



Wongawallen Drive, Yarrabilba: Noise Impact Assessment

ASSURED ENVIRONMENTAL

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Table 1: History of Revisions

Revision	Date	Issued to	Changes
R0	1/5/2020	M. Clayton	Initial Release
R1	7/05/2020	M. Clayton	Inclusion of reverse amenity impacts

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GLOSSARY

A-Weighting	A response provided by an electronic circuit which modifies sound in such a way that the resulting level is similar to that perceived by the human ear.
Background Noise	Noise level at a given location and time measured in the absence of any alleged noise nuisance sources. Typically, represented by the L_{A90} noise statistic.
Calibrator	An instrument used to carry out 'field calibrations' before and after monitoring to ensure the sound level meter does not drift.
dB (decibel)	This is the scale on which sound pressure level is expressed. It is defined as 20 times the logarithm of the ratio between the root-mean-square pressure of the sound field and the reference pressure (0.00002 N/m^2).
dB(A) or dBA	This is a measure of the overall noise level of sound across the audible spectrum with a frequency weighting (i.e. 'A' weighting) to compensate for the varying sensitivity of the human ear to sound at different frequencies.
Fast Time Weighting	Frequency the sound level meters records noise levels. Fast time weighting is every 125 ms.
Free-field	Refers to a sound pressure level determined at a point away from reflective surfaces other than the ground with no significant contribution due to sound from other reflective surfaces; generally, as measured outside and away from buildings.
L_{Aeq}	This is the equivalent steady sound level in dB(A) containing the same acoustic energy as the actual fluctuating sound level over the given period. Noise levels often fluctuate over a wide range with time. Therefore, when a noise varies over time, the L_{Aeq} is the equivalent continuous sound which would contain the same sound energy as the time varying sound. Many studies show that human reaction to level-varying sounds tends to relate closer to the L_{Aeq} noise level than any other descriptor.
L_{Amax}	The A-weighted, maximum, sound level. It should be noted that maximum noise levels are not peak levels.
L_{Amin}	The A-weighted, minimum, sound level.
L_{An}	The A-weighted, sound level exceeded for n% of the measurement period with A-weighted, calculated by statistical analysis - where n is between 0.01% and 99.99%. L_{A10} is representative of traffic noise. L_{A90} is representative of background noise.

ABBREVIATIONS

EPP (Noise)	Environmental Protection Policy Noise 2019
YPDADS	Yarrabilba PDA Development Scheme
LCCPS	Logan City Council Planning Scheme



1 INTRODUCTION

Assured Environmental (AE) was commissioned by Urbicus to undertake a reverse amenity noise assessment for a proposed commercial development including a childcare centre to be located at Wongawallen Drive, Yarrabilba.

The assessment has been undertaken in accordance with the following codes and policies:

- Yarrabilba PDA Development Scheme (YPDADS);
- Logan Planning Scheme Policy 3 – Environmental Management; and
- Environmental Protection (Noise) Policy 2019.

In accordance with the requirements of the above codes and policies, computational modelling and first principle calculations have been undertaken to assess the potential for adverse amenity impacts as a result of the development.



2 PROPOSED DEVELOPMENT

2.1 Development Description

The proposed development is located at 5-27 Wongawallan Drive on Lots 1 & 2 on SP279789. The site has an area of 9,904m².

The proposed development is defined as retail (showroom taking four tenancies) and service, community and other use category (childcare centre) in accordance with the Yarrabilba PDA Development Scheme (the Scheme).

The development will comprise two (2) buildings, one of which is intended to be occupied by commercial uses and second building to form the childcare centre with car parking facilities for a total of 92 vehicles.

2.1.1 Commercial Uses

The proposed development includes four (4) primarily Showroom tenancies (identified as Tenancy 1, 2, 3 and 4 in Appendix A), which are understood to potentially incorporate Food and Drink Premises and Indoor Sports and Recreation.

To the east of the development site (across Wongawallan Drive) is a retail centre including Coles supermarket. Uses to the west of the site are not yet constructed however future uses are understood to include a dental surgery, physio, skin clinic and specialist centre / day hospital.

With the exception of the Coles supermarket, fixed plant and equipment noise is expected to be limited to small to medium air conditioners with limited potential to adversely impact on the proposed childcare facility. For the Coles supermarket, there is potential for noise from fixed plant and equipment (including condensers and air handling units) to adversely impact on the amenity of the childcare facility. These potential impacts are considered in Section 3.3 of this report.

