Proposed Childcare Centre – Cnr Western Drive and Tyndall Circuit, Banya

Acoustic Report

Noise Impact Assessment

4 November 2024

Ref: 301050913

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Revision Schedule

Revision No.	Date	Description	Prepared by	Quality Reviewer
P01	23/09/2024	Noise Impact Assessment - Draft	MK	MLL
C01	4/11/2024	Noise Impact Assessment - Final	MK	MLL

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1. Introduction

Stantec Australia Pty Ltd (Stantec) have been engaged by the Stockland to undertake acoustic assessment for a proposed childcare centre. The project site is located on the corner of Western Drive and Tyndall Circuit, Banya QLD 4551 (Lot 8 on SP334576) and is within the Caloundra South PDA.

The purpose of this report is to:

- describes the project site in context with surrounding land uses.
- establishes environmental noise limits applicable to noise emissions from the proposed development.
- identifies all assessable noise sources / activities associated with the operations of the project.
- outlines acoustic modelling and calculations undertaken for the project to determine noise impacts on surrounding noise sensitive uses.
- where applicable, provides preliminary recommendations for noise control which are to be further investigated / refined during later design phases of the project.

Each of the acoustical aspects identified have been addressed in this report and recommendations are made to provide a consistent acoustical outcome for the project.

A glossary of acoustic terms used in this report is included in **Appendix A**.

The recommendations made in this report are specific to the project design at the date of issue of this report. The project design may be subject to change during the following stages. Where this occurs, the assumptions made to inform the recommendations in the report may no longer be valid; therefore, further advice should be sought to ensure that the acoustic outcomes presented in this report are achieved.

The performance of products referred to in this report are made to meet the acoustic requirements only. It does not consider other aspects, including but not limited to thermal, wind, impact, structural, mechanical, national construction code, security and fire requirements. Relevant discipline reports, drawings and specifications should be referred to for conformance.

This report relates to this specific project and must not be applied to any other project without prior consultation with Stantec. Designs and conditions can vary between projects causing significant variations in acoustic performance and relevant subsequent advice to one project may not apply to another.

This report shall not be relied upon as providing any warranties or guarantees of construction quality regarding acoustics.

2. Referenced Documentation

2.1 Regulations, Policies, Standards and Guidelines

The following acoustic design related documentation pertinent to the project and referenced in this document are outlined in **Table 1**.

Table 1: Applicable acoustic design related documentation referenced in this report

Title	Abbreviation
REGULATIONS AND LOCAL COUNCIL POLICIES	
Queensland Environmental Protection Act 1994	EPA 1994
Queensland Environmental Protection (Noise) Policy 2019	EPP 2019
Caloundra South Urban Development Area - Development Scheme	CS PDA
Caloundra City Plan 2004	CCP
AUSTRALIAN AND INTERNATIONAL STANDARDS	
Australian / New Zealand Standard AS/NZS 2107:2016 – *Acoustics – Recommended design sound levels and reverberation times for building interiors*	AS 2107
Australian Standard AS 1055:2018– *Acoustics – Description and measurement of environmental noise*	AS 1055:2018
Australian Standard AS 1055.1:1997– *Acoustics – Description and measurement of environmental noise*	AS 1055:1997
Australian / New Zealand Standard AS/NZS 3671:1989 – *Acoustics – Road traffic noise intrusion – Building siting and construction*	AS3671
DESIGN STANDARDS AND GUIDELINES	
Department of Transport and Main Roads (TMR) – Transport Noise Management Code of Practice 2013 Volume 1 – Road Traffic Noise	CoP 2013
Association of Australasian Acoustical Consultants – *Guideline for Child Care Centre Acoustic Assessment V 3.0*	AAAC Guide

2.2 Study Inputs

Acoustic assessment and the preparation of this report have been conducted based on the following received documentation detail in **Table 2**.

Table 2: Received documentation

Date Received	Detail	Revision / Date Prepared	Prepared By	Format
01/11/2024	Architectural DA drawings: • *STCK004 - DA - 01.11.24*	Various / 01/11/2024	77 Architecture	pdf

