

Noise Impact Assessment

29 Shirley Street, Byron Bay

LGC Properties Pty Ltd

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Acoustics Glossary

A-weighting	Correction to sound levels to mimic the response of the human ear at low sound frequencies.
AADT	Annual average daily traffic. The total traffic flow over a 24 hour period along a specific segment of road.
Broadband sound	Sound distributed across the whole audible frequency range.
Decibel (dB)	(1) Degree of loudness (2) A unit for expressing the relative intensity of sounds on a scale from zero for the average least perceptible sound to about 130 for the average pain level. A unit used to express relative difference in power or intensity, between two acoustic signals, equal to ten times the common logarithm of the ratio of the two levels, one of which is a standard reference value.
dB(A)	The A-weighted sound pressure level.
Façade adjusted	The noise level at 1m from a building façade is calculated by adding 2.5dB to the free-field noise level to account for sound reflected from the building façade. The external noise levels at the buildings facades are “façade-adjusted”.
Free-field	Noise level without any reflected sound from buildings or other hard, reflective surfaces (except for the ground plane).
Hz (Hertz)	Hertz is the standard measure of the frequency of oscillations in a wave motion. The frequency is most often measured in cycles per second (cps) or Hertz (Hz). Frequency of 1 Hz is one cycle per second.
Impulsive noise and impulsiveness adjustment	Noise having a high peak of short duration or a sequence of such peaks. Impulsive noise is present if the difference in A-weighted maximum noise levels between fast response and impulse response is greater than 2dB. Impulsiveness adjustment (penalty) of up to 5dB should be applied to the component noise level.
$L_{Amax,T}$	The maximum A-weighted sound pressure level occurring in a specified time period T in seconds.
$L_{Aeq,T}$	“Average-energy” sound level used in situations where sound varies over time. $L_{Aeq,T}$ is the A-weighted sound pressure level that has the same energy as the fluctuating sound over the time period T sec.
$L_{A01,T}$	Measure of the maximum sound level. $L_{A01,T}$ is a statistical parameter that is the A-weighted sound pressure level that is exceeded for 1% of the measurement time T.
$L_{A10,T}$	$L_{A10,T}$ is a statistical parameter that is the A-weighted sound pressure level that is exceeded for 10% of the measurement time T.
$L_{A90,T}$	Background sound level. $L_{A90,T}$ is a statistical parameter that is the A-weighted sound pressure level that is exceeded for 90% of the measurement time T.
$L_{A10,18hr}$	The arithmetic average of the 18 individual $L_{A10,1hr}$ values between 6:00am and 12:00am (midnight). It is a derived descriptor which is used as a main traffic noise descriptor in the Calculation of Road Traffic Noise (CoRTN) procedure developed by the UK Department of Environment, Welsh Office, HMSO, 1988
Noise	Unwanted sound.

Octave bands and 1/3 octave bands	A range of frequencies whose upper frequency limit is twice that of its lower frequency limit. In acoustics, the audible spectrum (20Hz to 20kHz) is divided into 10 parts (octaves) with centre frequencies of 31.5Hz, 63Hz, 125Hz, 250Hz, 500Hz, 1kHz, 2kHz, 4kHz, 8kHz and 16kHz. For more detailed frequency analysis, octave bands are further divided into more discrete bands. For examples, 1/3 octaves bands are where each octave band is divided into three parts. IEC 61260:1995, <i>Electroacoustics — Octave-band and fractional-octave band filters</i>
Rating Background Level (RBL)	Lowest tenth percentile of the $L_{A90,T}$ background noise levels over an assessment period.
Sound power	The sound energy radiated per unit time by a sound source, measured in Watts (W).
Sound Power Level, L_w (SWL)	Logarithmic measure of sound power on a decibel scale, referenced to the human hearing threshold of 1×10^{-12} W.
Sound pressure	The fluctuations in air, measured in Pascals (Pa).
Sound Pressure Level, L_p (SPL)	Logarithmic measure of sound pressure on a decibel scale, referenced to the human hearing threshold of 2×10^{-5} Pa.
Tonal noise, tonality and tonality adjustment	Tonal noise is characterised by one or more distinct frequency components (“tones”) that emerge audibly from the total sound. For example, distinct tones may be emitted by fans, saws, grinders and other equipment. Tonal noise is generally far more annoying than non-tonal noise. Presence of tonal sound (“tonality”) can be identified by analysing the sound levels in adjacent 1/3 octave bands. AS1055.1-1997 and the DEHP Noise Measurement Manual 2013 provides guidance on how tonality should be assessed. If tonal components are clearly audible and they can be detected by 1/3 octave analysis (1/3 octave band exceeds neighbouring bands by at least 5dB), tonality adjustment (penalty) of up to 5dB should be applied to the component noise level.
Weighted Sound Reduction Index (R_w)	A single-number quantity which characterises the airborne sound insulation of a material or building element over a range of frequencies.

Vibration Glossary

Acceleration	The rate of change of the speed of an element.
Airborne vibration	Structural vibration induced by low frequency sound.
Airblast Overpressure	The sudden increase in air pressure generated by a shock wave, produced when an explosive is detonated.
Continuous vibration	A vibration source that is continuous in nature during an assessment period (maybe constant or variable).
Component Particle Velocity (component PV)	The instantaneous particle velocity of a particle at each orthogonal component axis.
Crest factor	The ratio between the peak amplitude and the maximum RMS amplitude of a signal.
Displacement	The distance that an element moves away from its static position.
Frequency	Number of oscillations per second (in units of Hz).
Geophone	Transducer that converts ground or building motion into a voltage reading for measuring vibration levels.
Impulsive vibration	A vibration source (continuous or intermittent) which has a rapid build up to a peak followed by a damped decay that may or may not involve several cycles of oscillation (depending on frequency and damping)
Intermittent vibration	Intermittent vibration can be defined as interrupted periods of continuous (for example, a drill) or repeated periods of impulsive vibration (for example, a pile driver), or continuous vibration that varies significantly in magnitude.
Peak Component Particle Velocity (PCPV)	The maximum instantaneous velocity of a particle in any one of the three orthogonal component axis directions during a given time interval. Also represented by the notation v_i in DIN4150-3.
Peak Particle Velocity (Resultant PPV)	The maximum instantaneous velocity of a particle at a point during a given time interval being the vector sum of component velocities in three orthogonal directions (x, y, z).
Peak Particle Acceleration (PPA)	Maximum instantaneous particle acceleration (in units of m/s^2) recorded over the measurement interval.
Velocity	The instantaneous speed of an element,
Vibration	Vibration of the ground or of structures and buildings; that is, the oscillatory displacement of the ground or of structures and buildings.

1. Introduction

1.1 Project Background

ATP Consulting Engineers (ATP) was engaged to carry out noise impact assessment for the proposed development at 29 Shirley Street in Byron Bay.

This report presents the results of the investigation of the acoustic constraints and the potential vibration impacts on the proposed development imposed by the site location and proximity to the Murwillumbah railway line. In addition, the potential noise impact from the proposed development on the nearest noise sensitive places was assessed as per the requirements of the *Noise Policy for Industry (2017)*.

Issue 3 of the report was prepared in response to Byron Shire Council (BSC) information request to the DA application (Application No.: 10.2022.372.1 PAN-447501).

Summary of the responses to BSC's information request is presented in Section 1.2 of this report.

1.2 Responses to DA conditions

Table 1.1 presents the response to BSC's information request.

Table 1.1 Responses to BSC's information request

BSC's Information Request	ATP Response
Noise Impact Assessment Due to the addition of the roof top entertainment areas and pools, wellness centre and redesign of the development, an amended Noise Impact Assessment addressing the impact from these modifications (roof top entertainment areas and pools, wellness centre (amplified music), and plant deck, on the findings and recommendations of the original Noise Impact Assessment, is to be forwarded to Council for assessment and approval. The report should also address, the impact of the general redesign of the development, on the surrounding dwellings. Along with the impact of road traffic noise from Shirley Street onto the development. The amended assessment must include recommendations for acoustic treatment to affected dwellings facing Shirley Street, including appropriate measures to ensure that the following L_{Aeq} levels associated with traffic noise are not exceeded: (a) in any bedroom in the residential accommodation—35 dB(A) at any time between 10pm and 7am, (b) anywhere else in the residential accommodation (other than a garage, kitchen, bathroom or hallway)—40 dB(A) at any time. Such treatments, additional acoustic screening, or modifications to the design of the development must then be included in the Construction Certificate plans for approval.	Issue 3 of the Noise Impact Assessment considers the new layout of the development including modifications of the roof top entertainment areas and pools, and the wellness centre located in the basement. The 3D noise propagation models for light rail, road traffic and operational noise have been updated considering the latest layout of the development. The results of the different noise assessments can be found in Sections 3, 4, and 5 of this acoustic report and are representative of the new development layout. Recommendation for acoustic treatment to the affected dwellings, to ensure the L_{Aeq} levels as specified in the information request are not exceeded, can be found in Section 7 of the report. The amended assessment includes recommendations for acoustics treatment to the dwellings affected by light rail and road traffic noise, as well as recommendations to protect the noise amenity at the nearest noise sensitive places from the noise emissions associated with the modified development layout.

1.3 Study Objectives

Study objectives are as follows:

- Site visit and establishment of an automated noise logger at the subject site to record the existing background noise levels and to obtain railway noise data.
- Site visit and establishment of an automated vibration logger at the subject site to record vibration data associated with the nearby railway line.
- Site visit and establishment of an automated noise logger at the boundary of the development site facing Shirley Street to obtain representative road traffic noise data for validation of the three-dimensional (3D) road traffic noise propagation model.
- Development of a 3D noise propagation model using SoundPLAN software with consideration of the proposed development layout, current and future (10-year planning horizon) traffic flows along Shirley Street.
- Calculation of the road traffic noise levels ($L_{Aeq,15hr}$ and $L_{Aeq,9hr}$) at the façades of the proposed development within a 10-year planning horizon and recommendations for road traffic noise control measures.
- Assessment of potential noise and vibration impacts at the subject site associated with the nearby railway line.
- Calculation of the operational noise emissions associated with the activities at the development and assessment of the potential noise impact on the nearest noise sensitive places.
- Recommendation of noise mitigation measures to prevent noise impact from the activities associated with the established development on the nearest noise sensitive places.

1.4 Subject Site

The proposed development is located at 29 Shirley Street in Byron Bay within the Byron Shire Council (BSC) local government area on the land described as the following:

- Lot 1 on DP780935,
- Lot 10 on DP1153734,
- Lot 1 and 2 on DP582819,
- Lots 8 and 9, Section 52 on DP758207,
- Lot 7, 8 and 9 on DP841611,
- Lot 11 and 12 on DP1138310.

The site is located adjacent to the Murwillumbah railway line and is presented in Figure 1.1.



Figure 1.1 Site location

The Murwillumbah railway has closed and no longer serves as a rail corridor for passenger or freight trains. Clause 230 of the *Transport Administration Amendment (Closures of Railway Lines in Northern Rivers) Bill 2020* states that the rail line may only be leased for recreation, tourism or community and related purposes. The rail line is not capable of accommodating heavy rail.

Currently, the only train operating on the railway line is the lightweight *Byron Solar Train* which has a non-exclusive license to run on these lines.

1.5 Proposed Development

The proposed development consists of three, three-storey buildings with 25 residential units:

- One level of basement car parking (69 Spaces);
- A wellness centre located in the basement;
- Ground floor containing ten units, pool and communal recreation area;
- Level 1 containing ten units;
- Level 2 containing five units; and
- Roof deck containing ten rooftop terraces with swimming pools.

The site and floor plans of the proposed development, as per the latest modifications, are presented in Appendix A.

2. Existing Noise Amenity

2.1 Site-specific Noise Measurements

Noise monitoring was carried out at the subject site to obtain information about the existing light rail and background noise levels during day, evening and night time.

The noise measurement methodology is summarised in Table 2.1.

Table 2.1 Noise measurements

Relevant legislation, standards and guidelines	The noise measurements were carried out in accordance with: • Australian Standard AS 1055-2018 (<i>Acoustics – Description and measurement of environmental noise</i>); • Australian Standard AS 2702-1984 (<i>Acoustics – Methods for measurement of road traffic noise</i>); • Australian Standard AS 2377-2002 (<i>Acoustics – Methods for the measurements of railbound vehicle noise</i>); and • International Standard ISO 3095:2013 (<i>Acoustics – Railway applications – Measurement of noise emitted by railbound vehicles</i>).
Measurement locations	The noise measurements were carried out at the subject site at 29 Shirley Street in Byron Bay. For the railway noise measurements, the noise logger was set up towards the north of the site, facing the Murwillimbah railway line. For the road traffic noise measurements, the noise logger was set up towards the south of the site, facing Shirley Street. The railway and road traffic noise measurement locations are presented in Figure 2.1. Photos showing the unattended noise measurement locations are presented in Appendix B.
Measurement period	Continuous background noise monitoring and light rail noise measurements were carried out 24 hours a day from 11 to 20 February 2022. Unattended road traffic noise measurements were carried out 24 hours a day from 16 to 26 February 2024.
Measurement equipment	The following noise measurement equipment was used during the unattended measurements: • Environmental noise logger – ARL Ngara (Serial No. #878157); • Environmental noise logger – ARL Ngara (Serial No. #15-203-537); • Calibration – RION NC-75 sound level calibrator (Serial No. #34413140); and • Calibration – RION NC-74 sound level calibrator (serial No. #34615224). The noise measurement instruments conform to Australian Standard AS/NZS IEC61672.1-2019. Calibration was performed during set up and download of the data from the noise logger. The calibration drift was <0.1 dB(A).
Meteorological conditions	Rainfall was recorded during the monitoring period. Data affected by rainfall was disregarded in determination of the average background noise levels and Rating Background Levels (RBL) as well as in the determination of the average road traffic noise levels. Full meteorological data¹ for the monitoring periods are presented in Appendix C.

¹ Bureau of Meteorology (BoM) daily weather observations as recorded at the Byron Bay (Cape Byron AWS) meteorological station (058216).

Analysis of data	Light Rail Noise Assessment: The noise measurement data was analysed to determine the following light rail noise descriptors: • L_{Aeq,pass-by}: The L_{Aeq,pass-by} sound pressure level is the average energy noise level during the length of the time of the train pass-by event. Road Traffic Noise Assessment: The noise measurement data was analysed to determine the following road traffic noise descriptors: • L_{10,18hr}: L₁₀ is the level of noise exceeded for 10% of any time period; L_{10,18hr} is the typical traffic noise descriptor, and is the arithmetic average of 18-hourly L_{10,1hr} levels over consecutive hours between 6am and 12am. Operational Noise Assessment: The noise measurement data was analysed to determine the following operational noise descriptors: • L_{A90,T}: Background noise level during daytime (7am to 6pm), evening (6pm to 10pm) and nighttime (10pm to 7am). • RBL: Rating Background Level during day-time (7am to 6pm), evening (6pm to 10pm) and night-time (10pm to 7am). The RBL was calculated from the L_{A90,15min} noise levels using the procedure described in the <i>NSW Noise Policy for Industry</i>. The RBL noise levels are used to determine the Background Creep noise criteria as per Section 5 of this report.
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Figure 2.1 Railway and road traffic noise measurement location

2.2 Light Rail Noise Measurements

The Byron Solar Train operates at a maximum of twenty services per day. The loudest pass-by event recorded from 12 to 20 February 2022, are presented in Table 2.2.

Table 2.2 Measured railway noise levels

Date	Time of train pass-by	Railway noise level, dB(A)
		L _{Aeq,pass-by}
12 Feb 2022 (Sat)	5:05 PM	64
13 Feb 2022 (Sun)	3:06 PM	64
14 Feb 2022 (Mon)	12:18 PM	62
15 Feb 2022 (Tue)	11:17 AM	62
16 Feb 2022 (Wed)	11:09 AM	65
17 Feb 2022 (Thu)	5:17 PM	64
18 Feb 2022 (Fri)	11:18 AM	62
19 Feb 2022 (Sat)	5:17 PM	65
Arithmetic average		63

2.3 Road Traffic Noise Measurements

The results of the unattended noise measurements, relevant for the road traffic noise impact assessment, at No. 29 Shirley Street from 16 to 26 February 2024 are presented in Table 2.3 and in Appendix D.

Table 2.3 Measured road traffic noise levels

Date	Traffic noise levels		Background noise levels	
	L _{10,18hr} (6:00am-12:00am)	L _{10,1hr max} (6:00am-12:00am)	L _{90,18hr} (6:00am-12:00am)	L _{90,8hr} (10:00pm-6:00am)
16 Feb 2024 (Fri)	—	—	—	44
17 Feb 2024 (Sat)	64	66	55	42
18 Feb 2024 (Sun)	63	65	53	41
19 Feb 2024 (Mon)	64	67	55	42
20 Feb 2024 (Tue)	64	67	55	40
21 Feb 2024 (Wed)	63	67	54	40
22 Feb 2024 (Thu)	64	66	55	43
23 Feb 2024 (Fri)	64	66	56	47
24 Feb 2024 (Sat)	65	67	55	42
25 Feb 2024 (Sun)	64	65	53	40
Arithmetic average (weekdays only)	64	66	55	43

*Data for periods of inclement weather were disregarded in determination of average noise levels.

2.4 Operational Noise Measurements

The results of the background noise monitoring undertaken from 11 to 19 February 2022, and the RBLs, which were calculated as per the procedure in NSW *Noise Policy for Industry* are presented in Table 2.4 and Appendix D.

Table 2.4 Measured background noise levels

Date	Background noise levels L ₉₀ dB(A)			Assessment Background Levels (ABL) dB(A)		
	L _{90,11hr} day (7am–6pm)	L _{90,4hr} evening (6pm–10pm)	L _{90,9hr} night (10pm–7am)	L _{90,11hr} day (7am–6pm)	L _{90,4hr} evening (6pm–10pm)	L _{90,9hr} night (10pm–7am)
11 Feb 2022 (Fri)	—	—	44	—	—	43
12 Feb 2022 (Sat)	48	49	45	46	48	43
13 Feb 2022 (Sun)	46	50	48	45	48	46
14 Feb 2022 (Mon)	47	53	48	45	48	47
15 Feb 2022 (Tue)	47	51	46	45	49	43
16 Feb 2022 (Wed)	46	51	45	45	49	43
17 Feb 2022 (Thu)	47	53	49	45	51	47
18 Feb 2022 (Fri)	48	54	44	45	47	42
19 Feb 2022 (Sat)	45	50	44	43	46	42
Arithmetic Average	47	51	46	—	—	—
Rating Background Level (RBL)				45	48	43

*Data for periods of inclement weather were disregarded in determination of average noise levels.

3. Light Rail Noise Impact Assessment

3.1 Railway Noise Criteria

The NSW *State Environmental Planning Policy (Transport and Infrastructure)* (SEPP) 2021 specifies internal noise levels which should be achieved in relation to railway pass-by events.

The applicable external noise triggers for residential land uses are presented in Table 3.1

Table 3.1 Airborne railway noise limits for residential land uses

Sensitive receptor	Location	Period	Railway noise limits L _{Aeq,pass-by} dB(A)
Bedroom	Indoors	Night (10:00pm – 7:00am)	35
Habitable rooms		At any time	40
Bedrooms	Outdoors	Night (10:00pm – 7:00am)	42 (35 + 7)
Habitable rooms		At any time	47 (40 + 7)

The following is noted regarding the railway noise criteria:

- The *SEPP 2021* does not specify outdoor noise criteria for dwellings. However, the outdoor noise criteria have been derived from the internal criteria, assuming 7 dB noise reduction by the building envelope with windows open².

3.2 Rail Noise Calculation Methodology

Light rail noise levels at the development were calculated using SoundPLAN noise propagation modelling software.

SoundPLAN calculates light rail noise using the Nord 2000 railway noise prediction method.

The assumptions and data used in development of the light rail noise propagation model are presented in Table 3.2.

Table 3.2 Data and assumptions – Light rail noise model

Terrain	Department of Natural Resources and Mines Airborne Laser Scanning (LiDAR) 1 metre data was used to determine the elevation of the development relative to the surroundings.
Buildings	- The existing buildings at 29 Shirley Street were included in the model, along with the buildings adjacent to the development site for the validation. - The design and orientation of the proposed development were modelled as per the site plan prepared by Hayball (Project No. 255, dated 22 February 2024). - The development layout is presented in Appendix A.

² Typical noise reduction for windows partially open, *Planning for Noise Control Guideline*, QLD Dept. of Environment and Science (DES).

Light rail traffic	- The Murwillimbah railway line currently only carries the light-weight Byron Solar Train. - The Murwillimbah railway line has one rail line as it passes the development site. - The assumed speed of the Byron Solar Train used for this assessment is 40 km/hr. - The assumed length of the Byron Solar Train used for this assessment is 40m. - Current light rail traffic volumes³ on the line as it travels past the proposed development are as follows: 7:00am to 10:00pm: 20 pass-by events (combined northbound and southbound direction); and 10:00pm to 7:00am: No train pass-by events. - No specific information related to future traffic predictions for the Byron Solar Train is available. It was assumed that no significant increase in volume, speed and vehicle type is expected within a 10-year planning horizon.
Receivers	Building Façades: Receivers were attached to the façades of the building at a height of 1.5m above the first-floor level. - SoundPLAN adds +2.5dB(A) to the calculated noise levels when the receivers are attached to the buildings, thus the tabulated light rail noise levels are façade adjusted. 1m grid spacing was used for calculation of noise contour maps.
Calculation procedure	Nord 2000
Noise mitigation measures	Noise mitigation measures are discussed in further detail in Section 7 of this report.

3.3 Light Rail Noise Model Validation

The light rail noise data recorded on site (as presented in Table 2.3) was used to validate the accuracy of the SoundPLAN model.

The results of the SoundPLAN model validation are presented in Table 4.3 and in Appendix E.

Table 3.3 SoundPLAN light rail noise model validation results

Measurement location	Measured* Leq,pass-by dB(A)	Calculated* Leq,pass-by dB(A)	Difference dB	Validation factor
Noise logger	63	63	±0	N/A

*Free-field

Excerpt from the 3D SoundPLAN light rail noise propagation model is presented in Figure 3.1.

³ Timetable for Byron Solar Train. Source: Byron Solar Train website – <https://byronbaytrain.com.au/>



Figure 3.1 3D light rail noise model – SoundPLAN excerpt

3.4 Light Rail Noise Propagation Results

3.4.1 External Façades

The calculated light rail noise levels at the most exposed façades of the future residential units at 29 Shirley Street, are presented in Table 3.4.

Table 3.4 Light rail noise levels at façades

Unit	Room	Façade	Floor	Leq,pass-by assessment Day (7:00am to 10:00pm)	
				Leq,pass-by dB(A) Façade adjusted	Compliance with noise criterion of ≤47dB(A) Leq,pass-by
001	Living	North	Ground Level	41	Yes
	Living	East		37	Yes
	Bedroom	West		31	Yes
	Ensuite	West		26	Yes
	Entry	West		16	Yes
	Master	South		10	Yes
	Living	South		9	Yes
	Entry	North		0	Yes
002	Bedroom	North	Ground Level	0	Yes
	Living	North		39	Yes
	Living	East		29	Yes
	Master	East		28	Yes
	Ensuite	East		27	Yes
	Master	South		10	Yes
003	Bedroom	South		9	Yes
	Living	North		37	Yes
	Bedroom	South		10	Yes
	Entry	West		0	Yes
004	Master	North		0	Yes
	Living	West		37	Yes
	Bedroom	West		36	Yes
	Bedroom	South		10	Yes
	Entry	East		0	Yes
	Living	North		0	Yes
005	Master	North		0	Yes
	Living	West		58	No
	Master	West		58	No
	Ensuite	West		56	No
	Living	North		56	No
	Bedroom	South'		29	Yes
006	Entry	South		11	Yes
	Living	North		54	No
	Living	East		51	No
	Master	North		48	No

Unit	Room	Façade	Floor	Leq,pass-by assessment Day (7:00am to 10:00pm)	
				Leq,pass-by dB(A) Façade adjusted	Compliance with noise criterion of ≤47dB(A) Leq,pass-by
	Bedroom	South		28	Yes
	Bedroom	East		0	Yes
	Entry	South		0	Yes
007	Living	North		54	No
	Living	West		48	No
	Master	North		48	No
	Bedroom	South		29	Yes
	Bedroom	West		0	Yes
	Entry	South		0	Yes
008	Living	North		56	No
	Living	East		46	Yes
	Master	North		45	Yes
	Bedroom	South		30	Yes
	Bedroom	East		23	Yes
	Entry	South		0	Yes
009	Ensuite	East	Ground Level	56	No
	Master	East		56	No
	Bedroom	East		56	No
	Living	East		56	No
	Living	North		56	No
	Living	West		46	Yes
	Bedroom	South		30	Yes
	Entry	West		3	Yes
010	Bedroom W	North		41	Yes
	Living	North		37	Yes
	Master	East		35	Yes
	Ensuite	East		34	Yes
	Bedroom W	West		31	Yes
	Bedroom E	East		30	Yes
	Bedroom E	South		26	Yes
	Bedroom W	South		25	Yes
	Bedroom E	West		24	Yes
	Living	West		17	Yes
101	Living	North	Level 1	50	No
	Living	East		46	Yes
	Bedroom	West		39	Yes
	Ensuite	West		29	Yes
	Living	West		28	Yes
	Entry	North		27	Yes
	Bedroom	South		14	Yes
	Living	South		13	Yes

Unit	Room	Façade	Floor	Leq,pass-by assessment Day (7:00am to 10:00pm)	
				Leq,pass-by dB(A) Façade adjusted	Compliance with noise criterion of ≤47dB(A) Leq,pass-by
102	Entry	North		0	Yes
	Living	North		36	Yes
	Living	East		35	Yes
	Master	East		30	Yes
	Ensuite	East		30	Yes
	Master	South		14	Yes
	Bedroom	South		13	Yes
103	Master	North		49	No
	Living	North		41	Yes
	Bedroom	South		14	Yes
	Entry	West		0	Yes
104	Master	North		47	Yes
	Bedroom	West		44	Yes
	Living	West		42	Yes
	Living	North		39	Yes
	Bedroom	South		13	Yes
105	Entry	East	Level 1	0	Yes
	Living	West		59	No
	Master	West		58	No
	Ensuite	West		57	No
	Living	North		54	No
	Bedroom	South		32	Yes
	Bedroom	South		18	Yes
	Entry	South		14	Yes
106	Living	West		60	No
	Master	North		57	No
	Living	North		57	No
	Bedroom	East		35	Yes
	Bedroom	South		32	Yes
	Entry	South		30	Yes
107	Living	West		60	No
	Master	North		57	No
	Living	North		55	No
	Bedroom	South		36	Yes
	Bedroom	West		31	Yes
	Entry	South		24	Yes
	Living	North		54	No
108	Living	East		54	No
	Master	North		53	No
	Bedroom	East		38	Yes
	Bedroom	South		33	Yes
	Bedroom	South		33	Yes

Unit	Room	Façade	Floor	Leq,pass-by assessment Day (7:00am to 10:00pm)	
				Leq,pass-by dB(A) Façade adjusted	Compliance with noise criterion of ≤47dB(A) Leq,pass-by
109	Entry	South		30	Yes
	Living	East		60	No
	Ensuite	East		59	No
	Master	East		58	No
	Living	North		57	No
	Living	West		56	No
	Bedroom	South		42	Yes
	Entry	West		20	Yes
110	Bedroom W	North	Level 1	47	Yes
	Bedroom W	West		44	Yes
	Living	North		42	Yes
	Master	E		40	Yes
	Ensuite	East		38	Yes
	Bedroom E	East		37	Yes
	Living	West		35	Yes
	Bedroom E	South		30	Yes
201	Bedroom W	South	Level 2	29	Yes
	Bedroom E	West		28	Yes
	Living	North		52	No
	Living	East		50	No
	Bedroom	West		37	Yes
	Ensuite	West		37	Yes
	Bedroom	East		31	Yes
	Bedroom	North		30	Yes
	Entry	West		30	Yes
	Living	South		27	Yes
202	Bedroom	South		26	Yes
	Entry	North		15	Yes
	Living	North		44	Yes
	Living	East		43	Yes
	Ensuite	East		38	Yes
	Master	East		37	Yes
203	Master	South		24	Yes
	Bedroom	South		22	Yes
	Master	North		45	Yes
	Living	North		44	Yes
204	Bedroom	South		24	Yes
	Entry	West		20	Yes
	Living	West		48	No
204	Master	North		47	Yes
	Bedroom	West		47	Yes

Unit	Room	Façade	Floor	Leq,pass-by assessment Day (7:00am to 10:00pm)	
				Leq,pass-by dB(A) Façade adjusted	Compliance with noise criterion of ≤47dB(A) Leq,pass-by
	Living	North		45	Yes
	Bedroom	South		23	Yes
	Entry	East		19	Yes
210	Bedroom W	North		48	No
	Living	North		45	Yes
	Bedroom W	West		45	Yes
	Bedroom E	East		44	Yes
	Master	East		44	Yes
	Ensuite	East		42	Yes
	Living	West		42	Yes
	Ensuite	North		39	Yes
	Bedroom E	South		39	Yes
	Bedroom W	South		35	Yes
	Bedroom E	West		33	Yes

Tabulated railway noise levels are presented in Appendix F.

The maximum external $L_{eq,pass-by}$ noise level at the development is at the most exposed façade of Units 106, 107 and 109 and is predicted to be 60 dB(A) $L_{eq,pass-by}$. Therefore, a minimum 20 dB sound reduction is required through the building façades of the development.

Further details of the construction requirements to meet the internal noise levels is provided in Section 7 of this report.

4. Road Traffic Noise Impact Assessment

4.1 Road Traffic Noise Criteria

The proposed development is located near the Shirley Street and road traffic noise impacts must be assessed as per BSC's DA conditions and the recent information request considering modifications in the development layout.

The relevant traffic noise criteria are provided by the State Environmental Planning Policy (Transport and Infrastructure) 2021 (*Transport and Infrastructure SEPP 2021*).

The *Transport and Infrastructure SEPP 2021* recommended internal noise levels are presented in Table 4.1.

Table 4.1 Recommended Internal Noise Levels

Sensitive receptor	Location	Period	Road traffic noise limits L _{Aeq,T} dB(A)
Bedroom	Indoors	Night (10:00pm – 7:00am)	35
Habitable rooms		At any time	40
Bedrooms	Outdoors	Night (10:00pm – 7:00am)	42 (35 + 7)
Habitable rooms		At any time	47 (40 + 7)

The following is noted regarding the noise criteria:

- The *SEPP 2021* does not specify outdoor noise criteria for dwellings. However, the outdoor noise criteria have been derived from the internal criteria, assuming 7dB noise reduction by the building envelope with windows open⁴.

In case of exceedance of the external traffic noise criteria, architectural treatment must be applied to the external façade of the building to protect the internal noise amenity of the development.

The *Development near Rail Corridors and Busy Roads – Interim Guideline* supports the provisions of the *Transport and Infrastructure SEPP 2021* and suggests that architectural design, building orientation and good internal layout can achieve acceptable acoustic amenity near busy transport corridors.

⁴ Typical noise reduction for windows partially open, *Planning for Noise Control Guideline*, QLD Dept. of Environment and Science (DES).

4.2 Road Traffic Noise Calculation Methodology

The noise levels from the traffic on Shirley Street, within a planning horizon of 10 years (year 2035), were calculated using SoundPLAN noise propagation modelling software.

SoundPLAN calculates road traffic noise as per the procedure specified in the UK Department of Transport Welsh Office *Method of Calculation of Road Traffic Noise* (CoRTN'88). This is an accepted road traffic noise calculation procedure applied widely in Australia.

In accordance with the policy, to convert the traffic noise levels calculated in terms of $L_{A10,18hr}$ to $L_{Aeq,15hr}$ and $L_{Aeq,9hr}$ it is necessary to apply an appropriate conversion factor. Based on site- specific noise measurements the following conversion factors are presented in Table 4.2.

Table 4.2 Traffic Conversion Factors

Noise Descriptor	Traffic Conversion Factors
$L_{Aeq,15hr}$	$L_{A10,18hr} - 2 \text{ dB(A)}$
$L_{Aeq,9hr}$	$L_{A10,18hr} - 10 \text{ dB(A)}$

The assumptions and data used in development of the traffic noise propagation model are presented in Table 4.3.

Table 4.3 Data and assumptions – Traffic noise model

Terrain	- Elevation data for the development and the surroundings were obtained from Department of Natural Resources and Mines Airborne Laser Scanning (LiDAR) 1 metre elevation data. - Ground surface absorption factor of 0 was applied to all paved surfaces and 1 for all grassed areas.
Buildings	- The existing buildings at 29 Shirley Street were included in the model, along with the buildings adjacent to the development site for the validation. - The design and orientation of the proposed development were modelled as per the modified site plan prepared by Hayball (Project No. 255, dated 6 September 2024). - The modified development layout is presented in Appendix A.
Road traffic	- Shirley Street was included in the modelling, with alignment determined based on an aerial imagery. - Traffic volumes for Shirley Street were sourced from the Traffic Impact Statement prepared for the development by Greg Alderson Associates (Report No. 22381-TIS-F, dated 10 August 2023). - The data for Shirley Street as it passes the proposed development site is as follows: 2022 AADT of 24,925 vehicles per day; - The assumptions on Shirley Street traffic volumes are as follows: 2% heavy vehicles; and 10-year annual growth rate of 1% per annum. - Shirley Street has one lane in each direction as it passes the development site.

	- Speed limit on Shirley Street is 50km/h. - Pavement surface on Shirley Street is dense graded asphalt, which is acoustically neutral (neither increases nor reduces the noise emissions). - The CoRTN procedure requires traffic volume data input for 18-hours. Traffic volume for 18-hour period (6:00am to midnight) was considered as 94% of the 24-hour AADT.
Receivers	Building Façades: Receivers were attached to the façades of the proposed building. Receivers are placed at a height of 1.8m above each floor level. - SoundPLAN adds +2.5dB(A) to the calculated noise levels when the receivers are attached to the buildings, thus the tabulated traffic noise levels are façade adjusted. 1m grid spacing was used for calculation of noise contour maps.
Calculation procedure	CoRTN '88.

4.3 Traffic Flow Data

Traffic flow data, as considered in the SoundPLAN model, is presented in Table 4.4.

Table 4.4 Traffic flow data for validation

Road	Traffic volumes			Heavy vehicles (%)
	2022 AADT	2024 AADT	2035 AADT	
Shirley Street	24,925 vpd	25,426 vpd	28,367 vpd	2%

Notes:

- AADT – Average Annual Daily Traffic.
- Traffic data for Shirley Street was obtained from the Traffic Impact Statement by Greg Alderson Associates prepared for the development (Report No. 22381-TIS-F, dated 10 August 2023). Traffic growth for the site was not provided. Conservative assessment has considered 1% traffic growth in determination of 2024 and 2035 traffic volumes for Shirley Street.

4.4 Road Traffic Noise Model Validation

The noise data collected during the monitoring period (as presented in Table 2.2) was used to validate the accuracy of the SoundPLAN model prior to undertaking calculations of the future road traffic noise levels.

The results of the SoundPLAN model validation are presented in Table 4.5 and in Appendix G.

Table 4.5 SoundPLAN validation results

Measurement location	Measured* L _{10,18hr} dB(A)	Calculated* L _{10,18hr} dB(A)	Difference dB	Validation factor
Noise logger	64.0	66.0	+2.0	N/A

*Free field

The calculated road traffic noise level is within the acceptable tolerance of ± 2 dB, thus there is no need for the addition of a validation factor to the road traffic noise levels within the planning horizon (year 2035).

Excerpt from the 3D SoundPLAN noise propagation model is presented in Figure 4.1.



Figure 4.1 3D road traffic noise model – SoundPLAN excerpt

4.5 Road Traffic Noise Calculation Results

The calculated road traffic noise levels at the façades of the units of the proposed development are presented in Table 4.6.

Table 4.6 Road Traffic Noise Levels

Unit	Room	Façade	Floor	Traffic Noise Level $L_{eq,15hr}$ dB(A) <i>Façade adjusted</i>	Traffic Noise Level $L_{eq,9hr}$ dB(A) <i>Façade adjusted</i>	Compliance with ≤ 40 dB(A) $L_{eq,15hr}$ criterion?	Compliance with ≤ 35 dB(A) $L_{eq,9hr}$ criterion?
001	Master	South	Ground Level	62	54	No	No
	Living	South		62	54	No	No
	Ensuite	West		59	51	No	No
	Living	East		57	49	No	No
	Bedroom	West		55	47	No	No
	Entry	West		48	40	No	Yes
	Living	North		37	29	Yes	Yes
	Entry	North		31	23	Yes	Yes
	Bedroom	North		22	14	Yes	Yes
002	Master	South	Ground Level	62	54	No	No
	Bedroom	South		61	53	No	No
	Master	East		59	51	No	No
	Ensuite	East		57	49	No	No
	Living	East		53	45	No	No
	Living	North		37	29	Yes	Yes
003	Bedroom	South	Ground Level	63	55	No	No
	Entry	West		55	47	No	No
	Living	North		35	27	Yes	Yes
	Master	North		29	21	Yes	Yes
004	Bedroom	South	Ground Level	62	54	No	No
	Entry	East		58	50	No	No
	Bedroom	West		58	50	No	No
	Living	West		57	49	No	No
	Living	North		10	2	Yes	Yes
	Master	North		8	0	Yes	Yes
005	Bedroom	South'	Ground Level	50	42	No	Yes
	Ensuite	West		47	39	Yes	Yes
	Living	West		47	39	Yes	Yes
	Master	West		47	39	Yes	Yes
	Entry	South		42	34	Yes	Yes
	Living	North		35	27	Yes	Yes
006	Bedroom	South	Ground Level	50	42	No	Yes
	Living	East		40	32	Yes	Yes
	Master	North		39	31	Yes	Yes
	Bedroom	East		36	28	Yes	Yes
	Living	North		34	26	Yes	Yes
	Entry	South		31	23	Yes	Yes

Unit	Room	Façade	Floor	Traffic Noise Level $L_{eq,15hr}$ dB(A) <i>Façade adjusted</i>	Traffic Noise Level $L_{eq,9hr}$ dB(A) <i>Façade adjusted</i>	Compliance with $\leq 40dB(A)$ $L_{eq,15hr}$ criterion?	Compliance with $\leq 35dB(A)$ $L_{eq,9hr}$ criterion?
007	Bedroom	South	Ground Level	46	38	Yes	Yes
	Living	West		39	31	Yes	Yes
	Master	North		39	31	Yes	Yes
	Bedroom	West		37	29	Yes	Yes
	Living	North		34	26	Yes	Yes
	Entry	South		17	9	Yes	Yes
008	Bedroom	South		46	38	Yes	Yes
	Living	East		39	31	Yes	Yes
	Master	North		39	31	Yes	Yes
	Bedroom	East		38	30	Yes	Yes
	Living	North		34	26	Yes	Yes
	Entry	South		25	17	Yes	Yes
009	Bedroom	South		49	41	No	Yes
	Bedroom	East		47	39	Yes	Yes
	Ensuite	East		47	39	Yes	Yes
	Master	East		46	38	Yes	Yes
	Living	East		46	38	Yes	Yes
	Living	West		39	31	Yes	Yes
	Living	North		34	26	Yes	Yes
	Entry	West		28	20	Yes	Yes
010	Bedroom E	South		53	45	No	No
	Bedroom W	South		53	45	No	No
	Bedroom E	West		50	42	No	Yes
	Bedroom E	East		48	40	No	Yes
	Master	East		48	40	No	Yes
	Ensuite	East		47	39	Yes	Yes
	Living	West		47	39	Yes	Yes
	Bedroom W	West		42	34	Yes	Yes
	Living	North		39	31	Yes	Yes
	Bedroom W	North		34	26	Yes	Yes
101	Bedroom	South	Level 1	67	59	No	No
	Living	South		66	58	No	No
	Living	East		65	57	No	No
	Ensuite	West		62	54	No	No
	Bedroom	West		56	48	No	No
	Living	North		39	31	Yes	Yes
	Living	West		34	26	Yes	Yes
	Entry	North		33	25	Yes	Yes
	Entry	North		0	0	Yes	Yes
	Master	South		67	59	No	No
102	Bedroom	South		65	57	No	No
	Master	East		63	55	No	No

Unit	Room	Façade	Floor	Traffic Noise Level $L_{eq,15hr}$ dB(A) <i>Façade adjusted</i>	Traffic Noise Level $L_{eq,9hr}$ dB(A) <i>Façade adjusted</i>	Compliance with ≤ 40 dB(A) $L_{eq,15hr}$ criterion?	Compliance with ≤ 35 dB(A) $L_{eq,9hr}$ criterion?
	Ensuite	East	Level 1	60	52	No	No
	Living	East		56	48	No	No
	Living	North		37	29	Yes	Yes
103	Bedroom	South		67	59	No	No
	Entry	West		53	45	No	No
	Master	North		39	31	Yes	Yes
	Living	North		37	29	Yes	Yes
104	Bedroom	South		66	58	No	No
	Bedroom	West		61	53	No	No
	Living	West		60	52	No	No
	Entry	East		57	49	No	No
	Master	North		39	31	Yes	Yes
	Living	North		34	26	Yes	Yes
105	Bedroom	South		54	46	No	No
	Ensuite	West		51	43	No	No
	Master	West		51	43	No	No
	Living	West		51	43	No	No
	Entry	South		34	26	Yes	Yes
	Bedroom	South		32	24	Yes	Yes
	Living	North		30	22	Yes	Yes
106	Bedroom	South		54	46	No	No
	Living	West		44	36	Yes	Yes
	Master	North		43	35	Yes	Yes
	Living	North		31	23	Yes	Yes
	Bedroom	East		17	9	Yes	Yes
	Entry	South		17	9	Yes	Yes
107	Bedroom	South		47	39	Yes	Yes
	Living	West		44	36	Yes	Yes
	Master	North		43	35	Yes	Yes
	Bedroom	West		38	30	Yes	Yes
	Entry	South		33	25	Yes	Yes
	Living	North		32	24	Yes	Yes
108	Bedroom	South		48	40	No	Yes
	Living	East		44	36	Yes	Yes
	Master	North		43	35	Yes	Yes
	Bedroom	East		39	31	Yes	Yes
	Entry	South		32	24	Yes	Yes
	Living	North		31	23	Yes	Yes
109	Ensuite	East		50	42	No	Yes
	Bedroom	South		50	42	No	Yes
	Master	East		49	41	No	Yes
	Living	East		49	41	No	Yes

Unit	Room	Façade	Floor	Traffic Noise Level $L_{eq,15hr}$ dB(A) <i>Façade adjusted</i>	Traffic Noise Level $L_{eq,9hr}$ dB(A) <i>Façade adjusted</i>	Compliance with $\leq 40dB(A)$ $L_{eq,15hr}$ criterion?	Compliance with $\leq 35dB(A)$ $L_{eq,9hr}$ criterion?
	Living	West	Level 1	43	35	Yes	Yes
	Entry	West		37	29	Yes	Yes
	Living	North		33	25	Yes	Yes
110	Bedroom W	South		57	49	No	No
	Bedroom E	West		55	47	No	No
	Bedroom E	South		55	47	No	No
	Living	West		53	45	No	No
	Master	E		48	40	No	Yes
	Bedroom W	West		47	39	Yes	Yes
	Ensuite	East		47	39	Yes	Yes
	Bedroom E	East		46	38	Yes	Yes
	Living	North		41	33	Yes	Yes
	Bedroom W	North		36	28	Yes	Yes
201	Bedroom	South	Level 2	66	58	No	No
	Ensuite	West		63	55	No	No
	Living	East		62	54	No	No
	Living	South		62	54	No	No
	Bedroom	East		61	53	No	No
	Bedroom	West		58	50	No	No
	Living	North		48	40	No	Yes
	Entry	North		31	23	Yes	Yes
	Entry	West		30	22	Yes	Yes
	Bedroom	North		0	0	Yes	Yes
202	Master	South		67	59	No	No
	Bedroom	South		65	57	No	No
	Master	East		64	56	No	No
	Ensuite	East		62	54	No	No
	Living	East		58	50	No	No
	Living	North		40	32	Yes	Yes
	Bedroom	South		65	57	No	No
203	Entry	West		52	44	No	No
	Master	North		43	35	Yes	Yes
	Living	North		41	33	Yes	Yes
	Bedroom	South		66	58	No	No
204	Bedroom	West		61	53	No	No
	Living	West		60	52	No	No
	Entry	East		53	45	No	No
	Master	North		44	36	Yes	Yes
	Living	North		44	36	Yes	Yes
	Bedroom W	South		58	50	No	No
	Bedroom W	West		58	50	No	No
210	Bedroom E	West		56	48	No	No

Unit	Room	Façade	Floor	Traffic Noise Level $L_{eq,15hr}$ dB(A) <i>Façade adjusted</i>	Traffic Noise Level $L_{eq,9hr}$ dB(A) <i>Façade adjusted</i>	Compliance with ≤ 40 dB(A) $L_{eq,15hr}$ criterion?	Compliance with ≤ 35 dB(A) $L_{eq,9hr}$ criterion?
	Bedroom E	South		56	48	No	No
	Living	West		54	46	No	No
	Master	East		51	43	No	No
	Ensuite	East		51	43	No	No
	Bedroom E	East		48	40	No	Yes
	Living	North		45	37	Yes	Yes
	Bedroom W	North		39	31	Yes	Yes
	Ensuite	North		39	31	Yes	Yes

Full tabulated results of the calculated road traffic noise levels are presented in Appendix H.

The maximum external $L_{eq,15hr}$ noise level at the development is at the southern façades of Units 101, 102, 103 and 202 and is predicted to be 67 dB(A) $L_{eq,15hr}$. Therefore, a minimum 27 dB sound reduction is required through the building façades of the development.

Further details of the construction requirements to meet the internal noise levels is provided in Section 7 of this report.

5. Operational Noise Impact Assessment

5.1 Nearest Noise Sensitive Places

The nearest noise sensitive places to the subject site are identified in Table 5.1.

Table 5.1 Nearest noise sensitive places

Property description	Street address	Current use
Lot 10 DP1153734	1A Cavvanbah Street	Short-term accommodation
Lot 1 DP780935	2 Milton Street	Residential dwelling
Lot 1 on DP741161	3 Cavvanbah Street	Residential dwelling
Lot 1 DP582819	4 Milton Street	Residential dwelling
Lot 1 DP366084	20 Shirley Street	Commercial
Lot 1 SP68939	23-25 Shirley Street	Short-term accommodation
Lot 1 DP781456	24 Shirley Street	Commercial
Lot 1 DP827445	26 Shirley Street	Short-term accommodation
Lot 1 DP1090966	27 Shirley Street	Residential dwelling
Lot 1 DP942369	28 Shirley Street	Residential dwelling
Lot 1 DP390195	30 Shirley Street	Residential dwelling
Lot 2 DP390195	32 Shirley Street	Residential dwelling
Lot 2 DP317023	34 Shirley Street	Residential dwelling
Lot 1 SP72428	35-37 Shirley Street	Short-term accommodation
Lot 1 DP1085258	38 Shirley Street	Residential dwelling

The nearest noise sensitive places are presented in Figure 5.1 together with the zoning map from the Byron Local Environmental Plan 2014.