For other off-site uses, there is limited potential for significant impacts as a result of vehicle movements with the access point for existing (Coles) and future uses (Adler Circuit) shielded from the proposed childcare facility by the existing or future buildings.

2.1.2 Childcare Centre

The proposed childcare centre comprises a total of 130 students of the following ages:

- Kindy (4-5years) 22 children;
- Pre Kindy (3-4 years) 44 children;
- Toddlers (2-3 years) 20 children; and
- Babies (0-24 months) 24 children.

The childcare centre will operate between 6:00 AM to 6:00 PM Monday to Friday. The proposed plans are provided in Appendix A.

2.2 Surrounding Uses

The Subject Site will be located within the Yarrabilba development area which is primarily a residential development with some commercial uses. The area surrounding the development has a range of land uses, including business and industry to the south-west and east of the site, while residential uses are located to the north, and west.

Figure 1 provides the land uses for the surrounding area; it can be seen the Subject Site will be in an area of commercial retail or community uses.



Figure 1: Site Location and Surrounding Land uses

To assess reverse amenity of the adjacent commercial uses upon the childcare centre, receptors at each room of the childcare centre have been included in the model.

3 EXISTING ENVIRONMENT

3.1 Noise Monitoring Methodology

Background noise monitoring was undertaken at a single representative location between 16 - 23 April 2020 as shown in Figure 2. The monitoring location was selected to provide background noise levels representative of the proposed childcare centre.

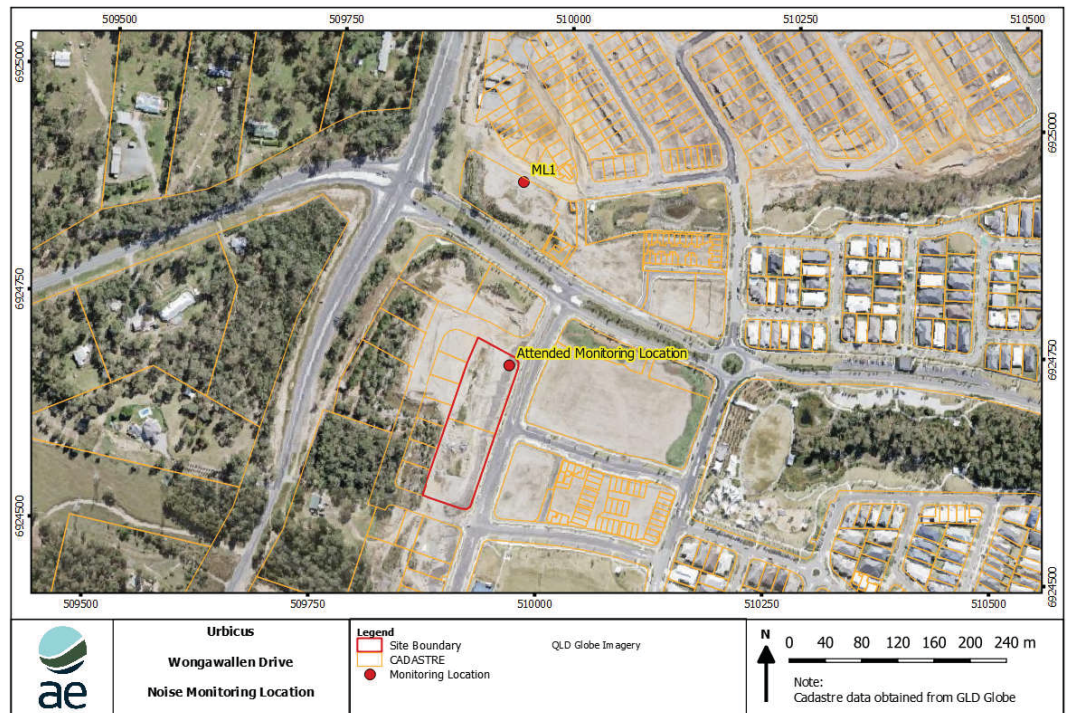


Figure 2: Noise Monitoring Locations

Noise measurements were undertaken in accordance with the requirements of Australian Standard AS 1055-1997 '*Acoustics – Description and measurement of environmental noise*' using a Rion NL42 type 2 environmental noise logger. The instrument was situated in a free-field position and an averaging time of 15 minutes adopted for the monitoring. The microphone was positioned at a height of 1.2 metres above ground level and fitted with a windshield throughout the measurements.

