

MANAGING DIRECTORS
MATTHEW PALAVIDIS
VICTOR FATTORETTO

GENERAL MANAGER
MATTHEW SHIELDS



Site 2A and 3A Walker St Rhodes

Acoustic Assessment Report

SYDNEY
A: 9 Sarah St Mascot NSW 2020
T: (02) 8338 9888
F: (02) 8338 8399

SYDNEY MELBOURNE BRISBANE CANBERRA
LONDON DUBAI SINGAPORE GREECE

www.acousticlogic.com.au
11 068 954 343

The information in this document is the property of Acoustic Logic Consultancy Pty Ltd ABN 11 068 954 343 and shall be returned on demand. It is issued on the condition that, except with our written permission, it must not be reproduced, copied or communicated to any other party nor be used for any purpose other than that stated in particular enquiry, order or contract with which it is issued.

TABLE OF CONTENTS

1	INTRODUCTION	4
2	SITE DESCRIPTION	4
3	NOISE DESCRIPTORS	6
4	NOISE IMPACT ASSESSMENT	7
4.1	NOISE IMPACT CRITERIA	7
4.2	EXTERNAL NOISE MEASUREMENTS	7
4.2.1	Unattended Measurements	7
4.2.2	Attended Measurements	7
4.2.3	Measured Noise Levels	7
4.3	RECOMMENDATIONS	8
4.4	POTENTIAL FUTURE INCREASE IN RAIL TRAFFIC	10
5	RAIL INDUCED VIBRATION	11
5.1	PROJECT VIBRATION OBJECTIVES	11
5.1.1	Tactile Vibration	11
5.1.2	Regenerated Noise (Structure Borne Vibration)	12
5.2	VIBRATION MEASUREMENTS	12
5.3	COMMENTS / RECOMMENDATIONS	12
6	NOISE EMISSION ASSESSMENT	13
6.1	BACKGROUND NOISE MONITORING	13
6.2	NOISE EMISSION OBJECTIVES	13
6.3	NOISE EMISSION ANALYSIS / COMMENTS	14
6.3.1	Mechanical Plant	14
6.3.2	Noise from Commercial/Retail Tenancies	14
7	CONCLUSION	15

1 INTRODUCTION

This report presents an analysis of acoustic impacts associated with the proposed mixed use development at sites 2A and 3A Walker Street, Rhodes.

This report has been prepared in order to address the following:

- Issues 6 and 8 as detailed in the Draft Director General's Requirements (DGR's).
- Bullet point 2 of the letter from Rail Corp dated 14 September 2010.
- Issues raised by the DECC in their letter of 13 September 2010

In this report we will:

- Identify environmental noise sources (primarily rail and traffic noise) which may impact future occupants and tenants on the site and recommend acoustic treatments to reduce these impacts to acceptable levels, as required by Director General's Requirement 6.
- Identify noise emissions which will be generated by the site (mechanical plant noise and increased vehicle noise) and recommend acoustic and management controls in order to reduce noise impacts on nearby properties and to new dwellings within the development, in satisfaction of Director General's Requirement 4.

2 SITE DESCRIPTION

The proposed development consists of a multi-storey residential development including 5 separate buildings with up to 24 levels of mixed retail and residential apartments .

Potential noise impacts on the site are primarily train noise from the northern line rail corridor, which lies approximately 35 metres to the east of the site boundary.

Noise potentially generated by the site will consist primarily of noise from mechanical plant.




The nearest potentially affected noise receivers are:

- Residential properties bounding the site to south;
- Future residential properties bounding the site to north;
- Other residential properties within the development;

Refer to Figure 1 below, which is an aerial photo of the existing development.



Figure 1 – Site Plan

-  SITE BOUNDARY
-  UNATTENDED MEASUREMENT LOCATION
-  ATTENDED MEASUREMENT LOCATION



3 NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-20 minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three-principle measurement parameters are used, namely L_{10} , L_{90} and L_{eq} .

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15 minute period. L_{eq} is important in the assessment of traffic noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

In the case of the LAeq (1 Hour) descriptor, the highest 10th-percentile hourly (or L_{10}) A-weighted Leq noise level applies when the particular class of building/place is in use.

4 NOISE IMPACT ASSESSMENT

4.1 NOISE IMPACT CRITERIA

Department of Planning Guideline Development Near Rail Corridors and Busy Roads – Interim Guidelines acoustic requirements are presented below. These are the criteria that will be adopted in this assessment.

Table 1 - Internal Railway Noise Level Criteria

LOCATION	TIME OF DAY	Allowable Noise Level
Living and sleeping areas	Day (7am-10pm)	40dB(A) $L_{eq(15hr)}$
	Night (10pm-7am)	35dB(A) $L_{eq(9hr)}$

4.2 EXTERNAL NOISE MEASUREMENTS

Noise levels generated by road traffic on Walker Street and rail movements on the northern rail line were measured using short term attended measurements and long term noise monitoring.