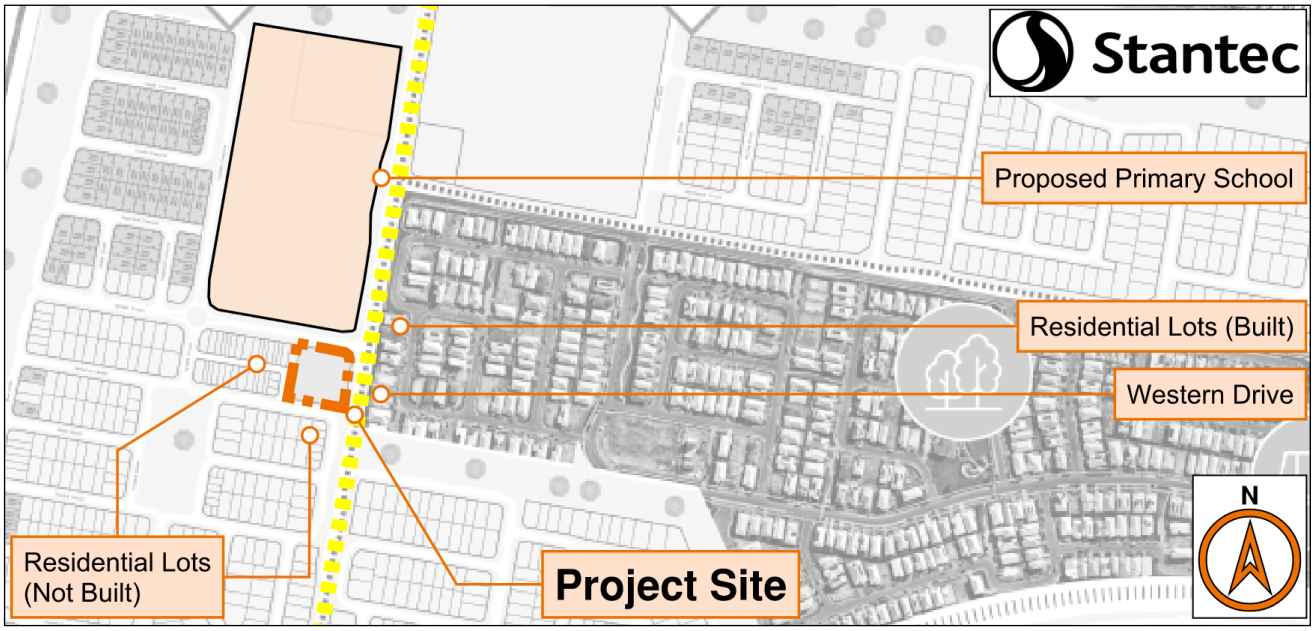
3. Project Details

3.1 Site Description

3.1.1 Project Location

The project site is located on the corner of Western Drive and Tyndall Circuit, Banya (Lot 8 on SP334576) and falls within the Caloundra South Priority Development Area. The project site and surrounding developments are detailed in **Figure 1**.

Figure 1: Project site and surrounding developments



Source: Stockland Aura Masterplan Map (accessed 28/05/2024 Online) | Annotations by Stantec

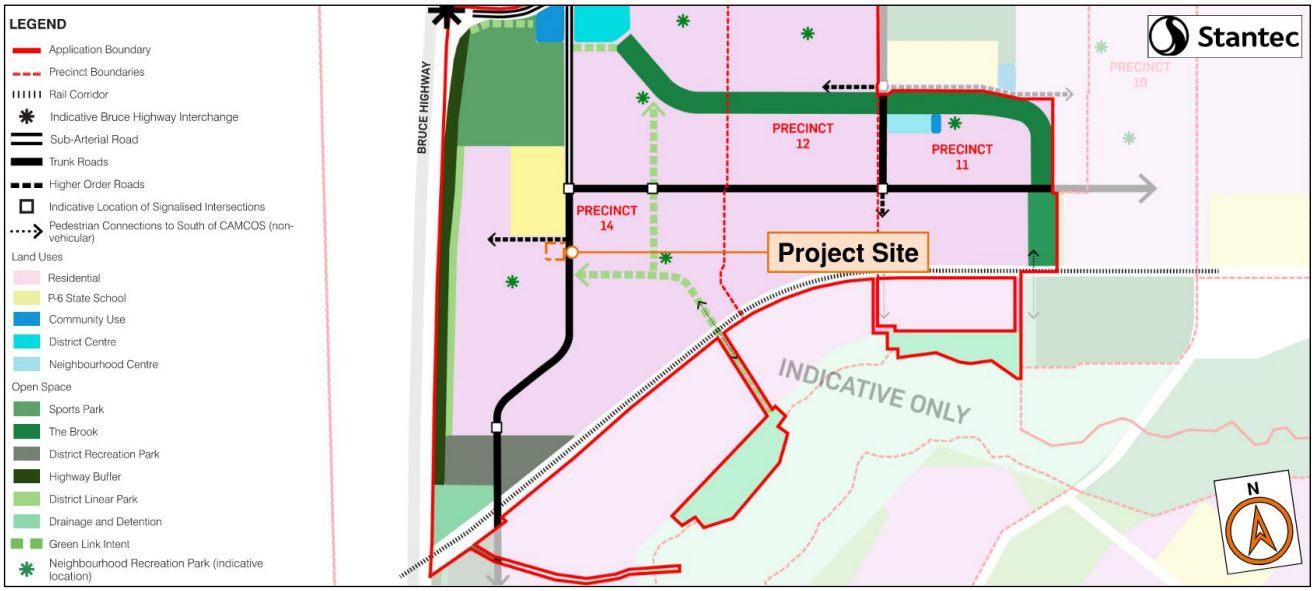
3.1.2 Surrounding Land Uses / Zoning

The Caloundra South Development Scheme (online) was accessed and reviewed on the 30th August 2024 to determine existing and proposed land uses surrounding the site (see **Figure 2**). The following was identified:

- The project site is indicated as residential land;
- Lots surrounding the proposed site generally consist of;
    - future residential lots to the east, south and west; and
    - a primary school north of the site.
- The nearest external noise sensitive receivers to the development are;
    - planned residential lots to the east, south and west of the site; and
    - the proposed primary school north of the site.
- The proposed development is located outside of the road transport noise corridor contours associated with the Bruce Highway (see **Figure 3**).
- The proposed development is not located within;
    - Rail Transport Noise Corridor Contours; or

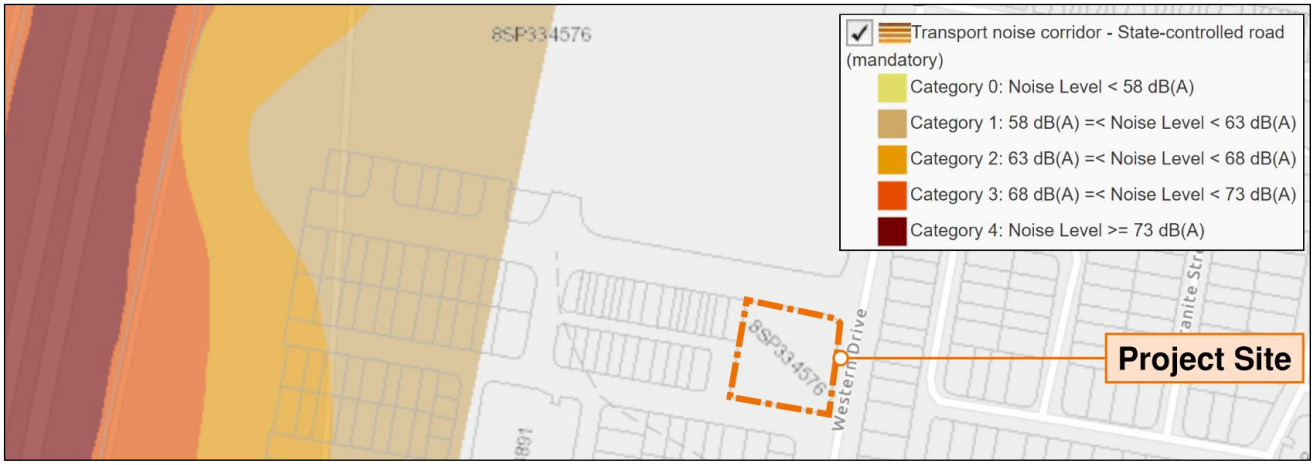
- Aircraft Noise Exposure Forecast (ANEF) contours.