The serial number and calibration information for the instruments used are presented in Table 2.



Table 2: Equipment Information

Instrument	Serial No.	Monitoring Dates	NATA Calibration Current to:	Pre-/Post Calibration (dB)
Rion NL42	01047100	16/4/2020 – 23/4/2020	02/08/2021	94.0 / 94.2
Pulsar 106 (Calibrator)	79636	N/A	22/01/2021	N/A
Weather Station 1	SN705	16/4/2020 – 23/4/2020	N/A	N/A

Noise monitoring has a potential to be affected by rainfall and wind speeds above 5 m/s. Review of meteorological data from the co-located weather station indicates that one (1) hour was affected by rainfall or high wind speeds. These periods were excluded from the analysis to minimise the potential for weather related bias in the monitoring results.

3.2 Background Monitoring Results

Table 3 below provides a summary of average noise levels of each period for a variety of statistical noise parameters. The periods are defined as follows:

- Day – 7 am to 6 pm;
- Evening – 6 pm to 10 pm; and
- Night – 10 pm to 7 am.

Table 3: Baseline Noise Monitoring Data for Each Day (dB(A))

Date	Period	L _{max}	L ₁₀	L ₉₀	L _{eq}	minL _{A90,1-hour}	median L _{Aeq,1-hour}
16-04-20	Day	-	-	-	-	-	-
	Evening	71.6	58.1	53.7	46.7	53.5	40.2
	Night	73.2	54.5	48.6	40.5	49.0	34.4
17-04-20	Day	75.9	60.5	53.9	45.9	51.7	44.8
	Evening	79.2	60.9	57.5	52.6	56.1	49.4
	Night	71.5	54.5	50.0	42.2	50.9	35.1
18-04-20	Day	78.4	61.1	54.0	45.3	52.1	43.1
	Evening	71.8	57.1	50.7	44.0	49.5	40.4
	Night	73.4	52.5	44.2	35.4	44.3	32.3
19-04-20	Day	73.4	59.5	52.3	43.0	50.2	41.3
	Evening	72.3	57.7	52.5	45.7	52.7	39.6
	Night	74.8	52.5	46.5	38.2	48.2	31.3
20-04-20	Day	76.0	59.6	53.2	45.0	51.0	42.3
	Evening	75.4	59.6	56.2	50.1	56.0	44.2



Date	Period	L _{max}	L ₁₀	L ₉₀	L _{eq}	minL _{A90,1-hour}	median L _{Aeq,1-hour}
21-04-20	Night	82.2	53.2	46.6	38.4	47.8	32.5
	Day	74.9	59.8	52.9	43.9	50.8	41.9
	Evening	74.6	59.3	55.9	52.1	56.2	47.0
	Night	77.6	54.1	48.8	40.9	48.1	36.2
22-04-20	Day	78.1	60.5	53.9	45.7	52.4	43.5
	Evening	70.6	61.2	58.7	51.6	57.3	46.6
	Night	72.7	54.9	48.1	39.5	48.0	34.4
23-04-20	Day	81.0	60.0	53.4	44.5	51.3	42.1
	Evening	71.4	59.4	54.0	47.7	55.1	41.8
	Night	78.0	53.9	46.7	38.5	48.1	33.5

Baseline Noise Monitoring Data for All Days (dB(A))

Period	L _{max}	L ₁₀	L ₉₀	L _{eq}	RBL
Day	81	53	45	51	42
Evening	79	55	49	55	43
Night	82	47	39	48	34