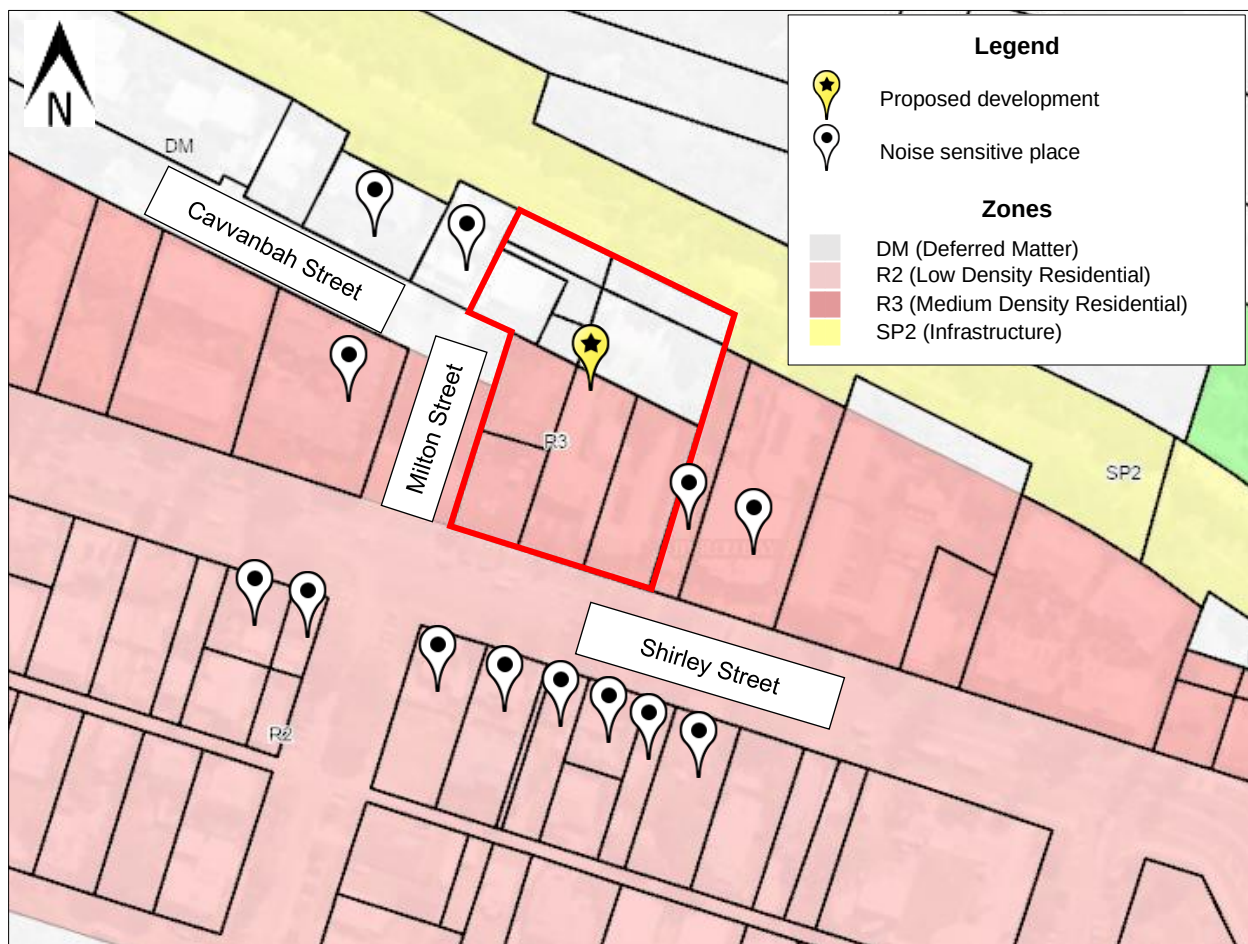


Figure 5.1 Nearest noise sensitive places

5.2 Operational Noise Criteria

The *Noise Policy for Industry* identifies three criteria for assessing the impact of noise from a premises:

- Intrusiveness noise levels – noise limits set relative to the existing background levels;
- Amenity noise levels – absolute noise limits set according to the surrounding land uses; and
- Maximum noise levels – maximum noise levels and number of events during night time.

5.2.1 Intrusiveness Noise Levels

Noise from the premises may generally be considered acceptable if the equivalent continuous A-weighted level of noise from the premises (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the rating background noise level measured in the absence of all the noise from premises by more than 5 dB as presented in Table 5.2.

Table 5.2 Intrusiveness noise criteria

Period	Intrusiveness noise level	
	L _{Aeq,15min} , dB(A)	
Day	RBL + 5dB(A)	50 (45 + 5)
Evening	RBL + 5dB(A)	50 (45* + 5)
Night	RBL + 5dB(A)	48 (43 + 5)

* The noise levels featured higher RBLs during evening than daytime. This is likely due to dominance of noise from wildlife and is typical of areas adjacent to bushland. As per the procedure from Section 2.3 of the NSW Noise Policy for Industry, the intrusiveness noise limits for evening were set to be no greater than the limits for day time.

The Rating Background Levels (RBL) considered in Table 5.2 are as per the noise measurements listed in Table 2.3 of this report.

Time of day is defined in the *Noise Policy for Industry* as follows:

- Day – the period from 7am to 6pm Monday to Saturday or 8am to 6pm on Sundays and public holidays;
- Evening – the period from 6pm to 10pm; and
- Night – the remaining periods.

5.2.2 Amenity Noise Levels

The *Policy* defines two planning noise levels:

- *Recommended amenity noise level* – the objective for total industrial noise at a receiver location; and
- *Project amenity noise level* – the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the *recommended amenity noise levels* for an area, a *project amenity noise level* applies for each new source of industrial noise as follows:

Project amenity noise level for industrial developments = *Recommended amenity noise level* minus 5dB(A).

The *recommended amenity noise level* is set according to the surrounding land uses (receiver category) and the existing background noise levels. The receiver categories and typical existing background noise levels are presented in Table 5.3.

Table 5.3 Residential receiver categories

Receiver category	Typical planning zoning – standard instrument	Typical existing background noise levels	Description
Rural residential	RU1 – primary production RU2 – rural landscape RU4 – primary production small lots R5 – large lot residential E4 – environmental living	Daytime RBL <40 dB(A) Evening RBL <35 dB(A) Night RBL <30 dB(A)	Rural – an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse. Note: Where background noise levels are higher than those presented in column 3 due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered.
Suburban residential	RU5 – village RU6 – transition R2 – low density residential R3 – medium density residential E2 – environmental conservation E3 – environmental management	Daytime RBL <45 dB(A) Evening RBL <40 dB(A) Night RBL <35dB(A)	Suburban – an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.
Urban residential	R1 – general residential R4 – high density residential B1 – neighbourhood centre (boarding houses and shop-top housing) B2 – local centre (boarding houses) B4 – mixed use	Daytime RBL > 45 dB(A) Evening RBL > 40 dB(A) Night RBL >35 dB(A)	Urban – an area with an acoustical environment that: • is dominated by ‘urban hum’ or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources • has through-traffic with characteristically heavy and continuous traffic flows during peak periods • is near commercial districts or industrial districts • has any combination of the above.

Note: This table is reproduced from Table 2.3 of the *Noise Policy for Industry*

Land zoning maps from the Byron Local Environmental Plan (LEP) 2014 indicate that the development site and areas to the west, south and east are zoned R3 (medium density residential) and R2 (low density residential).

Considering the above, the *recommended amenity noise levels* to be used in this assessment are presented in Table 5.4.

Table 5.4 Recommended amenity noise levels

Receiver	Time of Day	Receiver category based on zoning and existing RBLs	Recommended amenity noise level $L_{Aeq,15min}$, dB(A)
R2 (Low density residential) R3 (medium density residential)	Day	Suburban residential	55
	Evening	Suburban residential	45
	Night	Suburban residential	40

Then, considering the minus 5dB(A) adjustment to obtain the *project amenity noise level*:

Project amenity noise level for industrial developments = *Recommended amenity noise level* minus 5dB(A)

The resulting *project amenity noise levels* are presented in Table 5.5.

Table 5.5 Project amenity noise levels

Receiver	Time of Day	Recommended amenity noise level $L_{Aeq,15min}$, dB(A)	Project amenity noise level $L_{Aeq,15min}$, dB(A)
R2 (Low density residential) R3 (medium density residential)	Day	55	50 (55 – 5)
	Evening	45	40 (45 – 5)
	Night	40	35 (40 – 5)

5.2.3 Maximum Noise Levels

There is considerable published research into sleep disturbance caused by short duration or intermittent noise events. For example, sleep disturbance is addressed in the *Night Noise Guidelines for Europe* (World Health Organization, 2009). The *Night Noise Guidelines for Europe* states that the likelihood of awakening is related to the maximum instantaneous noise levels (L_{Amax}), ambient noise levels and number of events during night time. As a rule in planning for short-term or transient noise events, for good sleep over eight hours, the indoor sound pressure level measured as a maximum instantaneous value should not exceed approximately 45dB(A) L_{max} more than 10-15 times per night. The corresponding external noise level, assuming partially closed windows, is 52dB(A) L_{max} , measured in the free field.

In accordance with the *Noise Policy for Industry*, detailed maximum noise level event assessment is required when the night time (10pm to 7am) noise levels from the premises exceed the following:

- $L_{Aeq,15min}$ 40dB(A) or the prevailing RBL plus 5dB, whichever is greater; and/or
- L_{AFmax} 52dB(A) or the prevailing RBL plus 15dB, whichever is greater.

Considering the night time RBL of 43dB(A), the resulting noise limits are presented in Table 5.6.

Table 5.6 Maximum noise level criteria

Time of Day	Noise limit, $L_{Aeq,15min}$, dB(A)	Noise limit, L_{AFmax} , dB(A)
Night	Criteria 1: 40dB(A) Criteria 2: 48dB(A) (43 + 5) Criteria 2 is applicable	Criteria 1: 52dB(A) Criteria 2: 58dB(A) (43 + 15) Criteria 2 is applicable

5.3 Noise Propagation Modelling

5.3.1 Modelling Methodology

A 3D model of the site and surroundings was developed using SoundPLAN noise propagation software considering the proposed activities at the development and location relative to the nearest noise sensitive places.

The calculations were carried out as per the procedures specified in the International Standard ISO9613 (*Acoustics – Attenuation of sound during propagation outdoors*).

The calculation method for a single frequency is as follows:

$$L_S = [L_W + K_0] - [A_{DI} + A_{div} + A_{gr} + A_{bar} + A_{atm} + d_{Lrefl} + d_{Lw}]$$

Where:	L_S	Sound pressure for a single frequency
	L_W	Sound power of source
	K_0	Correction for propagation in limited spacial angle
	A_{DI}	Mean directivity correction
	A_{div}	Mean attenuation due to geometrical spreading
	A_{gr}	Mean attenuation due to ground effect
	A_{bar}	Mean attenuation due to screening
	A_{atm}	Mean attenuation due to air absorption
	d_{Lrefl}	Level increase due to reflections
	d_{Lw}	Correction due to source operation time

The noise propagation losses are calculated as a combination of distance attenuation (geometrical spreading), screening, ground attenuation and other factors. More details are shown in Appendix I.

The parameters and assumptions considered in the 3D noise propagation model are described in Table 5.7.

Table 5.7 Data and Assumptions – Operational Noise Model

Terrain	- Department of Natural Resources and Mines Airborne Laser Scanning (LiDAR) 1 metre data was used to determine the elevation of the development site relative to the surrounds. - Ground surface absorption factor of 0 was applied to all paved surfaces and 1 for all grassed areas.
Buildings	- The proposed residential development, as per the modified development layout, was included in the model along with neighbouring buildings. - The modified development plans are included in Appendix A.

Noise sources	Refer to Section 5.3.2 of this report.
Receivers	- Receivers were attached to the façades of the noise sensitive buildings at a height of 1.5m above each floor level. - SoundPLAN adds +2.5dB(A) to the calculated noise levels when the receivers are attached to the buildings, thus the tabulated traffic noise levels are façade adjusted. 1m grid spacing was used for calculation of noise contour maps.
Noise mitigation measures	The recommended noise control measures are discussed in Section 7 of this report.
Distance attenuation	3D model of the subject site and surroundings was developed using cadastral and survey data using SoundPLAN software. The source-receiver distances and geometrical spreading are automatically calculated in SoundPLAN to a high level of accuracy in accordance with the ISO9613 procedure. - Separation distances and distance attenuation values are presented in Appendix I.
Barrier attenuation / screening	- Screening by walls and roofs was considered in the model. The screening was calculated in SoundPLAN in accordance with the ISO9613 procedure. - Barrier attenuation / screening values are presented in Appendix I.
Ground attenuation	- Sound reflecting surfaces such as pavement are modelled with ground absorption coefficient of 0 (no absorption). Grassed and vegetated areas were modelled with ground absorption coefficient of 1 (100% absorption) in accordance with ISO9613. - Ground attenuation values are presented in Appendix I.

5.3.2 Noise Sources

The sound power levels, tonality/impulsiveness adjustment factors, and the operational scenarios for all noise sources considered in the model are presented in Table 5.8.

Table 5.8 Details of operational noise sources

Operational noise source	Location	Sound power level dB(A) (re 10⁻¹²W)	Operational scenario	Tonality/ impulsiveness
AC condensers	Refer Figure 4.3	Sound power of 79 dB(A) considering one air conditioner per unit (25 total) – 65 dB(A) sound power each	Continuous operation 24 hours a day	+5 dB
Resident car parking	Basement parking ramp	Sound power of 90 dB(A) for car slowly accelerating (10-20 km/h)	Day (7am to 6pm) – 40 car movements per hour Evening (6pm to 10pm) – 20 car movements per hour Night (10pm to 7am) – 10 car movements per hour	+5 dB

Operational noise source	Location	Sound power level dB(A) (re 10 ⁻¹² W)	Operational scenario	Tonality/ impulsiveness
Basement carpark roller door	Basement carpark entrance	Roller door – 65 dB(A) sound power	Day (7am to 6pm) – Operating 10 minutes per hour Evening (6pm to 10pm) – Operating 5 minutes per hour Night (10pm to 7am) – Operating 2.5 minutes per hour	+5 dB
Breakout noise ⁵ from Wellness Centre	Ground level entry door and lightwell	100dB(A) derived from 82 dB(A) SPL measured at 3m from the source. Based on noise measurements carried out by ATP at a similar development (gym) during typical operations including amplified music, large group of people exercising, drop of weights, etc. The breakout noise from the external building envelope components is as follows: – Breakout noise of 82dB(A) for the entry door open. – Breakout noise of 49dB(A) for entry door closed. – Breakout noise of 82dB(A) for the lightwell.	<u>Entry door:</u> Day (7am to 6pm) – Continuous use, door open for 2min per hour Evening (6pm to 10pm) – Continuous use, door open for 2min per hour Night (10pm to 7am) – Not in use <u>Lightwell:</u> Day (7am to 6pm) – Continuous use Evening (6pm to 10pm) – Continuous use Night (10pm to 7am) – Not in use	n/a
Human voices	Ground level communal recreation pool area	Sound power of 79 dB(A) for 10 people ⁶	Day (7am to 6pm) – Continuous use Evening (6pm to 10pm) – Continuous use Night (10pm to 7am) – Not in use	n/a
Human voices	Private open spaces on the ground level	Sound power of 73.0 dB(A) for 4 people ⁴ , per private open space (9 groups total)	Day (7am to 6pm) – Continuous use Evening (6pm to 10pm) – Continuous use Night (10pm to 7am) – Continuous use	n/a

⁵ Breakout noise - Breakout noise is undesirable sound that is caused by the transmission of sound through the walls of a building or other enclosure. In this complex situation, ATP has considered that multiple noise sources are operating inside of the wellness centre, with a combined sound pressure level of 100dB(A)

⁶ Hayne, M.J., 2011, Prediction of noise from small to medium sized crowds, Proceedings of ACOUSTICS 2011.

Operational noise source	Location	Sound power level dB(A) (re 10 ⁻¹² W)	Operational scenario	Tonality/ impulsiveness
Human voices	Rooftop terraces	Sound power of 79 dB(A) L_{eq} for 10 people ⁴ , per rooftop terrace (10 groups total)	Day (7am to 6pm) – Continuous use Evening (6pm to 10pm) – Continuous use Night (10pm to 7am) – Continuous use	n/a

During night time, the activity at the proposed development which will produce short duration, intermittent noise events will be the patrons at rooftop terraces.

Extract from the 3D noise propagation model developed in SoundPLAN is presented in Figure 5.2 to Figure 5.5.

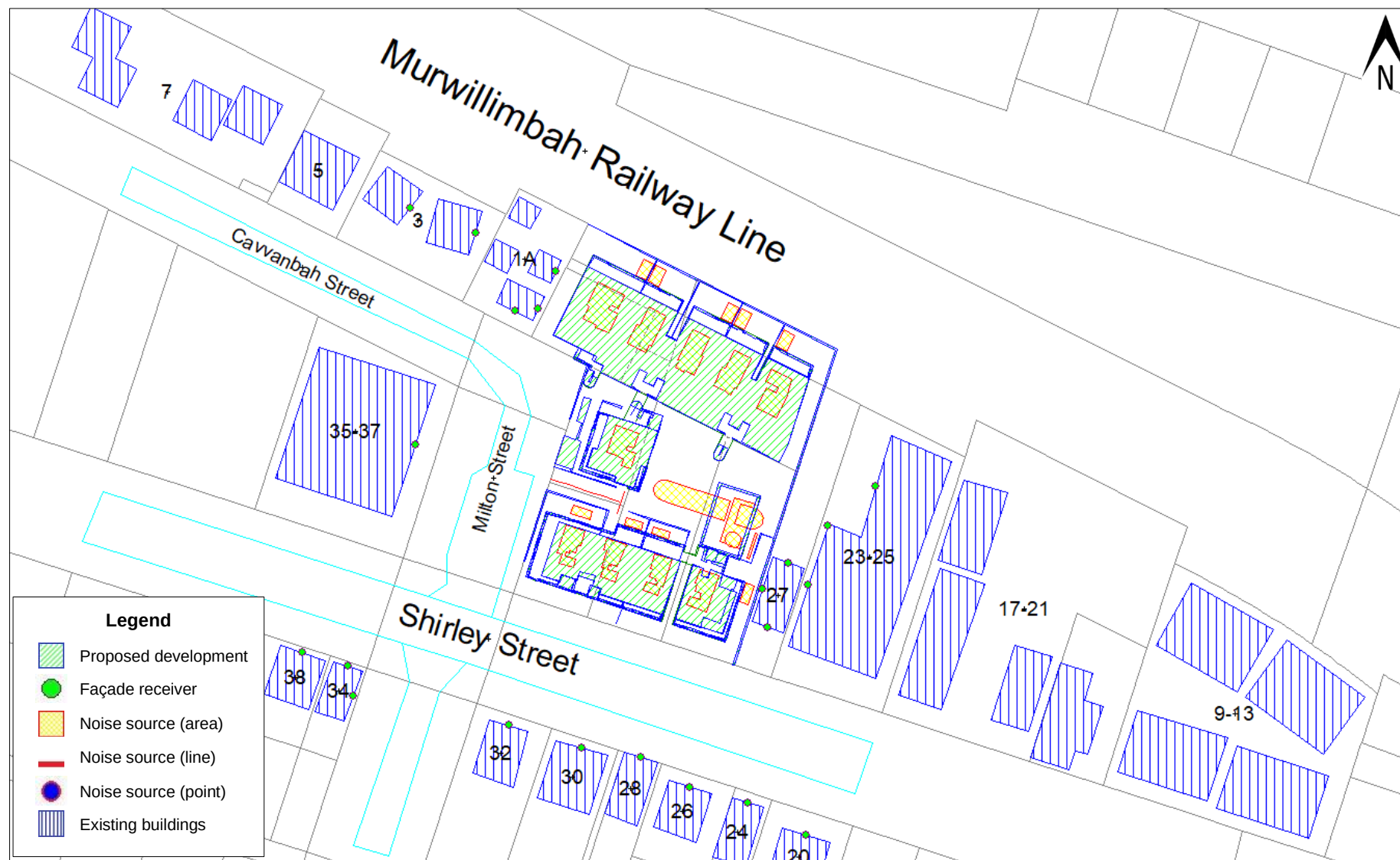


Figure 5.2 3D operational noise model – SoundPLAN excerpt

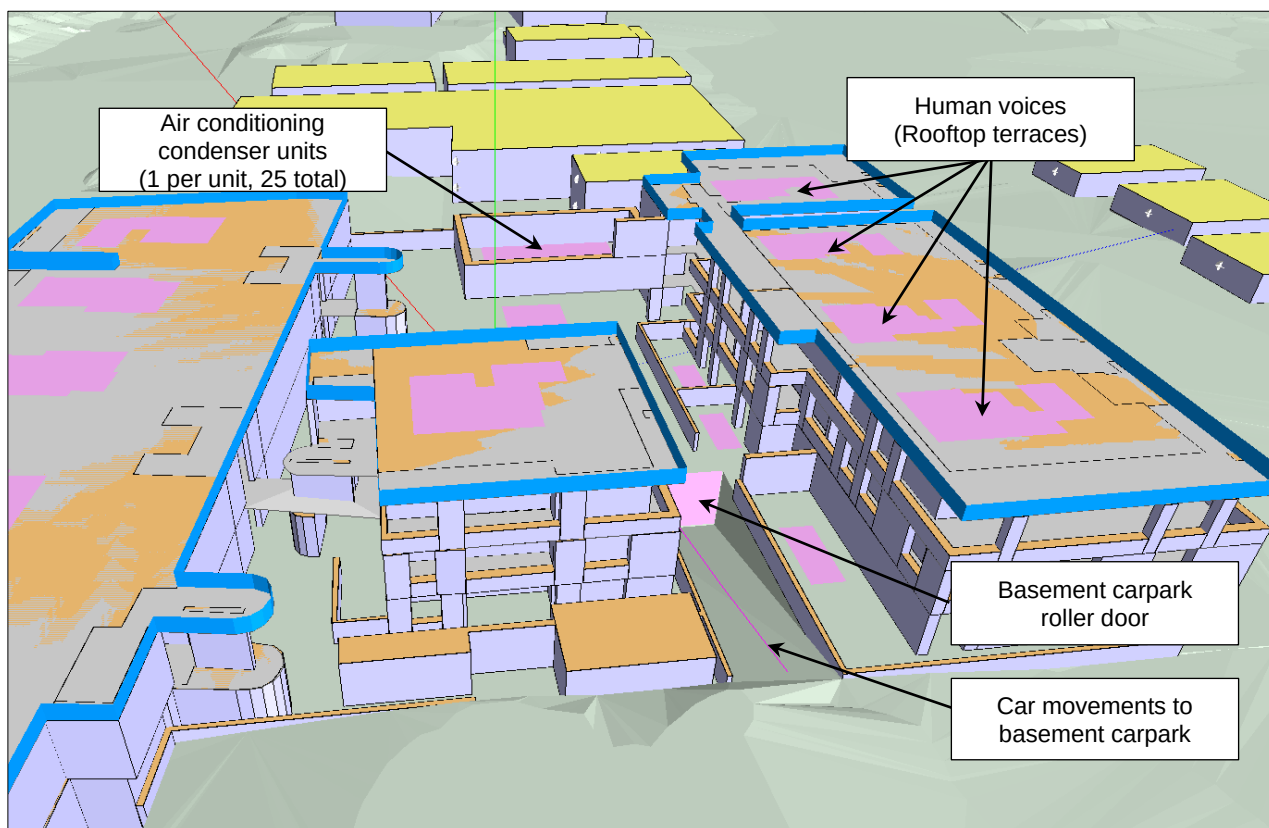


Figure 5.3 3D operational noise model – SoundPLAN excerpt (view due East)

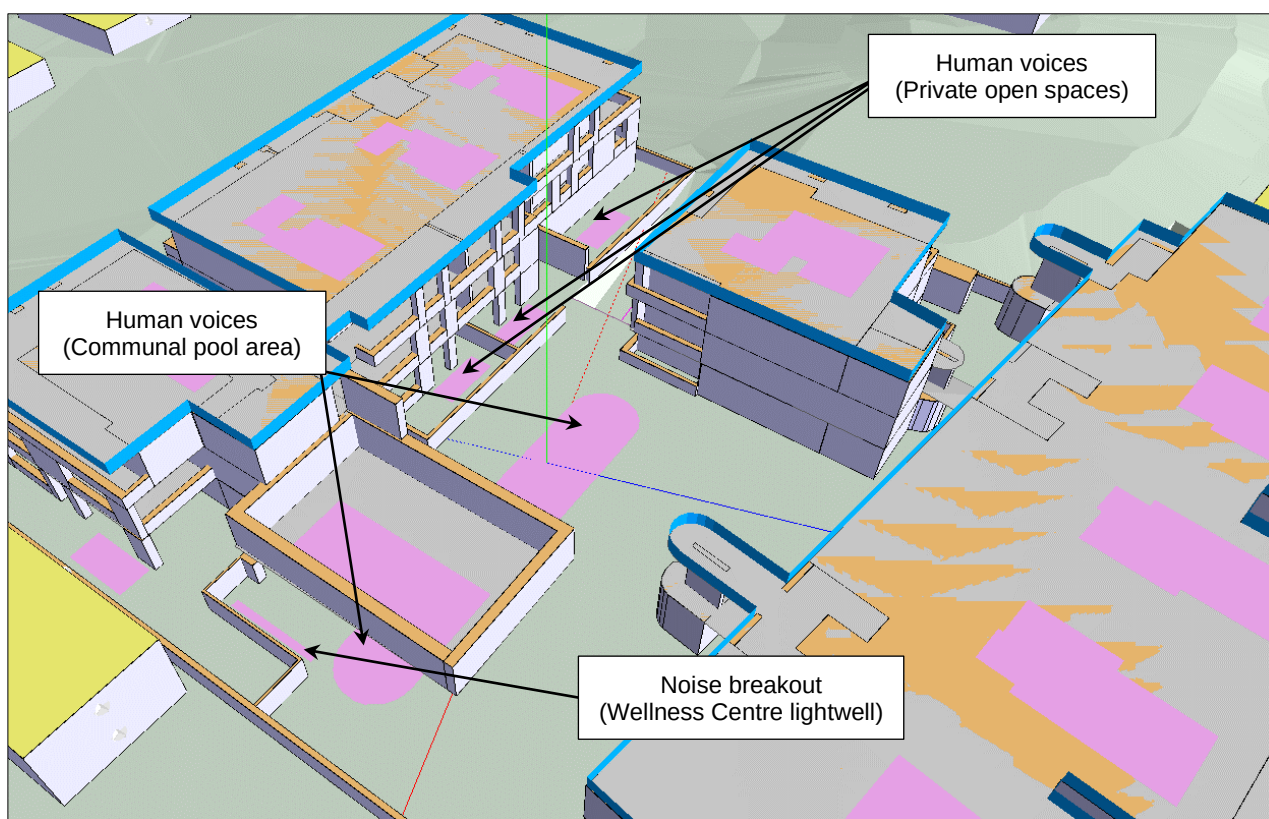


Figure 5.4 3D operational noise model – SoundPLAN excerpt (View due Southwest)

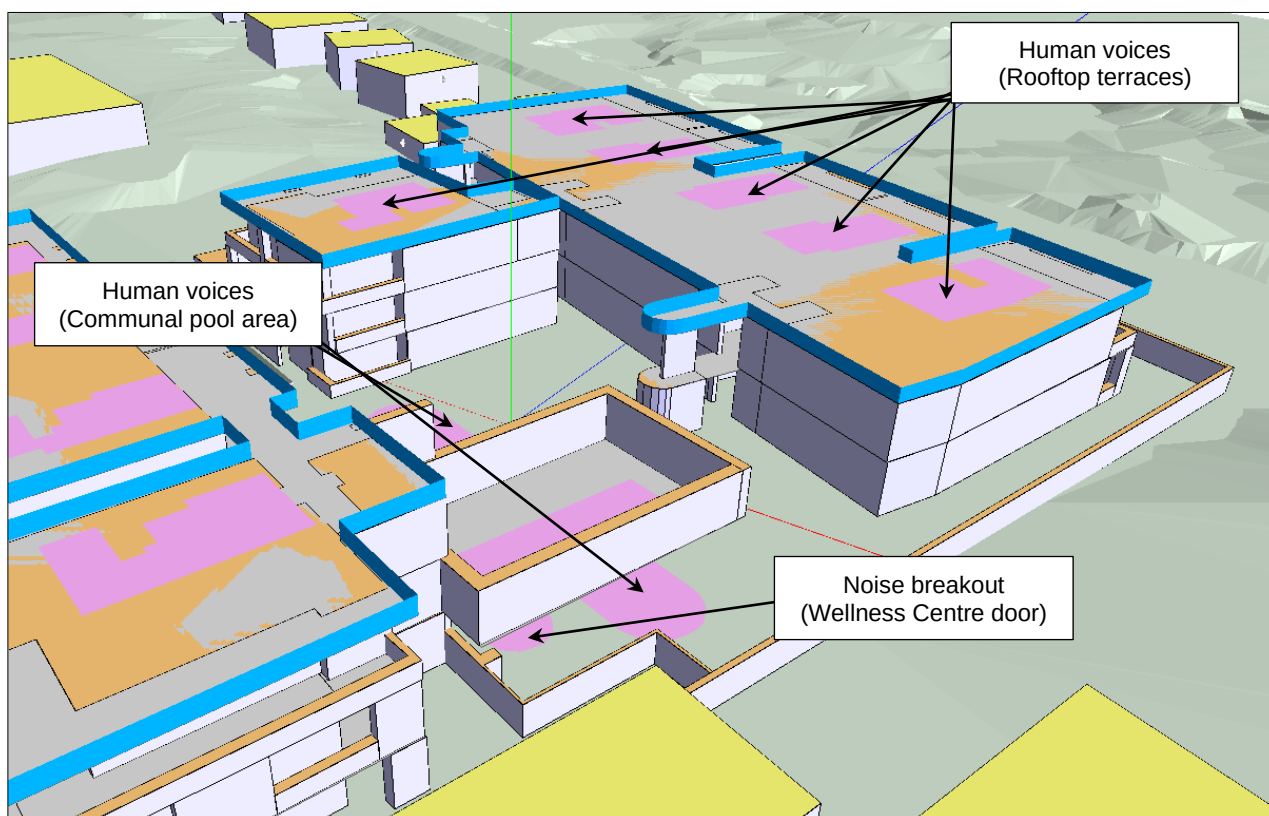


Figure 5.5 3D operational noise model – SoundPLAN excerpt (view due Northwest)

5.3.3 Operational Noise Calculation Results

The L_{eq} noise levels associated with the proposed development, assessed against the intrusiveness and amenity noise criteria, are presented in Table 5.9.

Table 5.9 Calculated L_{eq} noise levels

Receivers	Calculated noise levels, dB(A)			Compliance with noise criteria?
	L _{Aeq,adj,15min}			
	Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am)	
Intrusiveness noise criteria	50	45	40	
Project amenity noise criteria	55	45	40	
Night time criteria – L _{eq} noise levels	–	–	48	
1A Cavvanbah Street	31	30	30	Yes
3 Cavvanbah Street	33	33	33	Yes
20 Shirley Street	27	26	26	Yes
23-25 Shirley Street	38	38	35	Yes
24 Shirley Street	28	28	27	Yes
26 Shirley Street	30	30	29	Yes
27 Shirley Street	45	45	44	Yes
28 Shirley Street	30	30	30	Yes
30 Shirley Street	30	30	29	Yes
32 Shirley Street	30	29	29	Yes
34 Shirley Street	30	29	29	Yes
35-37 Shirley Street	37	36	36	Yes
38 Shirley Street	30	30	29	Yes

The maximum noise levels associated with rooftop terrace patrons at the proposed development during night time are presented in Table 5.10.

Table 5.10 Calculated L_{max} noise levels

Receivers	Calculated noise levels, dB(A)	Compliance with noise criteria?
	L _{AFmax}	
	Night (10pm-7am)	
Night time criteria – L _{AFmax} noise levels	58	
1A Cavvanbah Street	24	Yes
3 Cavvanbah Street	24	Yes
20 Shirley Street	17	Yes
23-25 Shirley Street	25	Yes
24 Shirley Street	18	Yes
26 Shirley Street	21	Yes
27 Shirley Street	38	Yes
28 Shirley Street	21	Yes
30 Shirley Street	20	Yes
32 Shirley Street	20	Yes
34 Shirley Street	19	Yes
35-37 Shirley Street	26	Yes
38 Shirley Street	19	Yes

Full SoundPLAN results, including tabulated L_{eq} and L_{max} noise levels, are presented in Appendix I.

Noise contour maps are presented in Appendix J.

6. Light Rail Vibration Assessment

The NSW Department of Planning *Development near Rail Corridors and Busy Roads – Interim Guideline* identifies there are vibration criteria for both building damage and for human comfort which new developments should comply with.

6.1 Vibration Criteria

6.1.1 BS 7385-2:1993

British Standard BS 7385-2:1993 recommends maximum vibration levels which buildings can be subjected to, depending on the frequency and duration of the vibration and the type of building. The vibration descriptor is peak particle velocity (PPV) in mm/s in the x, y and z components. For unreinforced or light framed structures (residential or light commercial type buildings), there is a risk of vibration-induced cosmetic damage to the structure when the PPV of the predominant pulse exceeds 15mm/s at 4Hz or 50mm/s at 40Hz or above when measured at the base or foundation of the building.

The criteria are presented in Table 6.1 and in Figure 6.1.

Table 6.1 Transient vibration guideline values – Minimal risk of cosmetic damage

Line	Type of building	Peak Component Particle Velocity ⁷ in frequency range of predominant pulse	
		4 Hz to 15 Hz	15 Hz and above
1	Reinforced or framed structures, industrial and heavy commercial buildings.	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures, residential or light commercial type buildings.	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Note: Values referred to are at measured at the base of the building.

Note that the criteria for light-weight buildings (Line 2) is frequency dependent and penalises low frequency vibrations more heavily. Vibration velocities at each axis (X, Y and Z) are considered separately.

⁷ Peak component particle velocity is the peak velocity in the X, Y and Z directions.

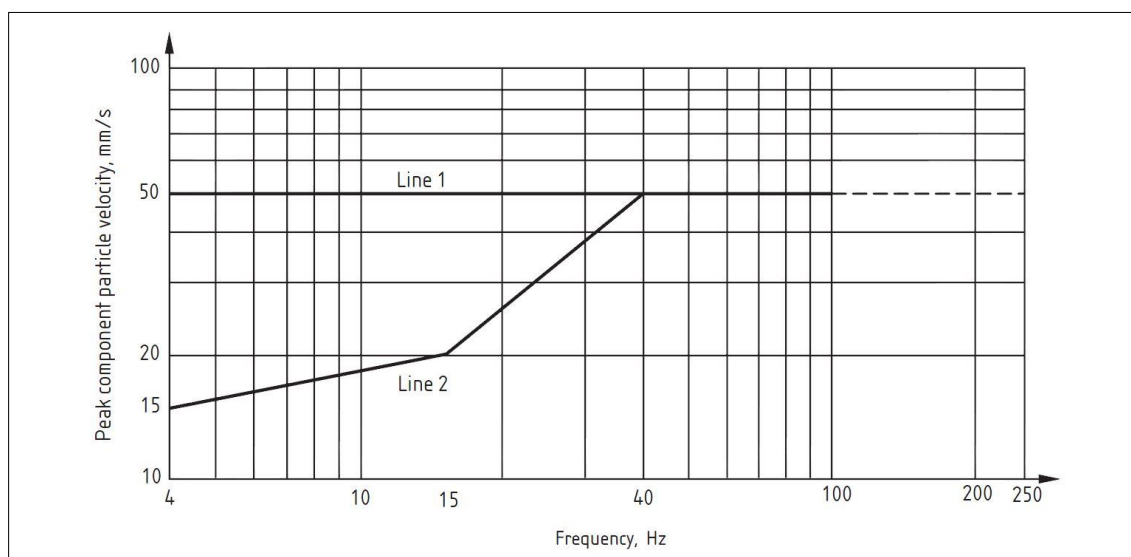


Figure 6.1 Transient vibration guideline values – Minimal risk of cosmetic damage

The standard states that at vibration values that are greater than two times the values given in Table 6.1, minor damage is possible, and at vibration greater than four times the values given in Table 6.1, major damage to a building structure may occur. Damage classifications from BS7385.1:1990 are presented in Table 6.2.

Table 6.2 BS7385.1:1990 – Damage classification

Damage classification	Description
Cosmetic	The formation of hairline cracks on drywall surfaces or the growth of existing cracks in plaster or drywall surfaces; in addition, the formation of hairline cracks in the mortar joints of brick/concrete block construction.
Minor	The formation of cracks or loosening and falling of plaster or drywall surface, or cracks through bricks/concrete blocks.
Major	Damage to structural elements of the building, cracks in support columns, loosening of joints, splaying of masonry cracks etc.

The vibration limits apply only to transient (short term)⁸ vibration that does not give rise to resonant responses in structures.

“Where the dynamic loading caused by continuous vibration is such as to give rise to dynamic magnification due to resonance⁹, especially at the lower frequencies where lower guide values apply, then the guide values may need to be reduced by up to 50%.”

The vibration limit is an idealised value that considers building vibration only. Other effects such as ground movement which could also lead to damage are not considered.

⁸ Transient vibration is a vibration caused by external force (e.g. movement of machinery or dropping of a pile hammer) which is sustained for a period of time under the influence of the external force and gradually dissipates when the activity causing the vibration stops

⁹ Resonance occurs when the frequency of the external forced vibration coincides with the natural frequency of a structure. If set in motion, the structure will vibrate (oscillate about its equilibrium position) at its natural frequency. If an external force causes a building to vibrate and if the vibration frequency of the external force is in harmony with the natural frequency of the building the movement around the equilibrium will increase due to the resonance effect.

“Only the direct effect of vibration on buildings is considered. The indirect effects on the building structure due to ground movement, the movement of loose objects within buildings, the possibility of damage to sensitive equipment and the effect of vibration on people are outside the scope of this Part of BS 7385. This Part of BS 7385 does not consider the many other causes of cracking in buildings; cracking commonly occurs in building whether they are exposed to vibration or not.”

The soil condition and response of the soil to vibration can lead to damage to buildings, although is difficult to predict.

“Depending on the type of ground, ground vibration can cause consolidation or densification of the soil, which has been known to result in differential settlement and consequent building damage. Loose and especially water-saturated cohesionless soils are vulnerable to vibration which may cause liquefaction. The loading transmitted to the soil through the foundations may reduce the vulnerability of the soil to such damage, but there are cases where the acceptable vibration limit may be set by considerations of soil-structure interaction, rather than distortion or inertial response of the building itself.”

The standard also provides general advice on important buildings in relation vibration limits.

“Important buildings which are difficult to repair may require special consideration on a case-by-case basis. A building of historical value should not (unless it is structurally unsound) be assumed to be more sensitive.”

6.1.2 DIN 4150-3:1999

German Standard DIN 4150-3:1999 gives guideline values for evaluating the effects of vibration on buildings. The vibration descriptor is peak particle velocity (mm/s) in the x, y and z components.

For dwellings and buildings of similar design and/or occupancy, there is a risk of vibration-induced cosmetic damage to the structure when the PPV of exceeds 5mm/s at 10Hz or 20mm/s at 100Hz or above when measured at the base or foundation of the building.

The criteria for short term vibration from DIN4150-3 are presented in Table 6.3 and in Figure 6.2.

Table 6.3 Vibration criteria – DIN 4150-3 – No structural or cosmetic damage

Line	Type of structure	Peak Component Particle Velocity at the foundation at a frequency of		
		Less than 10 Hz	10 Hz to 50 Hz	50 Hz to 100 Hz
1	Buildings used for commercial purposes, industrial buildings, and buildings of similar design	20 mm/s	20 to 40 mm/s	40 to 50 mm/s
2	Dwellings and buildings of similar design and/or use	5 mm/s	5 to 15 mm/s	15 to 20 mm/s
3	Structures that, because of their particular sensitivity to vibration, cannot be classified under lines 1 and 2 and are of great intrinsic value (e.g. listed buildings under preservation order)	3 mm/s	3 to 8 mm/s	8 to 10 mm/s

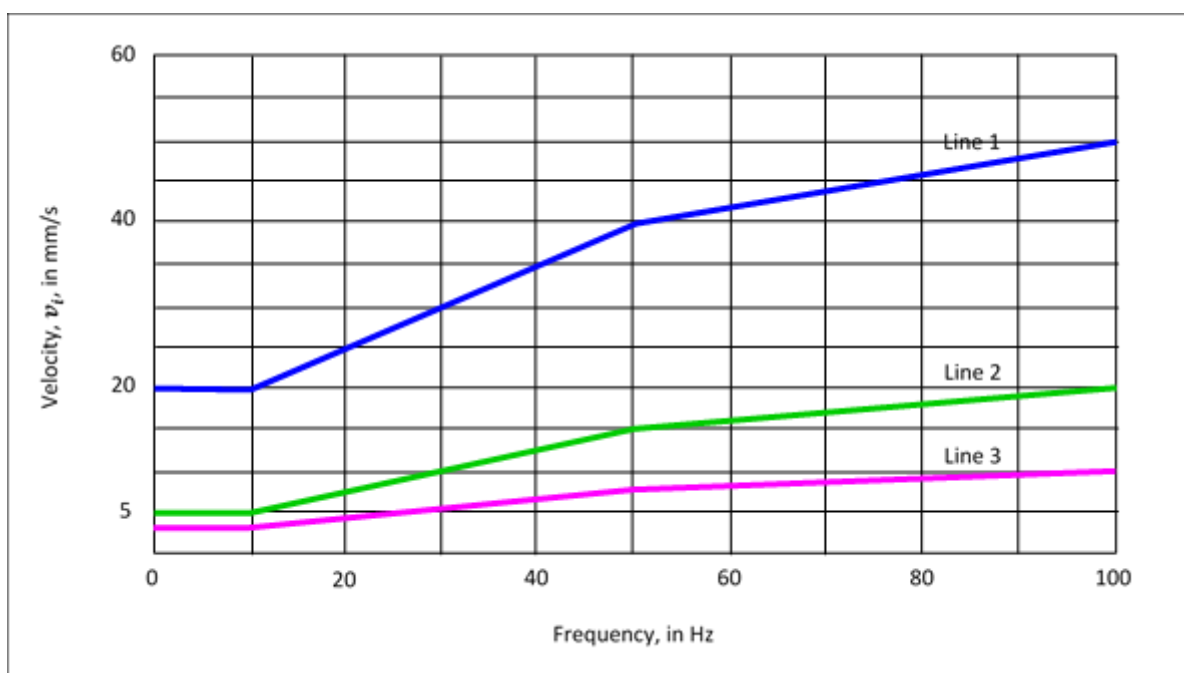


Figure 6.2 Vibration criteria (DIN 4150-3) – No structural or cosmetic damage

The vibration limit is frequency dependent and applies only to transient (short term) vibration that does not give rise to resonant responses in structures.

Like BS 7385-2, the vibration limits recommended in DIN 4150-3 do not take into account possibility of ground settlement as a means of causing damage. However, Appendix C of DIN 4150-3 does acknowledge that the effects of vibration on soil can be significant.

“Non-cohesive soil tends to settle, for instance when vibrating rams are used nearby to drive sheet piling. Vibration-induced foundation settlement can occur at vibration severities which are normally not expected to cause structural damage. For this to occur, the soil has to be very sensitive to vibration (as is non-cohesive, uniformly graded sand or silt, for instance), and the vibration has to be continuous or frequent.”

6.1.3 Assessing Vibration: A Technical Guideline (DECC 2006)

The NSW Department of Environment and Conservation (DECC) provides the document *Assessing Vibration: a technical guideline* which provides acceptable vibration dose values (VDV) which should be achieved from intermittent vibration sources such as railway trains.

The acceptable VDV ($\text{m/s}^{1.75}$) for residences during daytime, evening and night are provided in Table 6.4.

Table 6.4 Vibration Criteria – Intermittent railway pass-by

Location	Daytime & evening		Night-time	
	Preferred value	Maximum value	Preferred value	Maximum value
Residences	0.20	0.40	0.13	0.26

6.2 Transmissibility of Vibration into Structures

Given the human comfort vibration criteria relates to the occupants inside the building, a conversion factor between the external vibration levels and the internal vibration levels is required.

Research by the United States Federal Transit Administration has identified that the ground vibration can be reduced by 10 dB as the vibration wave transfers its energy from the ground into the concrete foundations. Therefore, a coupling loss of 10 dB was applied between the external vibration levels and the internal vibration levels based on Table 10-1 of *Transit Noise and Vibration Impact Assessment (FTA-VA-90-1003-06)*.

The report also notes additional propagation effects such as efficient propagation of vibration in soil. The vibration measurements undertaken for this project were in sandy soil, which is known to transfer higher levels of vibration along the surface. As such, an additional 3 dB reduction in the vibration levels has been assumed to account for the efficient propagation of vibration effects present at the subject site at 29 Shirley Street.

Considering the total coupling loss of 13 dB, the ratio between the internal and external vibration levels can be calculated as per the following calculation:

$$10\text{dB} = 20 \log_{10} \frac{v_{\text{external}}}{v_{\text{internal}}}$$

$$\frac{v_{\text{internal}}}{v_{\text{external}}} = 10^{\frac{-13}{20}} = 0.22$$

6.3 Vibration Measurement Methodology

6.3.1 Monitoring Location

A vibration logger was set up on site at 29 Shirley Street to determine the vibration levels from the adjacent Murwillimbah Railway Line and the Byron Solar Train, as presented in Figure 6.3 below and in Appendix B.

The measured vibration levels were adjusted to account for the difference between the distance from the railway track to the vibration logger and to the nearest point on the foundations of the future dwellings at 29 Shirley Street.



Figure 6.3 Vibration monitoring location

6.3.2 Monitoring Equipment

Vibration levels were measured with a Profound VIBRA vibration loggers fitted with tri-axial geophones. The geophones can detect vibrations from 0–100 mm/s and have frequency range of 1–150 Hz¹⁰.

The instruments (vibration loggers) were set to record at 5 second measurement intervals. The following parameters were recorded:

- Peak Particle Velocity (PPV) – maximum instantaneous particle velocity (in units of mm/s) in the X, Y and Z directions recorded over the measurement interval.
- Peak Particle Acceleration (PPA) – maximum instantaneous particle acceleration (in units of m/s²) in X, Y and Z directions recorded over the measurement interval.
- Dominant frequency of vibration (in units of Hz) in X, Y and Z directions over the measurement interval. The dominant frequency is determined by the zero-crossing method.
- Detailed velocity waveform in the time domain. Maximum of 4 waveforms are saved per hour for the events with the highest PPV.

¹⁰ According to BS7385:1993 Part 1 (*Evaluation and measurement for vibration in buildings – Part 1: Guide for measurement of vibrations and evaluations of their effects on buildings*) most building damage from man-made sources occurs from 1 Hz to 150 Hz. Vibration levels of interest range from a few to several hundred millimetres per second depending on frequency.

The geometric axes were positioned as follows:

- X axis – Horizontal plane, parallel to boundary wall;
- Y axis – Horizontal plane, perpendicular to boundary wall; and
- Z axis – Vertical.