Figure 2: Land use / zoning surrounding the project site



Source: Aura Precinct 11-14 Context Plan (online)

Figure 3: Transport noise corridor overlay



Source: Queensland Government State Planning Policy Interactive Mapping System (online – Transport Infrastructure overlay, accessed 30/08/2024)

3.2 Proposed Development

Based on the received architectural plans detailed in **Table 2**, the following architectural volumes have been proposed:

Childcare Centre

- 2 x 0 – 24 months rooms
- 3 x 36months + rooms
- Office
- Kitchen
- Laundry
- 3 x Playscapes (outdoor play areas) for each age group
- 2 x 24 – 36 months rooms
- 4 x Sleeping rooms
- Staff and Planning
- Amenities
- 4 x Prep rooms

3.3 Existing Acoustic Environment

Under normal circumstances noise logging would also be conducted onsite to quantify the existing background noise and specify noise limits for environmental noise emissions. Given that construction and earthworks are occurring around the site this is not currently feasible. Therefore, the background noise levels were assumed based AS1055:1997 noise area categories. Noise area category R3 (Refer to **Table 3)** was deemed suitable as the site acoustic environment will be affected by the adjacent sub-arterial road (Western Drive) as well as the Bruce Highway.

Table 3: AS1055 – 1997 - Estimated average background A-weighted sound pressure levels ($L_{A90,T}$) for different areas containing residences in Australia

Noise area category (Notes 1 and 2)	Description of neighbourhood	Average background A-weighted sound pressure level, $L_{A90,T}$					
		Monday to Saturday			Sundays and public holidays		
		0700–1800	1800–2200	2200–0700	0900–1800	1800–2200	2200–0900
R1	Areas with negligible transportation	40	35	30	40	35	30
R2	Areas with low density transportation	45	40	35	45	40	35
R3	Areas with medium density transportation or some commerce or industry	50	45	40	50	45	40
R4	Areas with dense transportation or some commerce or industry	55	50	45	55	50	45

The noise descriptors relevant to the assessment based on the R3 noise area category are provided in **Table 4**.

Table 4: Background noise descriptors used to determine noise limits

Assumed Background Noise Level, $L_{90,T}$ dB(A)		
Day [1)]	**Evening** [1)]	**Night** [1)]
50 [2)]	45 [2)]	40 [2)]

NOTES:

1) Day – 7am-6pm | Evening – 6pm-10pm | Night – 10pm-7am

2) Background noise levels obtained from AS 1055 – 1997 noise category R3

3.4 Acoustic Design Issues and Considerations

Based on the review of initial design documentation, noise measurement data and site observations, the following acoustic design issues have been identified:

- While the project site is not currently within any transport noise corridors, it will be exposed to road traffic noise from Western Drive adjoining the east boundary of the site. Therefore, assessment of road traffic noise intrusion is recommended.
- Environmental noise emissions from the subject site and noise intrusion to the project shall comply with relevant environmental noise limits and guidelines (EPA 1994, EPP 2019).

4. Acoustic Criteria

4.1 Environmental Noise Emissions

4.1.1 Caloundra South Urban Development Area – Development Scheme (PDA)

The Caloundra South Urban Development Area – Development Scheme (CS PDA) prepared by the Economic Development Queensland (EDQ) provides the following as guidance for assessment of noise.

3.3.1 Neighbourhoods:

- do not prejudice future core industry and enterprise precincts adjoining the northern boundary outside the UDA[3].

[3] The context planning process will resolve any development constraints and manage the interface between industrial land and sensitive land uses, consistent with State Planning Policy 5/10: Air, Noise and Hazardous Materials.

The State Planning Policy 5/10: Air, Noise and Hazardous Materials makes multiple references to the Environmental Protection (Noise) Policy 2008 for the assessment of noise and is deemed the primary regulation to apply for noise assessments within the CS PDA.

3.3.8 Natural Values

- manages air quality, noise and hazardous materials according to current standards.

3.3.9 Community safety and development constraints:

Development ensures that people and property are safe from potential hazards and disturbances including landslip, bushfire, noise, flooding and the predicted effects of climate change.

Future residents are to be provided with a level of amenity that addresses noise sources. Sensitive uses to nearby noise sources such as the Caloundra Aerodrome and the Bruce Highway are to be protected. The preferred means to control noise impacts will be determined at the development application stage.

Development adjoining the Bruce Highway

A buffer is to be provided between the limit of development, the Bruce Highway corridor and the southwest boundary of the site fulfilling the following:

- provision of a predominantly landscaped treatment that achieves a natural and rural edge as viewed from the Bruce
- Highway
- provision of visual separation between development and the highway. Acoustic walls are not visually prominent and do not result in a continuous, monotonous stretch of acoustic wall along the length of the site's frontage to the Bruce Highway
- inclusion of a variety of techniques at different locations including separation distances, mounding, landscaping, noise attenuation measures and recreational opportunities
- compliance with the applicable noise standards and requirements including:
    - Department of Transport and Main Road Traffic Noise Management: Code of Practice with respect to external road traffic noise levels
    - Queensland Development Code and Section MP 4.4 'Buildings in a Transport Noise Corridor'
- The visual buffer is designed to achieve the principles and standards set out in the applicable ULDA guideline.