A time history of the noise monitoring data is presented in Figure 3

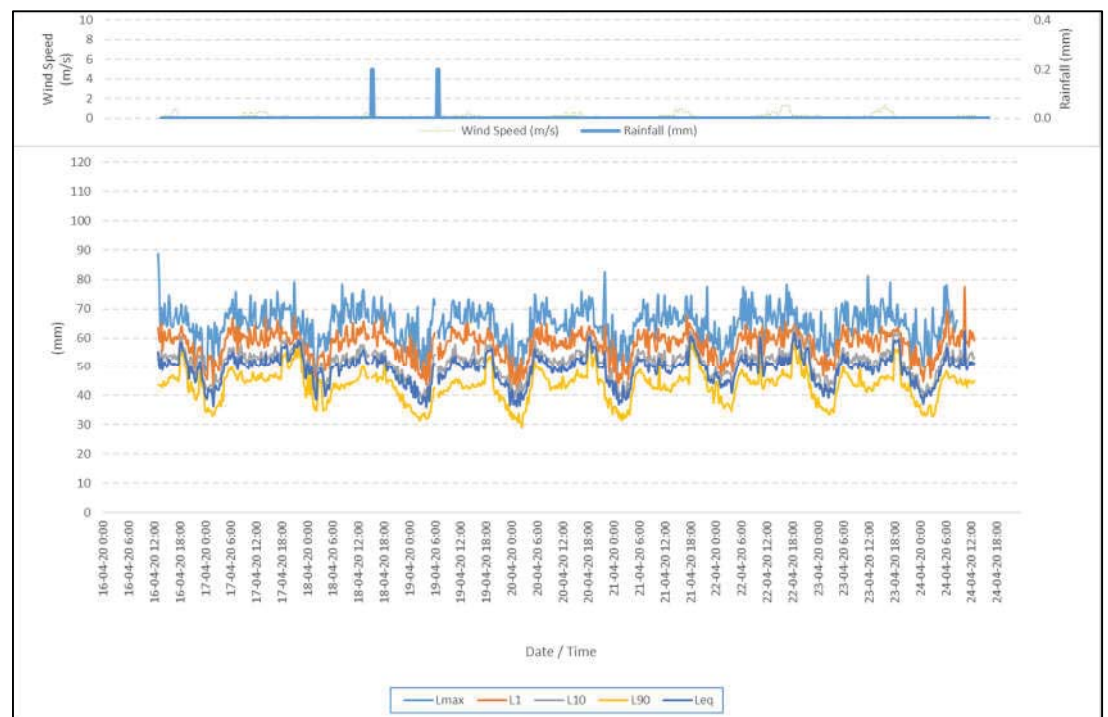


Figure 3: Time History of Monitoring Data



3.3 Attended Noise Monitoring

Attended noise monitoring was undertaken at a location representative of the future childcare facility on 7 May 2020. Specifically, the monitoring was undertaken to determine the influence of fixed plant and equipment noise from the nearby Coles supermarket on the proposed childcare facility.

Attended noise monitoring was undertaken in accordance with AS 1055.1 *"Acoustics—Description and measurement of environmental Noise Part 1: General procedures"* and the Noise Measurement Manual (EHP, 2013).

A NATA calibrated class 1 Sound Level Meter (SLM) was used for the assessment. The SLM was calibrated before and after the measurements with no calibration drift observed across the monitoring period. Table 4 provides a summary of the equipment utilised during the monitoring.

For the purposes of the monitoring, four 10-minute measurements were undertaken at the eastern boundary of the childcare centre as shown in Figure 2. During the measurement periods, all distinct extraneous noises (i.e. vehicle movements) were removed and subjective observations of specific noises contributing to measured noise levels recorded.

Table 4: Equipment Serial Numbers and Calibration

Instrument Model	Serial Number	Pre-/Post Calibration (dB)
Larson Davis 831	0002725	94.0 / 94.0
Larson Davis CAL:200	8356	-

On site observations identified that vehicle movements along Yarrabilba Drive was the dominant noise source. Measurements during periods of low traffic identified that noise from fixed plant at the Coles supermarket was approximately 45 dB(A), and barely audible at the Subject Site. Loading bay activities were noted to be approximately 50 dB(A) at the same location. The results of the attended noise monitoring are presented in Table 5 below.

Table 5: Attended Noise Monitoring Results

Time Started	Noise Level dB(A), 10-minute						
	LAFmax	LAeq	LAF1	LAF10	LAF50	LAF90	LAF99
11:53	81	55	62	54	50	47	45
12:11	65	52	60	55	51	47	45
12:27	72	53	62	55	51	47	44
12:44	66	52	61	55	50	46	44
Average	71	53	61	55	50	46	45

Based on the results of the attended noise monitoring, noise from fixed plant and equipment at the Coles supermarket was 46 dB(A), measured as the L_{A90} noise level in accordance with guidance provided in the Environmental Protection Regulation 2019. Noise from loading dock activities was taken to be 52-53 dB(A) measured as an L_{Aeq} .