Unattended measurements were recorded during the monitoring period from 26 January to 4 February 2022.

6.4 Vibration Monitoring Results

The highest daily vibration levels recorded from the Byron Solar Train at 29 Shirley Street during the vibration monitoring from 26 January to 4 February 2021 are presented in Table 6.5.

Table 6.5 Vibration monitoring results – 29 Shirley Street

Date	Axis	Maximum particle velocity (mm/s)	Frequency (Hz)	VR _{max} (mm/s)	Compliance with 5mm/s vibration limit
26-Jan (Wed)	X	1.08	44	2.02	Yes
	Y	0.91	29		Yes
	Z	1.96	29		Yes
27-Jan (Thu)	X	1.03	19	1.69	Yes
	Y	0.96	23		Yes
	Z	1.46	35		Yes
28-Jan (Tue)	X	0.64	53	2.42	Yes
	Y	0.71	55		Yes
	Z	2.39	63		Yes
29-Jan (Wed)	X	1.21	46	2.30	Yes
	Y	1.02	29		Yes
	Z	2.23	31		Yes
30-Jan (Thu)	X	1.17	44	2.10	Yes
	Y	1.28	33		Yes
	Z	1.84	34		Yes
31-Jan (Fri)	X	0.92	38	2.12	Yes
	Y	0.88	28		Yes
	Z	1.75	25		Yes
01-Feb (Sat)	X	1.13	46	1.87	Yes
	Y	1.08	31		Yes
	Z	1.72	55		Yes
02-Feb (Sun)	X	1.10	51	2.16	Yes
	Y	1.18	32		Yes
	Z	2.10	38		Yes

Date	Axis	Maximum particle velocity (mm/s)	Frequency (Hz)	VRmax (mm/s)	Compliance with 5mm/s vibration limit
03-Feb (Mon)	X	1.11	45	2.00	Yes
	Y	0.96	30		Yes
	Z	1.88	41		Yes
04-Feb (Tue)	X	1.03	44	1.73	Yes
	Y	0.98	29		Yes
	Z	1.48	34		Yes

Graph of the vibration levels recorded at 29 Shirley Street over the monitoring period are presented in Figure 6.4.

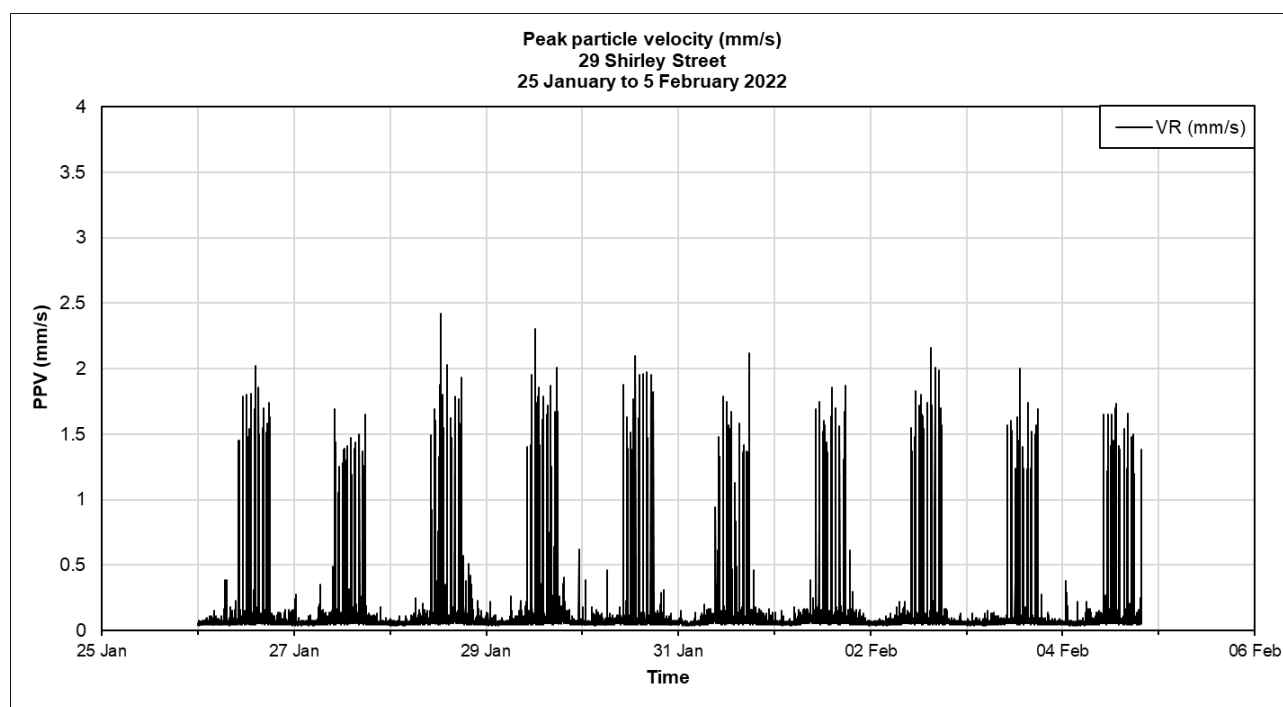


Figure 6.4 Vibration monitoring results – 29 Shirley Street

The highest vibration levels relative to the Byron Solar Train occurred on 28 January 2022 (Tuesday) when the peak particle velocity reached a maximum of 2.42mm/s V_{Rmax} , with highest component velocity of 2.39mm/s PCPV in the Z direction.

Plot of the vibration levels on 28 January 2022, in terms of resultant velocity, is presented in Figure 6.5.

Plot of the vibration levels during the time between 12:00am to 1:00pm, in terms of component velocity and frequency, are presented in Figure 6.6 and Figure 6.7.

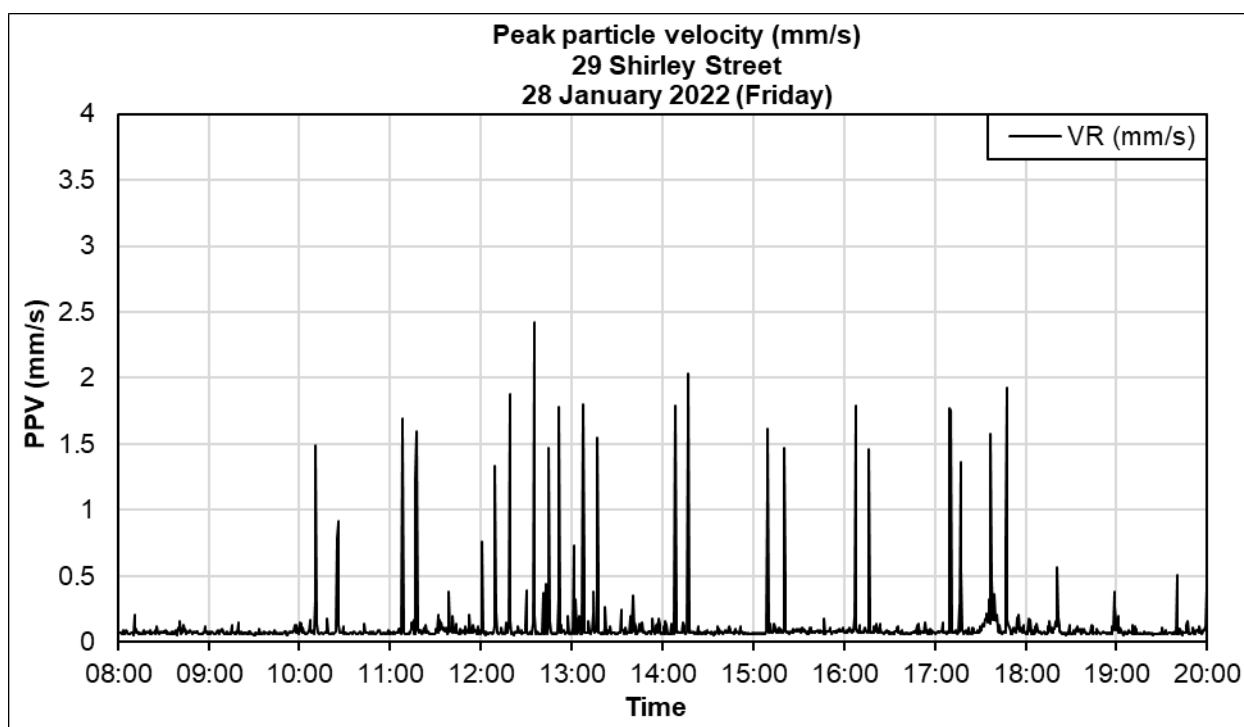


Figure 6.5 Highest PPV (mm/s) day – 29 Shirley Street

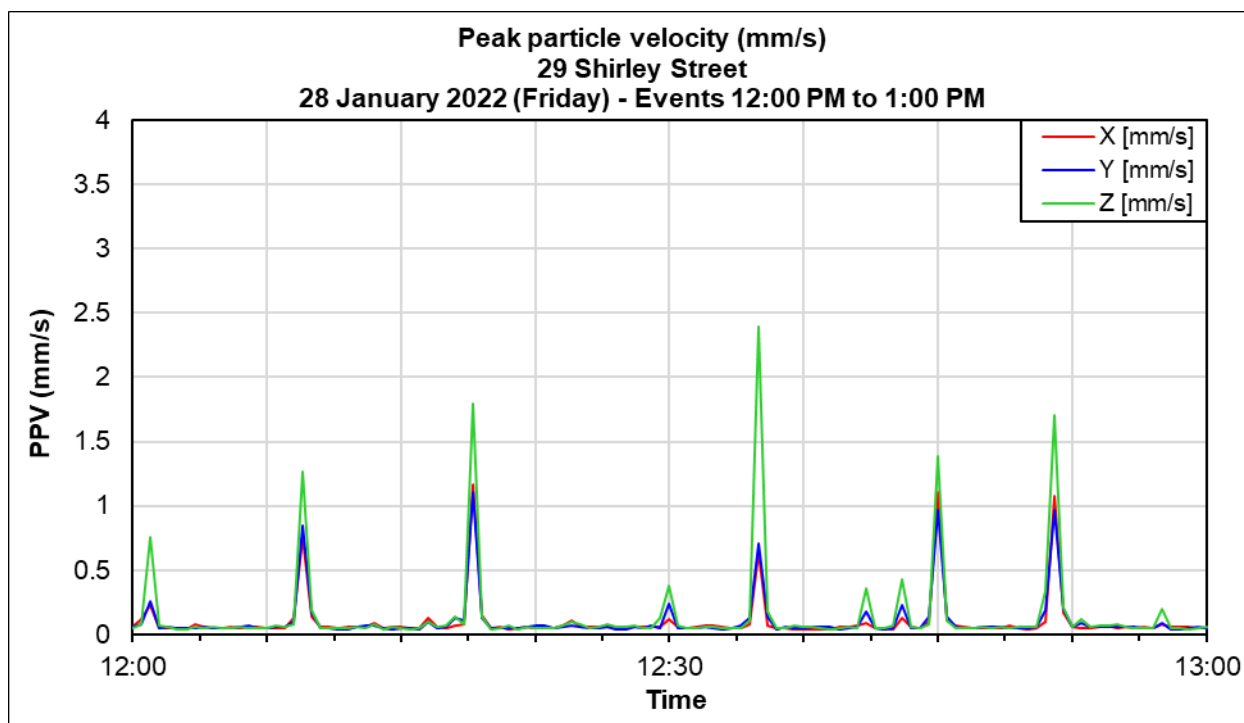


Figure 6.6 PPV (mm/s) – Highest hour – 29 Shirley Street

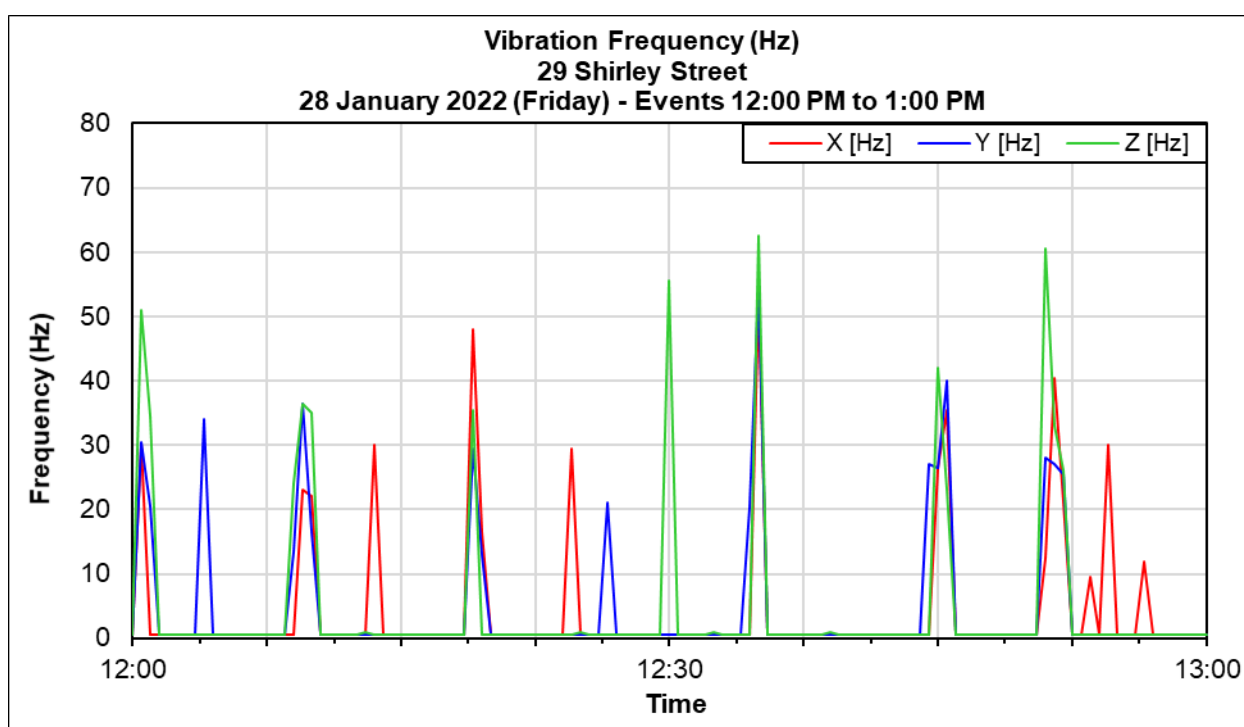


Figure 6.7 Vibration frequency (Hz) – Highest hour – 29 Shirley Street

6.5 Predicted Vibration Levels

A summary of the predicted vibration levels and vibration dose values at 29 Shirley Street is provided in Table 6.6.

Table 6.6 Predicted vibration levels – 29 Shirley Street

Predicted maximum vibration levels – Building damage	Predicted vibration dose values – Human comfort
0.46 mm/s	0.21 m/s ^{1.75}

When adjusted for distance attenuation and for the coupling loss factors, the maximum predicted vibration level at the future dwellings at 29 Shirley Street is 0.46 mm/s, which is well within the strictest 5 mm/s vibration limit for building damage.

When considering that the Byron Solar Train only operates during daytime and evening, the predicted vibration dose value must meet the maximum vibration limit of 0.4 m/s^{1.75}. Based on the vibration measurements conducted at 29 Shirley Street and adjusted for distance attenuation and for coupling loss factors, the predicted vibration dose values for the occupants of the future dwellings at 29 Shirley Street is 0.21 m/s^{1.75}.

Therefore, the predicted vibration levels from the associated Byron Solar Train at the future dwellings at 29 Shirley Street, will comply with the strictest vibration limits for cosmetic and building damage, as well as the human comfort vibration dose values.

7. Discussion and Recommendations

7.1 Light Rail Noise Impacts

The proposed development is located adjacent to Murwillimbah Railway Line, upon which the Byron Solar Train operates and which has a potential to cause railway noise impacts on the development. Site specific noise measurements and detailed acoustic design calculations were carried out to assess railway noise impacts.

Acoustic design specifications to mitigate railway noise from the Byron Solar Train at the proposed development (considering the railway noise impacted units) are presented in Table 7.1.

Table 7.1 Acoustic design specifications – Railway noise mitigation

Unit	Façade	Construction element	R _w required	Recommended construction
005, 006, 007, 008, 009, 101, 103, 105, 106, 107, 108, 109, 201, 204, 210	N	Windows	28	6.38mm laminated safety glass in an acoustically sealed frame
		External walls	28	Standard rendered block work construction
	E, W	Windows	21	Standard 4mm float glass with standard weather seals
		External walls	21	Standard rendered block work construction
	S	Windows	12	Standard 4mm float glass with standard weather seals
		External walls	12	Standard rendered block work construction
	-	Rooftop	26	Metal roof sheeting (Colorbond over steel or timber purlin); Single layer of 10mm gypsum plasterboard internally.

As per the NSW Department of Planning *Development near Rail Corridors and Busy Roads – Interim Guideline*, if internal noise levels with windows or doors open exceed the criteria by more than 10dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia.

In relation to the predicted railway noise levels associated with the Byron Solar Train, the following units will require mechanical ventilation:

- Ground Floor:
 - Unit 005.
- First Floor:
 - Units 105, 106, 107, and 109.

The mechanical ventilation system must be appropriately sized to ensure sufficient air circulation as per the requirements of AS 1668.2-2012. The ventilation must be designed so that the acoustic performance of the building envelope is not compromised.

7.2 Road Traffic Noise Impacts

The proposed development is located adjacent to Shirley Street which has a potential to cause road traffic noise impacts on the development. Site specific noise measurements and detailed acoustic design calculations were carried out to assess road traffic noise impacts.

Acoustic design specifications to mitigate road traffic noise from Shirley Street at the proposed development (considering the road traffic noise impacted units) are presented in Table 7.2.

Table 7.2 Acoustic design specifications – Road traffic noise mitigation

Unit	Façade	Construction element	R _w required	Recommended construction
001, 002, 003, 004, 005, 006, 009, 010, 101, 102, 103, 104, 105, 106, 108, 109, 110, 201, 202, 203, 204, 210	S	Windows	31	6.76mm laminated safety glass in an acoustically sealed frame
		External walls	31	Standard rendered block work construction
	E, W	Windows	26	Standard 4mm float glass in an acoustically sealed frame
		External walls	26	Standard rendered block work construction
	N	Windows	12	Standard 4mm float glass with standard weather seals
		External walls	12	Standard rendered block work construction
	-	Rooftop	28	Metal roof sheeting (Colorbond over steel or timber purlin); Single layer of 10mm gypsum plasterboard internally.

As per the NSW Department of Planning *Development near Rail Corridors and Busy Roads – Interim Guideline*, if internal noise levels with windows or doors open exceed the criteria by more than 10dBA, the design of the ventilation for these rooms should be such that occupants can leave windows closed, if they so desire, and also to meet the ventilation requirements of the Building Code of Australia.

In relation to the predicted road traffic noise levels associated with Shirley Street, the following units will require mechanical ventilation:

- Ground Floor:
 - Units 001, 002, 003 and 004.
- First Floor:
 - Units 101, 102, 103 and 104.

- Second Floor:
 - Units 201, 202, 203, 204 and 210.

The mechanical ventilation system must be appropriately sized to ensure sufficient air circulation as per the requirements of AS 1668.2-2012. The ventilation must be designed so that the acoustic performance of the building envelope is not compromised.

7.3 Operational Noise Impacts

Detailed noise propagation modelling was carried out considering noise emissions from the proposed development including vehicle movements along the driveway area, mechanical plant (air-conditioning condenser units, basement exhaust, pool pumps), and patron noise from communal and private open spaces.

The following noise mitigation measures are recommended to protect the noise amenity at the nearest noise sensitive places:

- Use of the communal pool area must be limited to daytime and evening hours only (7:00am to 10:00pm).
- The noise barrier fences (masonry walls), as proposed in the development layout, must be constructed and maintained along the eastern and northern property boundaries adjacent to the nearest residences to protect the noise amenity from the communal outdoor recreation area (pool area).
- The proposed mechanical plant deck, enclosing 25 A/C condenser units, must be constructed of core-filled concrete blockwork and to be maintained for the design life of the development.
- The solid balustrades proposed in the development layout at all rooftop terraces must be maintained in order to screen noise to the nearest noise sensitive uses.
- All noise barrier fences and acoustic screens must be constructed of a material with minimum superficial mass of 12.5 kg/m², such as concrete blockwork, brick, autoclaved aerated concrete, minimum 9mm thick compressed fibre cement sheeting, minimum 10mm thick toughened glass, minimum 25mm thick overlapping timber palings or approved modular wall system by Modular Walls, Poly-Tek or equivalent. There shall be no gaps on the surface and at the base of the noise barrier fences, unless required for drainage.
- Should there be a need to locate mechanical plant at a location other than what has been assumed in this assessment, or should they have higher sound power levels than the values assumed in this assessment, then the mechanical plant and equipment need to be designed to comply with the noise criteria stated in Section 5.2 and an assessment by a qualified consultant be conducted prior to installation. The assessment should include verification that the plant and equipment installed complies with the criteria as stated in Section 5.2.
- In addition, the following general recommendations must be considered for the design and installation of all mechanical equipment:
 - Select equipment with low sound power levels;

- Locate equipment as far away from noise sensitive areas as possible;
- Construct solid acoustic screens or enclosures around equipment to screen it from noise sensitive areas;
- Where equipment has directional noise characteristics, point equipment away from noise sensitive areas; and
- Provide acoustic lining to inside of ventilation ducts and/or provide duct silencers.

7.4 Light Rail Vibration Impacts

The proposed development is located adjacent to Murwillimbah Railway Line, upon which the Byron Solar Train operates and which has a potential to cause railway vibration impacts on the development. Site specific vibration measurements and detailed acoustic design calculations were carried out to assess railway noise impacts.

A vibration logger was set up on site at 29 Shirley Street to determine the vibration levels from the adjacent Murwillimbah Railway Line and the Byron Solar Train. The measured vibration levels were adjusted to account for the difference between the distance from the railway track to the vibration logger and to the nearest point on the foundations of the future dwellings at 29 Shirley Street.

Based on the measured vibration levels, and when adjusted for distance attenuation and for the coupling loss factors, the maximum predicted vibration level at the future dwellings at 29 Shirley Street is 0.46 mm/s, which is well within the strictest 5 mm/s vibration limit for building damage.

When considering that the Byron Solar Train only operates during daytime and evening, the predicted vibration dose value must meet the maximum vibration limit of 0.4 m/s^{1.75}. Based on the vibration measurements conducted at 29 Shirley Street and adjusted for distance attenuation and for coupling loss factors, the predicted vibration dose values for the occupants of the future dwellings at 29 Shirley Street is 0.21 m/s^{1.75}.

Therefore, the predicted vibration levels from the associated Byron Solar Train at the future dwellings at 29 Shirley Street, will comply with the strictest vibration limits for cosmetic and building damage, as well as the human comfort vibration dose values.

8. Conclusions

Based on the results of the noise impact assessment for the proposed development at 29 Shirley Street in Byron Bay, the following conclusions are made:

Light Rail Noise Impact Assessment

- The results of the light rail noise propagation modelling indicate that there is railway noise impact on the units identified in Table 3.4 of this report.
- To prevent railway noise impact the impacted units must be designed and constructed as per the acoustic design specifications presented in Table 7.1 of this report.
- As per the NSW Department of Planning *Development near Rail Corridors and Busy Roads – Interim Guideline*, the following units will require mechanical ventilation:
 - Ground Floor:
 - Unit 005.
 - First Floor:
 - Units 105, 106, 107 and 109.
- The mechanical ventilation system must be appropriately sized to ensure sufficient air circulation as per the requirements of AS 1668.2-2012. The ventilation must be designed so that the acoustic performance of the building envelope is not compromised.
- Fully ducted centralised air-conditioning system, as proposed, will ensure compliance with the ventilation requirements for the railway noise impacted units.

Road Traffic Noise Impact Assessment

- The results of the road traffic noise propagation modelling indicate that there is road traffic noise impact on the units identified in Table 4.6 of this report.
- To prevent road traffic noise impact the impacted units must be designed and constructed as per the acoustic design specifications presented in Table 7.2 of this report.
- As per the NSW Department of Planning *Development near Rail Corridors and Busy Roads – Interim Guideline*, the following units will require mechanical ventilation:
 - Ground Floor:
 - Units 001, 002, 003 and 004.
 - First Floor:
 - Units 101, 102, 103 and 104.

- Second Floor:
 - Units 201, 202, 203, 204 and 210.
- The mechanical ventilation system must be appropriately sized to ensure sufficient air circulation as per the requirements of AS 1668.2-2012. The ventilation must be designed so that the acoustic performance of the building envelope is not compromised.
- Fully ducted centralised air-conditioning system, as proposed, will ensure compliance with the ventilation requirements for the road traffic noise impacted units.

Operational Noise Impact Assessment

- The results of the operational noise impact assessment indicate noise impacts on the nearest noise sensitive premises associated with the patron noise from the communal open space, private open spaces on the ground floor and on the roof-top terraces, car movements, mechanical noise from A/C units, and use of the Wellness Centre.
- To prevent noise impact on the nearest noise sensitive places, the following noise control measures are recommended:
 - Use of the communal pool area must be limited to daytime and evening hours only (7:00am to 10:00pm).
 - Use of the Wellness Centre must be limited to daytime and evening hours only (7:00am to 10:00pm).
 - Amplified music must only be played indoors of the Wellness Centre. There must be no amplified music played outdoors.
 - The noise barrier fences (masonry walls), as proposed in the development layout, must be constructed and maintained along the eastern and northern property boundaries adjacent to the nearest residences to protect the noise amenity from the communal outdoor recreation area (pool area).
 - The proposed mechanical plant deck, enclosing 25 A/C condenser units, must be constructed of core-filled concrete blockwork and to be maintained for the design life of the development.
 - The solid balustrades proposed in the development layout at all rooftop terraces must be maintained in order to screen noise to the nearest noise sensitive uses.
 - All noise barrier fences and acoustic screens must be constructed of a material with minimum superficial mass of 12.5 kg/m², such as concrete blockwork, brick, autoclaved aerated concrete, minimum 9mm thick compressed fibre cement sheeting, minimum 10mm thick toughened glass, minimum 25mm thick overlapping timber palings or approved modular wall system by Modular Walls, Poly-Tek or equivalent. There shall be no gaps on the surface and at the base of the noise barrier fences, unless required for drainage.

- Should there be a need to locate mechanical plant at a location other than what has been assumed in this assessment, or should they have higher sound power levels than the values assumed in this assessment, then the mechanical plant and equipment need to be designed to comply with the noise criteria stated in Section 5.2 and an assessment by a qualified consultant be conducted prior to installation. The assessment should include verification that the plant and equipment installed complies with the criteria as stated in Section 5.2.
- In addition, the following general recommendations must be considered for the design and installation of all mechanical equipment:
 - Select equipment with low sound power levels;
 - Locate equipment as far away from noise sensitive areas as possible;
 - Construct solid acoustic screens or enclosures around equipment to screen it from noise sensitive areas;
 - Where equipment has directional noise characteristics, point equipment away from noise sensitive areas; and

Provide acoustic lining to inside of ventilation ducts and/or provide duct silencers.

Light Rail Vibration Impact Assessment

- The results of the light rail vibration assessment indicate that there will be no vibration impacts on the proposed dwellings.
- The predicted vibration levels at the nearest future dwellings will comply with the strictest vibration limits for human comfort ($<0.4 \text{ m/s}^{1.75}$), and for building damage ($<5 \text{ mm/s}$).

Provided the noise mitigation measures recommended in this report, considering the modified development layout dated 6 September 2024, are fully implemented in the detailed design and construction, there will be no further acoustic constraints on the establishment of the proposed development at 29 Shirley Street in Byron Bay.

9. References

- Australian Standard AS1055.2018 (*Acoustics - Description and Measurement of Environmental Noise*)
- Australian Standard AS 2702-1984 (*Acoustics – Methods for measurement of road traffic noise*)
- Australian Standard AS 2377-2002 (*Acoustics – Methods for the measurements of railbound vehicle noise*)
- International Standard ISO 3095:2013 (*Acoustics – Railway applications – Measurement of noise emitted by railbound vehicles*)
- Australian Standard AS3671-1989 (*Acoustics – Acoustics—Road traffic noise intrusion—Building siting and construction*)
- Australian Standard AS/NZS IEC61672.1-2019 (*Electroacoustics - Sound level meters – Specifications*)
- Australian Standard AS/NZS 2107:2016 (*Acoustics – Recommended Design Sound Levels and Reverberation Times for Building Interiors*)
- Byron Shire Council, 2014, *Byron Local Environmental Plan 2014*
- NSW Department of Planning, *Interim Guideline – Development near Rail Corridors and Busy Roads*, 2008
- NSW EPA, *Noise Policy for Industry*, 2017
- NSW EPA, *Road Noise Policy*, 2011
- *State Environmental Planning Policy (Transport and Infrastructure) 2021*

10. Appendices

Appendix A – Development Layout

Appendix B – Site Photos

Appendix C – Meteorological Data

Appendix D – Noise Measurement Results

Appendix E – Railway Noise Validation Results

Appendix F – Tabulated Railway Noise Levels

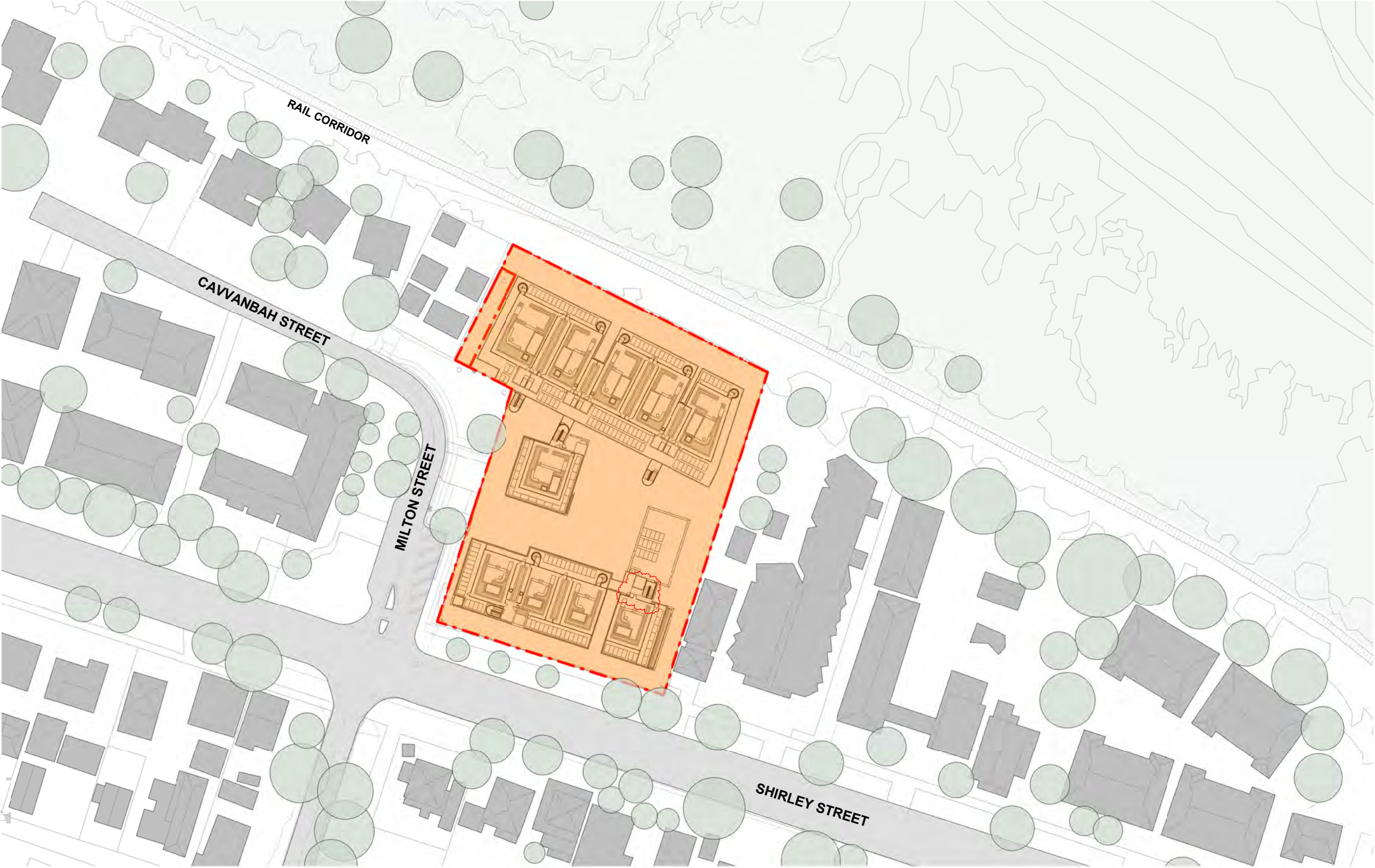
Appendix G – Road Traffic Noise Validation Results

Appendix H – Tabulated Road Noise Levels

Appendix I – Tabulated Operational Noise Levels

Appendix J – Operational Noise Contour Maps

Appendix A – Development Layout

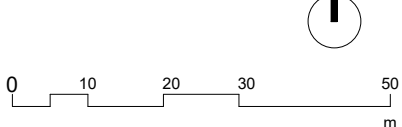


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VITALE PROPERTY GROUP
29 SHIRLEY STREET & 2-4 MILTON
STREET, BYRON BAY NSW 2481

Melbourne Level 1 250 Flinders Lane Melbourne VIC 3000 T +61 3 9699 3644 ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521, Richard Leonard 7522, David Tordoff 8028	Sydney Ground Floor 11-17 Buckingham Street Surry Hills NSW 2010 T +61 2 9660 9329	Brisbane Level 12, 324 Queen Street, Brisbane Qld 4000 T +61 7 3211 9821
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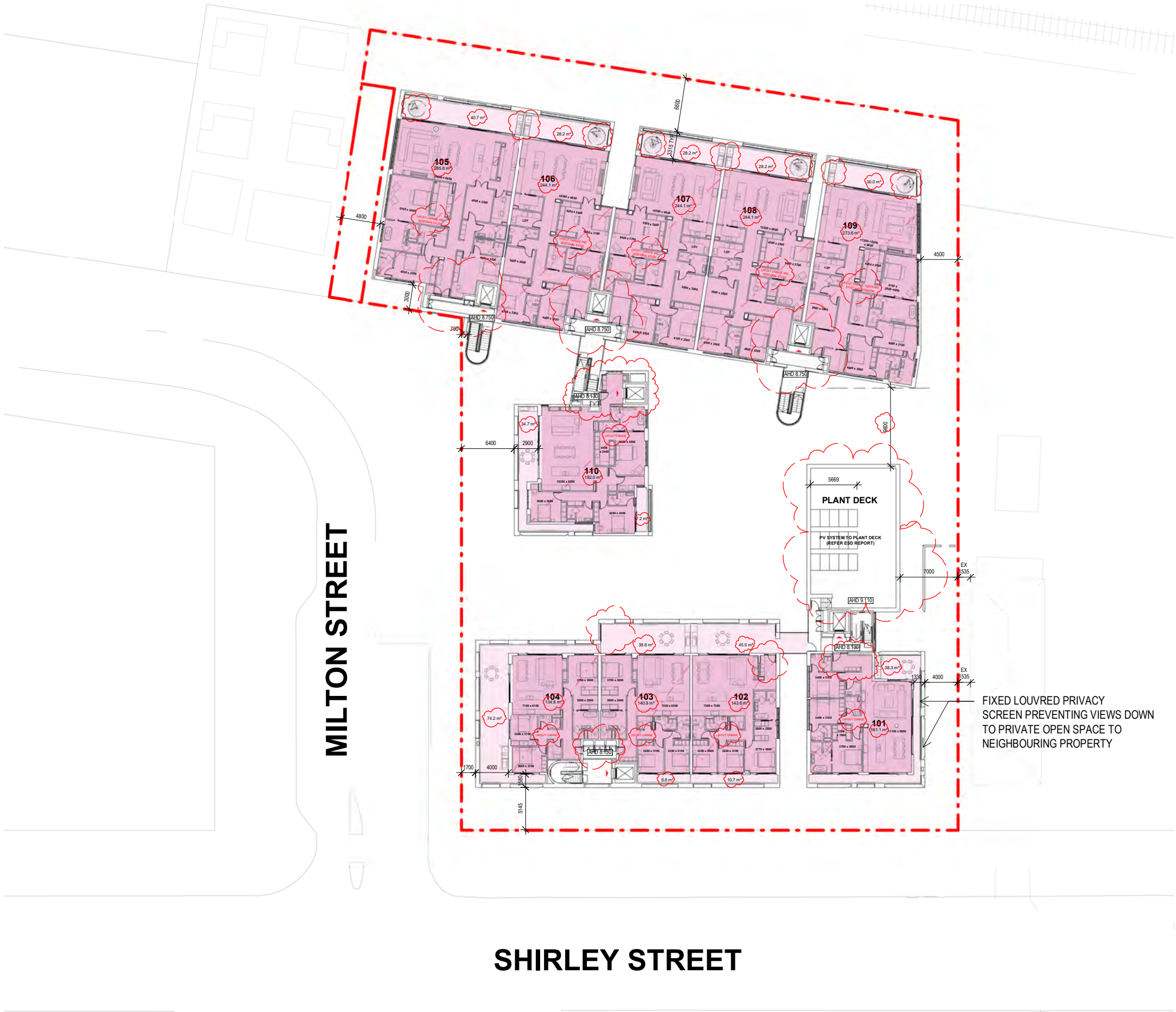
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2	06.09.2024	ISSUED FOR ENDORSEMENT

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Project No	Drawing No	Revision
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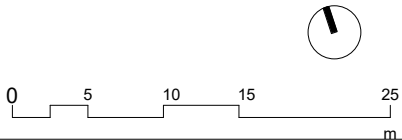


Project Title
VITALE PROPERTY GROUP
29 SHIRLEY STREET & 2-4 MILTON
STREET, BYRON BAY NSW 2481

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Level 1	Ground Floor	Level 12,
250 Flinders Lane	11-17 Buckingham Street	324 Queen Street,
Melbourne VIC 3000	Surry Hills NSW 2010	Brisbane Qld 4000
T +61 3 9699 3644	T +61 2 9660 9329	T +61 7 3211 9821
ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521,		
Richard Leonard 7522, David Tordoff 8028		



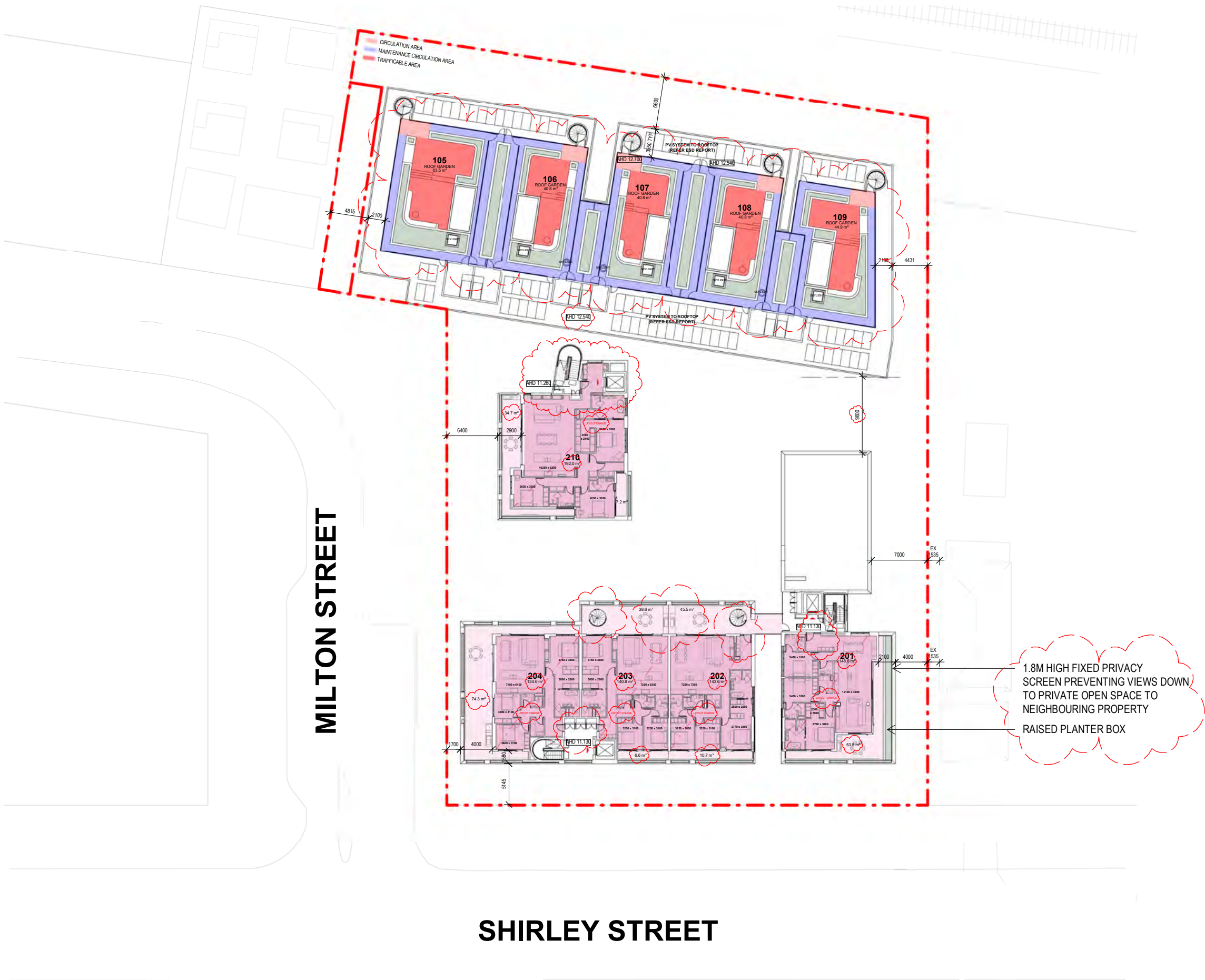
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Drawing Title
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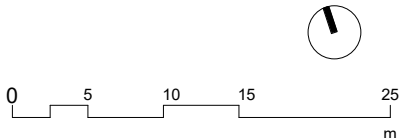
Melbourne
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ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521, Richard Leonard 7522, David Tordoff 8028

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Drawing Title
LEVEL 2

Project No	Drawing No	Revision
2555	DA1.14	2

NOTE:

AT LEAST 10% OF
ALL APARTMENTS
ARE ADAPTABLE

Apartment Types

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- 006, 007, 008
(Internal Layout Similar)
- 009

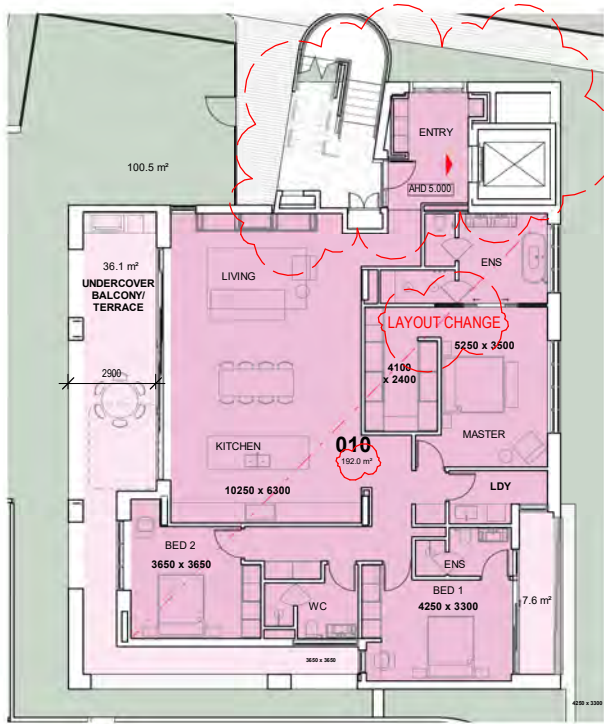


100.5 m²

7.5 m² Drying Area

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29 SHIRLEY STREET & 2-4 MILTON STREET, RYRON BAY NSW 2481	ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521, Richard Leonard 7522, David Tordoff 8028																

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- 003
- 004
- 010



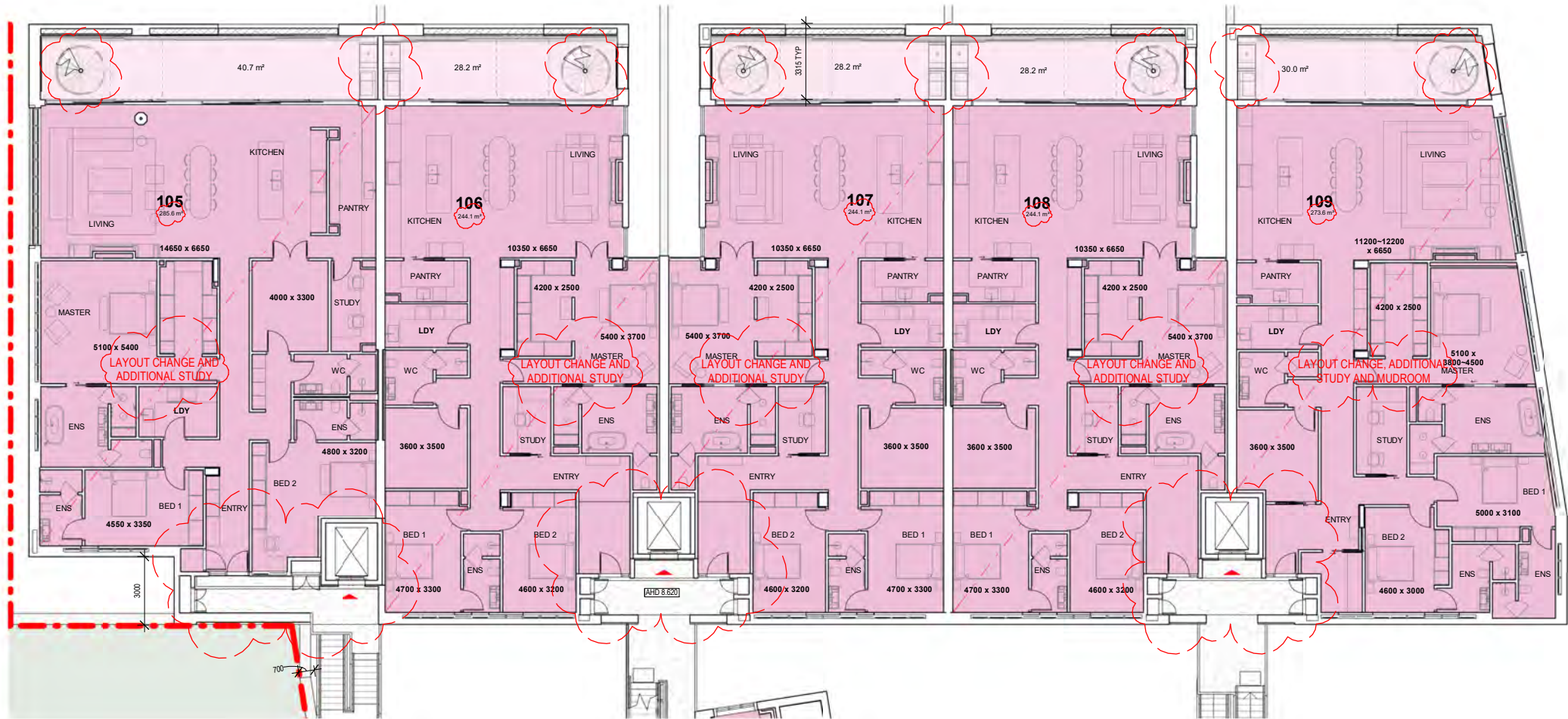
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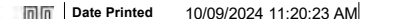
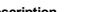
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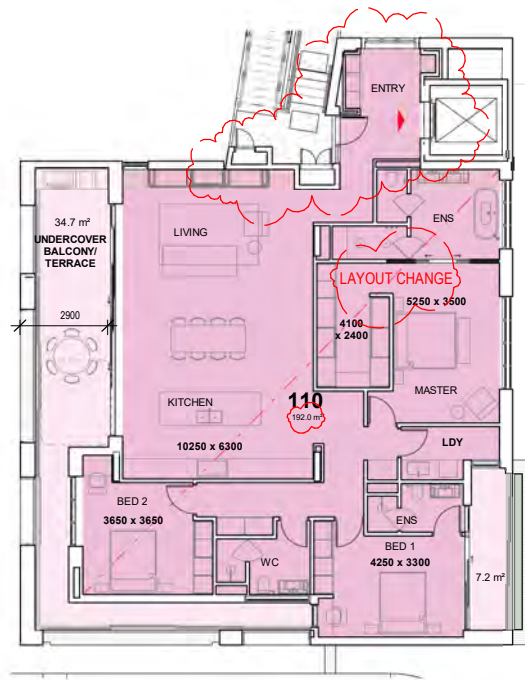
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- 106, 107, 108
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29 SHIRLEY STREET & 2-4 MILTON STREET, BYRON BAY NSW 2481	ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521, Richard Leonard 7522, David Tordoff 8028													