Development located near the Caloundra Aerodrome

Development located near the Caloundra Aerodrome must not prejudice the ongoing operations of the Aerodrome. Nearby noise sensitive development that has the potential to receive intrusive noise is required to address the following:

- Justify that the proposed land use is suitable on amenity grounds based on the extent of aircraft noise at the subject site and information about future noise projections from the aerodrome operator comprising both fixed wing aircraft and helicopter movements. This will include information about:
    - Areas forecast to be exposed to above 20 noise events a day exceeding 70dB(A)
    - The Transparent Noise Information Package (TNIP) N70 contour forecast for the year 2030
- Inclusion of a variety of appropriate noise attenuation measures
- Provision of suitable levels of indoor residential amenity (by appropriate building siting and construction) to comply with the indoor design sound levels from the applicable Australian Standard

Relationship with Sunshine Coast Planning Scheme 2014

The CS PDA does not reference the Sunshine Coast Planning Scheme 2014 for acoustic assessment. Therefore, based on guidance from State Planning Policy 5/10, assessment of environmental noise shall be in accordance with EPA 1994, EPP 2019.

4.1.2 Queensland Government – Environmental Protection Act 1994

The objective of the Queensland Government Environmental Protection Act 1994 (EPA 1994) is "*to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.*"

To uphold this intent, and of relevance to acoustic assessment for the project, the EPA 1994 defines a series of noise-related standards in *Chapter 8, Part 3B Offences relating to noise standards*. The following sections are considered applicable to the project:

Section 440R Building work

(1) A person must not carry out building work in a way that makes an audible noise—

(a) on a business day or Saturday, before 6.30a.m. or after 6.30p.m; or

(b) on any other day, at any time.

(2) The reference in subsection (1) to a person carrying out building work—

(a) includes a person carrying out building work under an owner-builder permit; and

(b) otherwise does not include a person carrying out building work at premises used by the person only for residential purposes.

Section 440U Air-conditioning equipment

(1) This section applies to premises at or for which there is air-conditioning equipment.

(2) An occupier of the premises must not use, or permit the use of, the equipment on any day:

(a) before 7am, if it makes a noise of more than 3dB(A) above the background level; or

(b) from 7am to 10pm, if it makes a noise of more than 5dB(A) above the background level; or

(c) after 10pm, if it makes a noise of more than 3dB(A) above the background level.

4.1.3 Queensland Government – Environmental Protection (Noise) Policy 2019

The Queensland Government Environmental Protection (Noise) Policy 2019 (EPP 2019) identifies environmental values to be enhanced or protected, states acoustic quality objectives, and provides a framework for making decisions about the acoustic environment.

Schedule 1 Acoustic Quality Objectives

The acoustic quality objectives are stated in Schedule 1 of the *Queensland Environmental Protection (Noise) Policy 2019.* In accordance with EPP 2019, the acoustic quality objectives are stated for a defined type of noise sensitive use and specified period of the day (reproduced in **Table 5**). The environmental values which EPP 2019 aims to enhance or protect are also stated. It is intended that the acoustic quality objectives be progressively achieved as part of achieving the purpose of EPP 2019 over the long term.

Table 5: Acoustic quality objectives as defined in Schedule 1 of the EPP 2019

Sensitive Receptor	Time of Day	Acoustic Quality Objectives [1] (measured at the receptor) dB(A)			Environmental Value
		$L_{Aeq,adj,1hr}$	$L_{A10,adj,1hr}$	$L_{A1,adj,1hr}$	
residence (for outdoors)	daytime and evening	50	55	65	health and wellbeing
residence (for indoors)	daytime and evening	35	40	45	health and wellbeing
	night-time	30	35	40	health and wellbeing, in relation to the ability to sleep
library and educational institution (including a school, college and university) (for indoors)	when open for business or when classes are being offered	35	—	—	health and wellbeing
childcare centre or kindergarten (for indoors)	when open for business, other than when the children usually sleep	35	—	—	health and wellbeing
childcare centre or kindergarten (for indoors)	when the children usually sleep	30	—	—	health and wellbeing, in relation to the ability to sleep
school or playground (for outdoors)	when the children usually play outside	55	—	—	health and wellbeing, and community amenity
commercial and retail activity (for indoors)	when the activity is open for business	45	—	—	health and wellbeing, in relation to the ability to converse

NOTES:

1) *The $L_{Aeq,Adj,T}$ noise limits apply to all noise sources, whilst the $L_{A10,Adj,1hr}$ and $L_{A1,Adj,1hr}$ only apply to intermittent noise sources (i.e., excludes air conditioning).*

4.1.4 Summary of Environmental Noise Emission Limits

The noise limits for the Project are applicable to all noise emissions from the proposed development. The applicable noise limits at sensitive receptors are obtained when the noise criteria are combined with the measured noise levels as summarised in the tables below.

Table 6: All operational environmental noise limits

Location	Noise Criteria, dB(A)	Noise limit at the receptor, dB(A)		
		Day (7 AM – 6 PM)	Evening (6 PM – 10 PM)	Night (10 PM – 7 AM)
EPA 1994 – Mechanical Plant Criteria				
At a sensitive use	Assumed L90 (AS1055 – 1997 noise category R3)	50	45	40
	Permitted increase above L90	+5	+5	+3
	Noise limit **external** to sensitive use, $L_{Aeq,T}$	55	50	43
EPP 2019 – Acoustic Amenity Criteria				
Residential dwellings	Noise limit **external**, $L_{Aeq,1hr}$	50	50	43 [1)]
	Noise limit **internal**, $L_{Aeq,1hr}$	35 [2)]	35 [2)]	30
Schools	At playgrounds when children usually play **(external)**	55	—	—
	Classrooms when classes are being offered **(internal)**	35	—	—

Notes:

1) The night external noise limit has been applied based on the assumed background of 40 dB(A) a +3dB adjustment.

2) The EPP 2019 internal noise criteria would be the most stringent noise limit for both residential and school receivers but does not consider the existing acoustic environment. The EPP 2019 internal noise limits are exceeded by the assumed background noise levels (see **Table 4**) after applying a 5dB reduction for noise travelling through an open window. Therefore, the EPP 2019 internal noise criteria is not considered reasonable for the assessment of noise emissions around the project site.

4.2 Road Traffic Noise

4.2.1 Caloundra City Plan 2004

The criteria for the assessment of road traffic noise to childcare centres is not specified within the CS PDA. For other developments impacted by road traffic noise within the CS PDA, the Sunshine Coast Regional Council has advised that application of the previous Caloundra City Plan 2004 is acceptable for the assessment of noise from non-state controlled roads. The criteria for noise sensitive development subject to road traffic noise from a new road is provided within Section 9.8.3 Specific Outcomes of the CCP Nuisance Code and has been reproduced below.

