, Port Dixon Refinery, Malaysia. Six-month special assignment at the Esso Petroleum Refinery, Port Dixon, Malaysia.
- **1971-75** Senior Analyst, Logistics and Corporate Strategy Departments, Esso Sydney Head office.

6 SOME REPORTS & PUBLICATIONS

- **High Speed Rail – Benefits for the Nation,** Keynote address at the UNSW Institute of Environmental and Urban Studies International High-Speed Rail Seminar, August 2018.
- **Electromagnetic Impact of Magnetic Levitation Trains,** Report to the Shanghai Municipal Transport Commission detailing constraints associated with electromagnetic field impacts, September 2017)
- **The M5 East Road Tunnel: Implications for Ventilation, Air Quality and Emission Treatment Systems**, International Road Transport and Tunneling Forum, Graz Austria, May 2016.
- **Sydney's High Residential Growth Areas: Averting the Risk of a Transportation Underclass**, World Transport & Environmental Forum, Reims France, June 2014.
- **Review of Options for the Treatment or "Filtration" of Tunnel Gases and Stack Emissions**, City of Sydney. January 2014
- **M5 East Freeway: A Review of Emission Treatment Technologies, Systems and Applications**, NSW RTA and NSW Department of Planning, April 2004; June 2008; September 2010)
- **High Speed Trains in Australia: Connecting Cities and Energising Regions**; with the Hon Peter Nixon AO, October 2010.
- **Transport Fuels in Australia: The Folly of Australia's Increasing Reliance on Imported Crude Oil**, Submission to the Australian Senate Rural and Regional Affairs and Transport Committee Inquiry into Australia's Future Oil Supply and Alternative Transport Fuels, February 2006.
- **The Japan 2003 CNG Emission Standard & the Emission Performance of the Isuzu 4HF-1-CNG: The Case for Acceptance under ADR80**. Submission on behalf of Isuzu GM Australia to the Commonwealth Department of Transport and Regional Services, June 2004.
- **Sustainable Transport for Sustainable Cities**, Warren Centre for Advanced Engineering, Sydney University, January 2003
- **Future Directions: Challenges & Opportunities in the Australian CNG Vehicle Industry**, ANGVC, December 2002
- **Engineering and Environmental Aspects of Enclosing the Cahill Expressway Cutting**, City of Sydney, May 2001.
- **High Speed Rail in Australia: Beyond 2000** (with the Hon Peter Nixon), November 2000
- **M5 East Motorway: Proposed Single Emission Stack at Turrella – Review of Air Quality Impacts and Consideration of Alternative Strategies**, Canterbury City Council, February 1999

7 PERSONAL & PROFESSIONAL REFERENCES

- The Hon Peter Nixon AO, Former Federal Transport Minister
- John Black, Professor Emeritus of Civil & Transport Engineering, University of NSW
- The Hon Frank Sartor, former Lord Mayor of Sydney; Former NSW Government Minister.
- Dr Jack Mundey, Past Chairman Historic Houses Trust, Environmentalist
- Mr Stephen Lye, Development Manager, Trumen Corporation, Sydney.
- Mr Peter Han, Project Director, Commonwealth Bank, Sydney
- Mr Michael Bell, Principal, Michael Bell Architects, Sydney.
- Mr Graeme Allen, Director, the Bathla Group
- Mr Luke Johnson, General Manager, Wollondilly Shire Council
- Mr Bernie Clark, Chief Executive, Thyssen Australia
- Mr Bruce Glanville, former Managing Partner, Deloitte Canberra
- Alex Mitchell, Journalist

Noel G Child
16 November 2021

ATTACHMENT A
Client Reference List

Acre Woods Childcare Pty Ltd
Australian Commonwealth Environmental Protection Agency
Australian Consulting Architects
Australian Federal Airports Corporation
Australian Federal Department of Transport and Regional Development
Bovis Lend Lease
Brenchley Architects
Campbelltown City Council
Canterbury City Council, Sydney, NSW
Commonwealth Banking Corporation
Environment Protection Authority of NSW
Exxon Chemical
Fairfield City Council, Sydney, NSW
First Impressions Property
FreightCorp, Sydney, NSW
Futurespace
GM - Isuzu
Guangxi Environment Protection Bureau
Gundagai Meat Processors
Hong Kong Department of the Environment
Hornsby and Ku-ring-gai Councils, Sydney, NSW
John McCormack
Kaunitz Yeung Architecture
LEDA Holdings
Michael Bell Architects
Minter Ellison
Mobil Oil Australia Associated
NSW Roads & Traffic Authority
Ove Arup & Partners
Qantas Airways
Queensland Ports Corporation
Renascent
Salibeau Pty Ltd
Shell Australia
Sinclair Knight Merz
Skouras and Mabrokardatos
Southern Sydney Regional Organisation of Councils (SSROC)
State Rail Authority of NSW
Stephen Davidson Property Investments
Sydney Skips & Galaxy Waste
The City of Sydney
The Western Sydney Alliance of Mayors
Thyssen Krup Transrapid Australia
Tom Howard QC
Trumen Corporation
UK Department of the Environment
United States Environment Protection Agency
University of Technology, Sydney
Warren Centre for Advanced Engineering, University of Sydney
Waverley Council, Sydney, NSW
Western Sydney Parklands