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NOTE:

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Apartment Types

101

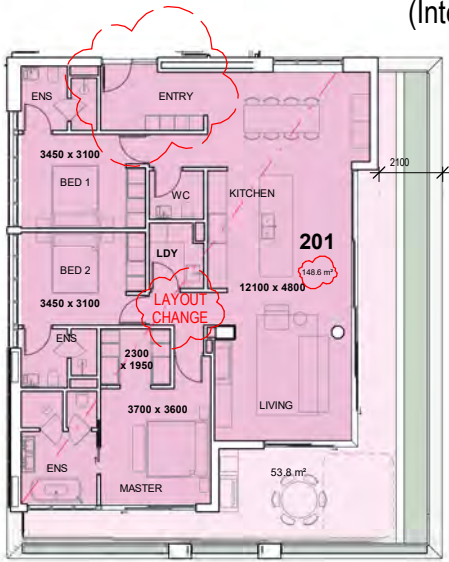
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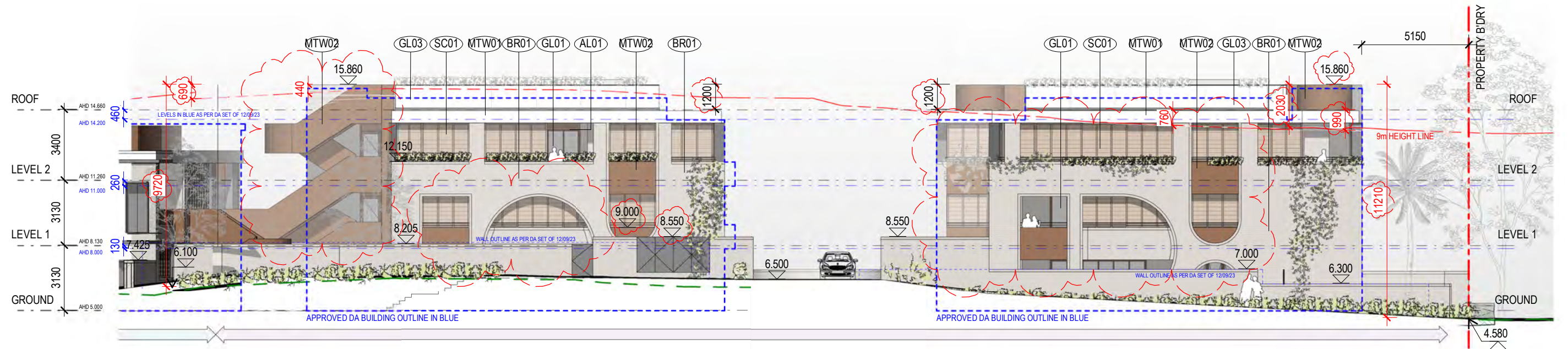
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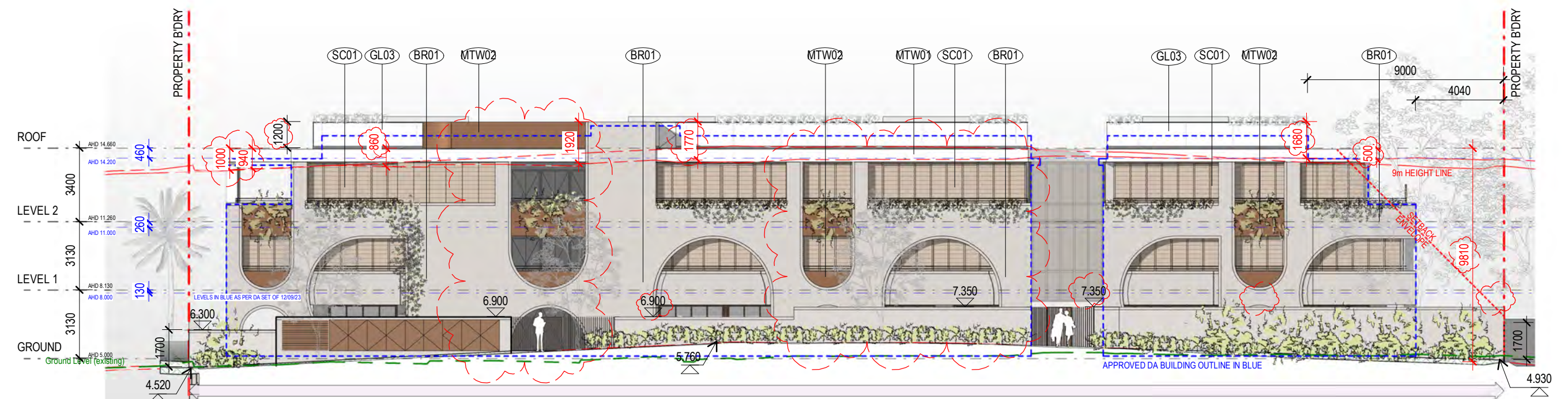
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 7.5 m² Drying Area



WEST ELEVATION - MILTON STREET



SOUTH ELEVATION - SHIRLEY STREET

KEY

--- 9m LINE ABOVE LEVELS SHOWN ON SURVEY DRAWING BYR111 Rev D DATED FEBRUARY 22ND 2023 BY BYRON BAY SURVEYING

--- GROUND LEVEL (EXISTING)

DM - DEFERRED MATTER AMMENDMENT #18 ZONE

R3 - MEDIUM DENSITY RESIDENTIAL

MATERIAL KEY

BR01 BAGGED BRICKWORK - PALE CREAM BRICK & RENDER

GL01 PERFORMANCE GLAZING

GL02 TRANSLUCENT PRIVACY GLAZING

GL03 GLASS BALUSTRADE

MT01 BRONZE SHEET CLADDING

MTW01 ALUMINIUM PLATE PROFILE - WHITE POWDERCOAT FINISH

MTW02 ALUMINIUM BALUSTRADE - MEDIUM BRONZE POWDERCOAT FINISH

AL01 ALUMINIUM FRAMED DOORS AND WINDOWS - MEDIUM BRONZE POWDERCOAT FINISH

SC01 ALUMINIUM LOUVRE SCREEN



Project Title
VITALE PROPERTY GROUP
29 SHIRLEY STREET & 2-4 MILTON STREET, BYRON BAY NSW 2481

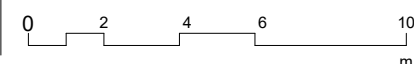
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ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521, Richard Leonard 7522, David Tordoff 8028

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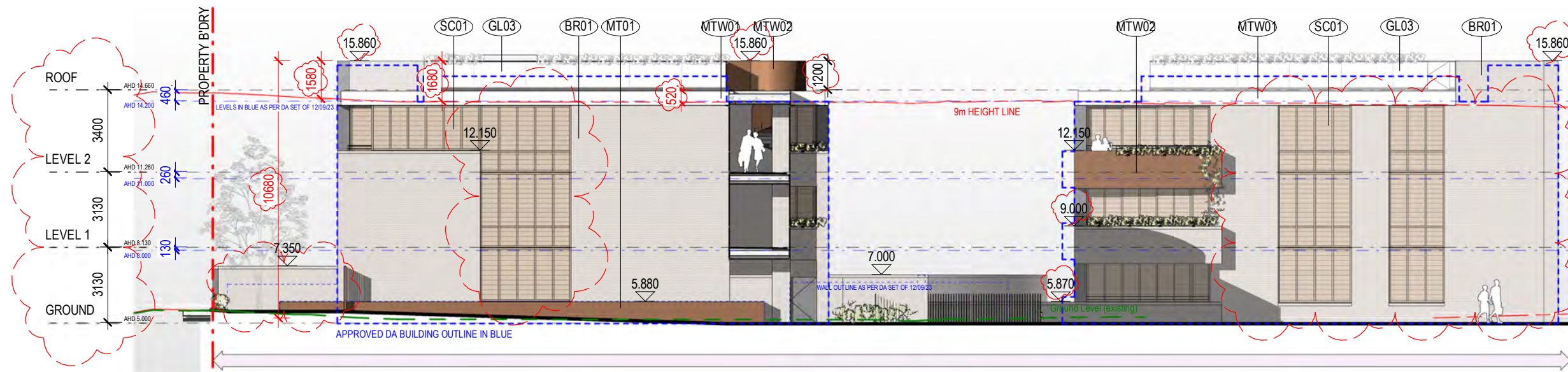
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Project No	Drawing No	Revision
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SOUTH BUILDING - EAST ELEVATION_DA



WEST BUILDING - NORTH ELEVATION

MATERIAL KEY

- BR01 BAGGED BRICKWORK - PALE CREAM BRICK & RENDER
- GL01 PERFORMANCE GLAZING
- GL02 TRANSLUCENT PRIVACY GLAZING
- GL03 GLASS BALUSTRADE
- MT01 BRONZE SHEET CLADDING
- MTW01 ALUMINIUM PLATE PROFILE - WHITE POWDERCOAT FINISH
- MTW02 ALUMINIUM BALUSTRADE - MEDIUM BRONZE POWDERCOAT FINISH
- AL01 ALUMINIUM FRAMED DOORS AND WINDOWS - MEDIUM BRONZE POWDERCOAT FINISH
- SC01 ALUMINIUM LOUVRE SCREEN

KEY

- 9m LINE ABOVE LEVELS SHOWN ON SURVEY DRAWING BYR111 Rev D DATED FEBRUARY 22ND 2023 BY BYRON BAY SURVEYING
- GROUND LEVEL (EXISTING)
- DM - DEFERRED MATTER AMMENDMENT #18 ZONE
- R3 - MEDIUM DENSITY RESIDENTIAL



Project Title
VITALE PROPERTY GROUP
29 SHIRLEY STREET & 2-4 MILTON STREET, BYRON BAY NSW 2481

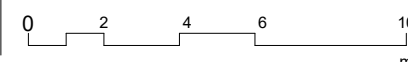
Melbourne
Level 1
250 Flinders Lane
Melbourne VIC 3000
T +61 3 9699 3644
ABN: 84006394261 NSW Nominated Architects: Tom Jordan 7521, Richard Leonard 7522, David Tordoff 8028

Sydney
Ground Floor
11-17 Buckingham Street
Surry Hills NSW 2010
T +61 2 9660 9329

Brisbane
Level 12,
324 Queen Street,
Brisbane Qld 4000
T +61 7 3211 9821

hayball

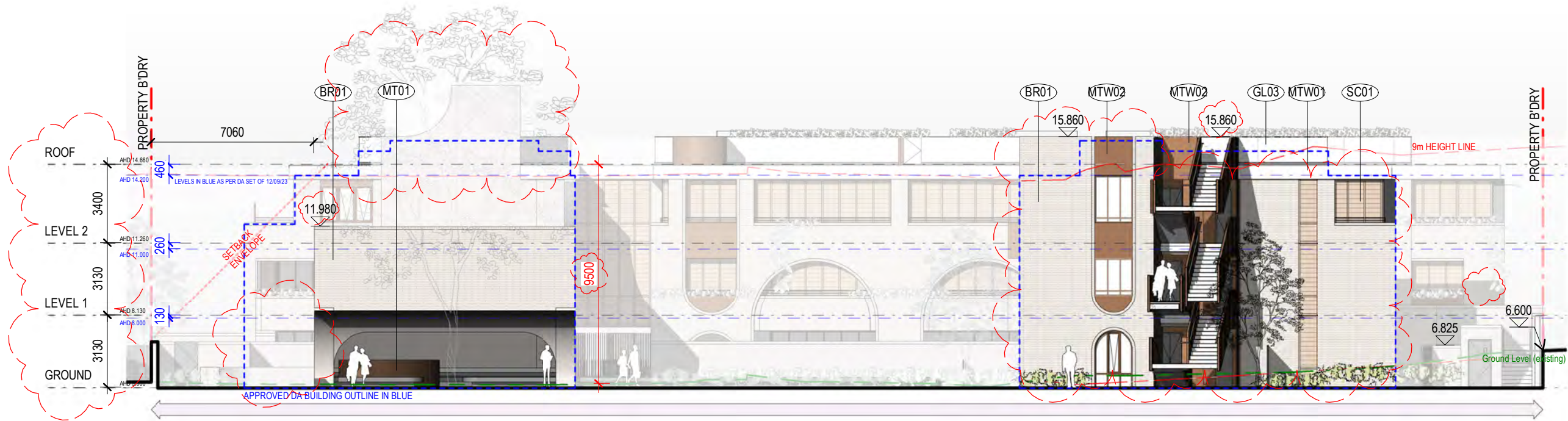
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Rev	Date	Description
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2	06.09.2024	ISSUED FOR ENDORSEMENT

Drawing Title
ELEVATIONS

Project No	Drawing No	Revision
2555	DA7.02	2



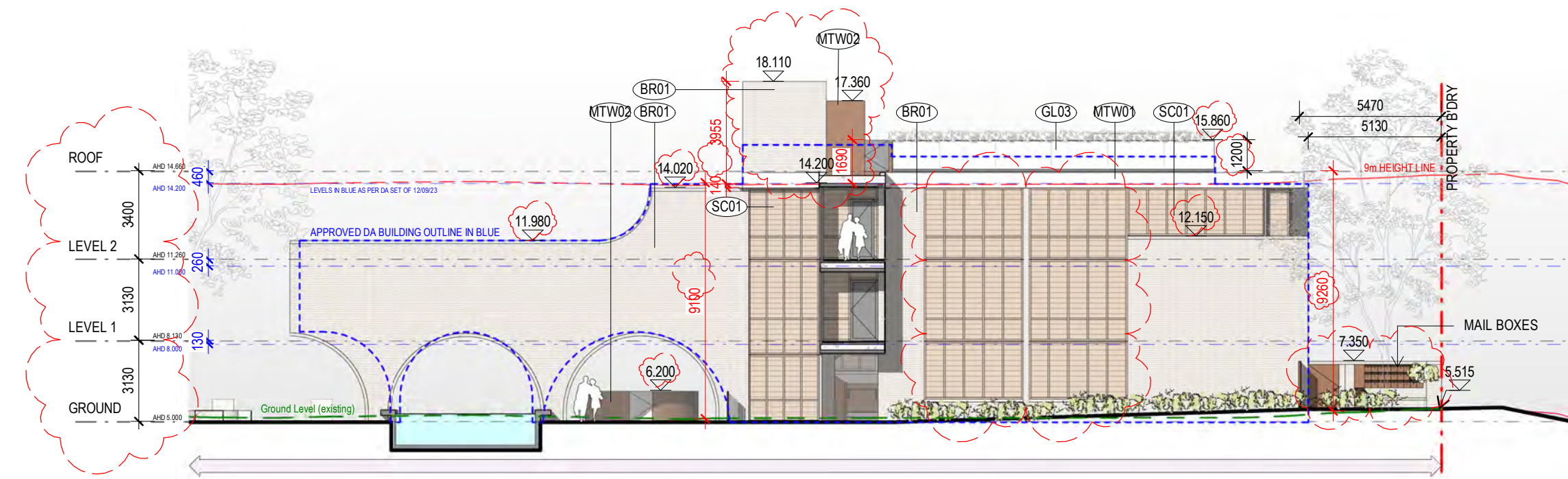
EAST BUILDING - NORTH ELEVATION_DA

MATERIAL KEY

- BR01 BAGGED BRICKWORK - PALE CREAM BRICK & RENDER
- GL01 PERFORMANCE GLAZING
- GL02 TRANSLUCENT PRIVACY GLAZING
- GL03 GLASS BALUSTRADE
- MT01 BRONZE SHEET CLADDING
- MTW01 ALUMINIUM PLATE PROFILE - WHITE POWDERCOAT FINISH
- MTW02 ALUMINIUM BALUSTRADE - MEDIUM BRONZE POWDERCOAT FINISH
- AL01 ALUMINIUM FRAMED DOORS AND WINDOWS - MEDIUM BRONZE POWDERCOAT FINISH
- SC01 ALUMINIUM LOUVRE SCREEN

KEY

- 9m LINE ABOVE LEVELS SHOWN ON SURVEY DRAWING BYR111 Rev D DATED FEBRUARY 22ND 2023 BY BYRON BAY SURVEYING
- GROUND LEVEL (EXISTING)
- DM - DEFERRED MATTER AMMENDMENT #18 ZONE
- R3 - MEDIUM DENSITY RESIDENTIAL



EAST BUILDING - WEST ELEVATION_DA



Project Title

VITALE PROPERTY GROUP
29 SHIRLEY STREET & 2-4 MILTON
STREET, BYRON BAY NSW 2481

Melbourne

Level 1
250 Flinders Lane
Melbourne VIC 3000
T +61 3 9699 3644
ABN: 84006394261 NSW

Sydney

Ground Floor
11-17 Buckingham Street
Surry Hills NSW 2010
T +61 2 9660 9329
Richard Leonard 7522, David Tordoff 8028

Brisbane

Level 12,
324 Queen Street,
Brisbane Qld 4000
T +61 7 3211 9821

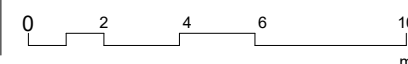


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Scale

As indicated @ A3



Rev

Rev	Date	Description
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2	06.09.2024	ISSUED FOR ENDORSEMENT

Drawing Title

ELEVATIONS

Project No

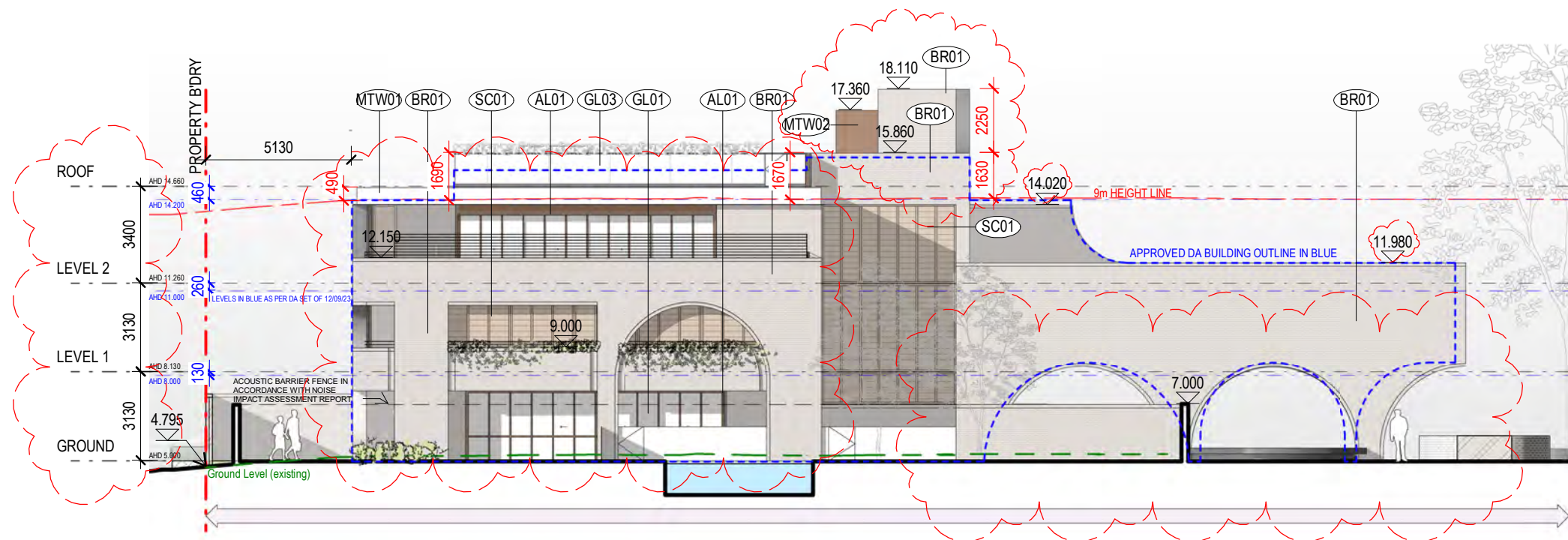
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Drawing No

DA7.03

Revision

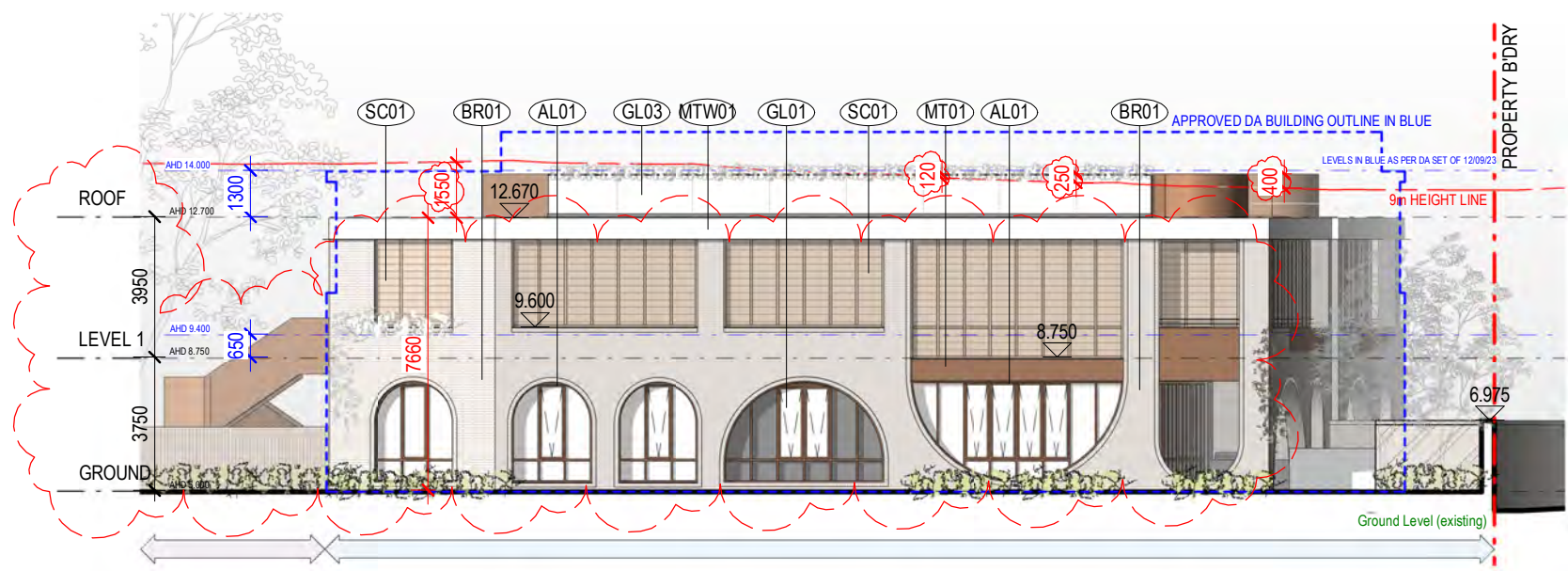
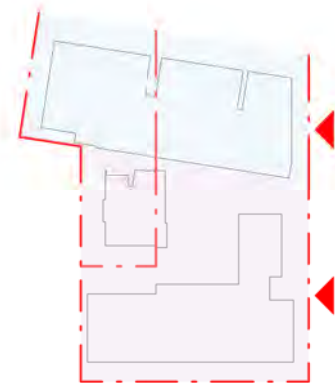
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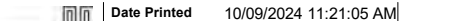
EAST BUILDING - EAST ELEVATION_DA

- MATERIAL KEY**
- BR01 BAGGED BRICKWORK - PALE CREAM BRICK & RENDER
 - GL01 PERFORMANCE GLAZING
 - GL02 TRANSLUCENT PRIVACY GLAZING
 - GL03 GLASS BALUSTRADE
 - MTW01 BRONZE SHEET CLADDING
 - MTW02 ALUMINIUM PLATE PROFILE - WHITE POWDERCOAT FINISH
 - MTW03 ALUMINIUM BALUSTRADE - MEDIUM BRONZE POWDERCOAT FINISH
 - AL01 ALUMINIUM FRAMED DOORS AND WINDOWS - MEDIUM BRONZE POWDERCOAT FINISH
 - SC01 ALUMINIUM LOUVRE SCREEN

- KEY**
- 9m LINE ABOVE LEVELS SHOWN ON SURVEY DRAWING BYR111 Rev D DATED FEBRUARY 22ND 2023 BY BYRON BAY SURVEYING
 - GROUND LEVEL (EXISTING)
 - DM - DEFERRED MATTER AMMENDMENT #18 ZONE
 - R3 - MEDIUM DENSITY RESIDENTIAL



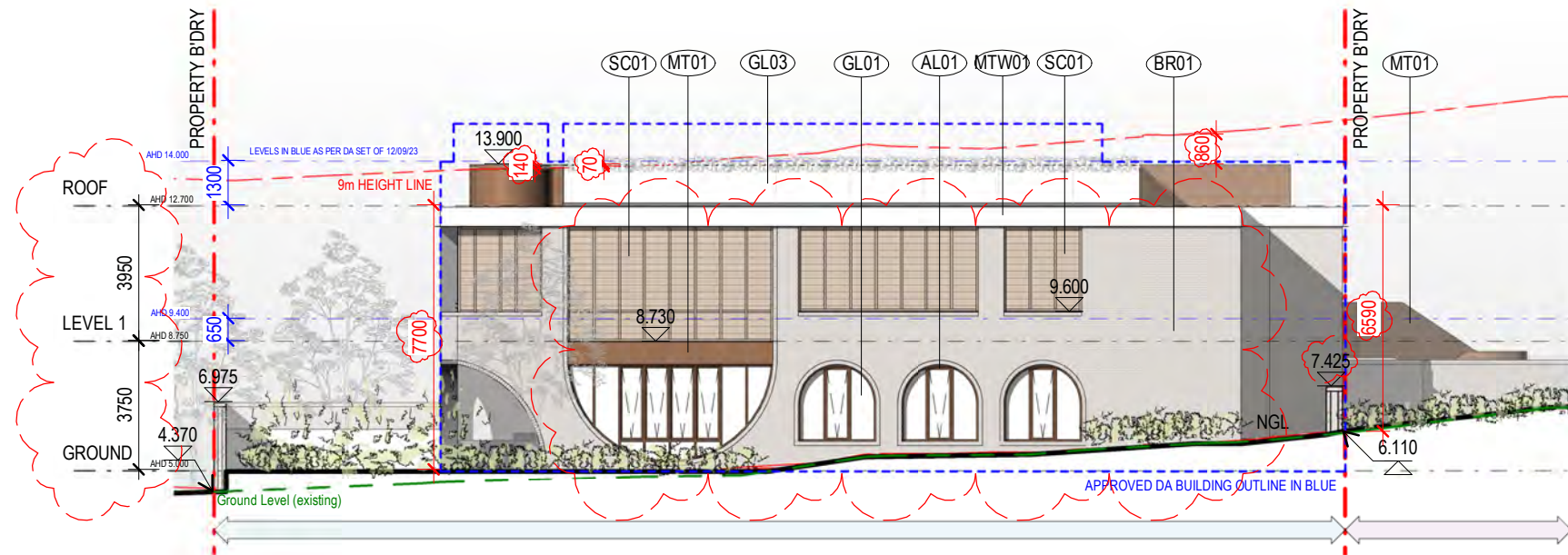
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Project Title	Melbourne	Sydney	Brisbane		Date Printed	10/09/2024 11:21:05 AM		Rev	Date	Description	Drawing Title	Project No	Drawing No	Revision
VITALE PROPERTY GROUP	Level 1 250 Flinders Lane Melbourne VIC 3000 T +61 3 9699 3644	Ground Floor 11-17 Buckingham Street Surry Hills NSW 2010 T +61 2 9660 9329	Level 12, 324 Queen Street, Brisbane Qld 4000 T +61 7 3211 9821		Scale	As indicated@ A3		1 15.05.2024 ISSUED FOR ENDORSEMENT	2 06.09.2024 ISSUED FOR ENDORSEMENT	ELEVATIONS	2555	DA7.04	2	
29 SHIRLEY STREET & 2-4 MILTON STREET, BYRON BAY NSW 2481	ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521, Richard Leonard 7522, David Tordoff 8028													

Builders/Contractors shall verify job dimensions before any job commences. Figured dimensions shall take precedence over scaled work. Work shall also conform to the specification, other drawings and job dimensions. All shop drawings shall be submitted to the Architect/Consultant and manufacture shall not commence prior to the return of inspected shop drawings signed by the Architect/Consultant. Hayball retains copyright and grants the client a licence to use the Design for the purposes of this project and for the particular stage of services for which the Hayball has been commissioned only. © Copyright 2008 All rights reserved



NORTH BUILDING - SOUTH ELEVATION



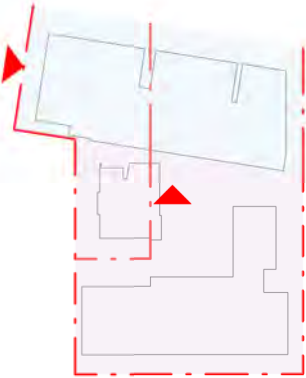
NORTH BUILDING - WEST ELEVATION_

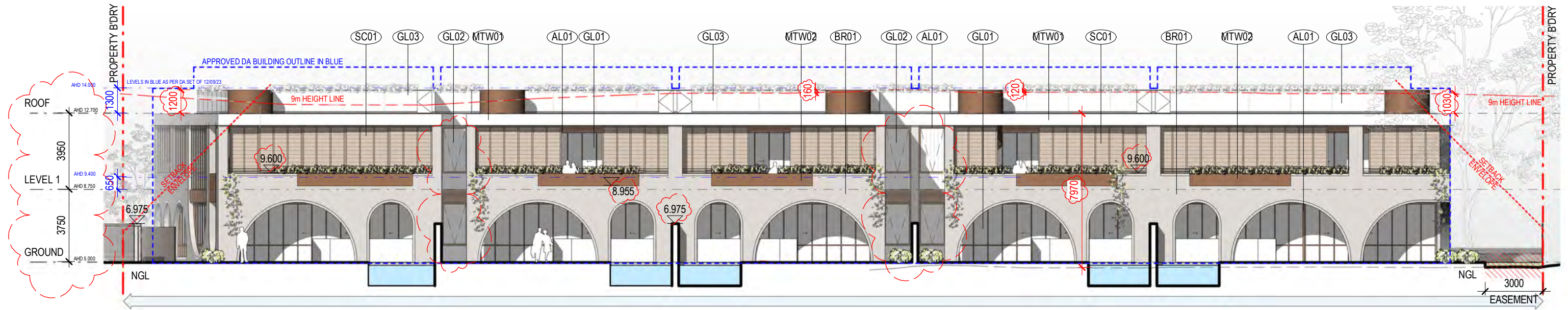
MATERIAL KEY

- (BR01) BAGGED BRICKWORK - PALE CREAM BRICK & RENDER
- (GL01) PERFORMANCE GLAZING
- (GL02) TRANSLUCENT PRIVACY GLAZING
- (GL03) GLASS BALUSTRADE
- (MT01) BRONZE SHEET CLADDING
- (MTW01) ALUMINIUM PLATE PROFILE - WHITE POWDERCOAT FINISH
- (MTW02) ALUMINIUM BALUSTRADE - MEDIUM BRONZE POWDERCOAT FINISH
- (AL01) ALUMINIUM FRAMED DOORS AND WINDOWS - MEDIUM BRONZE POWDERCOAT FINISH
- (SC01) ALUMINIUM LOUVRE SCREEN

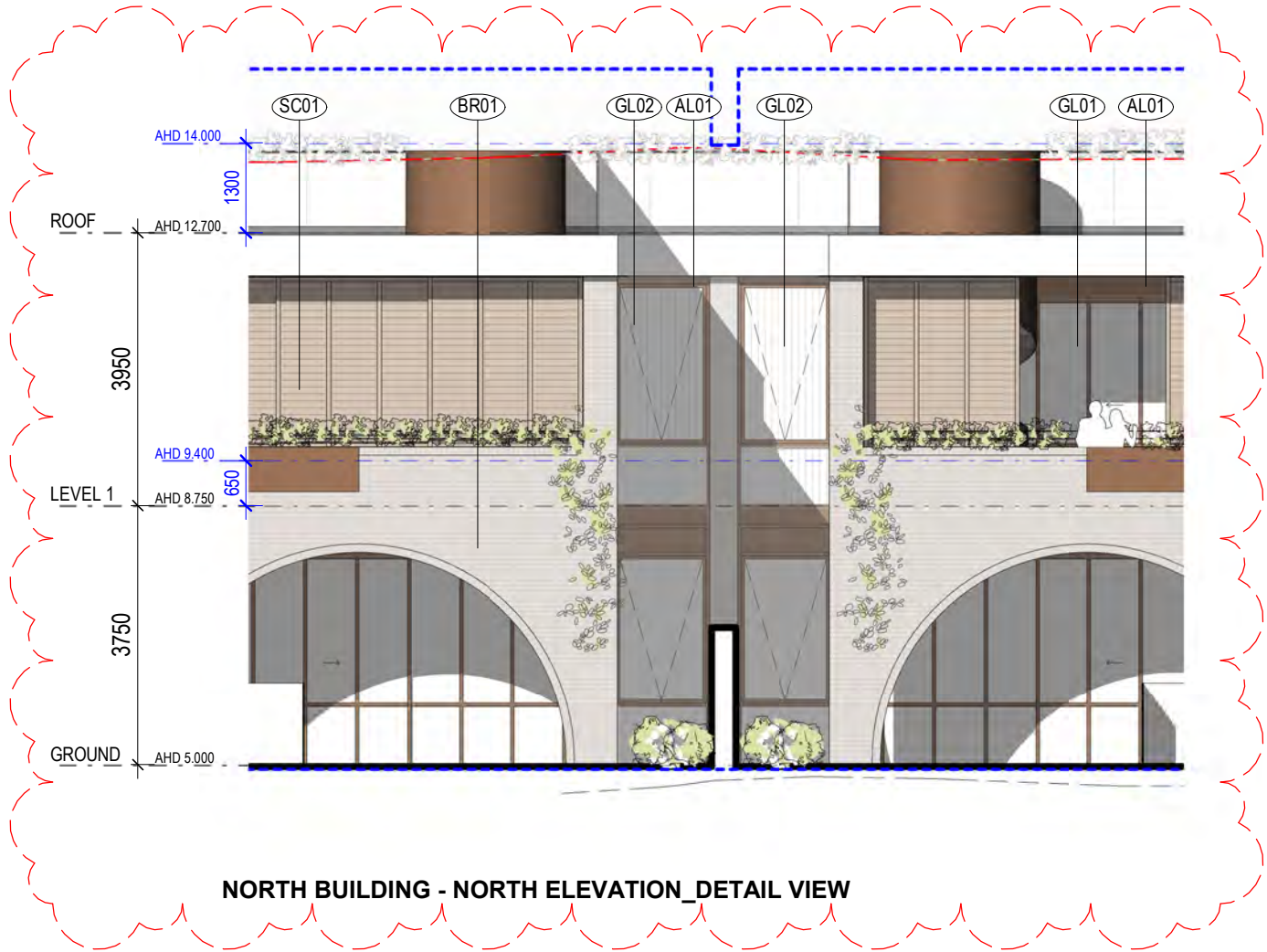
KEY

- 9m LINE ABOVE LEVELS SHOWN ON SURVEY DRAWING BYR111 Rev D DATED FEBRUARY 22ND 2023 BY BYRON BAY SURVEYING
- GROUND LEVEL (EXISTING)
- DM - DEFERRED MATTER AMMENDMENT #18 ZONE
- R3 - MEDIUM DENSITY RESIDENTIAL





NORTH BUILDING - NORTH ELEVATION_DA



NORTH BUILDING - NORTH ELEVATION_DETAIL VIEW

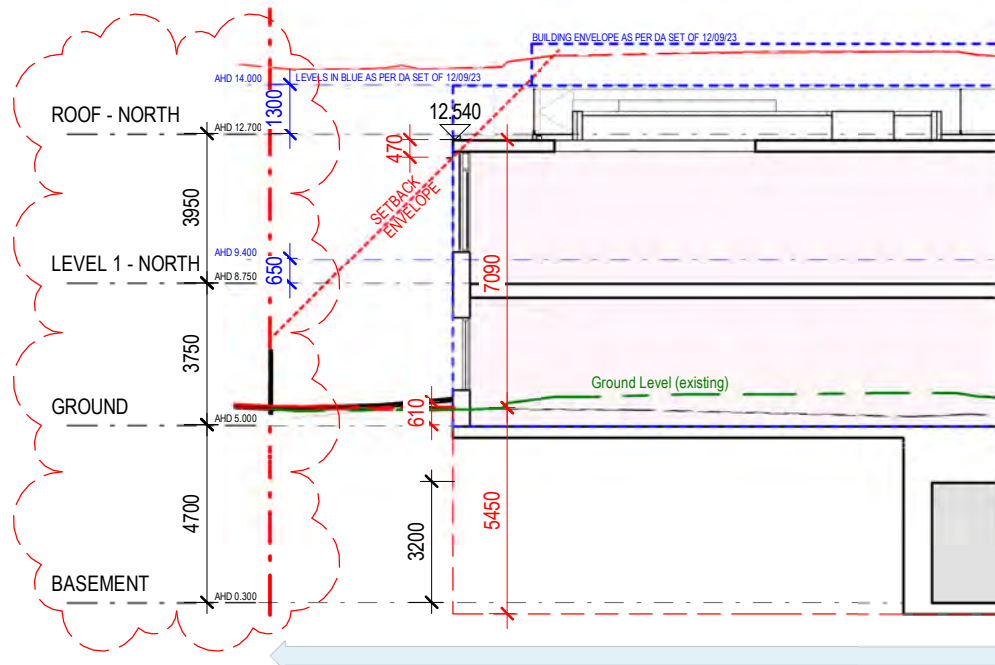
MATERIAL KEY

- BR01 BAGGED BRICKWORK - PALE CREAM BRICK & RENDER
- GL01 PERFORMANCE GLAZING
- GL02 TRANSLUCENT PRIVACY GLAZING
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- SC01 ALUMINIUM LOUVRE SCREEN

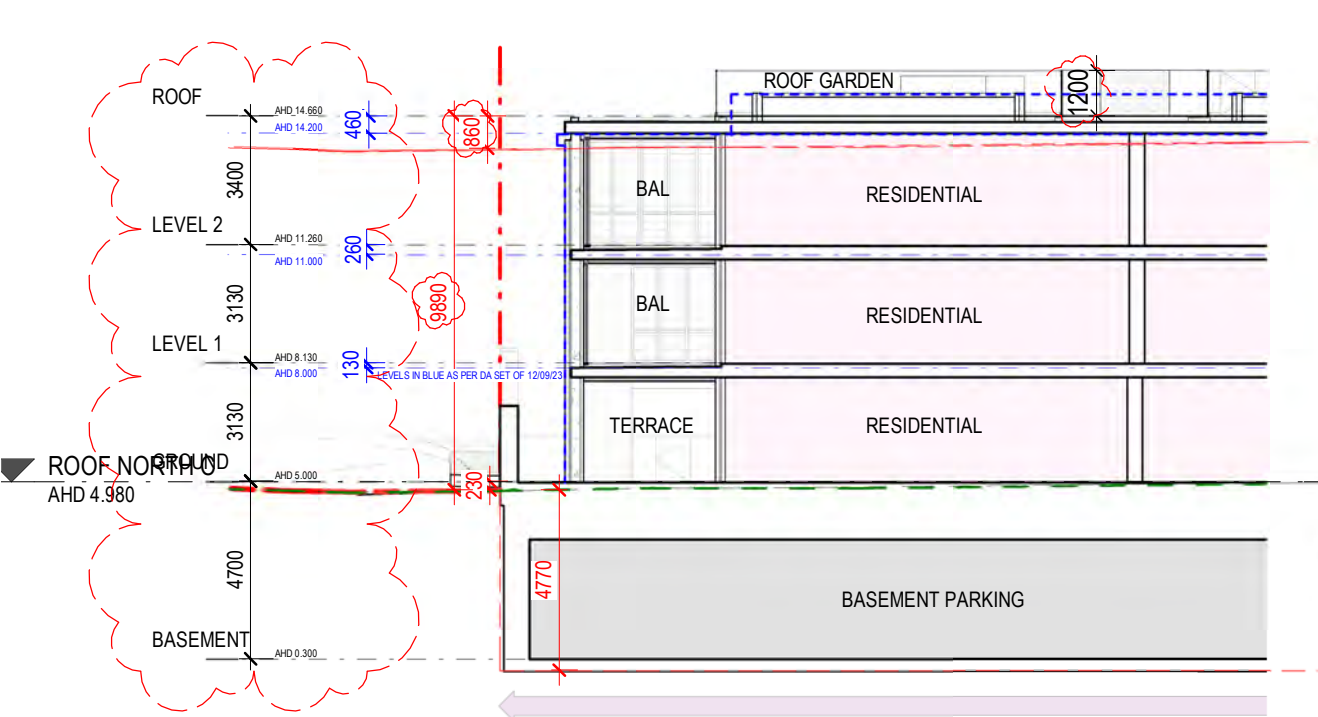
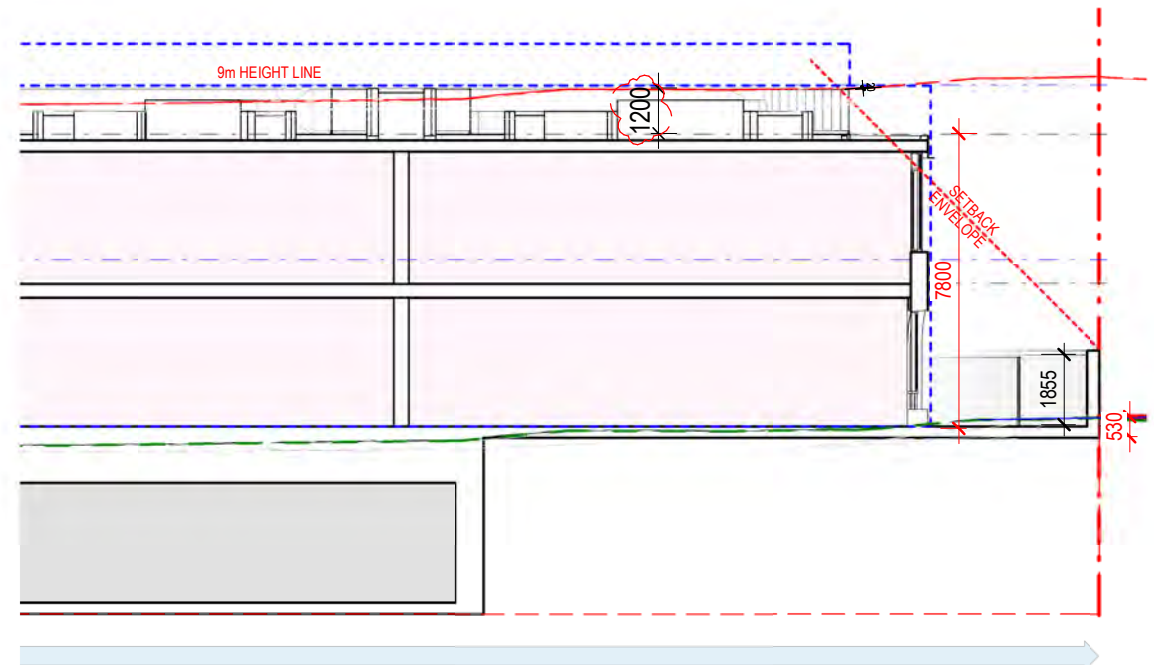
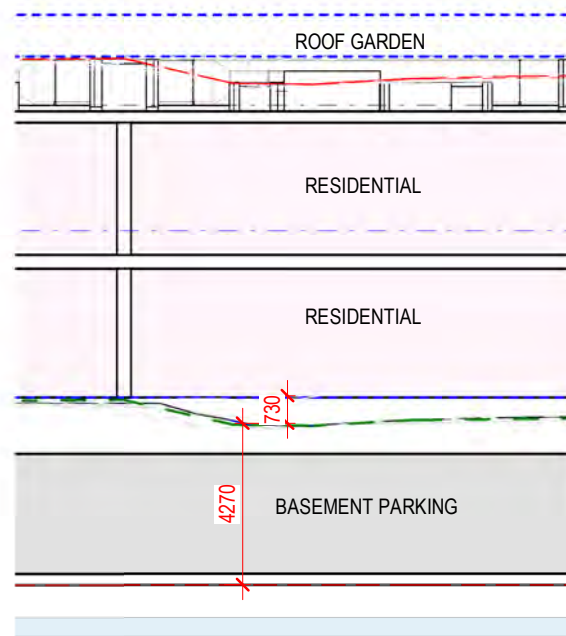
KEY

- 9m LINE ABOVE LEVELS SHOWN ON SURVEY DRAWING BYR111 Rev D DATED FEBRUARY 22ND 2023 BY BYRON BAY SURVEYING
- GROUND LEVEL (EXISTING)
- DM - DEFERRED MATTER AMMENDMENT #18 ZONE
- R3 - MEDIUM DENSITY RESIDENTIAL