Table 7: Caloundra City Plan Nuisance Code Specific Outcomes (Section 9.8.3)

Specific Outcomes	Probable Solutions
Road Traffic Noise	
O3 Road traffic noise resulting from new or altered roads is within recognised acceptable limits for existing or planned residential development.	**S3.1** The proposal achieves compliance with the planning levels specified in Schedule 1 of the Environmental Protection (Noise) Policy 1997 and the Code of Practice for the Management of Road Traffic Noise (Department of Main Roads, 2000).

The Environmental Protection (Noise) Policy 1997 and the Code of Practice for the Management of Road Traffic Noise (2000) have been superseded by the Environmental Protection (Noise) Policy 2019 and the Transport Noise Management Code of Practice 2013.

4.2.2 Transport Noise Management Code of Practice 2013

The Transport Noise Management Code of Practice 2013 (CoP 2013) includes criteria for the assessment of development near roads in Table 3.2 (a) which is reproduced in **Table 8**.

Table 8: Categories and criteria for roads (including Type 1 Multi-modal Corridor)

Categories	Criteria		
	Existing Residences (façade corrected)	**Educational, Community and Health Buildings (façade corrected)**	**Outdoor Educational and Passive Recreational Areas (including Parks) (free field)**
New Road – Access Controlled	63 LA10 (18h), existing level > 55 LA10 (18h) 60 LA10 (18h), existing level ≤55 LA10 (18h)	58 LA10 (1h)	63 LA10 (12h)
Upgrading Existing Road	68 LA10 (18h)	65 LA10 (1h)	N/A
Existing Road – No Roadworks			
Exposure of Second Row of Buildings	65 LA10 (18h)	60 LA10 (1h)	

4.2.3 Summary of Road Traffic Noise Intrusion Criteria

The EPP 2019 internal and external noise limits (see **Table 5**) are considered more stringent than the CoP 2013 criteria provided in **Table 8**, therefore, compliance with EPP 2019 is expected to also comply with CoP 2013. The applied criteria for the assessment of road traffic noise intrusion to the development is provided in **Table 9**.

Table 9: Road traffic noise intrusion criteria

Sensitive Receptor	$L_{Aeq,adj,1hr}$
Childcare centre playrooms (for indoors)	35
Childcare centre sleep rooms (for indoors)	30
Playgrounds (for outdoors)	55
Offices and staff rooms (commercial activity for indoors)	45

5. Acoustic Assessment

5.1 Noise Intrusion - Road Traffic

Road traffic noise has been identified to affect the proposed development and may place specific noise reduction performance requirements to outdoor spaces and the facades of the proposed building. The applicable noise criteria are defined in **Section 4.2.3**.

Road traffic noise calculations were conducted by applying the SoundPLAN 9.0 implementation of the UK Department of Transport Welsh Office *Calculation of Road Traffic Noise* 1988 (CoRTN) algorithms. CoRTN is widely accepted in Australia for the calculation of road traffic noise and, in addition, *SoundPLAN* is listed in the Department of Transport and Main Roads (DTMR) document *Transport Noise Management Code of Practice Volume 1 – Road Traffic Noise,* dated November 2013 (CoP 2013). Details regarding road traffic volume predictions and inputs, as well as other noise modelling parameters, have been provided in **Appendix B**.

As noise measurements of Western Drive are not possible at this stage, adjustment factors to convert the $L_{A10,18hr}$ noise parameter to the $L_{Aeq,1hr}$ must be assumed. For the purposes of this assessment the predicted $L_{A10,18hr}$ is considered equivalent to the $L_{Aeq,1hr}$ noise parameter.

5.1.1 Recommended Acoustic Barriers

The development is expected to exceed the outdoor noise criteria at the play areas without acoustic treatment. Therefore, an acoustic barrier is recommended as shown in **Figure 4** to comply with the outdoor noise criteria.

Figure 4: Recommended Acoustic Barriers

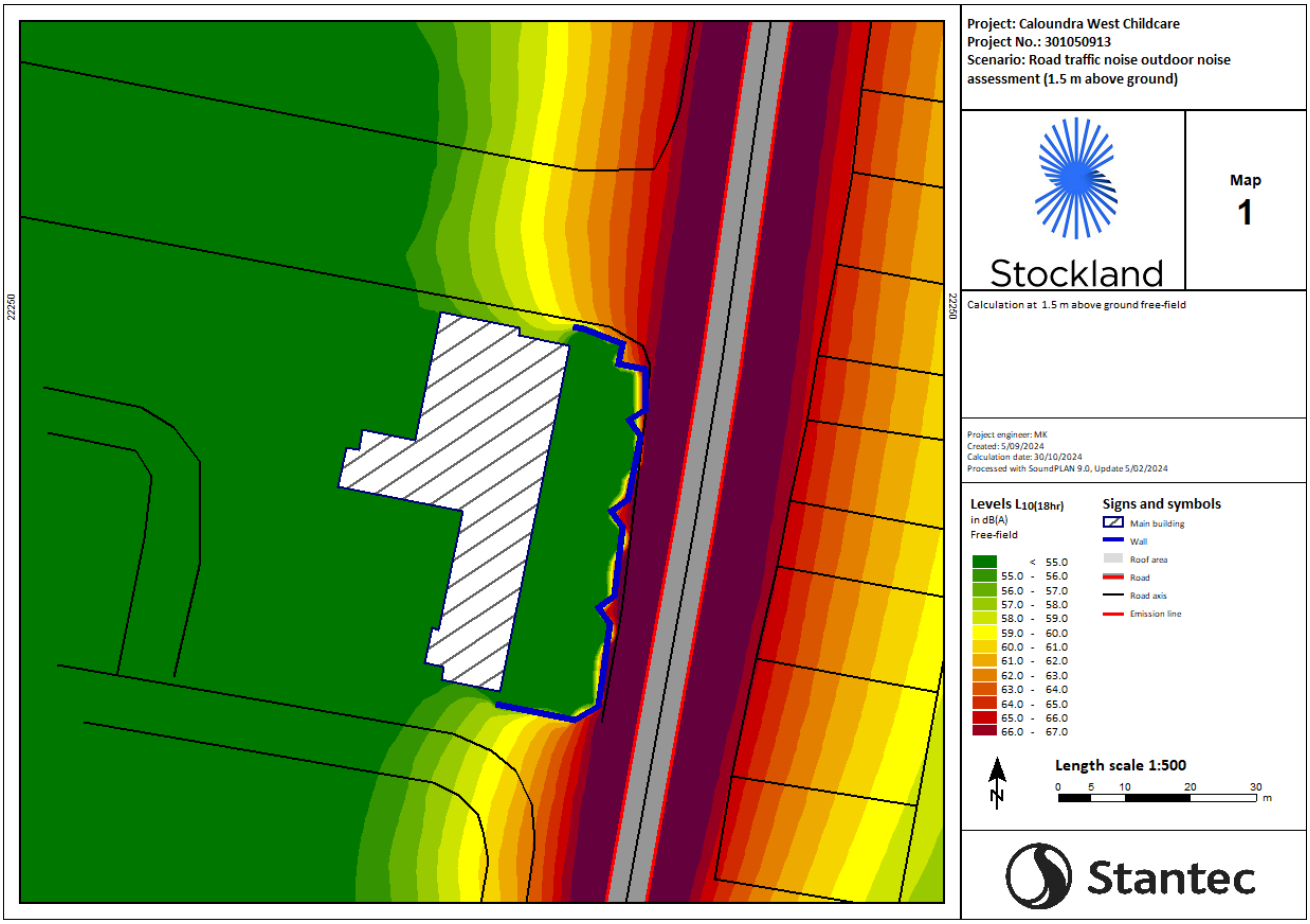
General construction recommendations for the acoustic barriers are provided below:

