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ACOUSTICAL REPORT

PROPOSED RESIDENTIAL DEVELOPMENT

48 HENDY AVENUE, PANANIA NSW

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1.0 INTRODUCTION

Koikas Acoustics Pty Ltd was engaged Jamie Jacob to prepare an acoustical assessment seeking approval for the construction of a new single-storey residential development at 48 Hendy Avenue, Panania.

For the DA proposal, the acoustic adequacy of the proposed design must be assessed in terms of standard planning guidelines issued by the Council in their Local Environment Plan (LEP) and Development Control Plan (DCP), and also in terms of other standard planning guidelines related to common sources of noise.

As per Council guidelines and other standard planning instruments, Koikas Acoustics has determined that rail noise associated with the T8 rail corridor and its impact on future occupants of the development require an assessment at the current DA stage.

In-principle acoustic treatments and noise control recommendations are included (where required) so that the premises may operate in compliance with the nominated acoustic planning levels.

2.0 THE PROPOSAL

The development is proposed to occupy the site at 48 Hendy Avenue, Panania.

The application is for a dual-occupancy residential development. The current development design can be seen in architectural drawings as prepared by McDonald Jones, detailed in Table 1. All calculations and noise modelled scenarios conducted for this assessment are referenced to these architectural drawings.

Table 1. Design drawings used in the assessment

Drawing Title	Sheet No.	Revision	Date
Draft Sales Plan – Contour Sketch	1	2	21/05/2021
Existing Conditions	2	2	21/05/2021
Draft Sales Plan – Plan	3	2	21/05/2021
Draft Sales Plan – Elevations	4	2	21/05/2021

Notes
1. Detailed above are the plans and drawings available at the time of assessment. Where design changes are made without the prior knowledge of Koikas Acoustics, the assessment results and conclusions published within this report may be incorrect.

The development location is situated in a primarily urban residential area. The subject site is classified as R2 'Low-Density Residential' as per relevant land zoning maps included in the Canterbury-Bankstown Council Local Environment Plan 2012. Surrounding properties are also predominantly residential in classification, also located within R2 'Low-Density Residential' zoning.

The subject site and surrounding properties are identified in the aerial photograph included in Figure 1.

Prevailing ambient noise conditions on-site and in the local area are generally the result of typical environmental noise such as distant traffic and localised domestic noise sources.

Figure 1. Aerial photo of the subject site, monitoring location and surrounding area (image source – Sixmaps)

3.0 AMBIENT NOISE SURVEY

Existing external ambient noise levels have been measured by Koikas Acoustics previously on Hendy Avenue.

A sound level meter data logger was installed on top of the awning that fronts the rail corridor at 36 Hendy Avenue, Panania. The installed location on the awning meant that the microphone was approximately 4.5-5 metres above ground level. This meter was placed to measure existing background and traffic noise levels that would be common for the façade fronting the rail corridor on the T8 line.

A Type 1 precision Svantek 977 noise logger was used for the survey. The instrument was set up to measure A-frequency and 'Fast' time-weighted noise levels.

Noise level data was stored within the logger memory at 15-minutes intervals for about one week between Thursday 25th February and Wednesday 3rd March 2021.

Calibration readings were taken before and after each survey with a NATA calibrated and certified Larson Davis CAL200 precision acoustic calibrator. No system drift was observed for this meter.

BOM weather records for the nearest available weather station indicate that inclement weather conditions may have impacted the noise survey. All extraneous noise and inclement weather events were removed from the survey. BOM weather reports are attached as **Appendix A**.

Table 2. Summary of noise logger results [dB]

Location	**Period, T** [1]	**Ambient noise level** LAeq	**Rating background level** LA90	**Traffic noise level** LAeq Period
36 Hendy Avenue	Day	57	43	58
	Evening	58	45	
	Night	53	42	53
Notes 1.	The **NSW EPA NPI** refers to: **Daytime**: 7 am – 6 pm Monday to Saturday and 8 am to 6 pm Sunday and public holidays. **Evening**: 6 pm – 10 pm Monday to Sunday **Night**: 10 pm - 7 am Monday to Saturday and 10 pm to 8 am Sunday and public holidays. The **RMS** refers to : **Daytime**: 7 am – 10 pm seven days per week. **Night**: 10 pm - 7 am seven days per week			

4.0 ACOUSTICAL REQUIREMENTS

As per Clause 87 of the State Environmental Planning Policy (Infrastructure) 2007, hereafter referred to as ISEPP, development for a residential, place of public worship, hospital, educational facility or child care centre use must be designed to consider the indoor noise amenity of future occupants. Where the development is for residential use, the consent authority must be satisfied that the following internal rail levels will not be exceeded:

- L_{Aeq} 35 dB in any bedroom in the building between the hours of 10 pm and 7 am
- L_{Aeq} 40 dB elsewhere in the building (excluding a garage, kitchen bathroom or hallway) at any other time.