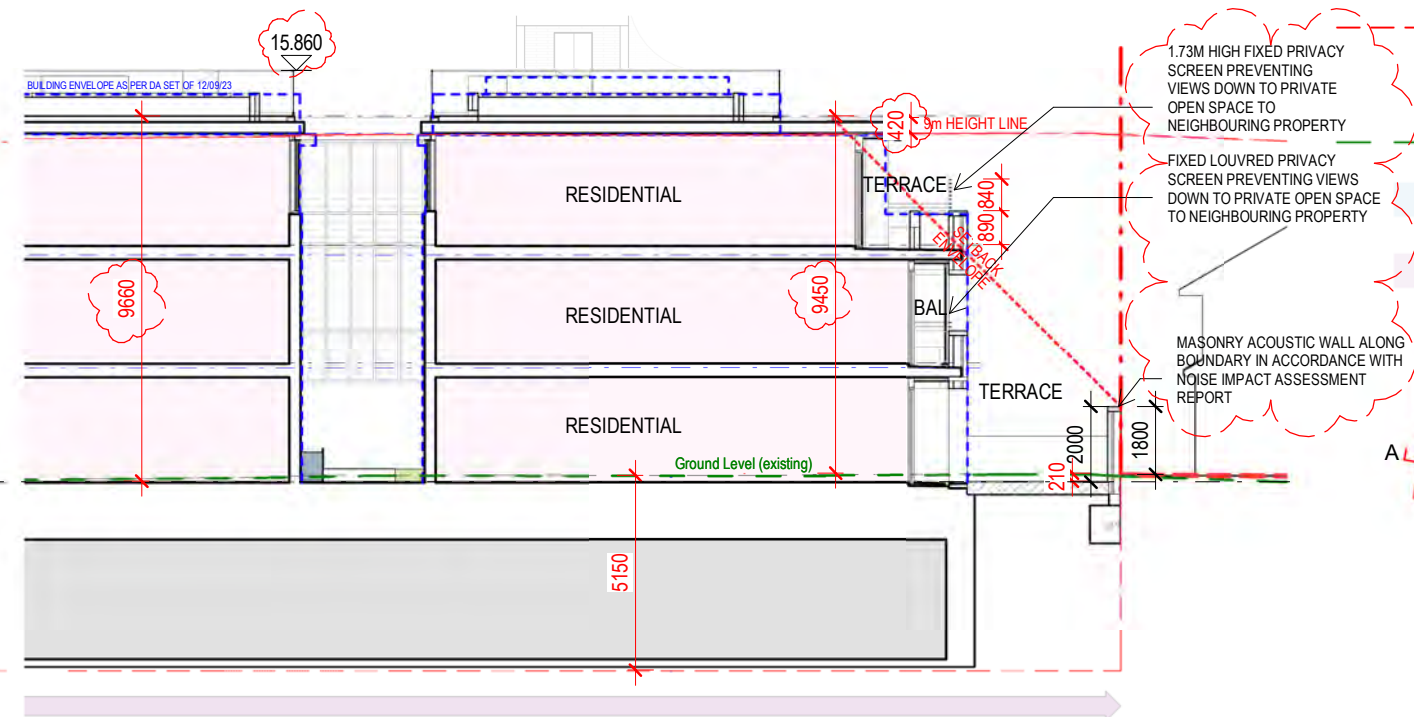




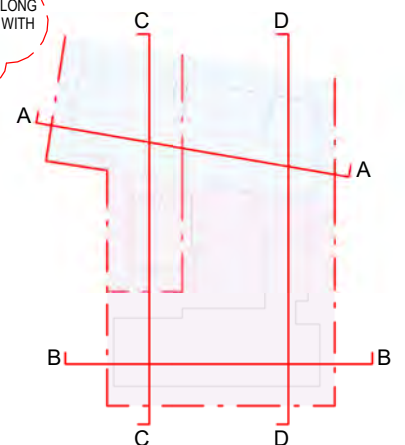
Section A



Section B



- KEY**
- 9m LINE ABOVE LEVELS SHOWN ON SURVEY DRAWING BYR111 Rev D DATED FEBRUARY 22ND 2023 BY BYRON BAY SURVEYING
 - GROUND LEVEL (EXISTING)
 - DM - DEFERRED MATTER AMMENDMENT #18 ZONE
 - R3 - MEDIUM DENSITY RESIDENTIAL



Project Title
VITALE PROPERTY GROUP
29 SHIRLEY STREET & 2-4 MILTON STREET, BYRON BAY NSW 2481

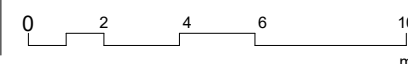
Melbourne
Level 1
250 Flinders Lane
Melbourne VIC 3000
T +61 3 9699 3644
ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521, Richard Leonard 7522, David Tordoff 8028

Sydney
Ground Floor
11-17 Buckingham Street
Surry Hills NSW 2010
T +61 2 9660 9329
T +61 7 3211 9821

Brisbane
Level 12,
324 Queen Street,
Brisbane Qld 4000
T +61 7 3211 9821



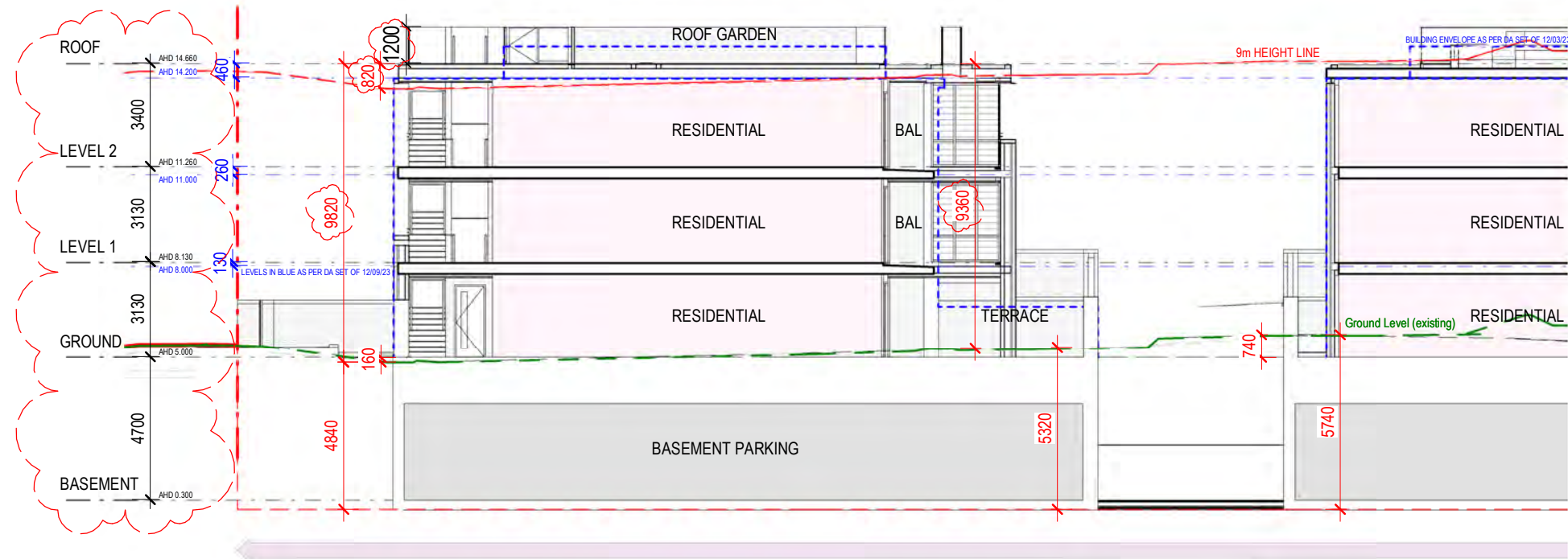
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Rev 1
Date 15.05.2024
Description ISSUED FOR ENDORSEMENT

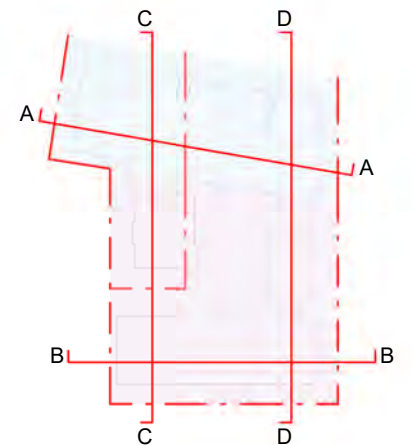
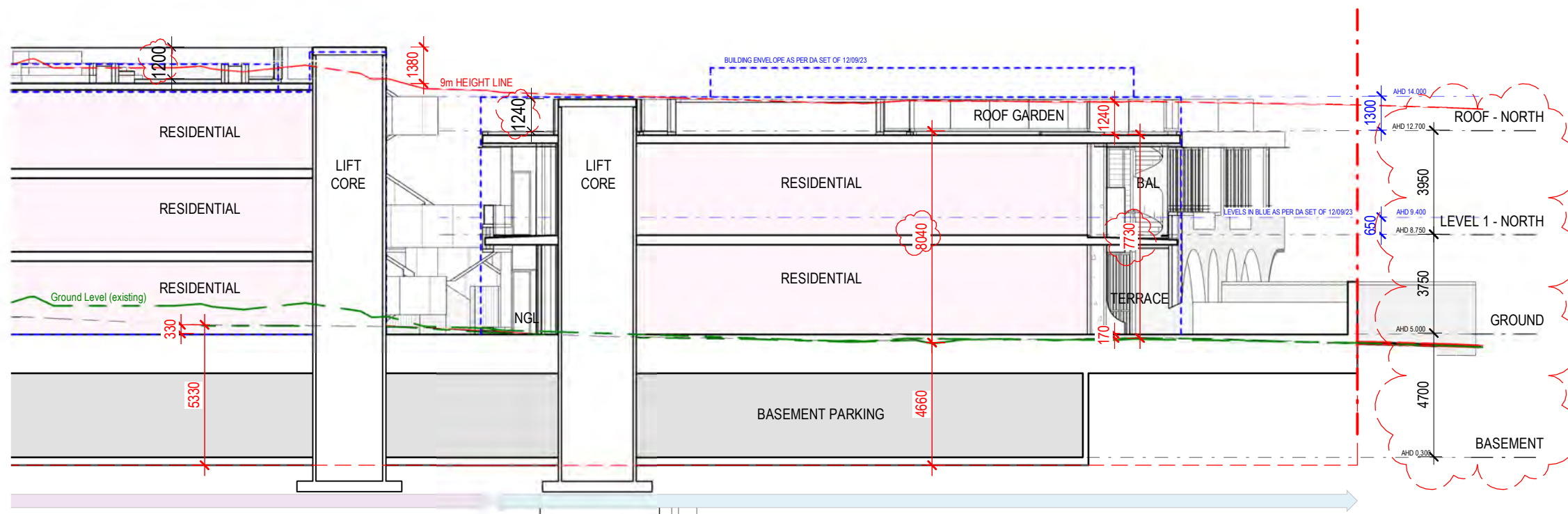
Drawing Title
SECTIONS

Project No 2555
Drawing No DA8.01
Revision 1



- KEY**
- 9m LINE ABOVE LEVELS SHOWN ON SURVEY DRAWING BYR111 Rev D DATED FEBRUARY 22ND 2023 BY BYRON BAY SURVEYING
 - GROUND LEVEL (EXISTING)
 - DM - DEFERRED MATTER AMMENDMENT #18 ZONE
 - R3 - MEDIUM DENSITY RESIDENTIAL

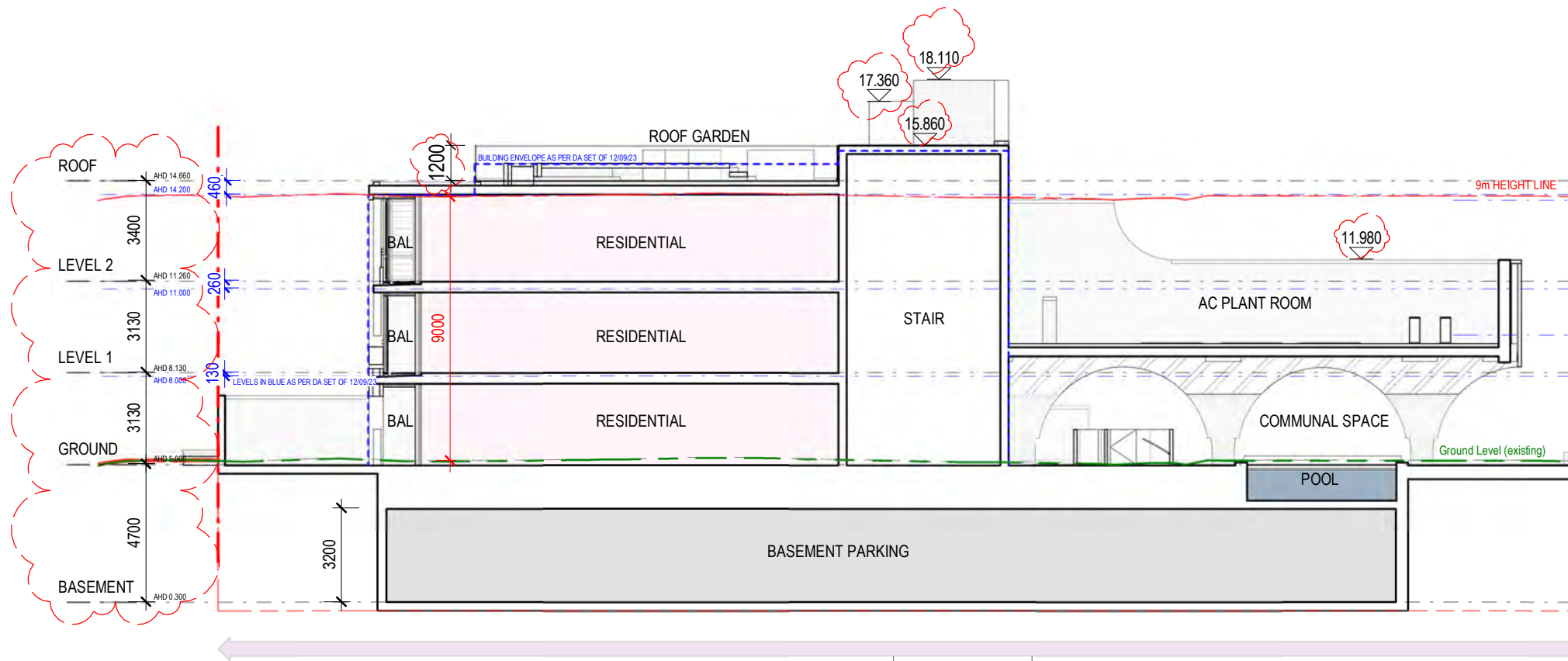
Section C - N-S Section 1



Section C - N-S Section 2

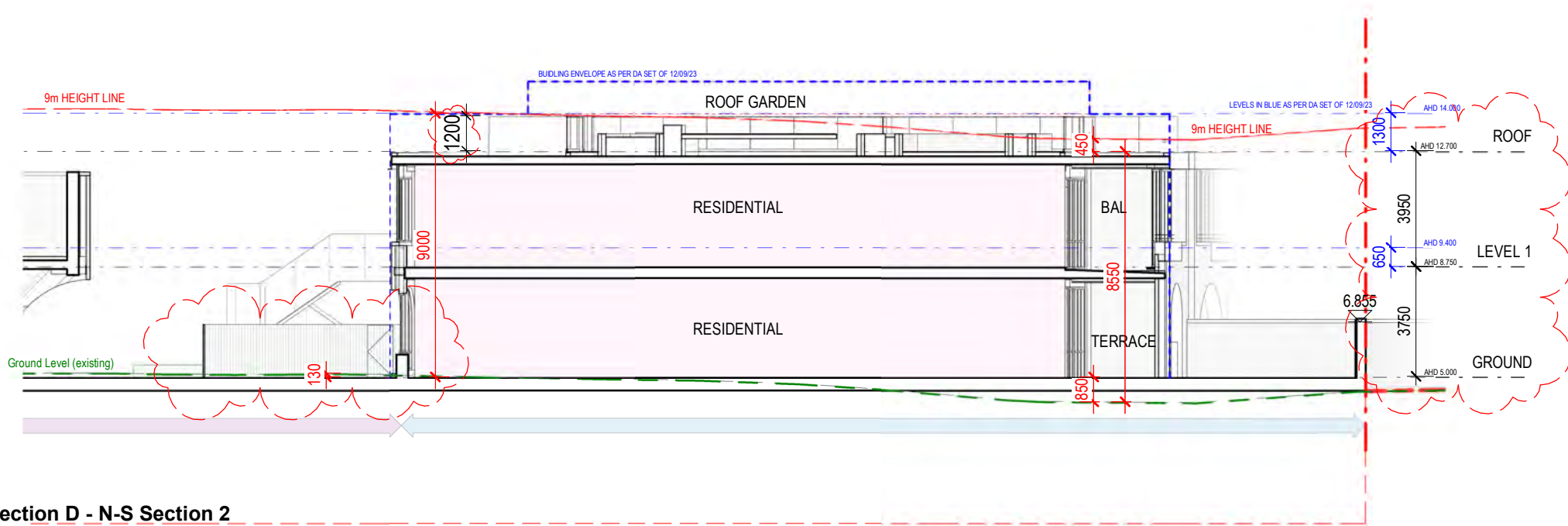
Project Title VITALE PROPERTY GROUP 29 SHIRLEY STREET & 2-4 MILTON STREET, BYRON BAY NSW 2481	Melbourne Level 1 250 Flinders Lane Melbourne VIC 3000 T +61 3 9699 3644 ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521, Richard Leonard 7522, David Tordoff 8028	Sydney Ground Floor 11-17 Buckingham Street Surry Hills NSW 2010 T +61 2 9660 9329	Brisbane Level 12, 324 Queen Street, Brisbane Qld 4000 T +61 7 3211 9821	hayball	Date Printed 10/09/2024 11:21:55 AM	Scale As indicated@ A3	0 2 4 6 10 m	Rev 1	Date 15.05.2024	Description ISSUED FOR ENDORSEMENT	Drawing Title SECTIONS	Project No 2555	Drawing No DA8.02	Revision 1
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Builders/Contractors shall verify job dimensions before any job commences. Figured dimensions shall take precedence over scaled work. Work shall also conform to the specification, other drawings and job dimensions. All shop drawings shall be submitted to the Architect/Consultant and manufacture shall not commence prior to the return of inspected shop drawings signed by the Architect/Consultant.Hayball retains copyright and grants the client a licence to use the Design for the purposes of this project and for the particular stage of services for which the Hayball has been commissioned only.© Copyright 2008 All rights reserved

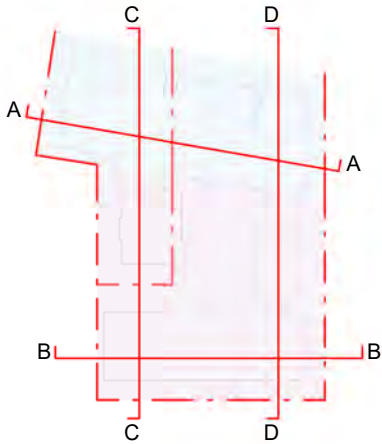


Section D - N-S Section 1

- KEY**
- 9m LINE ABOVE LEVELS SHOWN ON SURVEY DRAWING BYR111 Rev D DATED FEBRUARY 22ND 2023 BY BYRON BAY SURVEYING
 - GROUND LEVEL (EXISTING)
 - DM - DEFERRED MATTER AMMENDMENT #18 ZONE
 - R3 - MEDIUM DENSITY RESIDENTIAL



Section D - N-S Section 2



Project Title
VITALE PROPERTY GROUP
29 SHIRLEY STREET & 2-4 MILTON
STREET, BYRON BAY NSW 2481

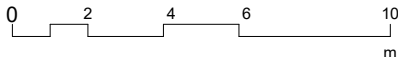
Melbourne
Level 1
250 Flinders Lane
Melbourne VIC 3000
T +61 3 9699 3644
ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521,
Richard Leonard 7522, David Tordoff 8028

Sydney
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11-17 Buckingham Street
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T +61 2 9660 9329

Brisbane
Level 12,
324 Queen Street,
Brisbane Qld 4000
T +61 7 3211 9821

hayball

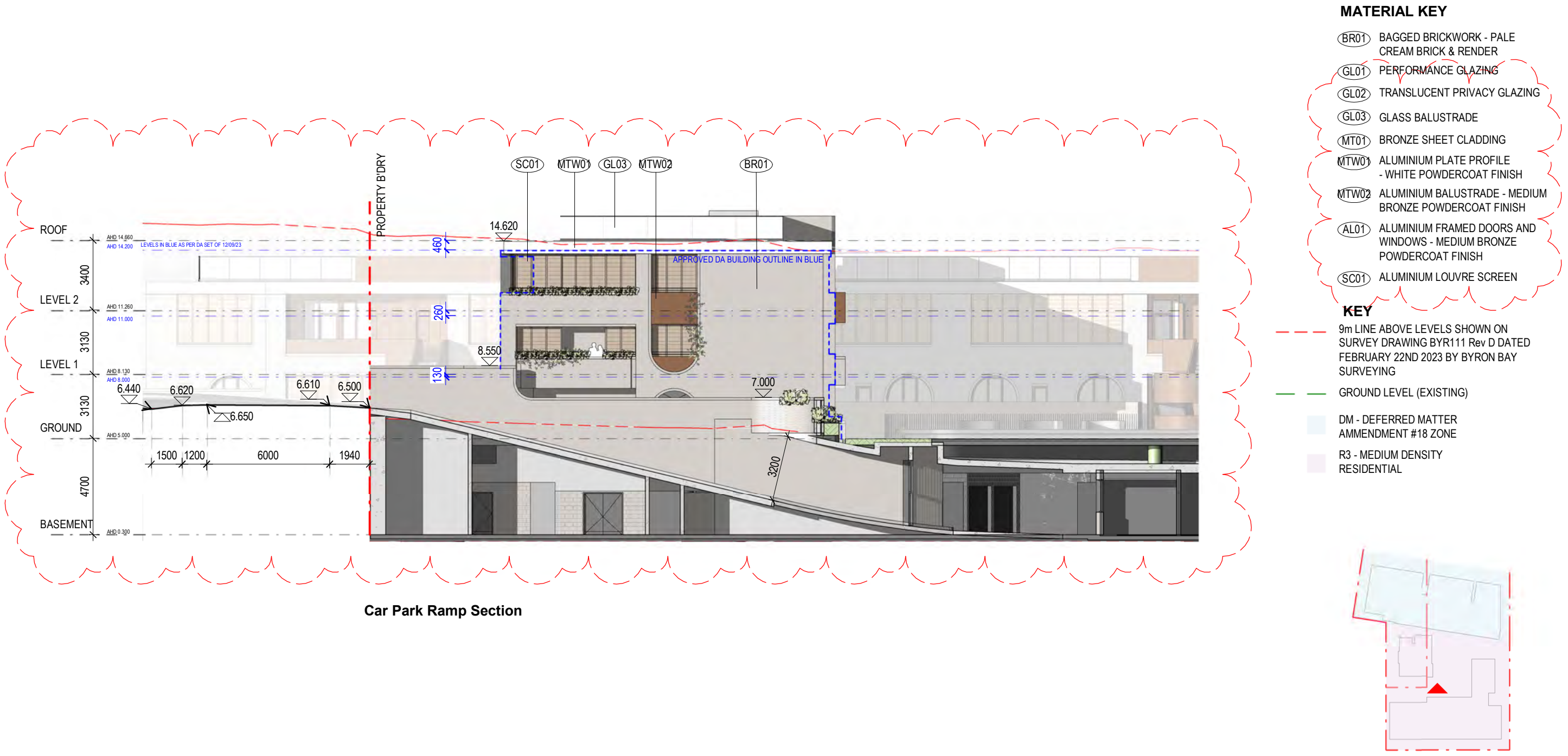
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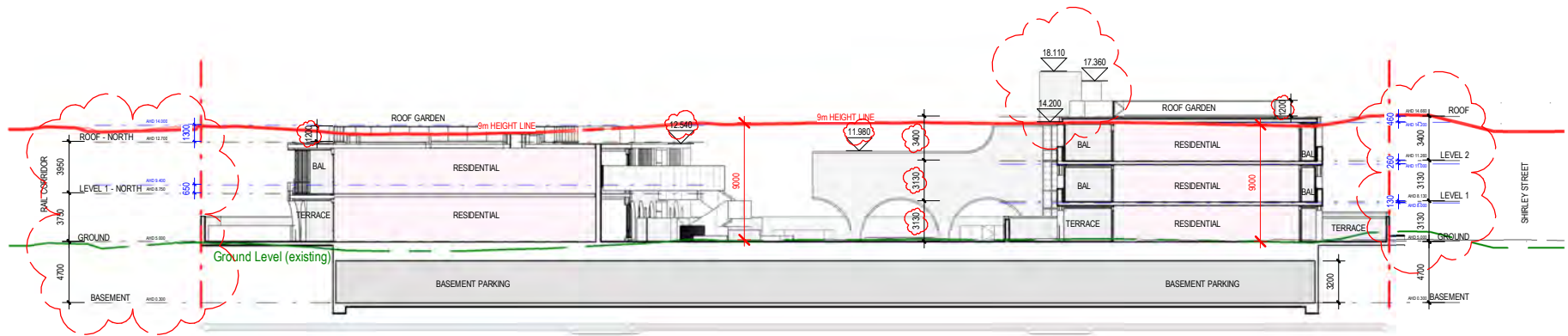


Rev	Date	Description
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2	06.09.2024	ISSUED FOR ENDORSEMENT

Drawing Title
SECTIONS

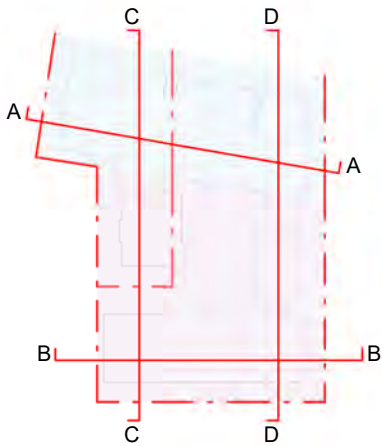
Project No	Drawing No	Revision
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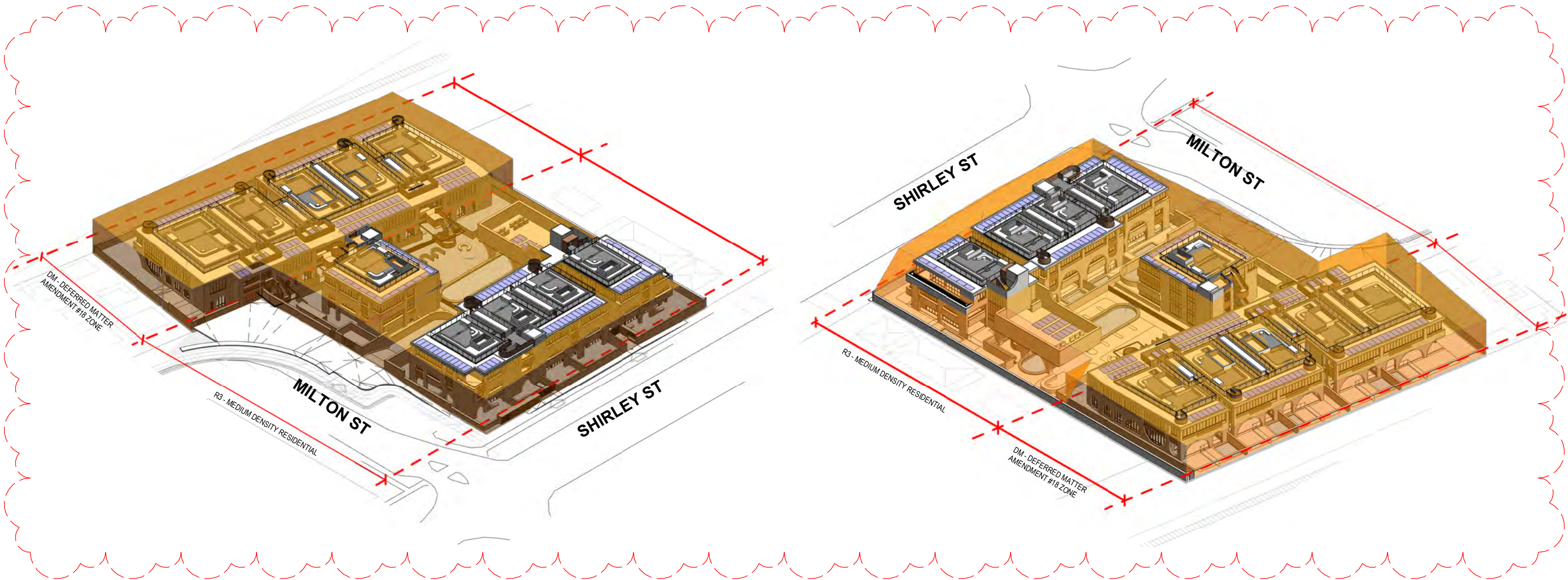
Indicative Section for a 2 Storey Building Along Railway Corridor - N-S Section

- KEY**
- 9m LINE ABOVE LEVELS SHOWN ON SURVEY DRAWING BYR111 Rev D DATED FEBRUARY 22ND 2023 BY BYRON BAY SURVEYING
 - GROUND LEVEL (EXISTING)
 - DM - DEFERRED MATTER AMMENDMENT #18 ZONE
 - R3 - MEDIUM DENSITY RESIDENTIAL



Project Title VITALE PROPERTY GROUP 29 SHIRLEY STREET & 2-4 MILTON STREET, BYRON BAY NSW 2481	Melbourne Level 1 250 Flinders Lane Melbourne VIC 3000 T +61 3 9699 3644 ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521, Richard Leonard 7522, David Tordoff 8028			Sydney Ground Floor 11-17 Buckingham Street Surry Hills NSW 2010 T +61 2 9660 9329			Brisbane Level 12, 324 Queen Street, Brisbane Qld 4000 T +61 7 3211 9821			hayball			Date Printed 10/09/2024 11:22:12 AM Scale As indicated@ A3			Rev 1 15.05.2024 ISSUED FOR ENDORSEMENT 2 06.09.2024 ISSUED FOR ENDORSEMENT			Drawing Title SECTIONS			Project No 2555 Drawing No DA8.05 Revision 2		

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Project Title
VITALE PROPERTY GROUP
29 SHIRLEY STREET & 2-4 MILTON
STREET, BYRON BAY NSW 2481

Melbourne Level 1 250 Flinders Lane Melbourne VIC 3000 T +61 3 9699 3644 ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521, Richard Leonard 7522, David Tordoff 8028	Sydney Ground Floor 11-17 Buckingham Street Surry Hills NSW 2010 T +61 2 9660 9329	Brisbane Level 12, 324 Queen Street, Brisbane Qld 4000 T +61 7 3211 9821
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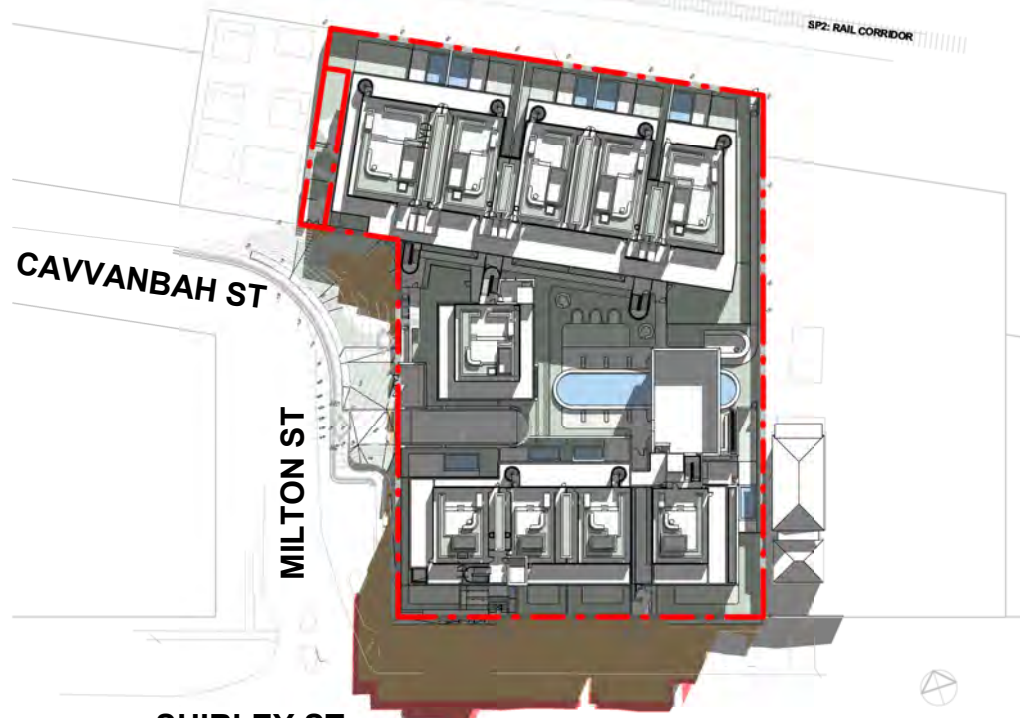


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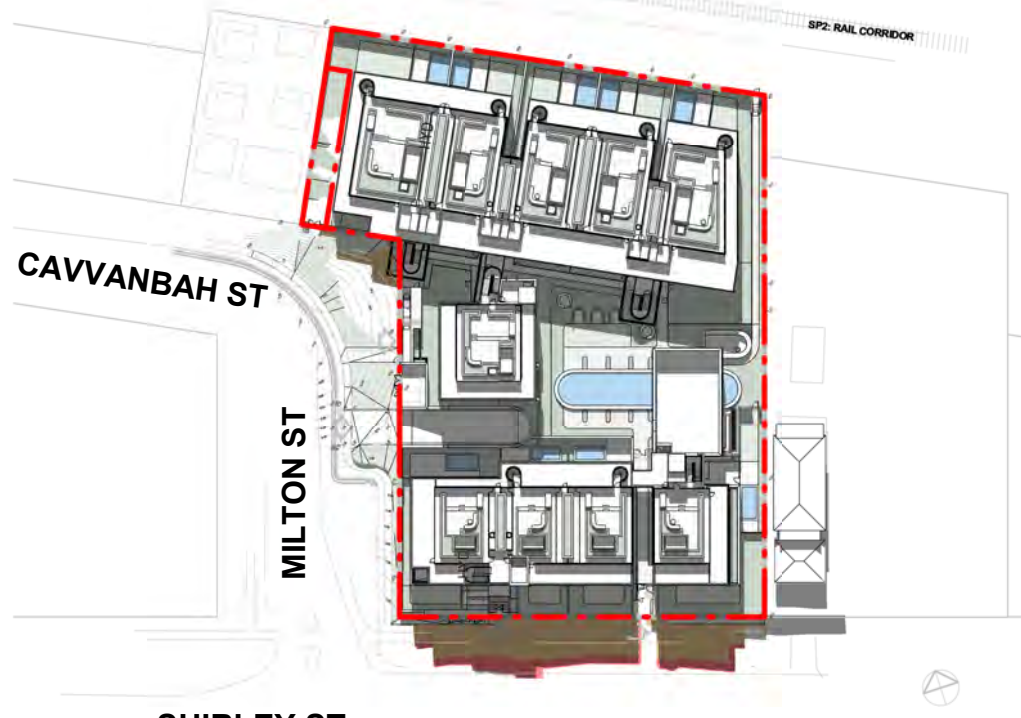
Rev	Date	Description
1	15.05.2024	ISSUED FOR ENDORSEMENT
2	06.09.2024	ISSUED FOR ENDORSEMENT

Drawing Title
HEIGHT PLANE

Project No	Drawing No	Revision
2555	DA9.01	2



SUN STUDY 21 JUN 9AM



SUN STUDY 21 JUN 11AM



SUN STUDY 21 JUN 1PM



SUN STUDY 21 JUN 3PM

**RED ZONE SHOWS
ADDITIONAL SHADOW
CAST FROM THE ROOF
PROTRUDING ABOVE THE
9M BUILDING ENVELOPE
AT WINTER SOLSTICE.**

LEGEND

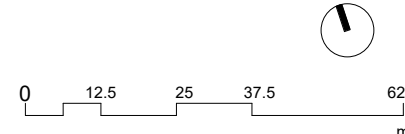
-  PORTION OF SHADOW BELOW THE 9m BUILDING ENVELOPE
-  PORTION OF SHADOW ABOVE THE 9m BUILDING ENVELOPE

Project Title
VITALE PROPERTY GROUP
29 SHIRLEY STREET & 2-4 MILTON
STREET, BYRON BAY NSW 2481

Melbourne Level 1 250 Flinders Lane Melbourne VIC 3000 T +61 3 9699 3644 ABN: 84006394261 NSW Nominated Architects: Tom Jordan 7521, Richard Leonard 7522, David Tordoff 8028	Sydney Ground Floor 11-17 Buckingham Street Surry Hills NSW 2010 T +61 2 9660 9329	Brisbane Level 12, 324 Queen Street, Brisbane Qld 4000 T +61 7 3211 9821
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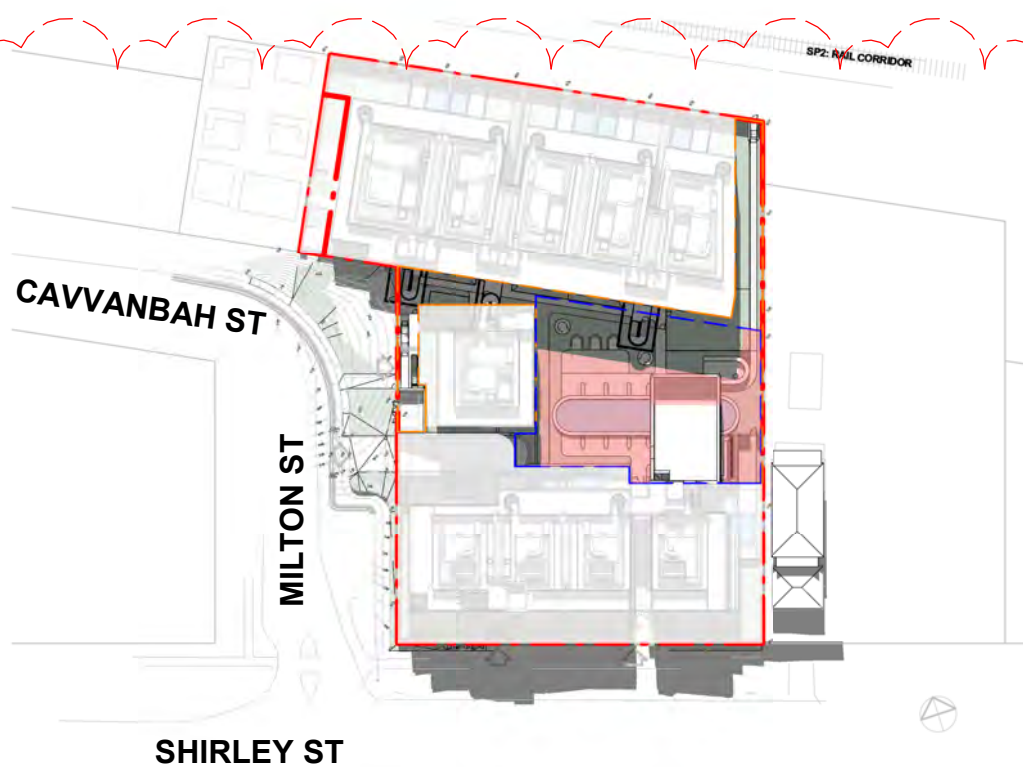
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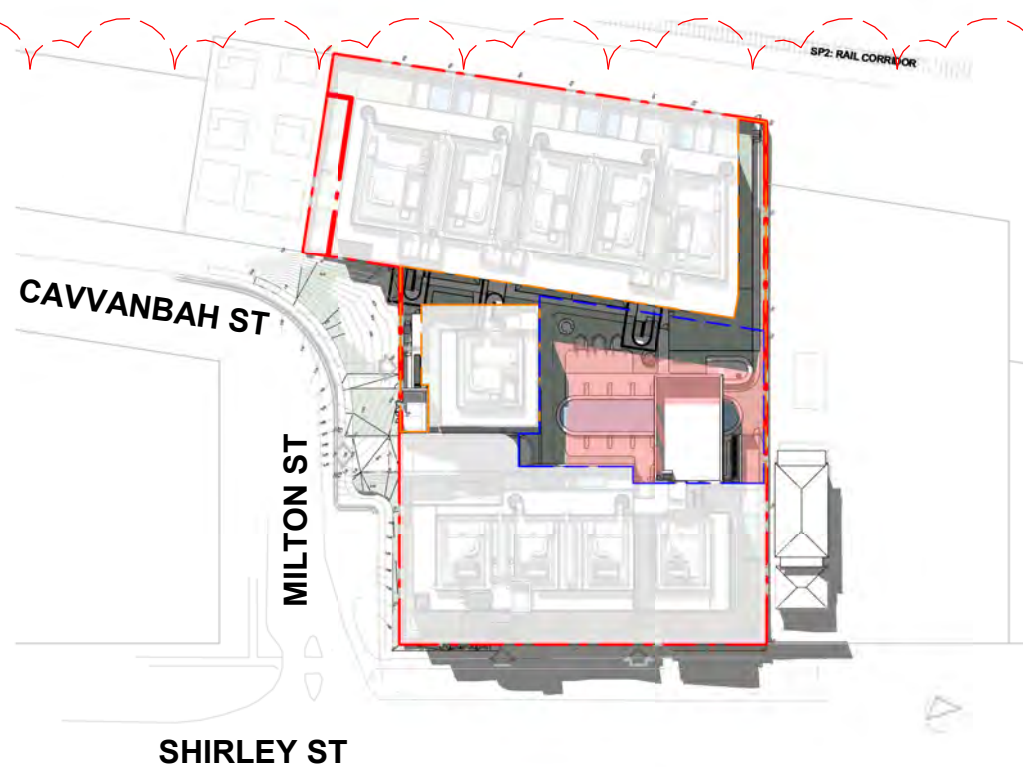
Rev	Date	Description
1	15.05.2024	ISSUED FOR ENDORSEMENT
2	06.09.2024	ISSUED FOR ENDORSEMENT

Drawing Title
SHADOW ANALYSIS - DA
PROPOSED SHADOW

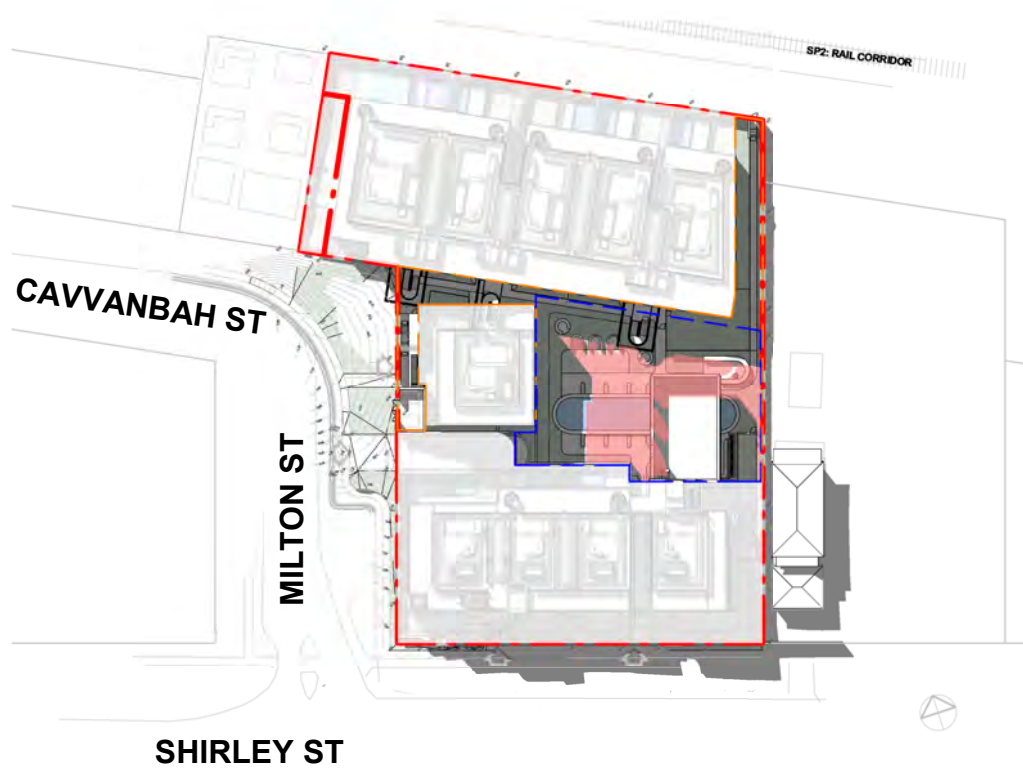
Project No	Drawing No	Revision
2555	DA9.11	2



SITE AREA - 5937 m²
COMMUNAL OPEN SPACE - 1410 m² (24%)
PRINCIPAL USABLE SPACE - 1012 m²
% OF DIRECT SUNLIGHT - 533 m² (52%)
SUN STUDY 21 JUN 11AM COMMUNAL SPACE



SITE AREA - 5937 m²
COMMUNAL OPEN SPACE - 1410 m² (24%)
PRINCIPAL USABLE SPACE - 1012 m²
% OF DIRECT SUNLIGHT - 469 m² (46%)
SUN STUDY 21 JUN 12PM COMMUNAL SPACE



SITE AREA - 5937 m²
COMMUNAL OPEN SPACE - 1410 m² (24%)
PRINCIPAL USABLE SPACE - 1012 m²
% OF DIRECT SUNLIGHT - 365 m² (36%)
SUN STUDY 21 JUN 1PM COMMUNAL SPACE

Project Title
VITALE PROPERTY GROUP
29 SHIRLEY STREET & 2-4 MILTON
STREET, BYRON BAY NSW 2481

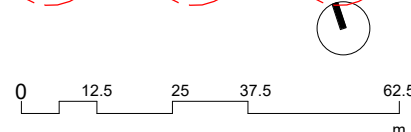
Melbourne
Level 1
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ABN: 84006394261 NSW Nominated Architects:Tom Jordan 7521,
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Brisbane Qld 4000
T +61 7 3211 9821

hayball

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Scale 1 : 1250@ A3



Rev	Date	Description
1	15.05.2024	ISSUED FOR ENDORSEMENT
2	06.09.2024	ISSUED FOR ENDORSEMENT

**SHADOW ANALYSIS SOLAR
ACCESS TO COMMUNAL
SPACES**

Project No	Drawing No	Revision
2555	DA9.12	2

Appendix B – Site Photos



Photo 1: Measurement location at 29 Shirley Street (February 2022)



Photo 2: Measurement location at 29 Shirley Street (February 2022)



Photo 3: Measurement location at 29 Shirley Street (February 2024)



Photo 4: Measurement location at 29 Shirley Street (February 2024)