- Construct of a material with a min. surface mass of 10 kg/m^2. Approved products include:
    - lapped kiln-dried softwood timber palings (min. 19 mm thick and overlapped by at least 15 mm);
    - 9 mm fibre cement sheet;
    - concrete blockwork or brick; or
    - an approved modular wall system (e.g., Wallmark, Poly-Tek, Modular Walls).

5.1.2 Predicted Noise Levels Outdoor Playscapes

The noise contour map presented in **Figure 5** shows that the outdoor playscapes are predicted to comply with the L_{eq} 55 dB(A) criteria provided the acoustic barrier recommended in **Section 5.1.1** is constructed.

Figure 5: Free-field 2034 road traffic noise contour map



5.1.3 Predicted Façade Noise Levels

Noise predictions were conducted to estimate the extent of road traffic noise impacts onto the project. Results of the worst-case noise predictions at the various building facades are presented in **Table 10**.

Table 10: Road traffic noise impacts

Room	Facade	$L_{eq(1hr)}$ dB(A)	Criteria $L_{eq,1hr}$ dB(A)	Minimum façade noise reduction
0 – 24 Months 01	N	59	35	24 dB(A)
	W	52		17 dB(A)
0 – 24 Months 02	W	37	35	2 dB(A)
36 Months+ 01	E	55	35	20 dB(A)
36 Months+ 02	E	55	35	20 dB(A)
36 Months+ 03	E	56	35	21 dB(A)
Office	W	49	45	4 dB(A)
Sleep RM B1 (North)	E	60	30	30 dB(A)
	N	60		30 dB(A)

Room	Facade	$L_{eq(1hr)}$ dB(A)	Criteria $L_{eq,1hr}$ dB(A)	Minimum façade noise reduction
Sleep RM B2	W	32	30	2 dB(A)
Staff and Planning	S	31	45	0 dB(A)
	W	46		1 dB(A)
24 – 36 Months 01	E	56	35	21 dB(A)
	N	60		25 dB(A)
24 – 36 Months 02	E	55	35	20 dB(A)

The following general acoustic recommendations are provided to address road traffic noise intrusion to internal spaces:

- Locations requiring ≤5 dB(A) façade noise reduction do not require any acoustic treatments.
- Locations requiring >5 dB(A) façade noise reduction are recommended to be provided with alternative ventilation to allow windows and doors to remain closed for the exclusion of road traffic noise. This provides up to 20 dB(A) noise reduction based on standard façade construction.
- Locations requiring >20 dB(A) façade noise reduction shall be provided with alternative ventilation to allow windows and doors to remain closed and be assessed in accordance with AS3671 to confirm minimum façade upgrades required in later design stages.

For preliminary costing purposes, locations which require additional façade treatments (>20dB(A) façade noise reduction) should allow for:

Table 11: Indicative facade treatments required for road traffic noise

Building component	R_w	Preliminary construction recommendations
Façade	45	9mm fibre cement sheeting externally / 92mm steel stud with 75mm 14kg/m^3 glasswool insulation in the cavity / 13mm standard plasterboard internally.
Glazing	32	6.38mm laminated glazing with acoustic rated frame.
Roof	41	Pitched 0.42mm sheet metal roof backed with ≥60mm anticon insulation and 165mm thick glasswool insulation on top of a 13mm standard plasterboard ceiling.

When the final internal room layout, glazing areas and internal finishes are known, calculations can be undertaken to determine finalised façade element acoustic ratings.

5.2 Environmental Noise Emissions

5.2.1 Outdoor Playscapes

Noise from the outdoor playscapes has the potential to affect the acoustic amenity for nearby sensitive receivers, therefore, an assessment was completed to determine whether acoustic treatments are required to comply with the project noise limits provided in **Section 4.1.4**. The assessment assumes all empty lots will have a two storey home built on it.

5.2.1.1 Noise source locations

The outdoor play areas were input into the SoundPLAN 9.0 model as area noise sources with the acoustic barrier recommended to address road traffic noise intrusion also included in the calculations as shown in **Figure 6**. Source heights and sound power levels were calculated in accordance with the AAAC Guide (refer to **Table 1**) and are provided in **Table 12**. It was assumed that the total amount of children for the night period would be 1/6th of the full attendance with the majority of drop-offs expected to occur after 7am.