4 PLANNING SCHEME AND ASSESSMENT CRITERIA

4.1 Yarrabilba Development Scheme

The proposed development falls under the Yarrabilba Propriety Development Area, gazetted by the Queensland Government. The Yarrabilba PDA Development Scheme 2011 (YBPDADA), provides the framework through which the suitability of a childcare centre at the proposed location is determined.

In accordance with the proposed context plan in Figure 1, the proposed childcare centre must demonstrate compliance with the industry and business zone code.

Table 6 provides a summary of those outcomes related to the potential acoustic impacts associated with the proposed development.

Table 6:YBDAD: Industry and Business Zone

Exempt development	Permissible	Prohibited Development
1. An environmentally relevant activity if: I. a code of environmental compliance has been made for that activity under the Environmental Protection Regulation 2008; and; II. The activity complies with that code 2. If the land is not on the environmental management register or the contaminated land register: I. Development in schedule 1; II. Making a material change of use where complying with the parking rates in the planning scheme and not involving building work) or operational work for a) Emergency Services; b) Low Impact Industry; c) Research and technology facility; d) Service industry; e) Showroom; and f) Warehouse.	1. Reconfiguring a lot that is not mentioned in schedule 1. 2. Making a material change of use if; a. The use is not defined in schedule 2, or b. The change of use is not mentioned in column 1, 2 or 3 B 3. Operational work or building work is the work is not mentioned in columns 1, 2 or 3B.	Development for 1. Extractive industry; 2. High Impact Industry; 3. Noxious and hazardous Industry; 4. Residential (other than short term); accommodation 5. Rural; and 6. Tourist park

The childcare centre is a permissible development. In accordance with Logan City Council's PSP3 – Environmental Management, the assessment should consider the potential for reverse amenity impacts on surrounding residential uses as a result of the proposed development.



4.2 Logan City Council Noise Planning Scheme

To protect the amenity of the proposed childcare centre, the LCCPS references (in Table 3.2.1.3) the indoor acoustic quality objectives as outlined in Schedule 1 of the Environmental Protection (Noise) Policy 2019. Table 7 below presents a summary of the applicable indoor noise criteria for childcare centres as provided in the EPP (Noise).

Table 7: EPP (Noise) Acoustic Quality Objectives 2019

Sensitive Receptor	Time of Day	Acoustic Quality Objectives (measured at receptor) dB(A)			Environmental Value
		L _{Aeq,adj,1hr}	L _{A10,adj,hr}	L _{A1,adj,1hr}	
Childcare Centre (indoor)	When open, other than sleeping	35	-	-	Health & Wellbeing
	When children sleeping	30	-	-	Sleeping

a) The time periods referred to in the EPP (2019) are defined as: Day: 7 am to 6 pm, Evening: 6 pm to 10 pm, Night: 10 pm to 7 am.

These acoustic quality objectives are considered in the assessment of potential impacts on the proposed childcare facility as a result of noise emissions from the surrounding commercial landuses.



5 NOISE IMPACT ASSESSMENT

5.1 Commercial Noise

5.1.1 Noise Modelling Methodology

For the purposes of predicting impacts associated with noise emissions from the Subject Site on nearby sensitive receptors, noise modelling of the sources was completed using the proprietary software CadnaA (version 2019 build 177.5010) developed by DataKustik. CadnaA incorporates the influence of meteorology, terrain, ground type and air absorption in addition to source characteristics to predict noise impacts at receptor locations. All predictions have been undertaken in accordance with ISO Standard 9613 (1996) *"Acoustics - Attenuation of sound during propagation outdoors"*.

The model is utilised to assess the potential noise emissions from the proposed commercial uses upon the childcare centre under a range of operating scenarios and meteorological conditions.

5.1.2 Assessment Criteria

The reverse amenity assessment criteria for commercial uses upon the childcare centre are detailed in the EPP (Noise) as required by the LCCPS:

- Internal Rooms: 35 dB $L_{Aeq, 1 \text{ hour}}$; and
- Sleeping Rooms: 30 dB $L_{Aeq, 1 \text{ hour}}$.

5.1.3 Noise Sources

Operational noise sources associated with the tenancies are expected to include vehicle movements, waste collection and fixed plant noise (associated with air conditioning).

Truck deliveries and unloading have been assumed to occur for all tenancies. The proposed development includes 92 car parking spaces; for this assessment it has been assumed that 37 vehicles per hour could access the car park via the loading dock driveway adjacent to the childcare centre which is conservative.