Appendix C – Meteorological Data

Byron Bay, New South Wales

February 2022 Daily Weather Observations



Australian Government
Bureau of Meteorology

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C					km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Tu	23.0	31.5	0.2			NNW	39	16:48	26.5	83		NNE	6	1005.3	29.4	74		NNE	20	1002.6
2	We	23.9	29.9	2.2			N	48	17:10	26.3	92			Calm	1003.2	29.2	84		N	15	1001.7
3	Th	22.1	23.4	24.6			SSW	70	15:57	23.3	98		SSW	31	1001.3	21.6	99		SW	33	1000.3
4	Fr	19.0	24.1	51.2			S	81	15:23	21.3	85		SSE	37	1006.4	22.7	71		S	50	1007.8
5	Sa	18.3	23.4	6.6			SE	85	21:20	23.0	63		S	48	1011.3	19.6	91		SSW	59	1011.6
6	Su	18.1	24.3	9.6			SE	76	01:12	21.8	72		SSE	44	1014.7	22.7	67		S	48	1015.3
7	Mo	17.4	24.1	1.6			S	69	16:21	19.7	82		SW	28	1016.7	23.1	70		SE	31	1015.0
8	Tu	17.1	24.6	0.8			S	59	23:05	18.1	88		SW	28	1015.2	23.3	65		S	28	1013.3
9	We	18.0	28.9	0.8			ENE	48	19:23	22.1	68		SW	13	1013.8	27.7	56		E	20	1011.7
10	Th	20.0	26.6	0			ESE	33	20:09	22.8	75		SW	11	1013.4	26.3	61		SE	17	1011.6
11	Fr	19.4	25.5	0			S	69	14:02	23.4	76		SW	22	1011.7	24.6	71		S	57	1010.0
12	Sa	19.3	23.9	8.0			S	80	13:58	19.9	95		SW	24	1011.9	21.0	78		S	57	1012.7
13	Su	17.3	25.2	22.8			S	61	23:05	19.4	89		SW	22	1018.7	24.5	67		SE	30	1018.9
14	Mo	18.9	24.0	4.0			E	50	16:16	20.8	88		SW	20	1022.7	20.2	95		S	26	1023.1
15	Tu	20.0	25.5	13.6			E	54	10:25	22.6	76		E	26	1022.6	23.3	71		E	28	1021.5
16	We	18.7	26.9	0.8			SE	44	02:53	21.6	87		SSW	17	1019.1	25.3	65		ESE	20	1016.8
17	Th	20.5		0.2						23.8	70		WNW	2	1014.8	28.1	62		NE	24	1011.9
18	Fr	21.7	28.3				NNE	35	15:26	24.1	75		NNW	6	1011.5	27.2	68		NNE	22	1009.5
19	Sa	20.2	26.9	0.4			SSE	56	18:17	22.1	92		SW	22	1015.3	26.3	73		SSE	28	1014.7
20	Su	19.9	29.2	1.8			ESE	41	23:02	20.6	96		WSW	19	1014.2	26.9	72		ENE	17	1011.5
21	Mo	20.5	30.4	0			NE	35	15:30	25.1	76		NNW	7	1011.1	29.5	63		NE	26	1009.8
22	Tu	22.2	29.6	2.8			E	41	21:14	24.2	87		ESE	6	1013.9	29.2	67		E	20	1013.5
23	We	21.1	24.0	19.8			NE	70	06:25	21.9	95		N	19	1015.3	21.8	98		SSW	17	1014.0
24	Th	21.3	27.0	57.4			ENE	61	09:27	23.9	95		ENE	28	1012.8	25.4	84		ENE	24	1011.9
25	Fr	22.6	25.4	10.4			ENE	50	07:19	23.7	89		NE	28	1011.0	24.9	83		ENE	24	1009.1
26	Sa	22.2	25.4	4.6			NNE	59	15:14	23.8	89		NE	37	1009.6	24.2	87		NE	35	1008.5
27	Su	20.3	23.7	52.6			NNE	67	21:40	21.5	98		NNE	30	1009.1	22.3	95		NNE	28	1006.3
28	Mo	20.4	23.5	124.6			N	93	06:15	23.3	98		N	39	1005.3	22.2	98		NNE	22	1005.1
Statistics for February 2022																					
Mean		20.1	26.1							22.5	84			22	1012.6	24.7	76			29	1011.4
Lowest		17.1	23.4							18.1	63			Calm	1001.3	19.6	56		N	15	1000.3
Highest		23.9	31.5	124.6			N	93		26.5	98		S	48	1022.7	29.5	99		SSW	59	1023.1
Total				421.4																	

Observations were drawn from Byron Bay (Cape Byron AWS) {station 058216}

IDCJDW2022.202202 Prepared at 13:00 UTC on 7 Mar 2022
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Users of this product are deemed to have read the information and
accepted the conditions described in the notes at
<http://www.bom.gov.au/climate/dwo/IDCJDW0000.pdf>

Byron Bay, New South Wales
February 2024 Daily Weather Observations

Date	Day	Temps		Rain	Evap	Sun	Max wind gust			9am						3pm					
		Min	Max				Dirn	Spd	Time	Temp	RH	Cld	Dirn	Spd	MSLP	Temp	RH	Cld	Dirn	Spd	MSLP
		°C	°C					km/h	local	°C	%	eighths		km/h	hPa	°C	%	eighths		km/h	hPa
1	Th	22.8	26.9	0			S	44	09:50	24.5	80		SSW	24	1011.4	26.4	70		SSE	26	1010.0
2	Fr	22.0	28.2	0			N	41	19:09	25.4	77		NNW	9	1008.7	28.0	68		N	20	1005.4
3	Sa	22.9	28.6	0			E	39	16:00	26.8	86		S	13	1012.4	26.9	82		E	31	1011.9
4	Su	25.4	29.5	0			NE	41	01:03	26.1	80		N	13	1013.9	27.7	73		NE	33	1012.2
5	Mo	25.1	29.4	0			NE	44	16:07	27.1	69		N	17	1013.4	29.1	60		NE	28	1010.4
6	Tu	24.2	29.6	0.2			NE	39	14:08	26.3	83		N	15	1011.5	29.2	73		NE	26	1009.2
7	We	22.5	24.6	0.2			S	72	16:31	23.1	90		S	43	1014.6	23.2	90		S	48	1014.5
8	Th	20.4	26.3	13.6			S	61	16:26	22.3	98		SSW	33	1017.6	26.2	75		S	24	1016.9
9	Fr	21.0	23.7	28.8			S	83	01:48	21.5	99		SSE	35	1019.1	22.2	98		SSW	22	1017.0
10	Sa	20.8	25.5	28.4			ESE	69	13:31	21.5	98		S	19	1017.9	23.0	96		ESE	37	1016.5
11	Su	21.2	27.1	28.6			SSE	48	00:03	22.8	96		SSE	7	1018.6	25.9	80		SE	26	1017.4
12	Mo	22.8	30.1	0			ENE	37	02:28	26.0	67		ENE	22	1019.9	29.7	56		E	22	1018.7
13	Tu	23.7	30.3	0			ENE	33	00:31	25.7	55		ENE	17	1019.3	27.9	58		E	11	1017.0
14	We	21.4	30.8	0			NE	35	20:36	25.8	65		NNE	6	1015.9	29.2	63		NE	26	1013.0
15	Th	24.4	29.6	0			E	52	19:39	26.2	73		E	20	1017.6	28.2	64		ESE	26	1017.5
16	Fr	22.0	24.2	45.0			NE	37	02:54	23.0	95		E	19	1019.7	22.2	88		N	13	1019.5
17	Sa	21.2	28.3	7.2			E	41	19:13	23.1	97		SSW	13	1021.0	27.9	69		E	28	1019.6
18	Su	21.6	29.2	2.4			ENE	41	22:43	23.9	84		SSW	15	1019.6	28.5	66		E	24	1017.6
19	Mo	21.7	27.1	2.2			ENE	52	22:44	24.0	87		S	9	1016.8	25.8	82		ENE	13	1015.4
20	Tu	19.0	25.8	10.4			E	44	23:07	20.6	93		SW	20	1015.7	25.4	76		SSE	26	1013.8
21	We	20.5	27.1	0			SW	33	07:03	22.9	83		SSW	24	1015.6	26.6	72		ESE	28	1013.2
22	Th	21.3	30.8	0			NNW	30	20:25	24.1	84		SW	15	1015.0	29.8	65		ENE	15	1012.5
23	Fr	23.1	29.7	0			N	39	13:44	25.9	83		N	17	1013.3	29.1	75		N	24	1009.8
24	Sa	25.8	27.0	0			SSW	41	19:17	26.1	91		NNW	17	1011.2	26.6	86		SSW	15	1010.5
25	Su	21.4	25.6	11.2			S	44	14:29	22.5	98		SW	20	1015.1	24.9	89		S	37	1013.2
26	Mo	21.5	30.3	14.8			SW	30	04:39	24.0	91		SW	11	1014.9	28.9	70		E	11	1012.9
27	Tu	23.5	27.9	0.2			ESE	39	13:54	23.8	87		SW	19	1016.7	26.8	66		SE	24	1016.4
28	We	23.6	29.9	0			E	31	23:14	25.1	74		S	11	1020.0	28.9	66		E	20	1018.8
29	Th	21.9	28.9	0			N	39	19:45	25.8	78		N	9	1018.9	27.8	65		NNE	22	1016.0
Statistics for February 2024																					
Mean		22.4	28.0							24.3	84			17	1016.0	27.0	73			24	1014.4
Lowest		19.0	23.7							20.6	55		NNE	6	1008.7	22.2	56		E	11	1005.4
Highest		25.8	30.8	45.0			S	83		27.1	99		S	43	1021.0	29.8	98		S	48	1019.6
Total				193.2																	

Observations were drawn from Byron Bay (Cape Byron AWS) {station 058216}

Appendix D – Noise Measurement Results



Unattended Noise Measurements
29 Shirley Street, Byron Bay

Environmental Noise Levels Day, Evening and Night

Logger Location - Northern boundary of lot

ARL Environmental Noise Logger
Logger Serial Number 878157
Measurement Title 20220211_185521
Measurement started at 11/02/2022 18:55
Measurement stopped at 20/02/2022 16:56
Frequency Weighting A
Time Averaging Fast
Statistical Interval 15 min
Pre-measurement Ref. 94.0
Post-measurement Ref. 94.0
Engineering Units dB SPL

		L _{Aeq,T} dB(A)			L _{A01,T} dB(A)			L _{A10,T} dB(A)			L _{A90,T} dB(A)			Assessment Background Level, dB(A)		
Date	Day	D	E	N	D	E	N	D	E	N	D	E	N	D	E	N
11/02/2022	Friday	—	—	48	—	—	52	—	—	49	—	—	44	—	—	43
12/02/2022	Saturday	55	54	47	64	62	51	57	56	48	48	49	45	46	48	43
13/02/2022	Sunday	52	56	51	63	64	54	52	57	52	46	50	48	45	48	46
14/02/2022	Monday	52	56	51	62	60	54	53	57	52	47	53	48	45	48	47
15/02/2022	Tuesday	54	55	48	63	62	50	54	57	48	47	51	46	45	49	43
16/02/2022	Wednesday	50	56	47	59	63	51	50	57	48	46	51	45	45	49	43
17/02/2022	Thursday	51	56	51	61	62	54	51	57	51	47	53	49	45	51	47
18/02/2022	Friday	53	59	46	63	66	51	54	61	48	48	54	44	45	47	42
19/02/2022	Saturday	51	54	47	61	60	50	52	56	48	45	50	44	43	46	42
Average		52	56	48	62	63	52	53	57	49	47	51	46	—	—	—

Note

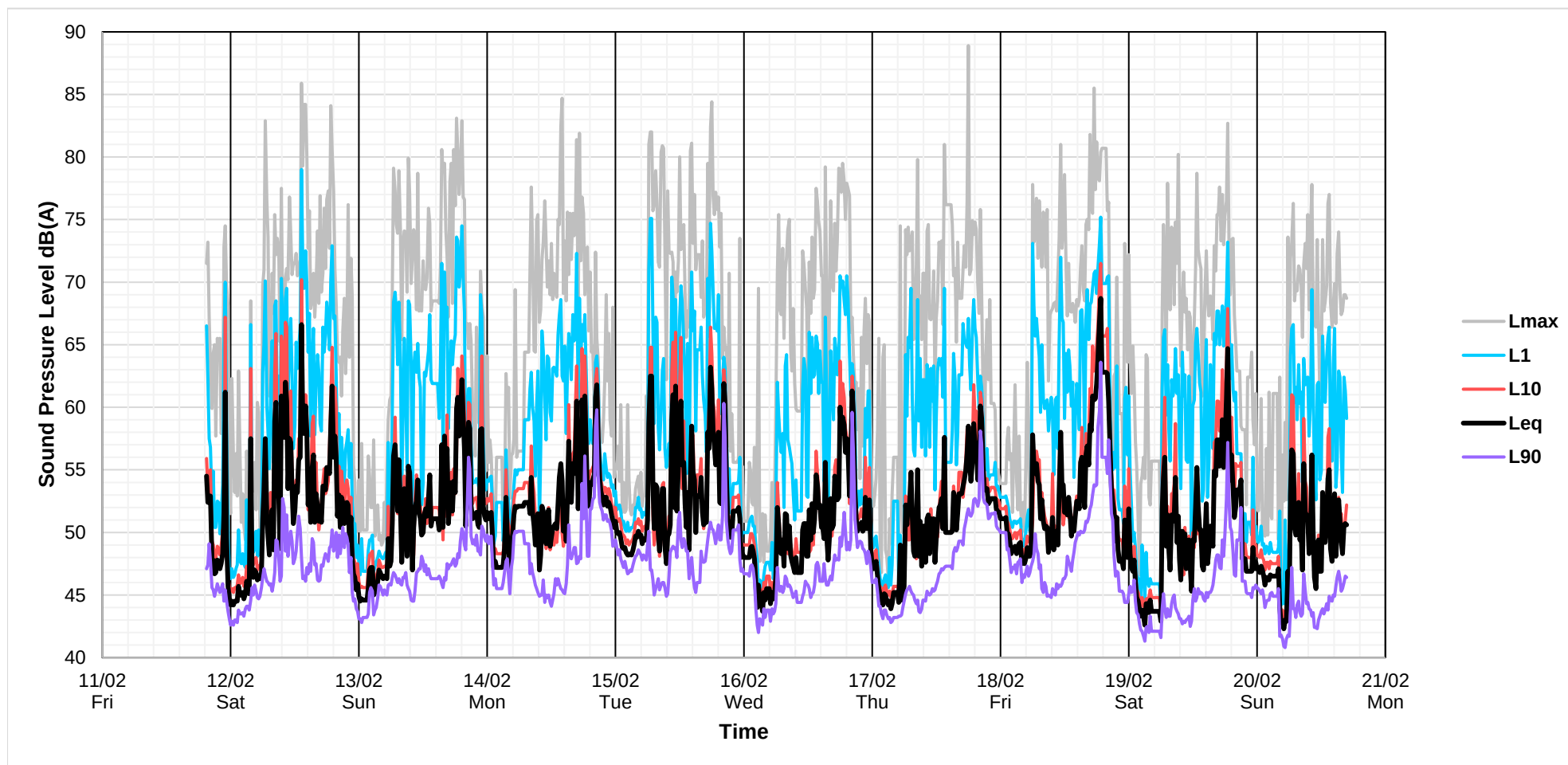
— No noise data available

Day (D): 7:00am to 6:00pm
Evening (E): 6:00pm to 10:00pm
Night (N): 10:00pm to 7:00am

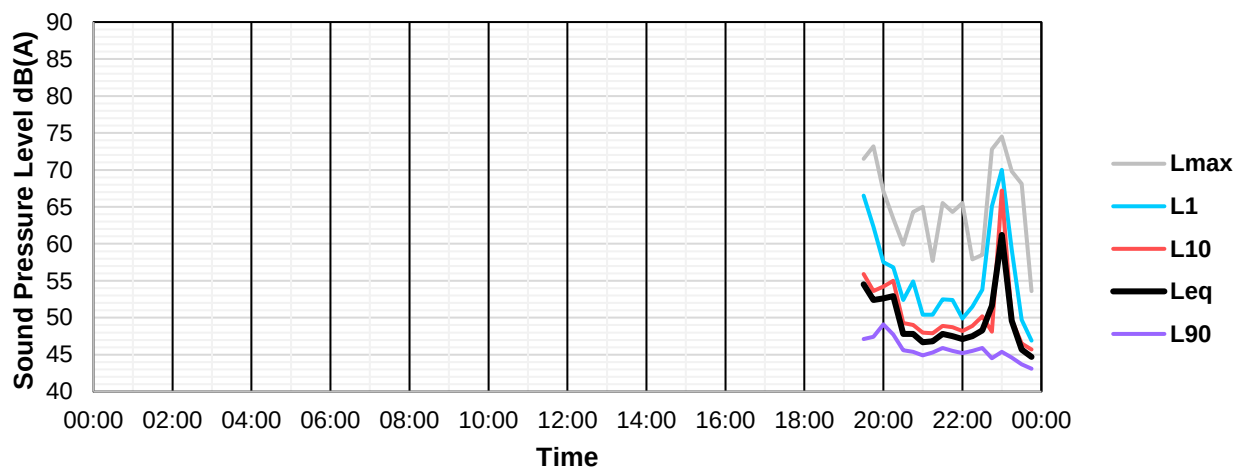
Rainfall recorded during this period

Rating Background Level dB(A)	45	48	43
----------------------------------	----	----	----

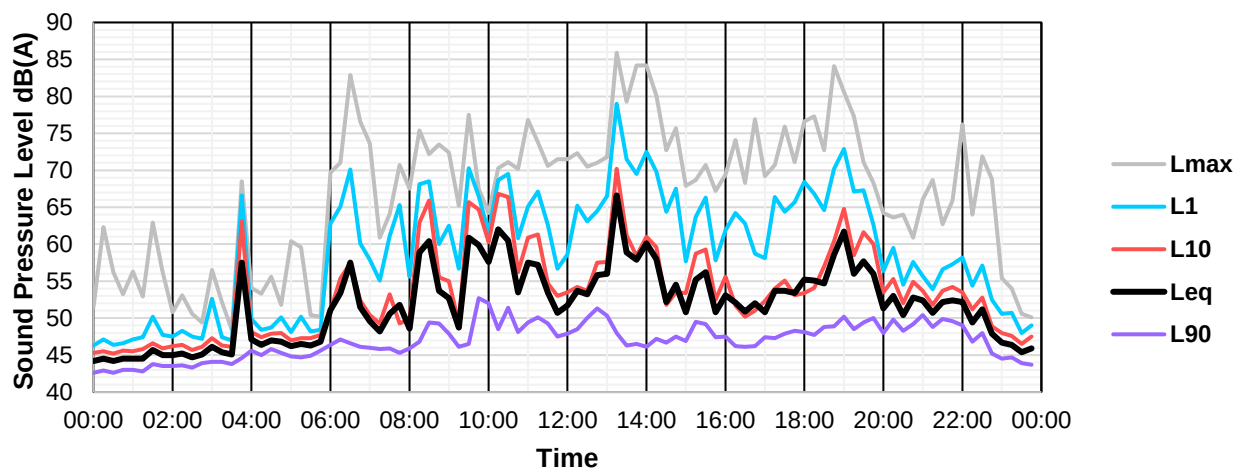
Unattended Noise Measurements 11 to 20 February 2022



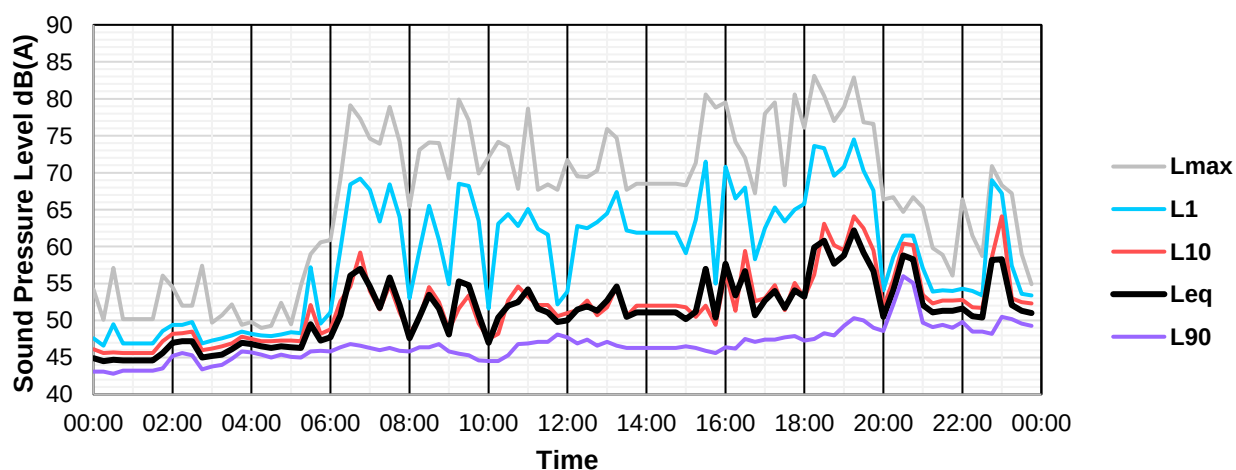
Unattended Noise Measurements Friday 11 February 2022



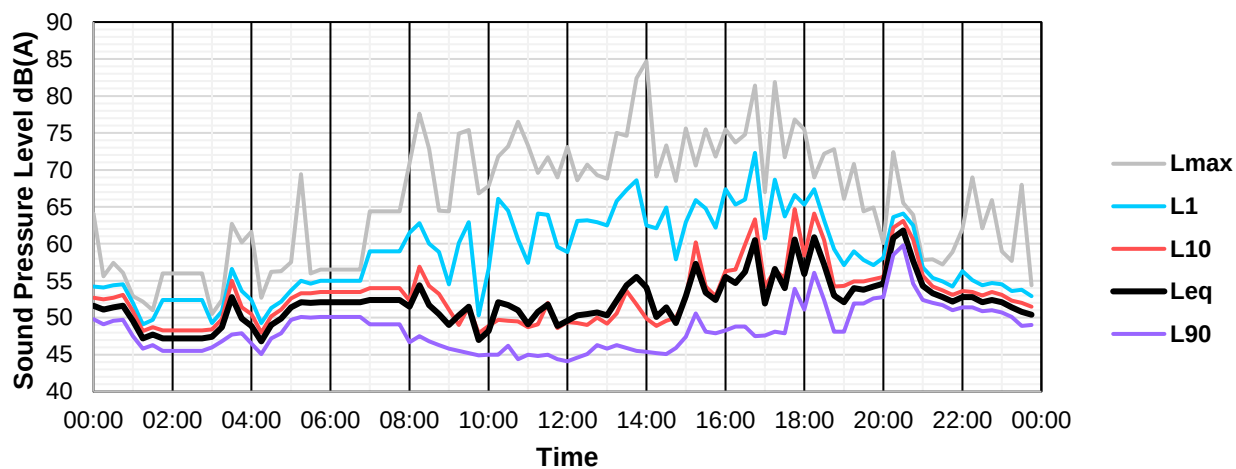
Unattended Noise Measurements Saturday 12 February 2022



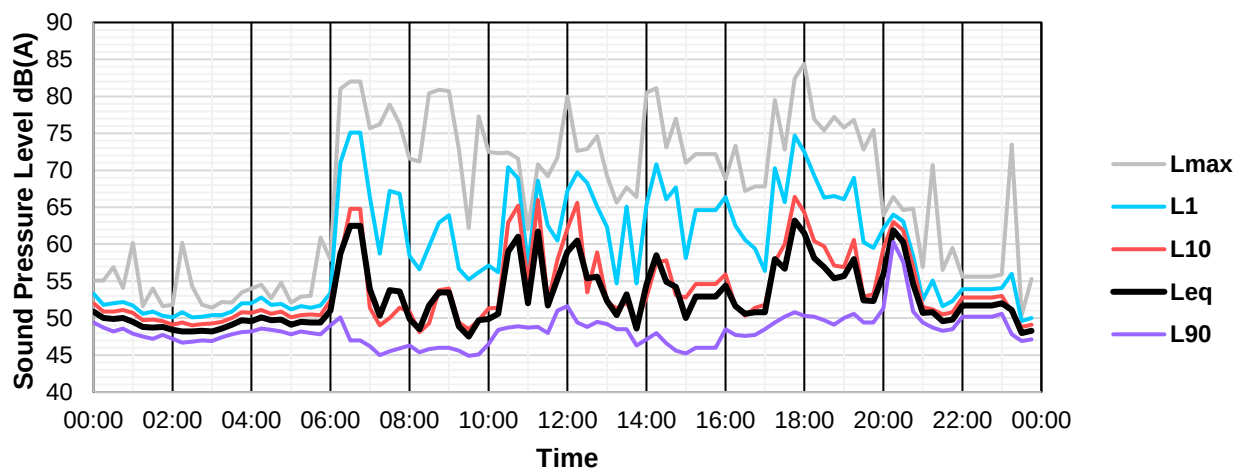
Unattended Noise Measurements Sunday 13 February 2022



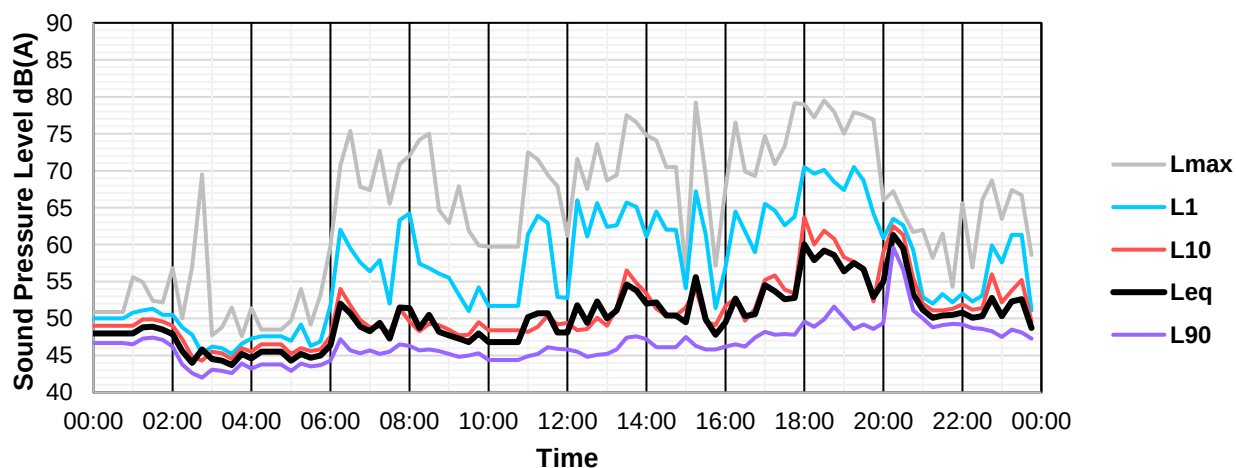
Unattended Noise Measurements Monday 14 February 2022



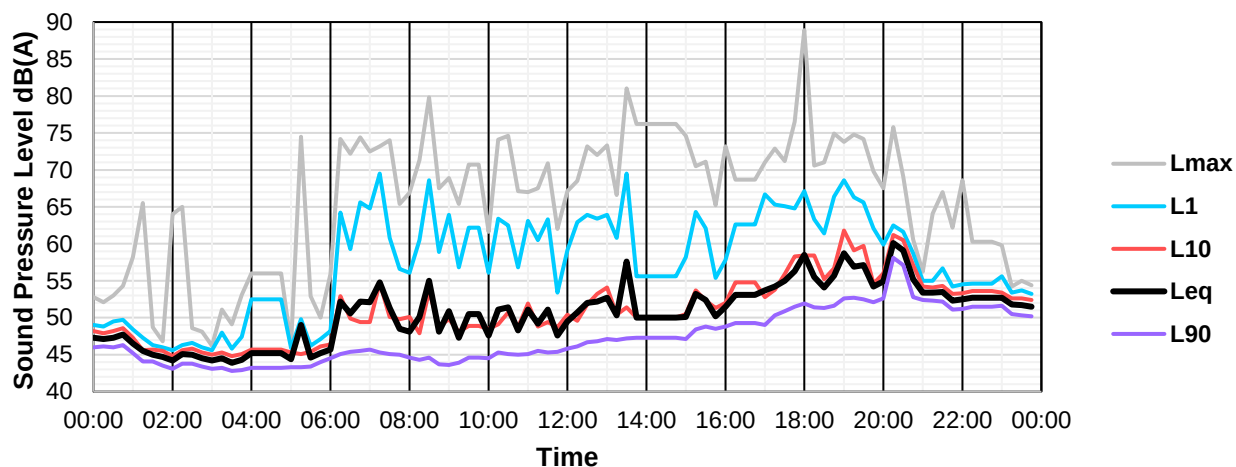
Unattended Noise Measurements Tuesday 15 February 2022



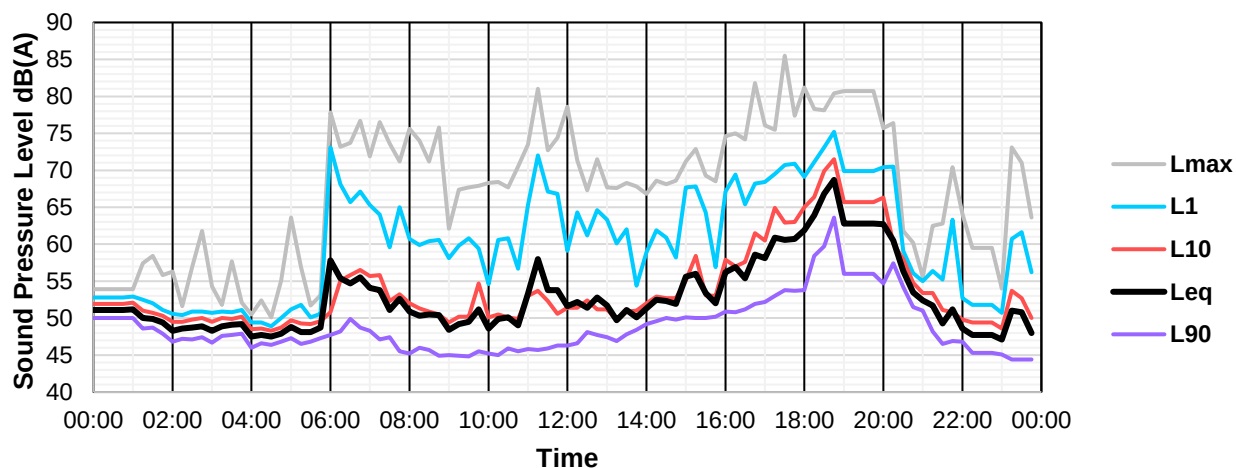
Unattended Noise Measurements Wednesday 16 February 2022



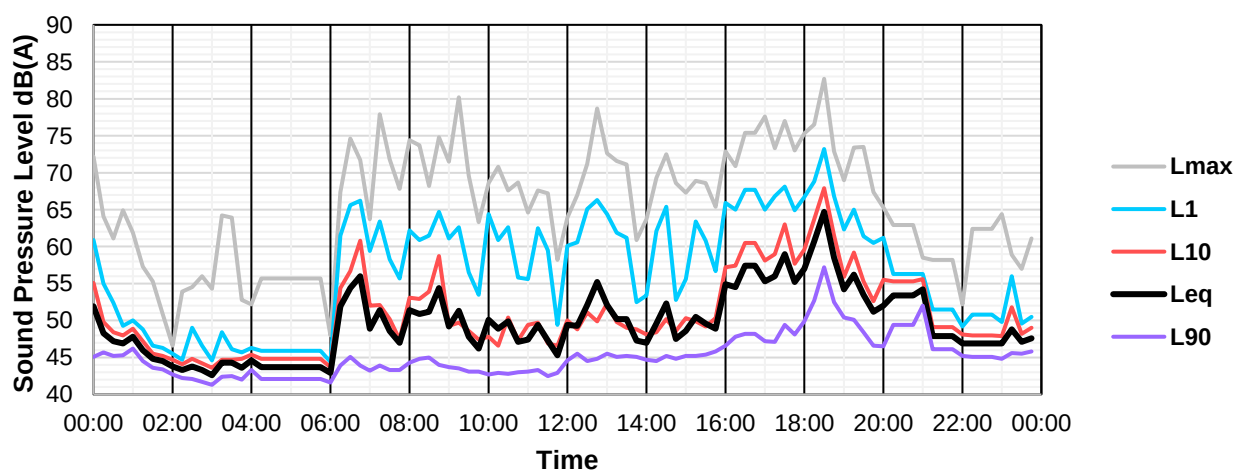
Unattended Noise Measurements Thursday 17 February 2022



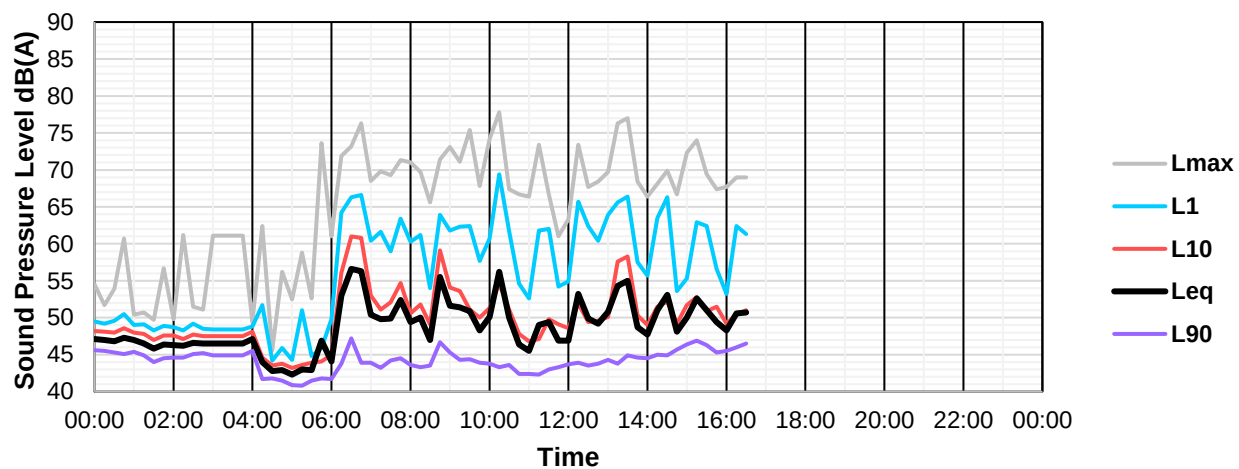
Unattended Noise Measurements Friday 18 February 2022



Unattended Noise Measurements Saturday 19 February 2022



Unattended Noise Measurements Sunday 20 February 2022





Unattended Noise Measurements
29 Shirley Street

Noise Levels - 18hr Day (Traffic Noise)

Logger Location - Southern boundary of lot

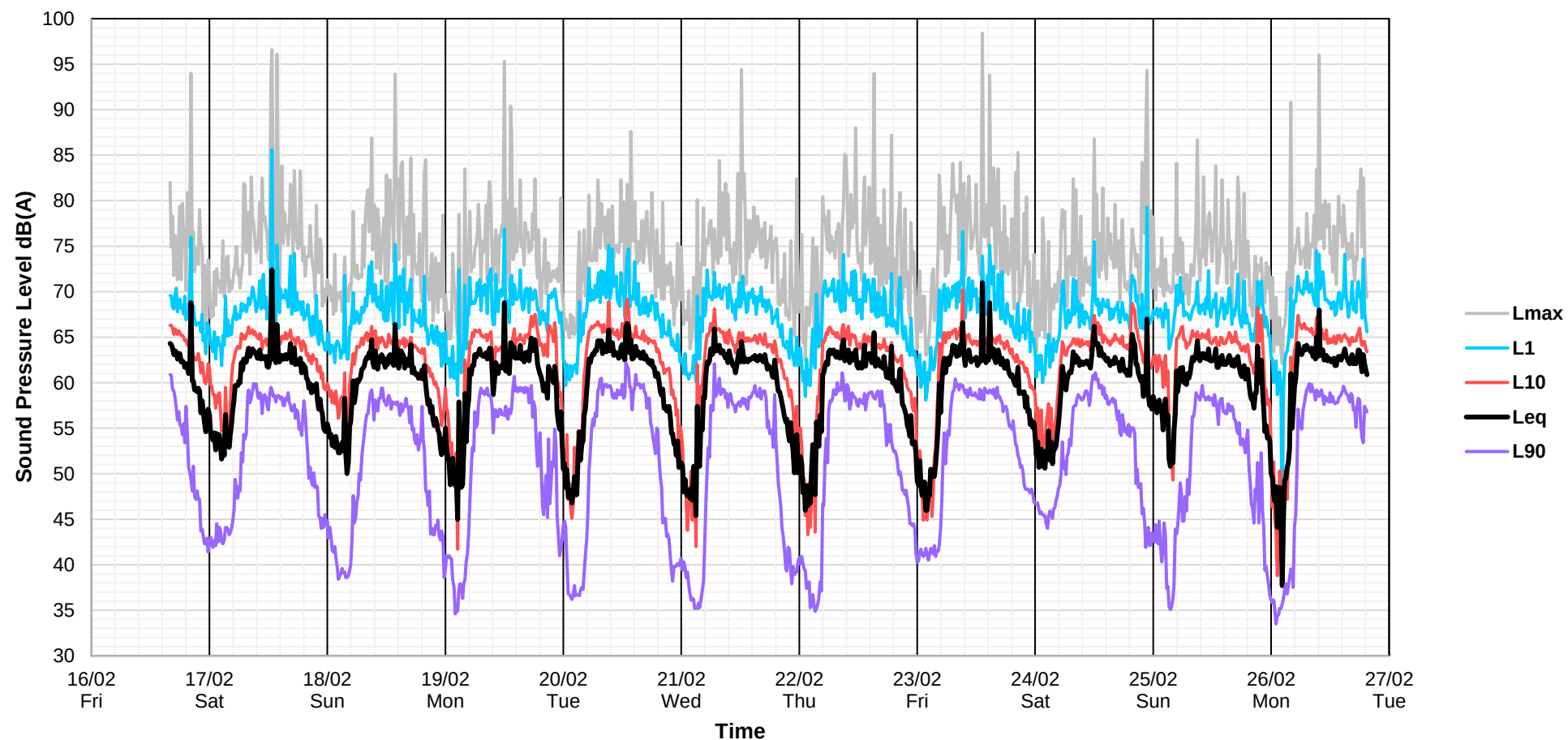
ARL Environmental Noise Logger
Logger Serial Number 15-203-537
Measurement Title RTNA Shirley Str
Measurement started at 16/02 13:21
Measurement stopped at 26/02 19:37
Frequency Weighting A
Time Averaging Fast
Statistical Interval 15 min
Pre-measurement Ref. 94.0
Post-measurement Ref. 93.9
Engineering Units dB SPL

Date	Day	L _{A10,T}			L _{Aeq,T}		L _{A90,T}	
		18hr day 6am-12am	1hr max 6am-12am	Time for 1hr max	18hr day 6am-12am	8hr night 10pm-6am	18hr day 6am-12am	8hr night 10pm-6am
16/02/2024	Friday	—	—	—	—	55	—	44
17/02/2024	Saturday	64	66	08:00	62	55	55	42
18/02/2024	Sunday	63	65	09:00	61	54	53	41
19/02/2024	Monday	64	67	18:00	62	54	55	42
20/02/2024	Tuesday	64	67	13:00	61	53	55	40
21/02/2024	Wednesday	63	67	06:00	61	53	54	40
22/02/2024	Thursday	64	66	06:00	61	53	55	43
23/02/2024	Friday	64	66	09:00	62	54	56	47
24/02/2024	Saturday	65	67	20:00	62	57	55	42
25/02/2024	Sunday	64	65	08:00	61	53	53	40
Average		64	66		61	53	55	42
Average (weekdays only)		64	66		61	53	55	43

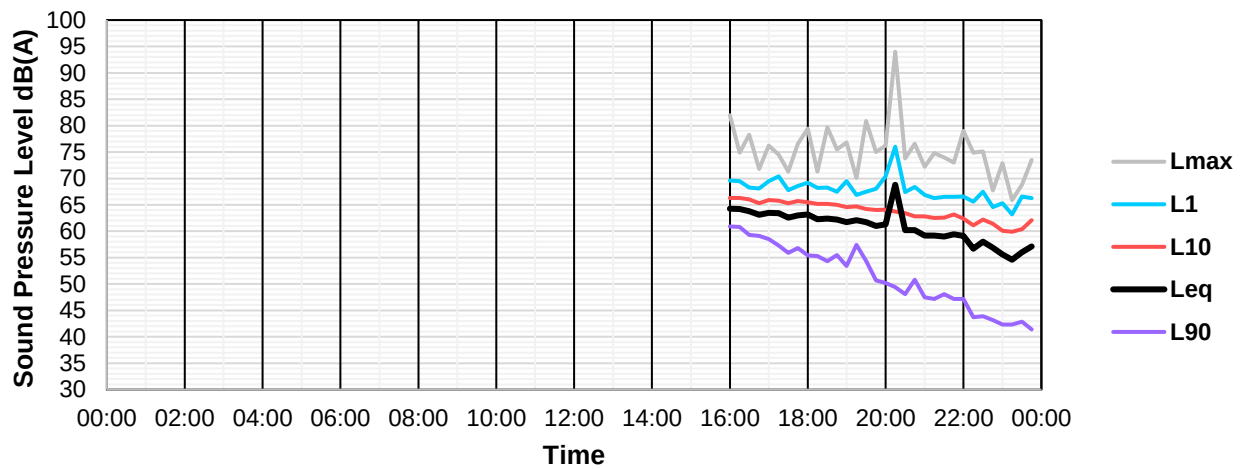
Note

- No noise data available
- Rainfall recorded on this day

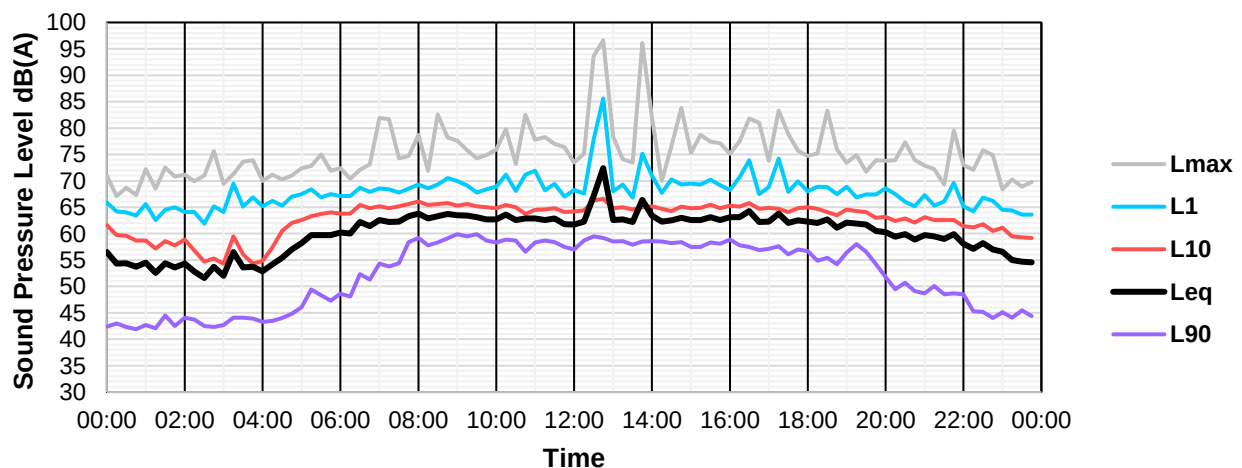
Unattended Noise Measurements 16 to 26 February 2024



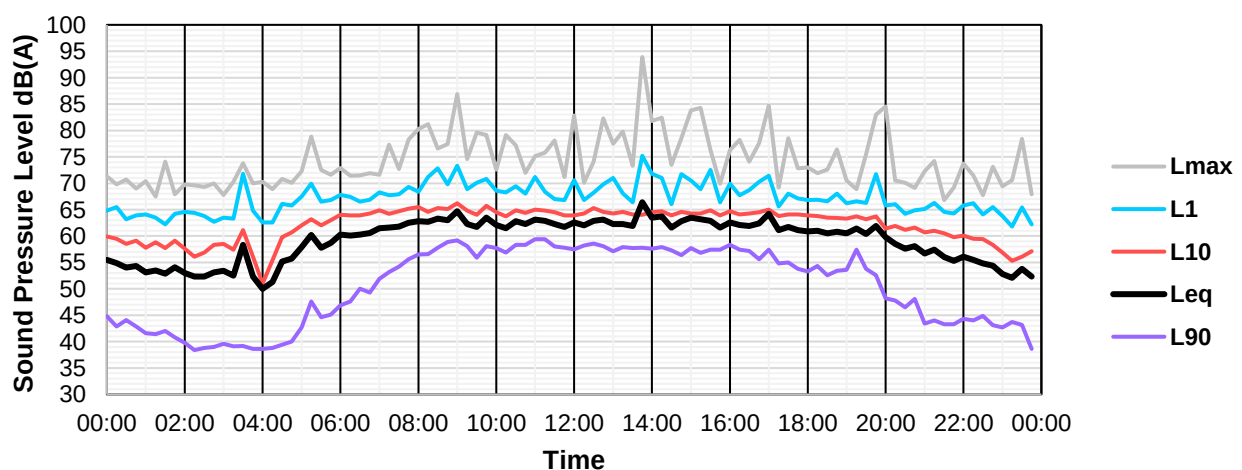
Unattended Noise Measurements Friday 16 February 2024



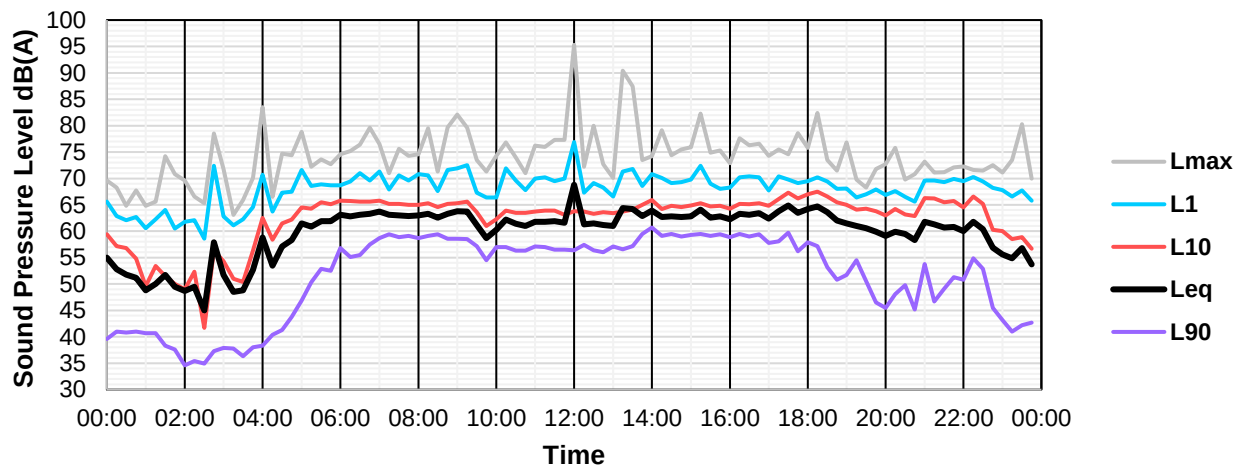
Unattended Noise Measurements Saturday 17 February 2024