Table 12: Outdoor playscape noise calculation inputs

Noise Source	Source Height (m)	Calculated L_{eq} Sound Power Level dB(A)
Playscape 01 (24 x 0 -2 year olds) day/eve	1	82
Playscape 02 (30 x 2 – 3 year olds) day/eve	1	90
Playscape 03 (66 x 3 – 5 year olds) day/eve	1	95
Playscape 01 (4 x 0 -2 year olds) night	1	74
Playscape 02 (5 x 2 – 3 year olds) night	1	82
Playscape 03 (11 x 3 – 5 year olds) night	1	87

Figure 6: Outdoor playscape area source locations

5.2.1.2 Predicted Noise Impacts

A noise emissions assessment was conducted based on the inputs outlined above with the predicted noise levels at the nearest sensitive receivers provided in **Table 13**.

Table 13: Predicted L_{eq} noise impacts to offsite receivers from outdoor play areas

Receptor	Noise source	Individual noise day / eve impacts L_{eq} dB(A)	Combined Noise day / eve impact L_{eq} dB(A)	Complies with day / eve criteria 50 dB(A) Y/N?	Individual noise level (night) L_{eq} dB(A)	Combined noise level (night) L_{eq} dB(A)	Complies with night criteria 43 dB(A) Y/N?
Residential East of Site (across Western Drive)	Playscape 01	14	50	Yes	5	42	Yes
	Playscape 02	43			35		
	Playscape 03	49			41		
Residential South of Site (across Tyndall Circuit)	Playscape 01	11	50	Yes	3	42	Yes
	Playscape 02	40			32		
	Playscape 03	50			42		
Residential West of Site (Lot 8018)	Playscape 01	44	44	Yes	36	36	Yes
	Playscape 02	22			14		
	Playscape 03	24			16		
School (nearest playground)	Playscape 01	13	35	Yes	—	—	—
	Playscape 02	32			—		
	Playscape 03	32			—		

5.2.2 Discussion and Recommendations

The outdoor play areas are predicted to with the noise limits on the basis the acoustic barriers recommended to address road traffic noise intrusion are implemented.

5.3 Onsite Carparking

5.3.1 Assessment Methodology

Noise emissions from carparks and the outdoor communal space have the potential to influence the general acoustic amenity of surrounding noise sensitive uses and are required to comply with all relevant environmental noise limits outlined in **Section 4.1.4** of this report.

The complexity of associated noise events can be difficult to accurately simulate as individual noise sources (i.e., vehicle parking bay turnover rates, location of noise event such as motion (acceleration, deceleration), idling, ignition, door slams etc.). Therefore, acoustic assessment has been based on the technical research paper *"Prediction of parking area noise in Australian conditions"* from the Australian Acoustical Society Conference (Nicol and Johnson, 2011) and parking lot study *"Recommendations for the Calculation of Sound Emissions of Parking Areas, Motorcar Centers and Bus Stations as well as of Multi-Storey Car Parks and Underground Car Parks"* (Bavarian Landesamt für Umwelt, 2007, 6th edn, BayLfU).

5.3.2 Assessment Inputs and Assumptions

The site was developed in the acoustic model based on the architectural drawings package (refer to **Table 2**) and included the inputs provided in **Table 14**. It is assumed that 100% peak movements occur during the day and evening time periods (7am – 10pm) and are equivalent to all carparks turning over within an hour period. The night carpark turnover rates are based on data provided by Stockland for childcare centres which revealed 14% of peak movements occurring between 6am - 7am.

Table 14: Parking noise assessment noise model inputs

Parameter	Model Input
Number of carparks	38
Carpark turnover rate – **day / evening**	38 carparks / hour
Carpark turnover rate – **night**	6 carparks / hour
Parking lot type	Visitors and Staff
Parking lot area source noise level (dependent on lot size)	Ref. L_w 87 dB(A)
Vehicle spectrum	Typical
Road surface correction	+ 0 dB

5.3.3 Predicted Noise Levels

A noise emissions assessment was conducted based on the inputs outlined above. **Table 15** provides the worst predicted noise levels assessed against the applied noise limits.

Table 15: Carpark predicted noise impacts

Receptor	Noise impact day / eve L_{eq} dB(A)	Complies with day / eve criteria 50 dB(A) Y/N?	Noise impact night L_{eq} dB(A)	Complies with night criteria 43 dB(A) Y/N?
Residential East of Site (across Western Drive)	22	Yes	14	Yes
Residential South of Site (across Tyndall Circuit)	46	Yes	38	Yes
Residential West of Site (Lot 8018)	49	Yes	39	Yes
School (nearest playground)	22	Yes	-	Yes

5.3.4 Discussion and Recommendations

The site carparking is predicted to comply without additional acoustic treatment for all time periods.

5.3.5 Building Services Plant

Noise emissions from proposed equipment selections are required to comply with the EPA 1994 mechanical noise limits outlined in **Table 6**.

Given the current stage of the project, the type of mechanical services plant has not been proposed and, therefore, detailed calculations of proposed selections could not be conducted. In lieu of this information, a calculation was conducted based on first principle formulation to estimate the maximum sound power level (L_w) for combined plant which is expected to comply with the applicable noise limits at the closest sensitive receptors.

The following inputs and assumptions were considered, which is considered highly conservative and result in underestimated sound power limits:

- Noise attenuation factors such as sound source directivity, noise barriers and other noise controls are not applied (this is conservative).
- Standard directivity influences caused by building reflections (Q-factor of 4 applied).
- Plant located at the nearest point to the nearest residential lot adjacent to south façade).
- Assessed against the night noise criteria.

5.3.6 Predicted Noise Levels and Recommendations

Based on the above, mechanical plant or air intake/discharge points which are without additional screening, attenuation or other noise mitigation measures shall not exceed **Lw 71 dB(A)**.

It is noted that this result is preliminary only, where the only purpose is to assess the viability of the project from a noise emissions perspective. Therefore, a development approval condition **should not** be imposed based on the limiting sound power level stated above. Later design stages of the development should also consider noise from the plant spaces to the nearby outdoor seating areas as these areas may suffer from poor acoustic amenity without sufficient acoustic treatment.