Neither the ISEPP nor DoP guidelines specifically define a target level for sleeping areas during daytime hours. To maintain a level of consistency between indoor noise amenity in living and sleeping areas during daytime hours, an $L_{Aeq,\ 15\ hours}$ limit of 40 dB is adopted by Koikas Acoustics. A summary of the applied rail noise planning levels is included in Table 4.

ISEPP requires that before any application is determined under which this clause applies, consideration must be given to guidelines that are issued by the Director-General. It is the understanding of Koikas Acoustics that the Director-General has issued guidelines relating to the determination of suitable indoor noise levels for development with open windows allowing natural ventilation of indoor areas. The Director-General has recommended under this condition (open windows) that indoor noise levels should not exceed:

- L_{Aeq} 45 dB in any bedroom in the building between the hours of 10 pm and 7 am.
- L_{Aeq} 50 dB elsewhere in the building (excluding a garage, kitchen bathroom or hallway) at any other time.

Koikas Acoustics has adopted for living and sleeping areas during daytime hours an $L_{Aeq,\ 15\ hours}$ 50 dB for windows and doors open. A summary of the rail noise planning levels is included in Table 3.

Table 4. Indoor design noise level [dB]

Design condition	Area	Noise metric	Day (7 am to 10 pm)	Night (10 pm to 7 am)
Windows/doors closed	Bedroom	L_{Aeq}	40	35
Windows/doors closed	Living area	L_{Aeq}	40	
Windows/doors open	Bedroom	L_{Aeq}	50	45
Windows/doors open	Living area	L_{Aeq}	50	

5.0 RAIL NOISE AND VIBRATION ASSESSMENT

5.1 NOISE

Calculating the resulting level of noise that is transmitted through a façade and into a room is dependent upon:

- the noise level to the external façade(s),
- the sound insulation performance of the building façade (inclusive of all building components), and
- the level of acoustic absorption that is present within the subject room.

A calibrated CadnaA noise model was used to predict external façade rail noise levels. The calibrated model considered:

- 151 trains passing by the site during daytime hours (between 7 am and 10 pm) – as per Sydney Trains timetables.
- 59 trains passing by the site during night hours (between 10 pm and 7 am) – as per Sydney Trains timetables.

Maximum external façade traffic noise levels are expected to be:

- Daytime $L_{Aeq,\ 15\ hours}$ 58 dB
- Nighttime $L_{Aeq,\ 9\ hours}$ 53 dB

at the ground floor level and along the northern façade of the building exposed to the rail corridor.

On account of the limited field of view of the rail corridor and partial noise shielding from adjacent buildings, rail noise will be lower along the sides of the building. The least noise-exposed façade of the building is along Hendy Avenue where noise shielding is provided by the subject building and surrounding buildings.

A maximum façade noise reduction of **18 dB** is required for the proposed residential dwelling to comply with the aforementioned criteria.

It is Koikas Acoustics' opinion that standard building materials will be sufficient to mitigate rail traffic noise and vibration intrusion. No additional acoustic attenuation measures are required.

In this case, rail traffic noise levels are not significant and naturally ventilated rooms are expected to achieve the 'open windows' noise criteria described in this report.

As the assessment site is not significantly impacted by rail noise, the noise impact can be adequately addressed by considering this site under Category 1, as defined by the document entitled "Development Near Rail Corridors and Busy roads – Interim Guideline", by the NSW Government Department of Planning (NSW DoPI). By achieving the minimum acoustic performance of building elements (Figure 1 of this report for Category 1) and utilising the standard building materials (Figure 2 of this report), the proposed residential dwelling is expected to be acoustically satisfactory.

Category of Noise Control Treatment	R_w of Building Elements (minimum assumed)				
	Windows/Sliding Doors	Frontage Facade	Roof	Entry Door	Floor
Category 1	24	38	40	28	29
Category 2	27	45	43	30	29
Category 3	32	52	48	33	50
Category 4	35	55	52	33	50
Category 5	43	55	55	40	50

Figure 2. The acoustic performance of building elements – Category 1 is applicable (extracted)

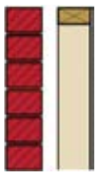
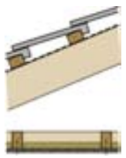
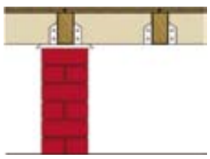
Category No.	Building Element	Standard Constructions	sample
1	**Windows/Sliding Doors**	Openable with minimum 4mm monolithic glass and standard weather seals	
	Frontage Facade	**Timber Frame or Cladding:** 6mm fibre cement sheeting or weatherboards or plank cladding externally, 90mm deep timber stud or 92mm metal stud, 13mm standard plasterboard internally	
		Brick Veneer: 110mm brick, 90mm timber stud or 92mm metal stud, minimum 50mm clearance between masonry and stud frame, 10mm standard plasterboard internally	
		Double Brick Cavity: 2 leaves of 110mm brickwork separated by 50mm gap	
	Roof	Pitched concrete or terracotta tile or metal sheet roof with sarking, 10mm plasterboard ceiling fixed to ceiling joists, R1.5 insulation batts in roof cavity.	
	Entry Door	35mm solid core timber door fitted with full perimeter acoustic seals	
	Floor	1 layer of 19mm structural floor boards, timber joist on piers	
		Concrete slab floor on ground	

Figure 3. Standard constructions and building materials for Category 1 assessment sites (extracted)

Alternative building materials could also be considered provided that adequate evidence is available to demonstrate compliance with the R_w ratings listed in Figure 2 of this report. The above standard building materials would be satisfactorily provided that there are no air gaps at the junctions.