Waste associated with the proposed use is to be stored within bins located within a dedicated refuse enclosure adjacent to the driveway to the facility. Collection of waste would be undertaken by a commercial contractor on a regular basis. For the purposes of this assessment, it has been assumed that waste collection could occur during the daytime period.

Fixed plant and equipment associated with the provision of commercial air conditioning is proposed to be located to the western façade of the building adjacent to the on-ramp.

Table 8 lists the noise sources modelled for the commercial tenancies.

Table 8: Noise Sources from Commercial Tenancies

Source	Operational Information	Activity (% of time)	Sound Power Level dB(A)
Car Movement	Up to 37 vehicles movements per hour.	100%	81 per vehicle
Truck unloading	1 Delivery per day.	Total of 60 mins.	92 per event ^{a)}
Truck Idling	For both delivers and waste collection.	80 mins.	80 per vehicle
Waste Collection	1 waste collection per hour	1 truck truck/hour	92 per vehicle
Car door slam	10 sources located within the car park.	10%	88 L _{A1} per event
Air con unit	10 x units on western facade of the building, operating continuously	100%	70 per unit

a) Includes a 5 dB(A) correction for impulsiveness or tonal noise

Figure 4 shows the location of the commercial noise sources as modelled, with the exception of vehicle movements, which will use the access roads.

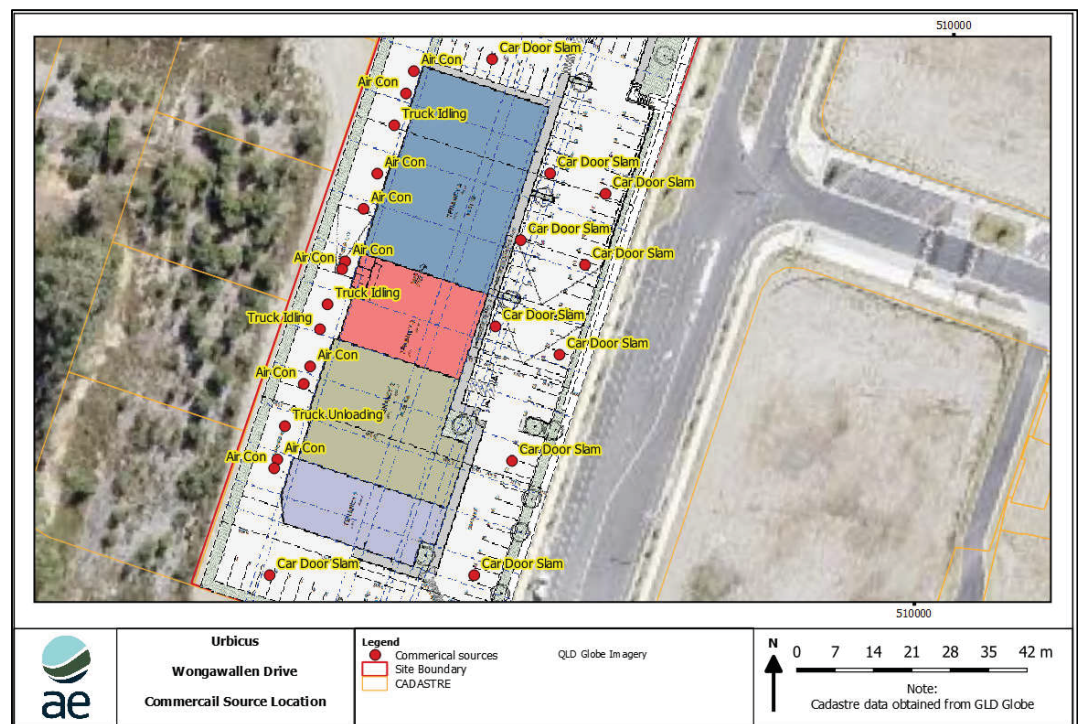


Figure 4: Location of Noise Sources: Commercial Use

5.2 Predicted External Noise Levels

Table 9 presents the highest predicted noise level in the outdoor play areas. These noise levels are based on the noise mitigation as shown in Figure 5. The following mitigation is:

- 1.5 m high acoustic barrier along the west side of the outdoor play area (2-5 years);
- 1.8 m acoustic barrier enclosing the outdoor play area (0-2 years).

It can be seen from Table 9 that the highest noise levels in the outdoor play areas comply with the assessment criteria during all operational hours.