Noise emissions from mechanical plant shall be assessed in detail during the design stages of the project, when equipment selections and information regarding the source type (e.g., operative periods, sound power levels, designated location, etc.) are established. Necessary details and information for thorough completion of the noise impact assessment shall be requested from and coordinated with the design team. The requirements (if any) and the extent of noise control measures shall be evaluated and specified during such stages to ensure the noise limits defined in this report are met.

Unattenuated plant may exceed the prescribed noise limits if large units are installed in a location near to receivers; however, the extent of treatments shall be determined by a suitably qualified person (acoustic consultant) once equipment selection details are known. For costing purposes, provisions shall be made for the following:

- Noise barriers or acoustic louvres;
- Acoustic attenuators;
- In-duct linings; and / or
- Quiet equipment selections of selections with custom silencer / attenuation options.

6. Conclusion

Stantec Australia Pty Ltd have been engaged by Stockland to undertake acoustic assessment for a childcare centre proposed for the corner of Western Drive and Tyndall Circuit, Banya QLD 4551.

This acoustic services report has:

- outlined the acoustic services scope of works for the project;
- established relevant acoustic criteria in accordance with current Australian Standards and Design Guidelines;
- identifies key acoustic issues that are to be addressed by the project; and
- provided design advice regarding construction to achieve the nominated acoustic performance objectives.

We trust that this report to be sufficient for your current requirements; however, should you have any queries, please do not hesitate to contact the undersigned on (07) 3029 5000.

Kind regards,

Marcus Kamppi (Author)
Acoustic Engineer for **Stantec**

Michael Lanchester (Reviewer)
Acoustics Section Manager (QLD) for **Stantec**

Appendices

Appendix A Glossary of Acoustic Terms

TERM	DEFINITION
Assessment Location	The position at which noise measurements are undertaken or estimated.
Attenuation	A reduction in the magnitude of sound.
A-weighting	A frequency dependent filter applied to an instrument-measured noise. In its simplest form, the filter is designed to replicate the relative sensitivity to loudness perceived by the human ear.
Background Noise	Background noise is the term used to describe the underlying level of noise present in the ambient noise, measured in the absence of the noise under investigation. It is described as the average of the minimum noise levels measured on a sound level meter and is measured statistically as the A-weighted noise level exceeded for ninety percent of a sample period. This is represented as the LA90 noise level.
Barrier	Solid walls or partitions, solid fences, earth mounds, earth berms, buildings, etc. used to reduce noise.
Ctr	A standard weighting curve which replicates low frequency noise, such as that from traffic. Often added to DnT,w or Rw to characterise airborne sound insulation performance.
dB	The abbreviation for decibel.
dB(A)	A-weighted sound level in decibels.
Dw	A single number value that represents a field measurement of the weighted level difference between two adjacent spaces separated by a partition. Dw = L1 – L2 where, L1 is the average sound pressure level in the source room; and L2 is the average sound pressure level in the receiver room.
Free Field	An environment in which there are no acoustic reflective surfaces. Free field noise measurements are carried out outdoors at least 3.5 m from any acoustic reflecting structures other than the ground.
Intermittent Noise	Level that drops to the background noise level several times during the period of observation.
LA1	The A-weighted sound pressure level exceeded for 1 % of the measurement time period.
LA10	The A-weighted sound pressure level exceeded for 10 % of the measurement time period.
LA90	The A-weighted sound pressure level exceeded for 90 % of the measurement time period. Typically represents the background noise level of an environment.
LAeq	The equivalent continuous sound pressure level in dB(A). It is often accompanied by an additional suffix “T”, which is indicative of the measurement time period. (e.g. LAeq,15min, symbolising the measurement is evaluated over 15-minutes).
Noise Logger	A sound level meter situated at a particular point of interest. The instrument is typically for an extended period in order to ascertain typical noise patterns associated with the measurement position.
Reflection	Sound wave changed in direction of propagation due to a solid object met on its path.
Reverberation	The persistence of a sound within a space, which will naturally decay over time. Most apparent once the source signal has ceased emitting. Reverberation may have effects on speech intelligibility if not adequately controlled. Reverberation time, represented in seconds, can vary depending on the volume and surface finishes of the space.
Rw	Weighted sound reduction index. A single number value which represents the airborne sound insulation performance of a partition or building element that has been determined under laboratory testing conditions.
Sound Power Level	The total sound energy radiated by a source, expressed in Watts. The sound power level is ten times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power.
Spectrum	The spectrum is the result of transforming a time domain signal to the frequency domain. Spectrum analysis is the procedure of doing the transformation, and it is most commonly done with an FFT analyser.

Appendix B Noise Modelling Details

A three-dimensional computer model of the study area was created within SoundPLAN 9.0 software. The following inputs were utilised:

- **Building receptors** – These were digitised at the location of the most exposed facades to the relevant noise sources. Single point receptors were modelled at 1.5 m above each finished floor level of each building digitised in the model. These were located at 1 m from the façade.
- **Noise map calculations** – Noise contour maps were calculated as free-field noise levels, 1.5 m above the ground at 2m resolution.
- **Road traffic noise** was calculated using the SoundPLAN implementation of the UK Department of Transport Welsh Office *Calculation of Road Traffic Noise* 1988 (CoRTN), which is accepted by TMR CoP 2013.
- **Ground surface corrections** – 30% ground absorption was applied.
- **Sound reflections –** A reflection order of 3 was used.
- **Façade correction** - +2.5dB façade correction applied for non-free field calculations.
- **Terrain:** A Digital Elevation Model (DEM) provided by Egis Group.
- **Road traffic parameters:** Western Drive traffic volumes obtained from the February 2024 traffic models by Scyne.

The traffic volumes digitised in the computer model are presented in **Table 16**.

Table 16: Traffic volumes utilised for model verification and noise assessment

Road	% HV	Speed, km/h	% Growth	AADT	94% AADT
Western Drive	3.0	60	4	6000	5640

+0 dB(A) surface corrections was applied to the Western Drive based on the assumption it will be dense grade asphalt.

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