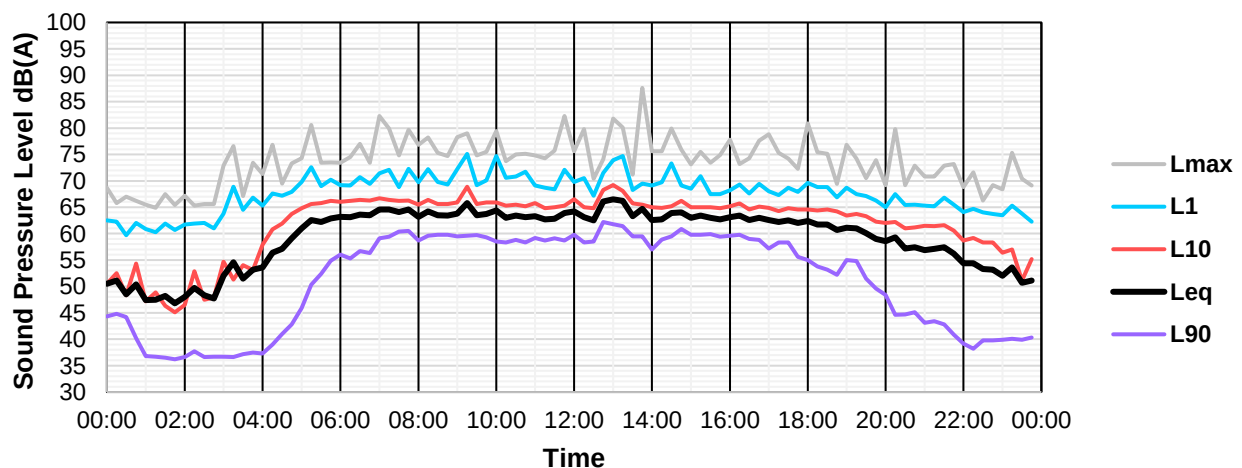
Unattended Noise Measurements Sunday 18 February 2024



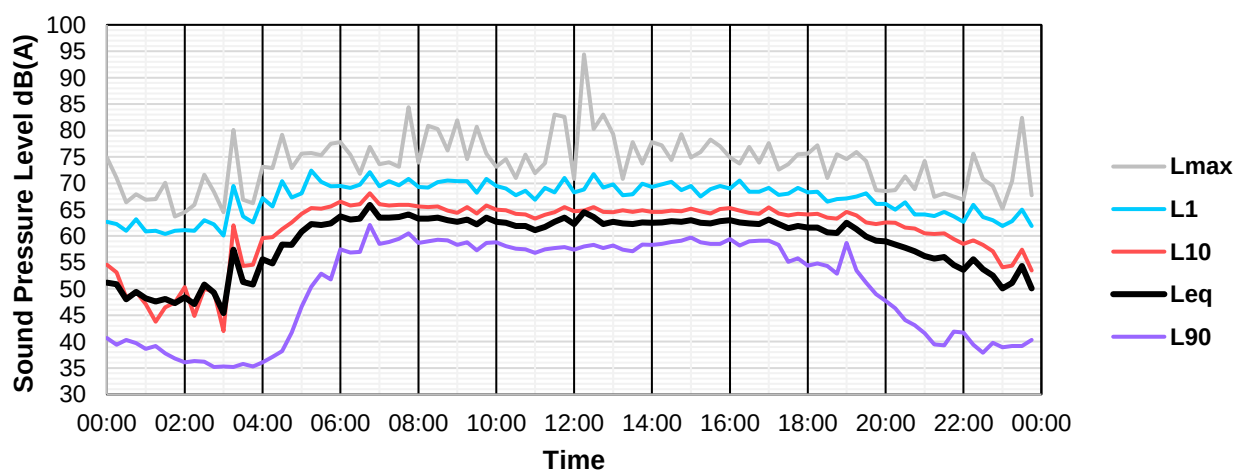
Unattended Noise Measurements Monday 19 February 2024



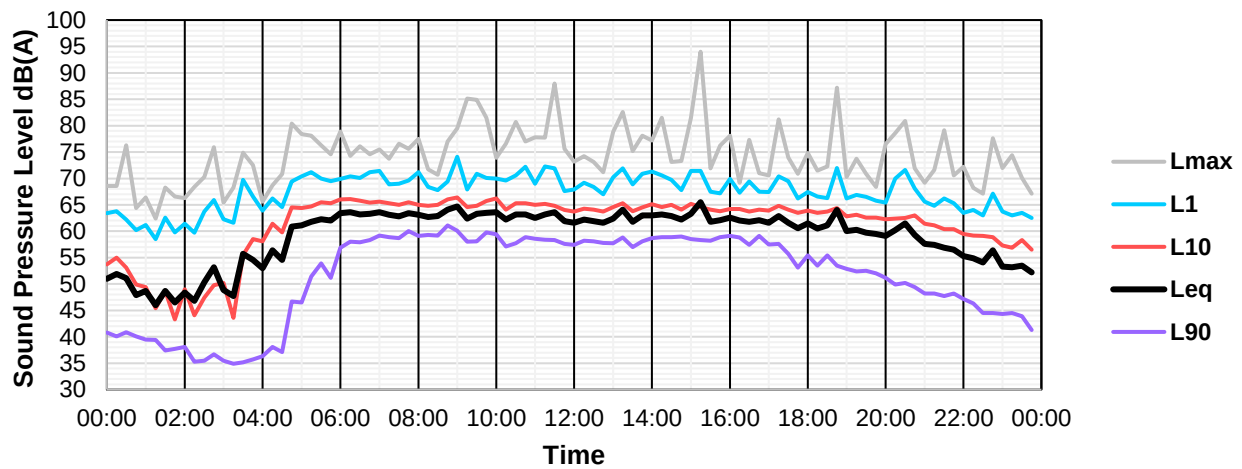
Unattended Noise Measurements Tuesday 20 February 2024



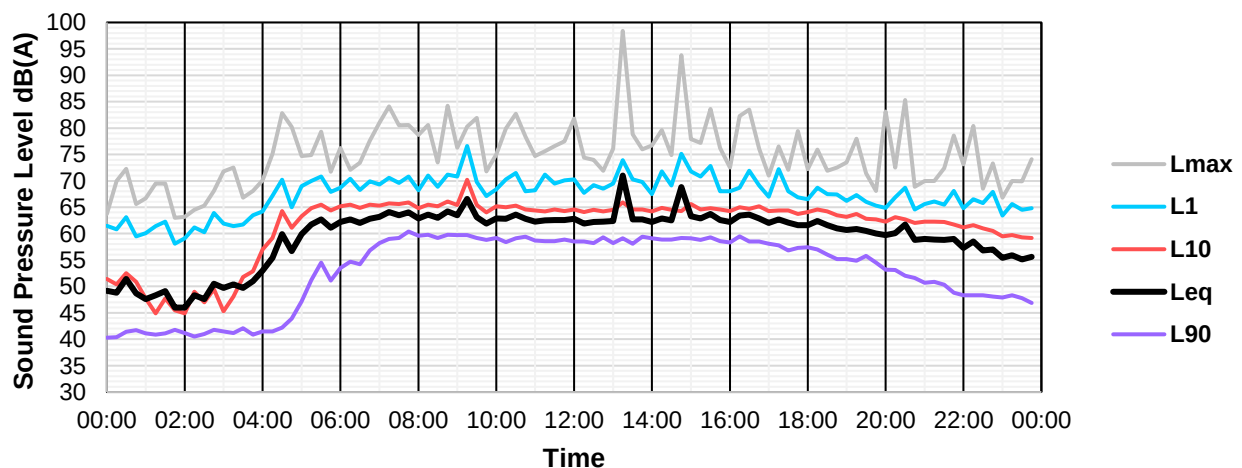
Unattended Noise Measurements Wednesday 21 February 2024



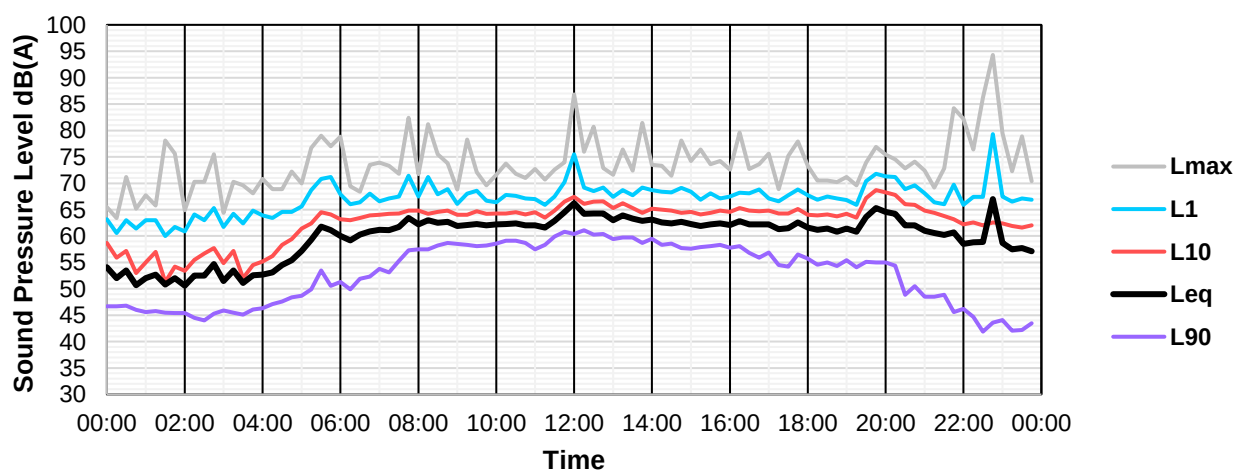
Unattended Noise Measurements Thursday 22 February 2024



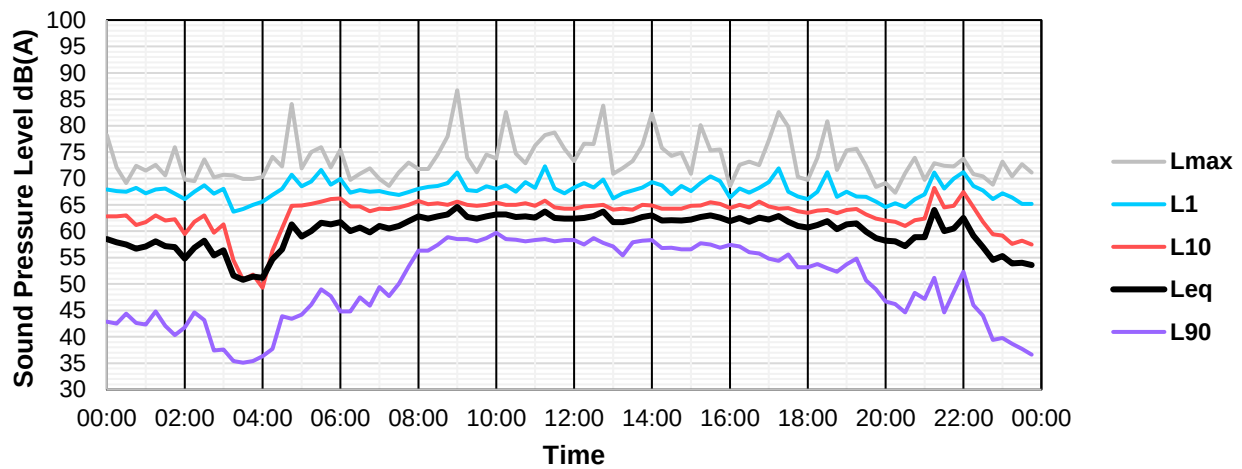
Unattended Noise Measurements Friday 23 February 2024



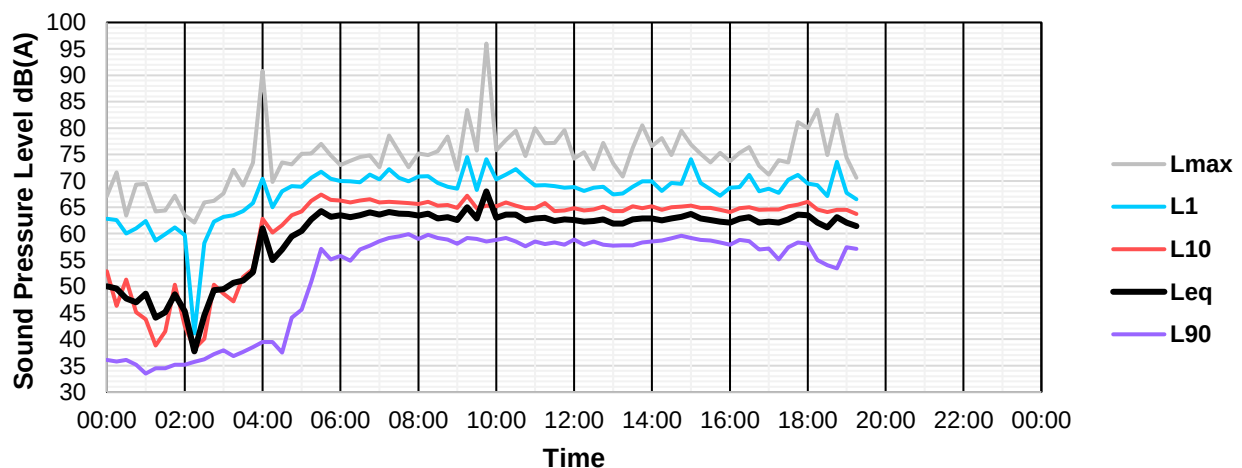
Unattended Noise Measurements Saturday 24 February 2024



Unattended Noise Measurements Sunday 25 February 2024



Unattended Noise Measurements Monday 26 February 2024



Appendix E – Railway Noise Validation Results

Proposed Development
29 Shirley Street, Byron Bay
Calculated Railway Noise Levels
RNIA Validation

Receiver Name	Leq,pass-by dB(A)
RNIA_Validation	63

Appendix F – Tabulated Railway Noise Levels

Proposed Development
29 Shirley Street, Byron Bay
Calculated Railway Noise Levels
Railway Noise Levels at External Facades

Receiver Name	Leq,pass-by
	dB(A)
106_Living_West	60
109_Living_East	60
107_Living_West	60
109_Ensuite_East	60
105_Living_West	59
109_Master_East	59
005_Living_West	58
005_Master_West	58
105_Master_West	58
106_Master_North	57
107_Master_North	57
105_Ensuite_West	57
109_Living_North	57
009_Ensuite_East	57
009_Master_East	57
106_Living_North	57
109_Living_West	56
005_Ensuite_West	56
009_Bedroom_East	56
009_Living_East	56
005_Living_North	56
008_Living_North	56
009_Living_North	55
107_Living_North	55
108_Living_North	54
007_Living_North	54
108_Living_East	54
006_Living_North	54
105_Living_North	54
108_Master_North	53
201_Living_North	52
006_Living_East	51
201_Living_East	50
101_Living_North	50
103_Master_North	49
006_Master_North	48
210_Bedroom W_North	48
007_Master_North	48
204_Living_West	48
204_Master_North	47
104_Master_North	47
007_Living_West	47
110_Bedroom W_North	47
204_Bedroom_West	47
008_Living_East	46
009_Living_West	46
101_Living_East	46
203_Master_North	46

Proposed Development
29 Shirley Street, Byron Bay
Calculated Railway Noise Levels
Railway Noise Levels at External Facades

Receiver Name	Leq,pass-by
	dB(A)
204_Living_North	45
210_Living_North	45
210_Bedroom W_West	45
008_Master_North	45
202_Living_North	45
104_Bedroom_West	44
210_Bedroom E_East	44
110_Bedroom W_West	44
203_Living_North	44
109_Bedroom_South	44
210_Master_East	44
202_Living_East	44
110_Living_North	42
210_Ensuite_East	42
001_Living_North	42
210_Living_West	42
104_Living_West	42
G10_Bedroom W_North	41
103_Living_North	41
002_Living_North	40
110_Master_E	40
210_Ensuite_North	40
101_Bedroom_West	39
104_Living_North	39
210_Bedroom E_South	39
003_Living_North	39
110_Ensuite_East	38
001_Living_East	38
107_Bedroom_South	38
202_Ensuite_East	38
108_Bedroom_East	38
010_Living_North	37
202_Master_East	37
110_Bedroom E_East	37
004_Living_West	37
201_Bedroom_West	37
201_Ensuite_West	37
102_Living_North	36
004_Bedroom_West	36
010_Master_East	35
210_Bedroom W_South	35
110_Living_West	35
106_Bedroom_East	35
102_Living_East	35
010_Ensuite_East	34
108_Bedroom_South	33
210_Bedroom E_West	33
105_Bedroom_South	32

Proposed Development
29 Shirley Street, Byron Bay
Calculated Railway Noise Levels
Railway Noise Levels at External Facades

Receiver Name	Leq,pass-by
	dB(A)
106_Bedroom_South	32
010_Bedroom E_East	32
010_Bedroom W_West	31
201_Bedroom_East	31
102_Master_East	31
001_Bedroom_West	31
107_Bedroom_West	31
009_Bedroom_South	30
106_Entry_South	30
108_Entry_South	30
102_Ensuite_East	30
110_Bedroom E_South	30
201_Bedroom_North	30
008_Bedroom_South	30
007_Bedroom_South	30
201_Entry_West	30
110_Bedroom W_South	29
002_Living_East	29
101_Ensuite_West	29
005_Bedroom_South'	29
002_Master_East	28
110_Bedroom E_West	28
101_Living_West	28
006_Bedroom_South	28
002_Ensuite_East	27
101_Entry_North	27
201_Living_South	27
001_Ensuite_West	26
201_Bedroom_South	26
010_Bedroom W_South	25
010_Bedroom E_South	25
107_Entry_South	24
202_Master_South	24
203_Bedroom_South	24
008_Bedroom_East	23
204_Bedroom_South	23
202_Bedroom_South	22
G10_Bedroom E_West	22
203_Entry_West	20
109_Entry_West	19
003_Master_North	19
204_Entry_East	19
105_Bedroom_South	18
010_Living_West	17
001_Entry_West	16
105_Entry_South	14
201_Entry_North	14
102_Master_South	14

Proposed Development
29 Shirley Street, Byron Bay
Calculated Railway Noise Levels
Railway Noise Levels at External Facades

Receiver Name	Leq,pass-by
	dB(A)
103_Bedroom_South	14
101_Bedroom_South	14
102_Bedroom_South	13
104_Bedroom_South	13
101_Living_South	13
005_Entry_South	11
002_Master_South	10
003_Bedroom_South	10
001_Master_South	10
004_Bedroom_South	10
001_Living_South	9
002_Bedroom_South	9
009_Entry_West	3
104_Entry_East	-6
006_Bedroom_East	-6
007_Bedroom_West	-6
004_Entry_East	-10
103_Entry_West	-10
003_Entry_West	-11
006_Entry_South	-11
007_Entry_South	-14
004_Living_North	-43
001_Entry_North	-68
G08_Entry_South	
101_Entry_North	
001_Bedroom_North	
004_Master_North	

Appendix G – Road Traffic Noise Validation Results

29 Shirley Street, Byron Bay
Road Traffic Noise Validation Model
Year 2024

Receiver Name	L10(18h)
	dB(A)
Noise Logger - Validation RTNA	66

Appendix H – Tabulated Road Noise Levels

29 Shirley Street, Byron Bay
Calculated Traffic Noise Levels
Road Traffic Noise Levels at External Facades - Year 2035

Receiver	L10(18h) dB(A)
103_Bedroom_South	69
202_Master_South	69
101_Bedroom_South	69
102_Master_South	69
201_Bedroom_South	68
104_Bedroom_South	68
101_Living_South	68
204_Bedroom_South	68
203_Bedroom_South	67
102_Bedroom_South	67
202_Bedroom_South	67
101_Living_East	67
202_Master_East	66
201_Ensuite_West	65
102_Master_East	65
003_Bedroom_South	65
101_Ensuite_West	64
001_Master_South	64
201_Living_East	64
002_Master_South	64
201_Living_South	64
001_Living_South	64
202_Ensuite_East	64
004_Bedroom_South	64
002_Bedroom_South	63
201_Bedroom_East	63
104_Bedroom_West	63
204_Bedroom_West	63
204_Living_West	62
102_Ensuite_East	62
104_Living_West	62
001_Ensuite_West	61
002_Master_East	61
004_Entry_East	60
210_Bedroom W_South	60
202_Living_East	60
210_Bedroom W_West	60
201_Bedroom_West	60
004_Bedroom_West	60
104_Entry_East	59
001_Living_East	59
004_Living_West	59

29 Shirley Street, Byron Bay
Calculated Traffic Noise Levels
Road Traffic Noise Levels at External Facades - Year 2035

Receiver	L10(18h) dB(A)
002_Ensuite_East	59
110_Bedroom W_South	59
101_Bedroom_West	58
102_Living_East	58
210_Bedroom E_West	58
210_Bedroom E_South	58
003_Entry_West	57
110_Bedroom E_West	57
110_Bedroom E_South	57
001_Bedroom_West	57
210_Living_West	56
106_Bedroom_South	56
105_Bedroom_South	56
010_Bedroom E_South	55
002_Living_East	55
103_Entry_West	55
204_Entry_East	55
110_Living_West	55
010_Bedroom W_South	55
203_Entry_West	54
105_Ensuite_West	53
105_Master_West	53
105_Living_West	53
210_Ensuite_East	53
210_Master_East	53
G10_Bedroom E_West	52
005_Bedroom_South'	52
009_Bedroom_South	52
109_Bedroom_South	52
109_Ensuite_East	52
006_Bedroom_South	52
109_Master_East	51
109_Living_East	51
001_Entry_West	51
108_Bedroom_South	50
010_Bedroom E_East	50
210_Bedroom E_East	50
110_Master_E	50
201_Living_North	50
010_Master_East	50
110_Bedroom W_West	49
110_Ensuite_East	49

29 Shirley Street, Byron Bay
Calculated Traffic Noise Levels
Road Traffic Noise Levels at External Facades - Year 2035

Receiver	L10(18h) dB(A)
107_Bedroom_South	49
005_Ensuite_West	49
005_Living_West	49
005_Master_West	49
010_Ensuite_East	49
010_Living_West	49
009_Bedroom_East	49
009_Ensuite_East	48
009_Master_East	48
009_Living_East	48
008_Bedroom_South	48
110_Bedroom E_East	48
007_Bedroom_South	48
210_Living_North	47
204_Master_North	46
204_Living_North	46
106_Living_West	46
107_Living_West	46
108_Living_East	46
109_Living_West	45
203_Master_North	45
108_Master_North	45
106_Master_North	45
107_Master_North	45
010_Bedroom W_West	44
005_Entry_South	44
203_Living_North	43
110_Living_North	43
202_Living_North	42
006_Living_East	42
007_Living_West	41
101_Living_North	41
008_Living_East	41
210_Bedroom W_North	41
009_Living_West	41
103_Master_North	41
008_Master_North	41
104_Master_North	41
007_Master_North	41
006_Master_North	41
010_Living_North	41
210_Ensuite_North	41

29 Shirley Street, Byron Bay
Calculated Traffic Noise Levels
Road Traffic Noise Levels at External Facades - Year 2035

Receiver	L10(18h) dB(A)
108_Bedroom_East	41
107_Bedroom_West	40
008_Bedroom_East	40
102_Living_North	39
001_Living_North	39
002_Living_North	39
103_Living_North	39
007_Bedroom_West	39
109_Entry_West	39
006_Bedroom_East	38
108_Entry_South	38
110_Bedroom W_North	38
003_Living_North	37
005_Living_North	37
104_Living_North	36
G10_Bedroom W_North	36
008_Living_North	36
007_Living_North	36
009_Living_North	36
006_Living_North	36
105_Entry_South	36
101_Living_West	36
107_Entry_South	35
109_Living_North	35
101_Entry_North	35
105_Bedroom_South	34
107_Living_North	34
006_Entry_South	33
106_Living_North	33
201_Entry_North	33
108_Living_North	33
001_Entry_North	33
105_Living_North	32
201_Entry_West	32
003_Master_North	31
009_Entry_West	30
G08_Entry_South	27
001_Bedroom_North	24
007_Entry_South	19
106_Bedroom_East	19
106_Entry_South	19
004_Living_North	12

29 Shirley Street, Byron Bay
Calculated Traffic Noise Levels
Road Traffic Noise Levels at External Facades - Year 2035

Receiver	L10(18h) dB(A)
004_Master_North	10
201_Bedroom_North	
101_Entry_North	

Appendix I – Tabulated Operational Noise Levels

29 Shirley Street, Byron Bay
Predicted Operational Noise Levels at Adjacent Uses
From Activities at Proposed Development

Receiver Name	Floor	Facade	Leq,adj,15min Day dB(A)	Leq,adj,15min Evening dB(A)	Leq,adj,15min Night dB(A)
1A Cavvanbah Street	GF	SE	29	29	29
1A Cavvanbah Street	GF	SW	30	29	29
1A Cavvanbah Street	GF	SE	31	30	30
3 Cavvanbah Street	GF	E	30	30	30
3 Cavvanbah Street	F 1	E	33	33	33
3 Cavvanbah Street	GF	SE	25	24	24
3 Cavvanbah Street	F 1	SE	30	30	30
20 Shirley Street	GF	N	27	26	26
23-25 Shirley Street	GF	W	33	33	31
23-25 Shirley Street	F 1	W	36	36	34
23-25 Shirley Street	GF	W	35	35	32
23-25 Shirley Street	F 1	W	38	38	35
23-25 Shirley Street	GF	W	28	28	26
23-25 Shirley Street	F 1	W	32	32	31
24 Shirley Street	GF	N	28	28	27
26 Shirley Street	GF	N	30	30	29
27 Shirley Street	GF	S	27	27	26
27 Shirley Street	F 1	S	29	29	27
27 Shirley Street	GF	N	36	36	32
27 Shirley Street	F 1	N	40	40	35
27 Shirley Street	GF	W	38	38	37
27 Shirley Street	F 1	W	45	45	44
28 Shirley Street	GF	N	30	30	30
30 Shirley Street	GF	N	30	30	29
32 Shirley Street	GF	N	30	29	29
34 Shirley Street	GF	N	30	29	29
34 Shirley Street	GF	E	30	29	28
35-37 Shirley Street	GF	E	34	34	33
35-37 Shirley Street	F 1	E	37	36	36
38 Shirley Street	GF	N	30	30	29

29 Shirley Street, Byron Bay
Predicted Operational Noise Levels at Adjacent Uses
From Activities at Proposed Development
Night Time Lmax Assessment

Receiver Name	Lmax Night dB(A)
1A Cavvanbah Street	35
1A Cavvanbah Street	31
1A Cavvanbah Street	34
20 Shirley Street	33
23-25 Shirley Street	36
23-25 Shirley Street	38
23-25 Shirley Street	36
23-25 Shirley Street	39
23-25 Shirley Street	30
23-25 Shirley Street	35
24 Shirley Street	34
26 Shirley Street	34
27 Shirley Street	35
27 Shirley Street	38
27 Shirley Street	35
27 Shirley Street	39
27 Shirley Street	26
27 Shirley Street	30
27 Shirley Street	34
27 Shirley Street	39
27 Shirley Street	35
27 Shirley Street	39
27 Shirley Street	36
27 Shirley Street	40
28 Shirley Street	35
3 Cavvanbah Street	36
3 Cavvanbah Street	38
3 Cavvanbah Street	29
3 Cavvanbah Street	36
30 Shirley Street	35
32 Shirley Street	35
34 Shirley Street	35
34 Shirley Street	35
35-37 Shirley Street	37
35-37 Shirley Street	39
38 Shirley Street	35

29 Shirley Street, Byron Bay
ISO9613 Calculation Method
Predicted Operational Noise Levels at Adjacent Uses
From Activities at Proposed Development

Legend

Source		Name of source
Source type		Type of source (point, line, area)
time slice		Name of time slice
Li	dB(A)	Level inside
R'w	dB	Rated transmission loss
L'w	dB(A)	Sound power per m, m ²
Lw	dB(A)	Sound power per unit
l or A	m,m ²	Size of source (Length or area)
KI	dB	Correction for source impulsiveness
KT	dB	Correction for source tonality
Ko	dB	Correction for propagation in limited spacial angle
S	m	Distance source - receiver
Adiv	dB	Mean attenuation due to geometrical spreading
Agr	dB	Mean attenuation due to ground effect
Abar	dB	Mean attenuation due to screening
Aatm	dB	Mean attenuation due to air absorption
Amisc	dB	Mean attenuation due to foliage, industrial areas and building areas
ADI	dB	Mean directivity correction
dLrefl	dB(A)	Level increase due to reflections
Ls	dB(A)	Unassessed sound pressure level at receiver $L_s = L_w + K_o + A_{DI} + A_{div} + A_{gr} + A_{bar} + A_{atm} + A_{fol_site_house} + A_{wind} + dL_{refl}$
dLw	dB	Correction due to source operation time
Cmet	dB	Meteorological correction
ZR	dB	Correction for rest periods
Lr	dB(A)	Assessed level of time slice

29 Shirley Street, Byron Bay
ISO9613 Calculation Method
Predicted Operational Noise Levels at Adjacent Uses
From Activities at Proposed Development

Source	Source type	time slice	Li dB(A)	Rw dB	L'w dB(A)	Lw dB(A)	l or A m,m²	Kl dB	KT dB	Ko dB	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	Amisc dB	ADI dB	dLrefl dB(A)	Ls dB(A)	dLw dB	Cmet dB	ZR dB	Lr dB(A)
Receiver 1A Cavvanbah Street FI GF Dir SE Le dB(A) Leq,15min 31 dB(A) Ln dB(A) Leq,adj,1h 30 dB(A) Leq,adj,1h 30 dB(A)																							
Amplified Music (Wellness Centre) Breakout Doors (Closed)	Area	Leq,adj,11			38.1	49.2	13.1	0.0	0.0	0	78.49	-48.9	1.9	-17.0	0.0		0.0	0.0	-14.7	-0.1	0.0	0.0	-14.9
Amplified Music (Wellness Centre) Breakout Doors (Closed)	Area	Leq,adj,4h			38.1	49.2	13.1	0.0	0.0	0	78.49	-48.9	1.9	-17.0	0.0		0.0	0.0	-14.7	-0.1	0.0	0.0	-14.9
Amplified Music (Wellness Centre) Breakout Doors (Closed)	Area	Leq,adj,9h			38.1	49.2	13.1	0.0	0.0	0	78.49	-48.9	1.9	-17.0	0.0		0.0	0.0	-14.7		0.0		
Amplified Music (Wellness Centre) Breakout Doors (Open)	Area	Leq,adj,11			70.8	82.0	13.1	0.0	0.0	0	78.49	-48.9	-0.7	-18.7	-0.1		0.0	0.2	13.8	-14.8	0.0	0.0	-1.0
Amplified Music (Wellness Centre) Breakout Doors (Open)	Area	Leq,adj,4h			70.8	82.0	13.1	0.0	0.0	0	78.49	-48.9	-0.7	-18.7	-0.1		0.0	0.2	13.8	-14.8	0.0	0.0	-1.0
Amplified Music (Wellness Centre) Breakout Doors (Open)	Area	Leq,adj,9h			70.8	82.0	13.1	0.0	0.0	0	78.49	-48.9	-0.7	-18.7	-0.1		0.0	0.2	13.8		0.0		
Amplified Music (Wellness Centre) Lightwell	Area	Leq,adj,11			76.4	82.0	3.6	0.0	0.0	0	84.47	-49.5	-0.7	-31.6	0.0		0.0	0.0	0.2	0.0	0.0	0.0	-4.1
Amplified Music (Wellness Centre) Lightwell	Area	Leq,adj,4h			76.4	82.0	3.6	0.0	0.0	0	84.47	-49.5	-0.7	-31.6	0.0		0.0	0.0	0.2	0.0	0.0	0.0	-4.1
Amplified Music (Wellness Centre) Lightwell	Area	Leq,adj,9h			76.4	82.0	3.6	0.0	0.0	0	84.47	-49.5	-0.7	-31.6	0.0		0.0	0.0	0.2		0.0		
Car Movements	Line	Leq,adj,11			47.1	60.1	19.7	0.0	5.0	0	48.81	-44.8	-2.3	-12.3	-0.1		0.0	0.8	1.5	16.0	0.0	0.0	22.5
Car Movements	Line	Leq,adj,4h			47.1	60.1	19.7	0.0	5.0	0	48.81	-44.8	-2.3	-12.3	-0.1		0.0	0.8	1.5	13.0	0.0	0.0	19.5
Car Movements	Line	Leq,adj,9h			47.1	60.1	19.7	0.0	5.0	0	48.81	-44.8	-2.3	-12.3	-0.1		0.0	0.8	1.5	10.0	0.0	0.0	16.5
Human Voices (Roof Garden) 201	Area	Leq,adj,11			62.3	79.0	46.2	0.0	0.0	0	85.04	-49.6	-1.1	-21.2	-0.3		0.0	0.0	6.8	0.0	0.0	0.0	6.8
Human Voices (Roof Garden) 201	Area	Leq,adj,4h			62.3	79.0	46.2	0.0	0.0	0	85.04	-49.6	-1.1	-21.2	-0.3		0.0	0.0	6.8	0.0	0.0	0.0	6.8
Human Voices (Roof Garden) 201	Area	Leq,adj,9h			62.3	79.0	46.2	0.0	0.0	0	85.04	-49.6	-1.1	-21.2	-0.3		0.0	0.0	6.8	0.0	0.0	0.0	6.8
Human Voices (Roof Garden) 202	Area	Leq,adj,11			62.9	79.0	40.4	0.0	0.0	0	75.87	-48.6	-1.1	-17.0	-0.2		0.0	0.0	12.1	0.0	0.0	0.0	12.1
Human Voices (Roof Garden) 202	Area	Leq,adj,4h			62.9	79.0	40.4	0.0	0.0	0	75.87	-48.6	-1.1	-17.0	-0.2		0.0	0.0	12.1	0.0	0.0	0.0	12.1
Human Voices (Roof Garden) 202	Area	Leq,adj,9h			62.9	79.0	40.4	0.0	0.0	0	75.87	-48.6	-1.1	-17.0	-0.2		0.0	0.0	12.1	0.0	0.0	0.0	12.1
Human Voices (Roof Garden) 203	Area	Leq,adj,11			62.9	79.0	40.9	0.0	0.0	0	67.91	-47.6	-1.0	-10.3	-0.2		0.0	0.0	19.9	0.0	0.0	0.0	19.9
Human Voices (Roof Garden) 203	Area	Leq,adj,4h			62.9	79.0	40.9	0.0	0.0	0	67.91	-47.6	-1.0	-10.3	-0.2		0.0	0.0	19.9	0.0	0.0	0.0	19.9
Human Voices (Roof Garden) 203	Area	Leq,adj,9h			62.9	79.0	40.9	0.0	0.0	0	67.91	-47.6	-1.0	-10.3	-0.2		0.0	0.0	19.9	0.0	0.0	0.0	19.9
Human Voices (Roof Garden) 204	Area	Leq,adj,11			62.6	79.0	43.2	0.0	0.0	0	62.28	-46.9	-1.0	-8.5	-0.2		0.0	0.0	22.5	0.0	0.0	0.0	22.5
Human Voices (Roof Garden) 204	Area	Leq,adj,4h			62.6	79.0	43.2	0.0	0.0	0	62.28	-46.9	-1.0	-8.5	-0.2		0.0	0.0	22.5	0.0	0.0	0.0	22.5

29 Shirley Street, Byron Bay
ISO9613 Calculation Method
Predicted Operational Noise Levels at Adjacent Uses
From Activities at Proposed Development

Source	Source type	time slice	Li	Rw	L'w	Lw	l or A	KI	KT	Ko	S	Adiv	Agr	Abar	Aatm	Amisc	ADI	dLrefl	Ls	dLw	Cmet	ZR	Lr
			dB(A)	dB	dB(A)	dB(A)	m,m ²	dB	dB	dB	m	dB	dB	dB	dB	dB	dB	dB(A)	dB(A)	dB	dB	dB	dB(A)
Human Voices (Roof Garden) 204	Area	Leq,adj,9h			62.6	79.0	43.2	0.0	0.0	0	62.28	-46.9	-1.0	-8.5	-0.2		0.0	0.0	22.5	0.0	0.0	0.0	22.5
Human Voices (Roof Garden) 205	Area	Leq,adj,11			60.1	79.0	78.2	0.0	0.0	0	17.69	-35.9	-0.4	-17.0	-0.1		0.0	0.0	25.6	0.0	0.0	0.0	25.6
Human Voices (Roof Garden) 205	Area	Leq,adj,4h			60.1	79.0	78.2	0.0	0.0	0	17.69	-35.9	-0.4	-17.0	-0.1		0.0	0.0	25.6	0.0	0.0	0.0	25.6
Human Voices (Roof Garden) 205	Area	Leq,adj,9h			60.1	79.0	78.2	0.0	0.0	0	17.69	-35.9	-0.4	-17.0	-0.1		0.0	0.0	25.6	0.0	0.0	0.0	25.6
Human Voices (Roof Garden) 206	Area	Leq,adj,11			61.4	79.0	57.2	0.0	0.0	0	29.24	-40.3	-0.6	-18.0	-0.1		0.0	0.1	20.0	0.0	0.0	0.0	20.0
Human Voices (Roof Garden) 206	Area	Leq,adj,4h			61.4	79.0	57.2	0.0	0.0	0	29.24	-40.3	-0.6	-18.0	-0.1		0.0	0.1	20.0	0.0	0.0	0.0	20.0
Human Voices (Roof Garden) 206	Area	Leq,adj,9h			61.4	79.0	57.2	0.0	0.0	0	29.24	-40.3	-0.6	-18.0	-0.1		0.0	0.1	20.0	0.0	0.0	0.0	20.0
Human Voices (Roof Garden) 207	Area	Leq,adj,11			61.5	79.0	55.7	0.0	0.0	0	41.96	-43.4	-0.8	-19.0	-0.2		0.0	0.2	15.7	0.0	0.0	0.0	15.7
Human Voices (Roof Garden) 207	Area	Leq,adj,4h			61.5	79.0	55.7	0.0	0.0	0	41.96	-43.4	-0.8	-19.0	-0.2		0.0	0.2	15.7	0.0	0.0	0.0	15.7
Human Voices (Roof Garden) 207	Area	Leq,adj,9h			61.5	79.0	55.7	0.0	0.0	0	41.96	-43.4	-0.8	-19.0	-0.2		0.0	0.2	15.7	0.0	0.0	0.0	15.7
Human Voices (Roof Garden) 208	Area	Leq,adj,11			61.5	79.0	56.1	0.0	0.0	0	53.47	-45.6	-0.9	-18.2	-0.2		0.0	0.2	14.3	0.0	0.0	0.0	14.3
Human Voices (Roof Garden) 208	Area	Leq,adj,4h			61.5	79.0	56.1	0.0	0.0	0	53.47	-45.6	-0.9	-18.2	-0.2		0.0	0.2	14.3	0.0	0.0	0.0	14.3
Human Voices (Roof Garden) 208	Area	Leq,adj,9h			61.5	79.0	56.1	0.0	0.0	0	53.47	-45.6	-0.9	-18.2	-0.2		0.0	0.2	14.3	0.0	0.0	0.0	14.3
Human Voices (Roof Garden) 209	Area	Leq,adj,11			61.3	79.0	59.0	0.0	0.0	0	65.49	-47.3	-1.0	-19.3	-0.3		0.0	0.4	11.5	0.0	0.0	0.0	11.5
Human Voices (Roof Garden) 209	Area	Leq,adj,4h			61.3	79.0	59.0	0.0	0.0	0	65.49	-47.3	-1.0	-19.3	-0.3		0.0	0.4	11.5	0.0	0.0	0.0	11.5
Human Voices (Roof Garden) 209	Area	Leq,adj,9h			61.3	79.0	59.0	0.0	0.0	0	65.49	-47.3	-1.0	-19.3	-0.3		0.0	0.4	11.5	0.0	0.0	0.0	11.5
Human Voices (Roof Garden) 210	Area	Leq,adj,11			61.8	79.0	52.1	0.0	0.0	0	42.34	-43.5	-0.8	-17.8	-0.1		0.0	0.4	17.1	0.0	0.0	0.0	17.1
Human Voices (Roof Garden) 210	Area	Leq,adj,4h			61.8	79.0	52.1	0.0	0.0	0	42.34	-43.5	-0.8	-17.8	-0.1		0.0	0.4	17.1	0.0	0.0	0.0	17.1
Human Voices (Roof Garden) 210	Area	Leq,adj,9h			61.8	79.0	52.1	0.0	0.0	0	42.34	-43.5	-0.8	-17.8	-0.1		0.0	0.4	17.1	0.0	0.0	0.0	17.1
Human Voices GF (Pool) 001	Area	Leq,adj,11			62.7	73.0	10.7	0.0	0.0	0	92.71	-50.3	-4.5	-20.3	-0.5		0.0	0.0	-2.7	0.0	0.0	0.0	-2.7
Human Voices GF (Pool) 001	Area	Leq,adj,4h			62.7	73.0	10.7	0.0	0.0	0	92.71	-50.3	-4.5	-20.3	-0.5		0.0	0.0	-2.7	0.0	0.0	0.0	-2.7
Human Voices GF (Pool) 001	Area	Leq,adj,9h			62.7	73.0	10.7	0.0	0.0	0	92.71	-50.3	-4.5	-20.3	-0.5		0.0	0.0	-2.7	0.0	0.0	0.0	-2.7
Human Voices GF (Pool) 002	Area	Leq,adj,11			63.6	73.0	8.8	0.0	0.0	0	66.24	-47.4	-4.2	-20.6	-0.3		0.0	1.2	1.6	0.0	0.0	0.0	1.6
Human Voices GF (Pool) 002	Area	Leq,adj,4h			63.6	73.0	8.8	0.0	0.0	0	66.24	-47.4	-4.2	-20.6	-0.3		0.0	1.2	1.6	0.0	0.0	0.0	1.6
Human Voices GF (Pool) 002	Area	Leq,adj,9h			63.6	73.0	8.8	0.0	0.0	0	66.24	-47.4	-4.2	-20.6	-0.3		0.0	1.2	1.6	0.0	0.0	0.0	1.6
Human Voices GF (Pool) 003	Area	Leq,adj,11			63.6	73.0	8.7	0.0	0.0	0	61.17	-46.7	-4.1	-20.6	-0.3		0.0	3.0	4.2	0.0	0.0	0.0	4.2
Human Voices GF (Pool) 003	Area	Leq,adj,4h			63.6	73.0	8.7	0.0	0.0	0	61.17	-46.7	-4.1	-20.6	-0.3		0.0	3.0	4.2	0.0	0.0	0.0	4.2
Human Voices GF (Pool) 003	Area	Leq,adj,9h			63.6	73.0	8.7	0.0	0.0	0	61.17	-46.7	-4.1	-20.6	-0.3		0.0	3.0	4.2	0.0	0.0	0.0	4.2
Human Voices GF (Pool) 004	Area	Leq,adj,11			62.4	73.0	11.5	0.0	0.0	0	54.16	-45.7	-4.0	-13.7	-0.2		0.0	4.5	14.0	0.0	0.0	0.0	14.0
Human Voices GF (Pool) 004	Area	Leq,adj,4h			62.4	73.0	11.5	0.0	0.0	0	54.16	-45.7	-4.0	-13.7	-0.2		0.0	4.5	14.0	0.0	0.0	0.0	14.0
Human Voices GF (Pool) 004	Area	Leq,adj,9h			62.4	73.0	11.5	0.0	0.0	0	54.16	-45.7	-4.0	-13.7	-0.2		0.0	4.5	14.0	0.0	0.0	0.0	14.0
Human Voices GF (Pool) 005	Area	Leq,adj,11			61.7	73.0	13.6	0.0	0.0	0	29.34	-40.3	-3.1	-18.6	-0.1		0.0	0.4	11.2	0.0	0.0	0.0	11.2
Human Voices GF (Pool) 005	Area	Leq,adj,4h			61.7	73.0	13.6	0.0	0.0	0	29.34	-40.3	-3.1	-18.6	-0.1		0.0	0.4	11.2	0.0	0.0	0.0	11.2

29 Shirley Street, Byron Bay
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Predicted Operational Noise Levels at Adjacent Uses
From Activities at Proposed Development

Source	Source type	time slice	Li dB(A)	Rw dB	L'w dB(A)	Lw dB(A)	l or A m,m²	Kl dB	KT dB	Ko dB	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	Amisc dB	ADI dB	dLrefl dB(A)	Ls dB(A)	dLw dB	Cmet dB	ZR dB	Lr dB(A)
Human Voices GF (Pool) 005	Area	Leq,adj,9h			61.7	73.0	13.6	0.0	0.0	0	29.34	-40.3	-3.1	-18.6	-0.1		0.0	0.4	11.2	0.0	0.0	0.0	11.2
Human Voices GF (Pool) 006	Area	Leq,adj,11			61.6	73.0	13.9	0.0	0.0	0	31.90	-41.1	-3.2	-21.7	-0.2		0.0	0.5	7.3	0.0	0.0	0.0	7.3
Human Voices GF (Pool) 006	Area	Leq,adj,4h			61.6	73.0	13.9	0.0	0.0	0	31.90	-41.1	-3.2	-21.7	-0.2		0.0	0.5	7.3	0.0	0.0	0.0	7.3
Human Voices GF (Pool) 006	Area	Leq,adj,9h			61.6	73.0	13.9	0.0	0.0	0	31.90	-41.1	-3.2	-21.7	-0.2		0.0	0.5	7.3	0.0	0.0	0.0	7.3
Human Voices GF (Pool) 007	Area	Leq,adj,11			61.5	73.0	14.1	0.0	0.0	0	49.61	-44.9	-3.9	-21.1	-0.3		0.0	0.5	3.4	0.0	0.0	0.0	3.4
Human Voices GF (Pool) 007	Area	Leq,adj,4h			61.5	73.0	14.1	0.0	0.0	0	49.61	-44.9	-3.9	-21.1	-0.3		0.0	0.5	3.4	0.0	0.0	0.0	3.4
Human Voices GF (Pool) 007	Area	Leq,adj,9h			61.5	73.0	14.1	0.0	0.0	0	49.61	-44.9	-3.9	-21.1	-0.3		0.0	0.5	3.4	0.0	0.0	0.0	3.4
Human Voices GF (Pool) 008	Area	Leq,adj,11			61.6	73.0	13.8	0.0	0.0	0	52.99	-45.5	-4.0	-21.0	-0.3		0.0	0.2	2.5	0.0	0.0	0.0	2.5
Human Voices GF (Pool) 008	Area	Leq,adj,4h			61.6	73.0	13.8	0.0	0.0	0	52.99	-45.5	-4.0	-21.0	-0.3		0.0	0.2	2.5	0.0	0.0	0.0	2.5
Human Voices GF (Pool) 008	Area	Leq,adj,9h			61.6	73.0	13.8	0.0	0.0	0	52.99	-45.5	-4.0	-21.0	-0.3		0.0	0.2	2.5	0.0	0.0	0.0	2.5
Human Voices GF (Pool) 009	Area	Leq,adj,11			61.2	73.0	15.3	0.0	0.0	0	64.55	-47.2	-4.2	-20.7	-0.3		0.0	0.4	0.9	0.0	0.0	0.0	0.9
Human Voices GF (Pool) 009	Area	Leq,adj,4h			61.2	73.0	15.3	0.0	0.0	0	64.55	-47.2	-4.2	-20.7	-0.3		0.0	0.4	0.9	0.0	0.0	0.0	0.9
Human Voices GF (Pool) 009	Area	Leq,adj,9h			61.2	73.0	15.3	0.0	0.0	0	64.55	-47.2	-4.2	-20.7	-0.3		0.0	0.4	0.9	0.0	0.0	0.0	0.9
Human Voices GF (Pool) Communal Pool	Area	Leq,adj,11			57.2	79.0	150.6	0.0	0.0	0	65.32	-47.3	-4.2	-20.4	-0.3		0.0	0.6	7.3	0.0	0.0	0.0	7.3
Human Voices GF (Pool) Communal Pool	Area	Leq,adj,4h			57.2	79.0	150.6	0.0	0.0	0	65.32	-47.3	-4.2	-20.4	-0.3		0.0	0.6	7.3	0.0	0.0	0.0	7.3
Human Voices GF (Pool) Communal Pool	Area	Leq,adj,9h			57.2	79.0	150.6	0.0	0.0	0	65.32	-47.3	-4.2	-20.4	-0.3		0.0	0.6	7.3	0.0	0.0	0.0	7.3
Mechanical Plant	Area	Leq,adj,11			60.7	79.0	67.2	0.0	5.0	0	75.81	-48.6	-1.2	-21.9	-0.3		0.0	0.1	7.1	0.0	0.0	0.0	12.1
Mechanical Plant	Area	Leq,adj,4h			60.7	79.0	67.2	0.0	5.0	0	75.81	-48.6	-1.2	-21.9	-0.3		0.0	0.1	7.1	0.0	0.0	0.0	12.1
Mechanical Plant	Area	Leq,adj,9h			60.7	79.0	67.2	0.0	5.0	0	75.81	-48.6	-1.2	-21.9	-0.3		0.0	0.1	7.1	-3.0	0.0	0.0	9.1
Roller Door	Area	Leq,adj,11			50.5	65.0	27.9	0.0	5.0	0	54.73	-45.8	-3.1	-21.5	-0.4		0.0	2.4	-3.4	-7.8	0.0	0.0	-6.2
Roller Door	Area	Leq,adj,4h			50.5	65.0	27.9	0.0	5.0	0	54.73	-45.8	-3.1	-21.5	-0.4		0.0	2.4	-3.4	-10.8	0.0	0.0	-9.2
Roller Door	Area	Leq,adj,9h			50.5	65.0	27.9	0.0	5.0	0	54.73	-45.8	-3.1	-21.5	-0.4		0.0	2.4	-3.4	-12.6	0.0	0.0	-11.0