Table 9: Predicted External Noise Levels

Receptor	Predicted Outdoor Noise Levels, $L_{Aeq,period}$			Assessment Criteria ($L_{Aeq,period}$ dB(A))			Compliance
	Day	Evening	Night	Day	Evening	Night	
Outdoor Play 0-2 years	47	43	37	55	55	55	Y
Outdoor Play 2-5 years	50	36	36	55	55	55	Y

Note: Levels represent the highest predicted value across the entire play area

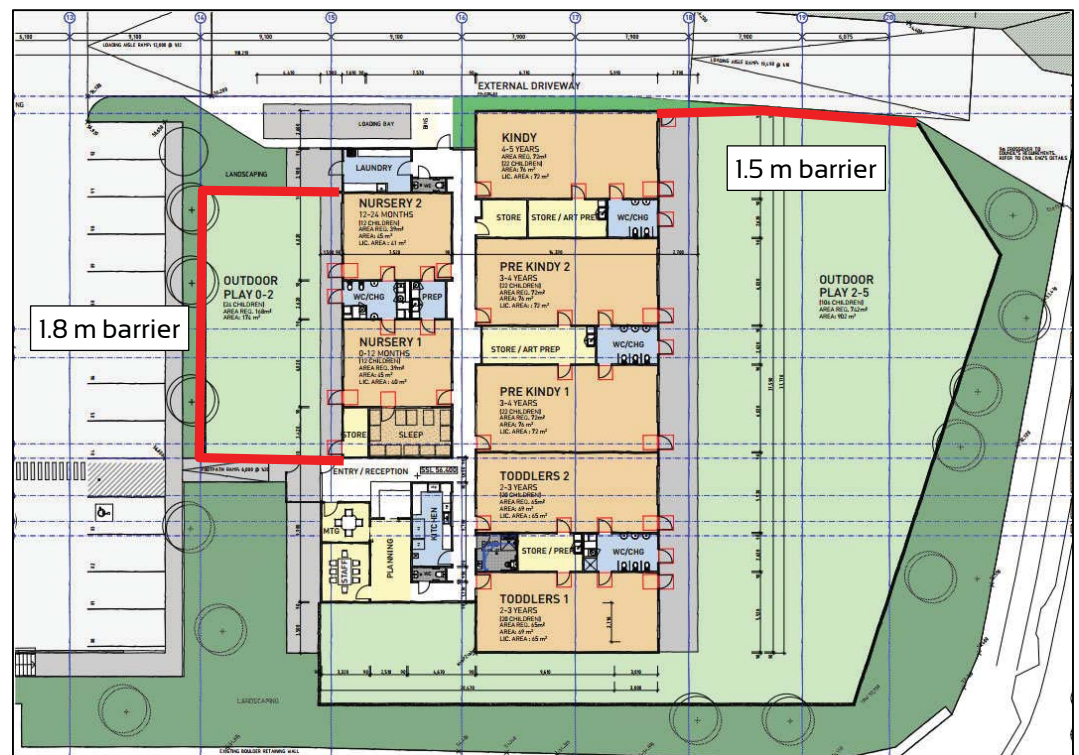


Figure 5: Recommended Noise Barrier Location for the Childcare Centre



5.2.1 Predicted Internal Noise Levels

The proposed building construction has been used to predict the façade attenuation expected to be achieved for the childcare facility. Based on the proposed construction materials and the design of the childcare facility, a facade reduction of 30 dB is expected. Achieving this requires that all windows and doors remain closed. As all rooms will be fitted with mechanical ventilation, the operator of the future childcare facility would have the ability to achieve the recommended internal noise levels by closing windows and doors, as necessary.

Table 10: Calculated façade Attenuation

Room	Component	Minimum RW Value*	Proposed Construction
All Playrooms	Ceiling	32	Assumed standard Colourbond roof
	Windows	24	6 mm horizontal sliding
	Doors	28	Solid core 35 mm thick plywood door with seals around sides and top
	External Walls	28	90 mm timber frame with insulation and 10 mm plasterboard and 9 mm FC sheeting.
Total Facade		30	

Review of the predicted noise levels at the façade of each of the play/sleep rooms of the proposed childcare facility (see Table 11) indicates that, where a minimum façade attenuation of 24 dB (maximum façade noise level of 54 dB(A) – 30 dB(A)) is achieved, compliance with the indoor noise levels provided in the EPP (Noise) will be achieved. On this basis, compliance with the requirements of the LCCPS in relation to noise immission to the childcare facility is expected to be achieved.