5.1.1 Ventilation

In some cases where external rail traffic noise levels are high, it is not a viable option to naturally ventilate rooms through the opening of windows and/or doors. This is due to the level of traffic noise being transmitted through the open doors resulting in a breach of the applied noise criterion.

As a general rule, where windows or doors are opened sufficiently to provide natural ventilation to a room, the indoor noise level is 10 dB below the outside noise level. Therefore, a window or sliding door to a room may be opened to provide natural ventilation where the outdoor noise level does not exceed 10 dB above the "Windows open" criteria as detailed within this report.

In this case, rail noise levels are not loud enough to warrant mechanical ventilation and therefore natural open window ventilation to the indoor spaces will comply with the noise criteria.

5.2 VIBRATION

Rail vibration levels have been measured by Koikas Acoustic previously, at 50 Hendy Avenue, Panania. The survey location can be seen in Figure 1.

The assessment procedure of AS 2377-2002 considers that a minimum of 20 rail pass-by events should be recorded to acquire reliable vibration.

Rail vibration levels were measured with a Vibrock 901 seismograph. Vibration levels were recorded in the x-, y- and z-axes as unweighted R.M.S. acceleration. The survey data was subsequently analysed as per ISO2631-2:2003 to appropriate a Vibration Dose Value (VDV) in $m/s^{1.75}$ for each measured train pass-by event.

The calculated VDV's for all 20 recorded events were averaged. The average VDV for a single train pass-by event was then used to calculate the total Day and Night period VDV for all rail pass-bys.

A summary of the surveyed data is included below.

Table 3. Rail noise & vibration survey results		
Description	**Value**	**Measurement result**
Vibration from train pass-by	VDV (i)	0.044 m/s$^{1.75}$
Notes 1.	VDV (i) = Vibration Dose Vale for a single pass-by event	

Vibration levels (VDV) for individual pass-by events have been calculated from site survey results and are included in Table 3 of this report. Where the individual VDV values for commuter train pass-bys are corrected for the cumulative impact throughout the day and night periods based on the expected rail movements summarised above in Section 5.1, the total VDV for the day and night periods calculated for the future development are:

- Daytime total VDV (commuter and freight trains): 0.085m/s$^{1.75}$
- Nighttime total VDV (commuter and freight trains): 0.067m/s$^{1.75}$

These values are significantly below the human comfort thresholds recommended in the Department of Environment and Conservation NSW (DEC) *Assessing Vibration: a technical guideline*. As such, Koikas Acoustics expects a low probability of adverse comment. Below is an extract of Table 2.4 from the DEC's guideline.

Table 2.4 Acceptable vibration dose values for intermittent vibration (m/s$^{1.75}$)

Location	Daytime[1]		Night-time[1]	
	Preferred value	Maximum value	Preferred value	Maximum value
Critical areas[2]	0.10	0.20	0.10	0.20
Residences	0.20	0.40	0.13	0.26
Offices, schools, educational institutions and places of worship	0.40	0.80	0.40	0.80
Workshops	0.80	1.60	0.80	1.60

1 Daytime is 7.00 am to 10.00 pm and night-time is 10.00 pm to 7.00 am.
2 Examples include hospital operating theatres and precision laboratories where sensitive operations are occurring. These criteria are only indicative, and there may be a need to assess intermittent values against the continuous or impulsive criteria for critical areas.
Source: BS 6472–1992

Assessing vibration: a technical guideline

6.0 CONCLUSION

Koikas Acoustics was requested to prepare an acoustic report for the proposed residential development at 48 Hendy Avenue, Panania. The acoustic report is to accompany a development application being submitted to Canterbury Bankstown Council.

The assessment considers potential noise impacts to future occupants of the development, and to surrounding residents such that acceptable acoustic amenity for the area is maintained.

Acoustic planning levels have been referenced from current ISEPP and NSW DoP acoustic planning guidelines and requirements.

The included recommendations are based on designs prepared by McDonald Jones.

The conclusions reached in this report should assist Council in making their determination of the proposal in terms of compliance with the necessary acoustic design requirements. A further detailed acoustic report may be required for the CC submission should the building design be amended, or as required by Council.

Of the assessed components of noise, the following conclusions have been reached:

1. The building can be sufficiently insulated against existing external sources of noise in the area such as rail traffic associated with the T8 rail corridor.

In our professional opinion, there is sufficient scope within the proposed building design to achieve the applied acoustic planning guidelines.