29 Shirley Street, Byron Bay
ISO9613 Calculation Method
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From Activities at Proposed Development

Source	Source type	time slice	Li dB(A)	Rw dB	L'w dB(A)	Lw dB(A)	l or A m,m ²	Kl dB	KT dB	Ko dB	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	Amisc dB	ADI dB	dLrefl dB(A)	Ls dB(A)	dLw dB	Cmet dB	ZR dB	Lr dB(A)
Receiver 27 Shirley Street FI F 1 Dir W Le dB(A) Leq,15min 45 dB(A) Ln dB(A) Leq,adj,1h 45 dB(A) Leq,adj,1h 44 dB(A)																							
Amplified Music (Wellness Centre) Breakout Doors (Closed)	Area	Leq,adj,11			38.1	49.2	13.1	0.0	0.0	0	16.82	-35.5	1.5	-7.2	0.0		0.0	0.0	8.0	-0.1	0.0	0.0	7.8
Amplified Music (Wellness Centre) Breakout Doors (Closed)	Area	Leq,adj,4h			38.1	49.2	13.1	0.0	0.0	0	16.82	-35.5	1.5	-7.2	0.0		0.0	0.0	8.0	-0.1	0.0	0.0	7.8
Amplified Music (Wellness Centre) Breakout Doors (Closed)	Area	Leq,adj,9h			38.1	49.2	13.1	0.0	0.0	0	16.82	-35.5	1.5	-7.2	0.0		0.0	0.0	8.0		0.0		
Amplified Music (Wellness Centre) Breakout Doors (Open)	Area	Leq,adj,11			70.8	82.0	13.1	0.0	0.0	0	16.82	-35.5	-0.3	-8.1	0.0		0.0	0.0	38.0	-14.8	0.0	0.0	23.2
Amplified Music (Wellness Centre) Breakout Doors (Open)	Area	Leq,adj,4h			70.8	82.0	13.1	0.0	0.0	0	16.82	-35.5	-0.3	-8.1	0.0		0.0	0.0	38.0	-14.8	0.0	0.0	23.2
Amplified Music (Wellness Centre) Breakout Doors (Open)	Area	Leq,adj,9h			70.8	82.0	13.1	0.0	0.0	0	16.82	-35.5	-0.3	-8.1	0.0		0.0	0.0	38.0		0.0		
Amplified Music (Wellness Centre) Lightwell	Area	Leq,adj,11			76.4	82.0	3.6	0.0	0.0	0	14.73	-34.4	-0.2	-16.5	0.0		0.0	0.0	30.9	0.0	0.0	0.0	26.9
Amplified Music (Wellness Centre) Lightwell	Area	Leq,adj,4h			76.4	82.0	3.6	0.0	0.0	0	14.73	-34.4	-0.2	-16.5	0.0		0.0	0.0	30.9	0.0	0.0	0.0	26.9
Amplified Music (Wellness Centre) Lightwell	Area	Leq,adj,9h			76.4	82.0	3.6	0.0	0.0	0	14.73	-34.4	-0.2	-16.5	0.0		0.0	0.0	30.9		0.0		
Car Movements	Line	Leq,adj,11			47.1	60.1	19.7	0.0	5.0	0	52.55	-45.4	-2.2	-17.9	-0.1		0.0	0.2	-5.3	16.0	0.0	0.0	15.7
Car Movements	Line	Leq,adj,4h			47.1	60.1	19.7	0.0	5.0	0	52.55	-45.4	-2.2	-17.9	-0.1		0.0	0.2	-5.3	13.0	0.0	0.0	12.7
Car Movements	Line	Leq,adj,9h			47.1	60.1	19.7	0.0	5.0	0	52.55	-45.4	-2.2	-17.9	-0.1		0.0	0.2	-5.3	10.0	0.0	0.0	9.7
Human Voices (Roof Garden) 201	Area	Leq,adj,11			62.3	79.0	46.2	0.0	0.0	0	16.43	-35.3	0.0	-18.1	-0.1		0.0	0.0	25.5	0.0	0.0	0.0	25.5
Human Voices (Roof Garden) 201	Area	Leq,adj,4h			62.3	79.0	46.2	0.0	0.0	0	16.43	-35.3	0.0	-18.1	-0.1		0.0	0.0	25.5	0.0	0.0	0.0	25.5
Human Voices (Roof Garden) 201	Area	Leq,adj,9h			62.3	79.0	46.2	0.0	0.0	0	16.43	-35.3	0.0	-18.1	-0.1		0.0	0.0	25.5	0.0	0.0	0.0	25.5
Human Voices (Roof Garden) 202	Area	Leq,adj,11			62.9	79.0	40.4	0.0	0.0	0	28.21	-40.0	0.0	-23.2	-0.1		0.0	0.2	15.9	0.0	0.0	0.0	15.9
Human Voices (Roof Garden) 202	Area	Leq,adj,4h			62.9	79.0	40.4	0.0	0.0	0	28.21	-40.0	0.0	-23.2	-0.1		0.0	0.2	15.9	0.0	0.0	0.0	15.9
Human Voices (Roof Garden) 202	Area	Leq,adj,9h			62.9	79.0	40.4	0.0	0.0	0	28.21	-40.0	0.0	-23.2	-0.1		0.0	0.2	15.9	0.0	0.0	0.0	15.9
Human Voices (Roof Garden) 203	Area	Leq,adj,11			62.9	79.0	40.9	0.0	0.0	0	40.50	-43.1	0.0	-23.6	-0.2		0.0	4.7	16.8	0.0	0.0	0.0	16.8
Human Voices (Roof Garden) 203	Area	Leq,adj,4h			62.9	79.0	40.9	0.0	0.0	0	40.50	-43.1	0.0	-23.6	-0.2		0.0	4.7	16.8	0.0	0.0	0.0	16.8
Human Voices (Roof Garden) 203	Area	Leq,adj,9h			62.9	79.0	40.9	0.0	0.0	0	40.50	-43.1	0.0	-23.6	-0.2		0.0	4.7	16.8	0.0	0.0	0.0	16.8
Human Voices (Roof Garden) 204	Area	Leq,adj,11			62.6	79.0	43.2	0.0	0.0	0	51.85	-45.3	0.0	-23.6	-0.2		0.0	1.6	11.4	0.0	0.0	0.0	11.4
Human Voices (Roof Garden) 204	Area	Leq,adj,4h			62.6	79.0	43.2	0.0	0.0	0	51.85	-45.3	0.0	-23.6	-0.2		0.0	1.6	11.4	0.0	0.0	0.0	11.4

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Source	Source type	time slice	Li	Rw	L'w	Lw	l or A	KI	KT	Ko	S	Adiv	Agr	Abar	Aatm	Amisc	ADI	dLrefl	Ls	dLw	Cmet	ZR	Lr
			dB(A)	dB	dB(A)	dB(A)	m, m²	dB	dB	dB	m	dB	dB	dB	dB	dB	dB	dB(A)	dB(A)	dB	dB	dB	dB(A)
Human Voices (Roof Garden) 204	Area	Leq,adj,9h			62.6	79.0	43.2	0.0	0.0	0	51.85	-45.3	0.0	-23.6	-0.2		0.0	1.6	11.4	0.0	0.0	0.0	11.4
Human Voices (Roof Garden) 205	Area	Leq,adj,11			60.1	79.0	78.2	0.0	0.0	0	84.23	-49.5	0.0	-13.2	-0.3		0.0	0.0	16.0	0.0	0.0	0.0	16.0
Human Voices (Roof Garden) 205	Area	Leq,adj,4h			60.1	79.0	78.2	0.0	0.0	0	84.23	-49.5	0.0	-13.2	-0.3		0.0	0.0	16.0	0.0	0.0	0.0	16.0
Human Voices (Roof Garden) 205	Area	Leq,adj,9h			60.1	79.0	78.2	0.0	0.0	0	84.23	-49.5	0.0	-13.2	-0.3		0.0	0.0	16.0	0.0	0.0	0.0	16.0
Human Voices (Roof Garden) 206	Area	Leq,adj,11			61.4	79.0	57.2	0.0	0.0	0	73.88	-48.4	0.0	-11.6	-0.2		0.0	0.0	18.7	0.0	0.0	0.0	18.7
Human Voices (Roof Garden) 206	Area	Leq,adj,4h			61.4	79.0	57.2	0.0	0.0	0	73.88	-48.4	0.0	-11.6	-0.2		0.0	0.0	18.7	0.0	0.0	0.0	18.7
Human Voices (Roof Garden) 206	Area	Leq,adj,9h			61.4	79.0	57.2	0.0	0.0	0	73.88	-48.4	0.0	-11.6	-0.2		0.0	0.0	18.7	0.0	0.0	0.0	18.7
Human Voices (Roof Garden) 207	Area	Leq,adj,11			61.5	79.0	55.7	0.0	0.0	0	64.22	-47.1	0.0	-11.9	-0.2		0.0	0.0	19.7	0.0	0.0	0.0	19.7
Human Voices (Roof Garden) 207	Area	Leq,adj,4h			61.5	79.0	55.7	0.0	0.0	0	64.22	-47.1	0.0	-11.9	-0.2		0.0	0.0	19.7	0.0	0.0	0.0	19.7
Human Voices (Roof Garden) 207	Area	Leq,adj,9h			61.5	79.0	55.7	0.0	0.0	0	64.22	-47.1	0.0	-11.9	-0.2		0.0	0.0	19.7	0.0	0.0	0.0	19.7
Human Voices (Roof Garden) 208	Area	Leq,adj,11			61.5	79.0	56.1	0.0	0.0	0	56.81	-46.1	0.0	-8.3	-0.2		0.0	0.0	24.3	0.0	0.0	0.0	24.3
Human Voices (Roof Garden) 208	Area	Leq,adj,4h			61.5	79.0	56.1	0.0	0.0	0	56.81	-46.1	0.0	-8.3	-0.2		0.0	0.0	24.3	0.0	0.0	0.0	24.3
Human Voices (Roof Garden) 208	Area	Leq,adj,9h			61.5	79.0	56.1	0.0	0.0	0	56.81	-46.1	0.0	-8.3	-0.2		0.0	0.0	24.3	0.0	0.0	0.0	24.3
Human Voices (Roof Garden) 209	Area	Leq,adj,11			61.3	79.0	59.0	0.0	0.0	0	50.76	-45.1	0.0	-8.6	-0.2		0.0	0.1	25.1	0.0	0.0	0.0	25.1
Human Voices (Roof Garden) 209	Area	Leq,adj,4h			61.3	79.0	59.0	0.0	0.0	0	50.76	-45.1	0.0	-8.6	-0.2		0.0	0.1	25.1	0.0	0.0	0.0	25.1
Human Voices (Roof Garden) 209	Area	Leq,adj,9h			61.3	79.0	59.0	0.0	0.0	0	50.76	-45.1	0.0	-8.6	-0.2		0.0	0.1	25.1	0.0	0.0	0.0	25.1
Human Voices (Roof Garden) 210	Area	Leq,adj,11			61.8	79.0	52.1	0.0	0.0	0	52.55	-45.4	0.0	-15.7	-0.2		0.0	0.0	17.7	0.0	0.0	0.0	17.7
Human Voices (Roof Garden) 210	Area	Leq,adj,4h			61.8	79.0	52.1	0.0	0.0	0	52.55	-45.4	0.0	-15.7	-0.2		0.0	0.0	17.7	0.0	0.0	0.0	17.7
Human Voices (Roof Garden) 210	Area	Leq,adj,9h			61.8	79.0	52.1	0.0	0.0	0	52.55	-45.4	0.0	-15.7	-0.2		0.0	0.0	17.7	0.0	0.0	0.0	17.7
Human Voices GF (Pool) 001	Area	Leq,adj,11			62.7	73.0	10.7	0.0	0.0	0	6.05	-26.6	-0.5	-3.3	0.0		0.0	1.0	43.5	0.0	0.0	0.0	43.5
Human Voices GF (Pool) 001	Area	Leq,adj,4h			62.7	73.0	10.7	0.0	0.0	0	6.05	-26.6	-0.5	-3.3	0.0		0.0	1.0	43.5	0.0	0.0	0.0	43.5
Human Voices GF (Pool) 001	Area	Leq,adj,9h			62.7	73.0	10.7	0.0	0.0	0	6.05	-26.6	-0.5	-3.3	0.0		0.0	1.0	43.5	0.0	0.0	0.0	43.5
Human Voices GF (Pool) 002	Area	Leq,adj,11			63.6	73.0	8.8	0.0	0.0	0	30.83	-40.8	-2.8	-22.0	-0.2		0.0	7.4	14.7	0.0	0.0	0.0	14.7
Human Voices GF (Pool) 002	Area	Leq,adj,4h			63.6	73.0	8.8	0.0	0.0	0	30.83	-40.8	-2.8	-22.0	-0.2		0.0	7.4	14.7	0.0	0.0	0.0	14.7
Human Voices GF (Pool) 002	Area	Leq,adj,9h			63.6	73.0	8.8	0.0	0.0	0	30.83	-40.8	-2.8	-22.0	-0.2		0.0	7.4	14.7	0.0	0.0	0.0	14.7
Human Voices GF (Pool) 003	Area	Leq,adj,11			63.6	73.0	8.7	0.0	0.0	0	37.93	-42.6	-3.2	-21.5	-0.2		0.0	4.5	10.0	0.0	0.0	0.0	10.0
Human Voices GF (Pool) 003	Area	Leq,adj,4h			63.6	73.0	8.7	0.0	0.0	0	37.93	-42.6	-3.2	-21.5	-0.2		0.0	4.5	10.0	0.0	0.0	0.0	10.0
Human Voices GF (Pool) 003	Area	Leq,adj,9h			63.6	73.0	8.7	0.0	0.0	0	37.93	-42.6	-3.2	-21.5	-0.2		0.0	4.5	10.0	0.0	0.0	0.0	10.0
Human Voices GF (Pool) 004	Area	Leq,adj,11			62.4	73.0	11.5	0.0	0.0	0	51.39	-45.2	-3.6	-21.3	-0.3		0.0	1.0	3.6	0.0	0.0	0.0	3.6
Human Voices GF (Pool) 004	Area	Leq,adj,4h			62.4	73.0	11.5	0.0	0.0	0	51.39	-45.2	-3.6	-21.3	-0.3		0.0	1.0	3.6	0.0	0.0	0.0	3.6
Human Voices GF (Pool) 004	Area	Leq,adj,9h			62.4	73.0	11.5	0.0	0.0	0	51.39	-45.2	-3.6	-21.3	-0.3		0.0	1.0	3.6	0.0	0.0	0.0	3.6
Human Voices GF (Pool) 005	Area	Leq,adj,11			61.7	73.0	13.6	0.0	0.0	0	88.75	-50.0	-4.2	-20.6	-0.4		0.0	0.0	-2.2	0.0	0.0	0.0	-2.2
Human Voices GF (Pool) 005	Area	Leq,adj,4h			61.7	73.0	13.6	0.0	0.0	0	88.75	-50.0	-4.2	-20.6	-0.4		0.0	0.0	-2.2	0.0	0.0	0.0	-2.2

29 Shirley Street, Byron Bay
ISO9613 Calculation Method
Predicted Operational Noise Levels at Adjacent Uses
From Activities at Proposed Development

Source	Source type	time slice	Li dB(A)	Rw dB	L'w dB(A)	Lw dB(A)	l or A m,m²	Kl dB	KT dB	Ko dB	S m	Adiv dB	Agr dB	Abar dB	Aatm dB	Amisc dB	ADI dB	dLrefl dB(A)	Ls dB(A)	dLw dB	Cmet dB	ZR dB	Lr dB(A)
Human Voices GF (Pool) 005	Area	Leq,adj,9h			61.7	73.0	13.6	0.0	0.0	0	88.75	-50.0	-4.2	-20.6	-0.4		0.0	0.0	-2.2	0.0	0.0	0.0	-2.2
Human Voices GF (Pool) 006	Area	Leq,adj,11			61.6	73.0	13.9	0.0	0.0	0	86.10	-49.7	-4.2	-20.7	-0.4		0.0	0.3	-1.8	0.0	0.0	0.0	-1.8
Human Voices GF (Pool) 006	Area	Leq,adj,4h			61.6	73.0	13.9	0.0	0.0	0	86.10	-49.7	-4.2	-20.7	-0.4		0.0	0.3	-1.8	0.0	0.0	0.0	-1.8
Human Voices GF (Pool) 006	Area	Leq,adj,9h			61.6	73.0	13.9	0.0	0.0	0	86.10	-49.7	-4.2	-20.7	-0.4		0.0	0.3	-1.8	0.0	0.0	0.0	-1.8
Human Voices GF (Pool) 007	Area	Leq,adj,11			61.5	73.0	14.1	0.0	0.0	0	72.60	-48.2	-4.0	-20.9	-0.4		0.0	0.0	-0.5	0.0	0.0	0.0	-0.5
Human Voices GF (Pool) 007	Area	Leq,adj,4h			61.5	73.0	14.1	0.0	0.0	0	72.60	-48.2	-4.0	-20.9	-0.4		0.0	0.0	-0.5	0.0	0.0	0.0	-0.5
Human Voices GF (Pool) 007	Area	Leq,adj,9h			61.5	73.0	14.1	0.0	0.0	0	72.60	-48.2	-4.0	-20.9	-0.4		0.0	0.0	-0.5	0.0	0.0	0.0	-0.5
Human Voices GF (Pool) 008	Area	Leq,adj,11			61.6	73.0	13.8	0.0	0.0	0	70.59	-48.0	-4.0	-20.9	-0.4		0.0	0.1	-0.1	0.0	0.0	0.0	-0.1
Human Voices GF (Pool) 008	Area	Leq,adj,4h			61.6	73.0	13.8	0.0	0.0	0	70.59	-48.0	-4.0	-20.9	-0.4		0.0	0.1	-0.1	0.0	0.0	0.0	-0.1
Human Voices GF (Pool) 008	Area	Leq,adj,9h			61.6	73.0	13.8	0.0	0.0	0	70.59	-48.0	-4.0	-20.9	-0.4		0.0	0.1	-0.1	0.0	0.0	0.0	-0.1
Human Voices GF (Pool) 009	Area	Leq,adj,11			61.2	73.0	15.3	0.0	0.0	0	65.13	-47.3	-3.9	-21.0	-0.3		0.0	0.3	0.7	0.0	0.0	0.0	0.7
Human Voices GF (Pool) 009	Area	Leq,adj,4h			61.2	73.0	15.3	0.0	0.0	0	65.13	-47.3	-3.9	-21.0	-0.3		0.0	0.3	0.7	0.0	0.0	0.0	0.7
Human Voices GF (Pool) 009	Area	Leq,adj,9h			61.2	73.0	15.3	0.0	0.0	0	65.13	-47.3	-3.9	-21.0	-0.3		0.0	0.3	0.7	0.0	0.0	0.0	0.7
Human Voices GF (Pool) Communal Pool	Area	Leq,adj,11			57.2	79.0	150.6	0.0	0.0	0	26.20	-39.4	-2.5	-1.5	-0.2		0.0	0.4	35.9	0.0	0.0	0.0	35.9
Human Voices GF (Pool) Communal Pool	Area	Leq,adj,4h			57.2	79.0	150.6	0.0	0.0	0	26.20	-39.4	-2.5	-1.5	-0.2		0.0	0.4	35.9	0.0	0.0	0.0	35.9
Human Voices GF (Pool) Communal Pool	Area	Leq,adj,9h			57.2	79.0	150.6	0.0	0.0	0	26.20	-39.4	-2.5	-1.5	-0.2		0.0	0.4	35.9		0.0	0.0	
Mechanical Plant	Area	Leq,adj,11			60.7	79.0	67.2	0.0	5.0	0	18.26	-36.2	-0.1	-15.8	0.0		0.0	0.2	27.1	0.0	0.0	0.0	32.1
Mechanical Plant	Area	Leq,adj,4h			60.7	79.0	67.2	0.0	5.0	0	18.26	-36.2	-0.1	-15.8	0.0		0.0	0.2	27.1	0.0	0.0	0.0	32.1
Mechanical Plant	Area	Leq,adj,9h			60.7	79.0	67.2	0.0	5.0	0	18.26	-36.2	-0.1	-15.8	0.0		0.0	0.2	27.1	-3.0	0.0	0.0	29.1
Roller Door	Area	Leq,adj,11			50.5	65.0	27.9	0.0	5.0	0	43.97	-43.9	-2.7	-21.8	-0.3		0.0	0.7	-2.9	-7.8	0.0	0.0	-5.7
Roller Door	Area	Leq,adj,4h			50.5	65.0	27.9	0.0	5.0	0	43.97	-43.9	-2.7	-21.8	-0.3		0.0	0.7	-2.9	-10.8	0.0	0.0	-8.7
Roller Door	Area	Leq,adj,9h			50.5	65.0	27.9	0.0	5.0	0	43.97	-43.9	-2.7	-21.8	-0.3		0.0	0.7	-2.9	-12.6	0.0	0.0	-10.4

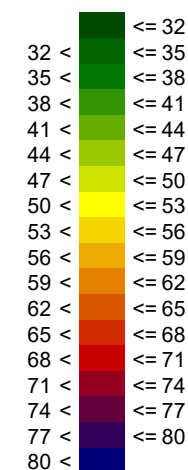
Appendix J – Operational Noise Contour Maps

**Proposed Development
29 Shirley Street, Byron Bay**

**Noise Levels Associated with
Proposed Development**

Ground Floor (1.8m AGL)

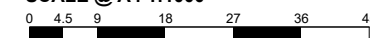
Operational Noise Level
 $L_{eq,adj,15min,Day}$ dB(A)



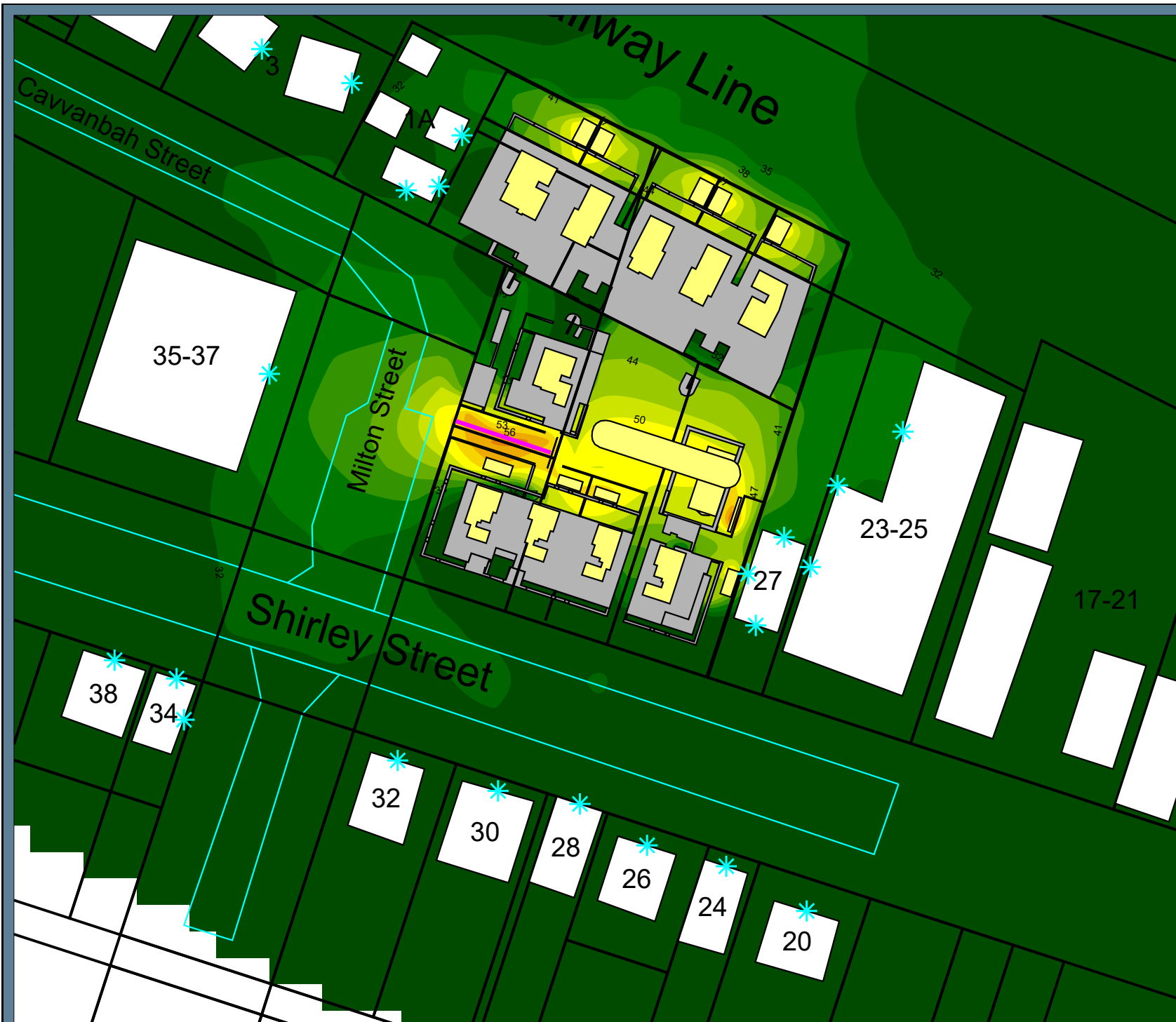
Legend

-  Adjacent building
-  Ground absorption
-  Noise barrier fence
-  Noise source (area)
-  Noise source (line)
-  Point receiver
-  Proposed development

SCALE @ A4 1:1000



Grid Spacing: 5m
Project Engineer: F.G.R.
Created: 13/09/2024
Processed with SoundPLAN 8.2

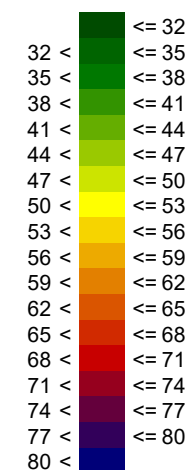


**Proposed Development
29 Shirley Street, Byron Bay**

**Noise Levels Associated with
Proposed Development**

Ground Floor (1.8m AGL)

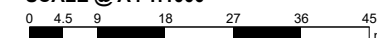
Operational Noise Level
 $L_{eq,adj,15min,Evening}$ dB(A)



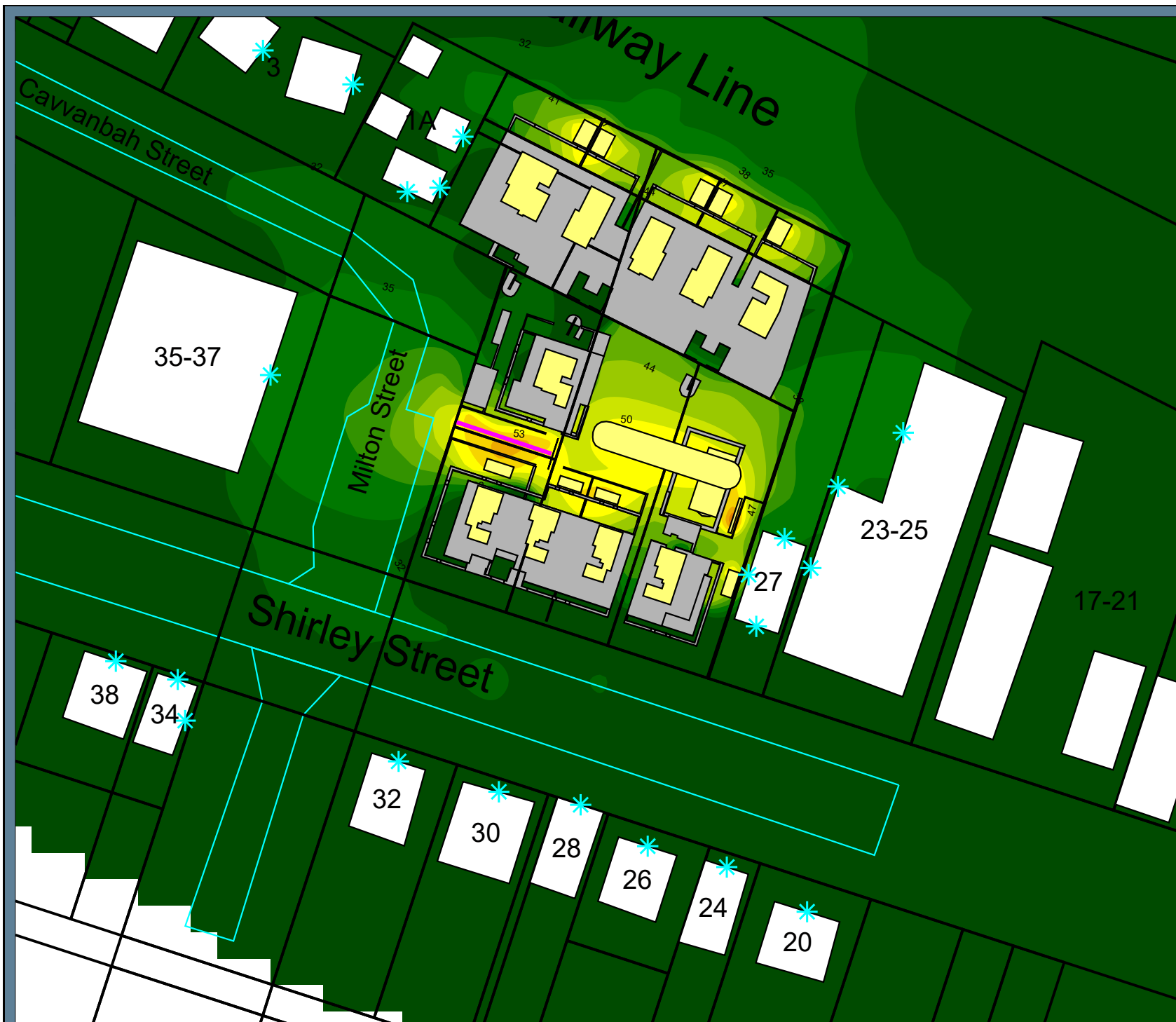
Legend

-  Adjacent building
-  Ground absorption
-  Noise barrier fence
-  Noise source (area)
-  Noise source (line)
-  Point receiver
-  Proposed development

SCALE @ A4 1:1000



Grid Spacing: 5m
Project Engineer: F.G.R.
Created: 13/09/2024
Processed with SoundPLAN 8.2

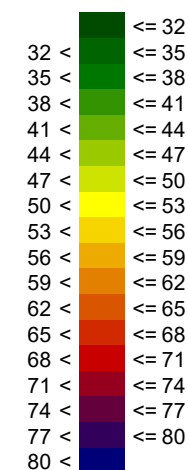


**Proposed Development
29 Shirley Street, Byron Bay**

**Noise Levels Associated with
Proposed Development**

Ground Floor (1.8m AGL)

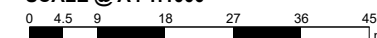
Operational Noise Level
 $L_{eq,adj,15min,Night}$ dB(A)



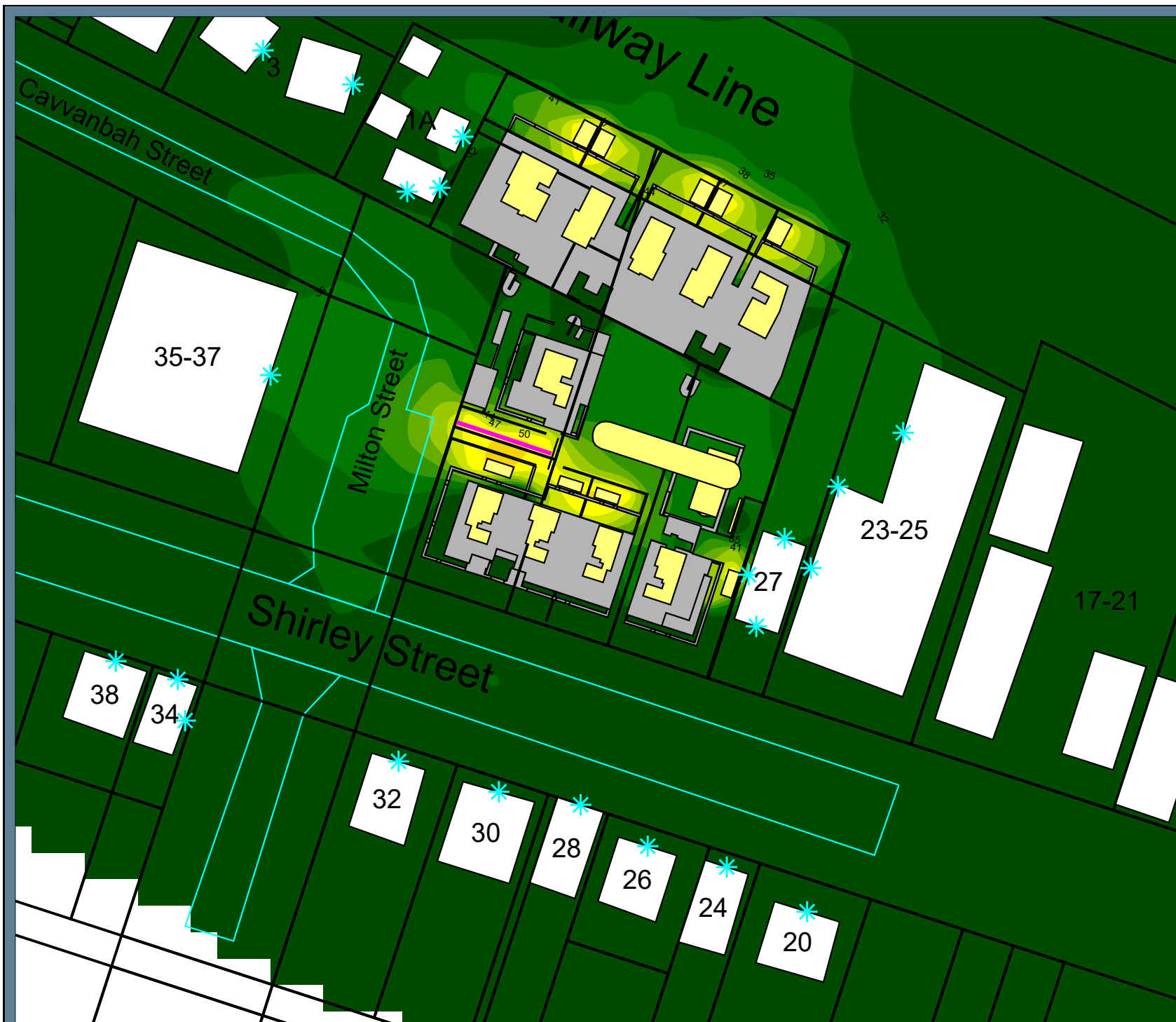
Legend

-  Adjacent building
-  Ground absorption
-  Noise barrier fence
-  Noise source (area)
-  Noise source (line)
-  Point receiver
-  Proposed development

SCALE @ A4 1:1000



Grid Spacing: 5m
Project Engineer: F.G.R.
Created: 13/09/2024
Processed with SoundPLAN 8.2

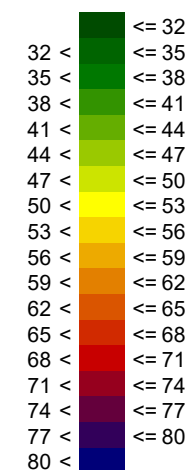


**Proposed Development
29 Shirley Street, Byron Bay**

**Noise Levels Associated with
Proposed Development**

First Floor (4.6m AGL)

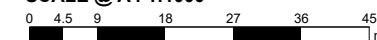
Operational Noise Level
 $L_{eq,adj,15min,Day}$ dB(A)



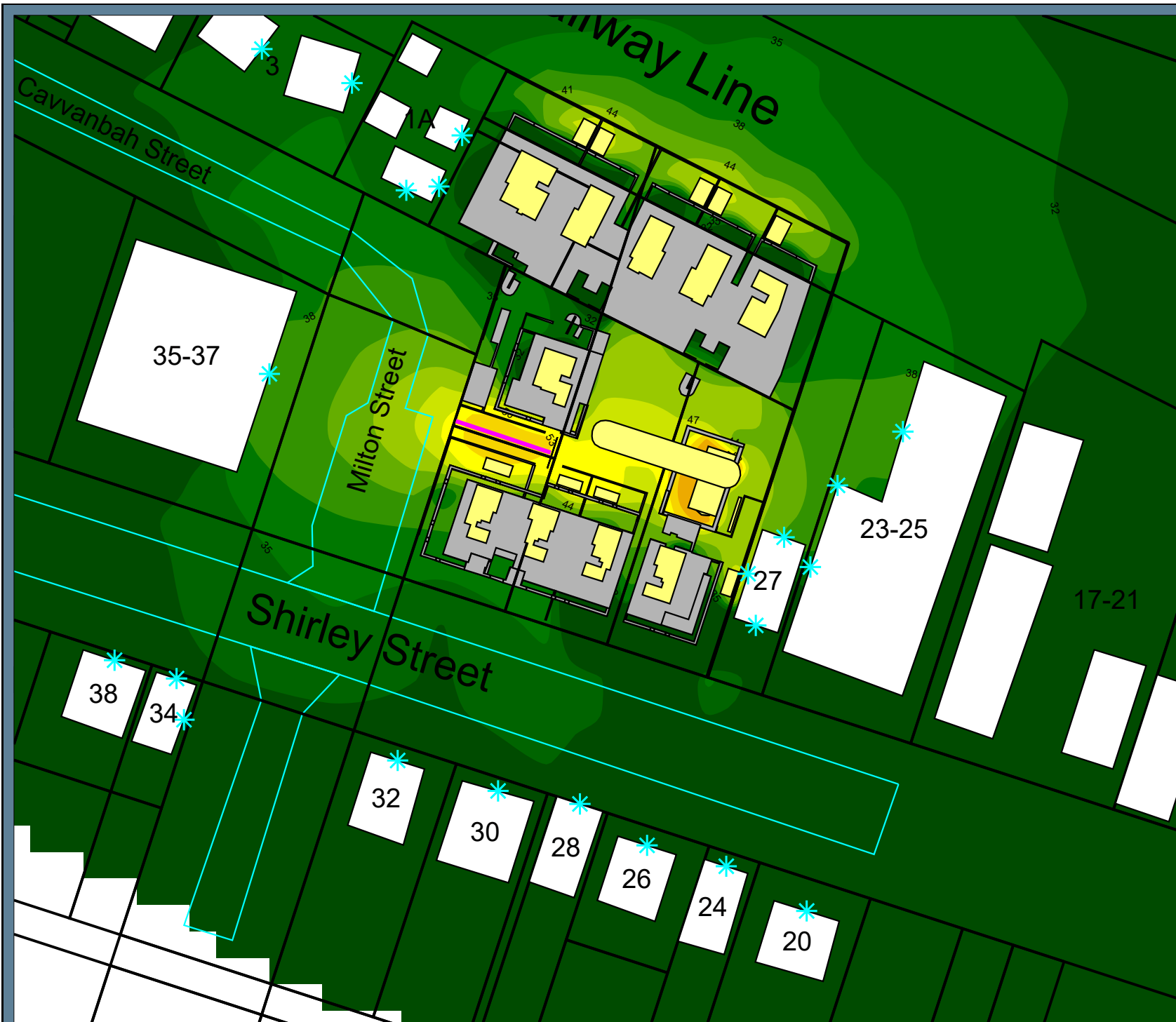
Legend

-  Adjacent building
-  Ground absorption
-  Noise barrier fence
-  Noise source (area)
-  Noise source (line)
-  Point receiver
-  Proposed development

SCALE @ A4 1:1000



Grid Spacing: 5m
Project Engineer: F.G.R.
Created: 13/09/2024
Processed with SoundPLAN 8.2

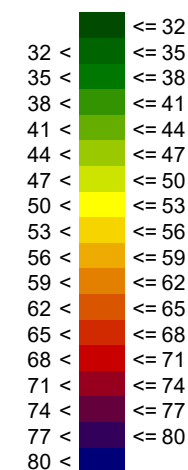


**Proposed Development
29 Shirley Street, Byron Bay**

**Noise Levels Associated with
Proposed Development**

First Floor (4.6m AGL)

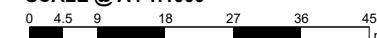
Operational Noise Level
Leq,adj,15min,Evening dB(A)



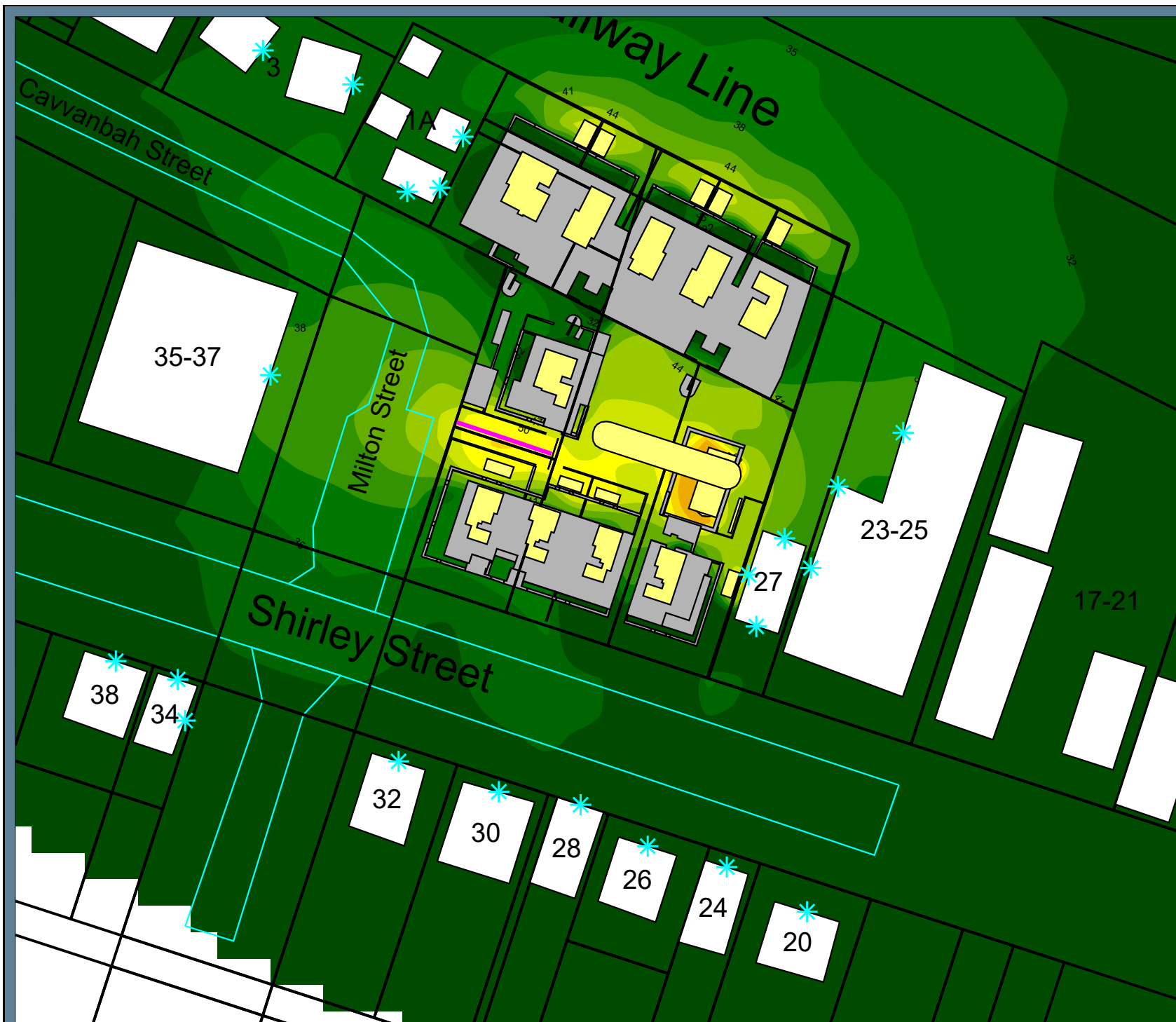
Legend

-  Adjacent building
-  Ground absorption
-  Noise barrier fence
-  Noise source (area)
-  Noise source (line)
-  Point receiver
-  Proposed development

SCALE @ A4 1:1000



Grid Spacing: 5m
Project Engineer: F.G.R.
Created: 13/09/2024
Processed with SoundPLAN 8.2



**Proposed Development
29 Shirley Street, Byron Bay**

**Noise Levels Associated with
Proposed Development**

First Floor (4.6m AGL)

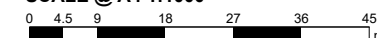
Operational Noise Level
 $L_{eq,adj,15min,Night}$ dB(A)

<= 32
32 <
35 <
38 <
41 <
44 <
47 <
50 <
53 <
56 <
59 <
62 <
65 <
68 <
71 <
74 <
77 <
80 <

Legend

-  Adjacent building
-  Ground absorption
-  Noise barrier fence
-  Noise source (area)
-  Noise source (line)
-  Point receiver
-  Proposed development

SCALE @ A4 1:1000



Grid Spacing: 5m
Project Engineer: F.G.R.
Created: 13/09/2024
Processed with SoundPLAN 8.2