Table 11: Calculated Building Requirements

Room	Predicted LAeq,1-hour Noise Level	Acoustic Quality Objective (indoors)	Required Façade Attenuation
Kindy	53	30	23
Nursery 1	54	30	24
Nursery 2	54	30	24
Toddlers 1	54	30	24
Toddlers 2	53	30	23
Pre-kindy 1	53	30	23
Pre-kindy 2	53	30	23
a) Includes contribution from Coles fixed plant and equipment and loading dock (as measured)			



5.3 Road Traffic Noise

The Subject Site is located 170 m east of the Waterford-Tamborine Motorway. The baseline noise monitoring was undertaken at a similar distance from the motorway as the Subject Site as discussed in Section 3. The measured median $L_{Aeq, 1 \text{ hour}}$ during the daytime period was 51 dB(A) and the overall $L_{A10, 18 \text{ hour}}$, which is representative of traffic noise was 53 dB(A).

To assess future traffic impacts, traffic data was collected from the Queensland Government 2018 traffic census data. This report provides the follow data regarding.

- AADT: 4,467 (2018)
- Commercial/heavy vehicle percentage: 13%
- Vehicle Growth: 6% per annum
- Number of Lanes: 2

A 10-year forecast for 2030 was calculated using the vehicle growth percentage and the estimated AADT for Waterford-Tamborine Road is 9,229 vehicles.

Noise predictions have been undertaken in accordance with the methodology described in the United Kingdom, Department of Transport procedure, Calculation of Road Traffic Noise (CRTN), which considers various elements of the road design including traffic flow and composition, road gradient, acoustic shielding by other buildings and road surface type. In accordance with the requirements of the RNP, the predictive noise modelling incorporated the following assumptions:

- L_{Aeq} values were calculated from the L_{A10} values predicted by the CRTN methodology using the approximation $L_{Aeq, 1 \text{ hour}} = L_{A10, 1 \text{ hour}} - 3$.
- Noise source heights were set at 0.5 m above road level for cars and heavy vehicle tyre noise, 1.5 m for heavy vehicle engines and 3.6 m for heavy vehicle exhausts.
- Noise from heavy vehicle exhausts is 8 dB lower than the steady continuous engine noise; and
- Corrections established for Australian conditions applied through a negative correction to the CRTN predictions of -1.7 dB and +0.5 dB for façade-corrected levels for day and night periods respectively (Samuels and Saunders, 1982).

The highest predicted noise level at any playroom based on 2030 future traffic volume is 50 dB(A). Assessing the required façade attenuation in accordance with "AS 3671 – 1989: Acoustics – Road Traffic Noise Intrusion – Building Siting and Construction", the required attenuation is 26 dB.

Review of the proposed construction of the childcare centre as detailed in Table 10 will provide attenuation of R_w 30 dB. Therefore, the predicted internal noise levels from future traffic on Waterford-Tamborine Road will comply with the internal noise criteria of 30 dB(A).



6 CONCLUSIONS AND RECOMMENDATIONS

Assured Environmental was commissioned to undertake a noise impact assessment for the proposed childcare centre at Wongawallen Drive, Yarrabilba. Specifically, the assessment has considered the potential for adverse impacts upon existing residential uses as a result of noise emissions associated with the operation of the childcare centre.

Predicted noise modelling has been undertaken of noise immisions from existing and proposed noise sources (commercial tenancies and road traffic noise) upon the childcare centre to determine the internal noise environment can comply with the EPP (Noise) acoustic quality objectives.

The proposed building construction and the proposed layout have been used to calculate the internal noise levels within each room. It has been determined that the proposed construction as presented in Table 10 will provide sufficient noise attenuation to achieve the required internal noise levels for all sources in the area. It should be noted that alternative to the construction presented in Table 10, can be used as long as the proposed construction meets the required minimum R_w value.

It is also recommended that mechanical ventilation that complies with the Building Code of Australia (BCA) is installed in the childcare centre to enable all doors and windows to remain closed during sleep periods.

Overall, based on the results of the modelling and monitoring, reverse amenity impacts upon the proposed childcare centre is expected to be low with the proposed recommendations implemented.

APPENDIX A: PROPOSED PLANS