Measurements were performed generally in accordance with the Australian Standard AS 1055 - "Description and measurement of environmental noise - General Procedures".

Measurement locations are detailed above in figure 1.

4.2.1 Unattended Measurements

Unattended measurements were carried out from 8th October 2010 till 13th October 2010. An Acoustic Research Laboratories Pty Ltd noise monitor was used. The monitor was programmed to store 15 minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of the measurements; no significant drift was detected. Measurements were taken on A-weighted fast response mode.

4.2.2 Attended Measurements

Attended measurements were conducted on 13th October 2010. A CEL 593 Type 1 Sound Analyser was used for the noise measurements. The analyser was set to fast response and calibrated before and after the measurements using a Norsonics Sound Calibrator type 1251. No significant drift was noted.

4.2.3 Measured Noise Levels

The external noise levels from measurements conducted on site are detailed in Table 2 below. The levels take into account the measured level during the passby, the duration of the train passby and the number of rail movements per hour.

Table 2 – Unattended Measured Noise Levels

LOCATION	Daytime Level dB(A) $L_{eq}(15hour)$	Night time Level dB(A) $L_{eq}(9hour)$
Eastern façade of 40 Walker St (approx 40 metres from rail line)	63	58

4.3 RECOMMENDATIONS

Noise intrusion into the proposed development will be assessed using the measured levels in table 2. Calculations were performed taking into account the orientation of windows, barrier effects, roof, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way the likely interior noise levels can be predicted.

In all cases, the selected glazing type (refer below) reduces external noise to internal noise levels within the nominated criteria for the various space types. The external noise levels used in the calculations are those that would occur when the buildings are constructed on the site.

Table 3 - Glazing Constructions Block A and D

Façade	Level	Unit	Room Type	Glazing	Seals
Eastern (including east facing Bedroom windows at rear of building)	All	All	Bedroom	6.38mm or 6.38mm laminated/12/6mm	Yes
			Living	6.38mm or 6.38mm laminated/12/6mm	Yes
Northern and Southern	All	All	Bedroom	6.38mm or 6mm/12/6mm	Yes
			Living	6.38mm or 6mm/12/6mm	Yes
Western	All	All	Bedroom	6mm or 6mm/12/6mm	Yes
			Living	6mm or 6mm/12/6mm	Yes

Table 4 - Glazing Constructions Block B

Façade	Level	Unit	Room Type	Glazing	Seals
Northern	All	All	Bedroom	6mm or 6mm/12/6mm	Yes
			Living	6mm or 6mm/12/6mm	Yes
Remaining	All	All	Bedroom	4mm or 6mm/12/6mm	Yes
			Living	4mm or 6mm/12/6mm	Yes

Table 5 - Glazing Constructions Block E

Façade	Level	Unit	Room Type	Glazing	Seals
Southern and Eastern	All	All	Bedroom	6mm or 6mm/12/6mm	Yes
			Living	6mm or 6mm/12/6mm	Yes
Remaining	All	All	Bedroom	4mm or 6mm/12/6mm	Yes
			Living	4mm or 6mm/12/6mm	Yes

Table 6 - Glazing Constructions Block C

Façade	Level	Unit	Room Type	Glazing	Seals
Eastern, Southern and Northern	All	All	Bedroom	6mm or 6mm/12/6mm	Yes
			Living	6mm or 6mm/12/6mm	Yes
Remaining	All	All	Bedroom	4mm or 6mm/12/6mm	Yes
			Living	4mm or 6mm/12/6mm	Yes

Note: Final glazing thickness will be determined following the final design of elevations.

Thicker glazing may be required for structural, safety or other purposes. Where it is required to use thicker glazing than scheduled, this will also be acoustically acceptable.

It is recommended that only window systems having test results indicating compliance with the required ratings obtained in a certified laboratory be used where windows with acoustic seals have been recommended.

In addition to complying with the minimum scheduled glazing thickness, the STC rating of the glazing fitted into open-able frames and fixed into the building opening should not be lower than the values listed in Table 5 for all rooms. Where nominated, this will require the use of acoustic seals around the full perimeter of open-able frames and the frame will need to be sealed into the building opening using a flexible sealant. Note that all these windows are assumed as aluminium awning windows and mohair seals in windows and doors are not acceptable where acoustic seals are required.

Table 7 - Minimum STC of Glazing

Glazing Assembly	Acoustic Seals	Minimum STC of Installed Window
6.38mm laminated or 6.38mm laminated /12mm airgap/6mm	Yes	31
6mm/12mm airgap/6mm	Yes	30
6mm	Yes	29
4mm	Yes	27

The window/door suppliers should provide evidence that the systems proposed have been tested in a registered laboratory with the recommended glass thicknesses and comply with the minimum STC requirements listed in. Also, the glazing installer should certify that the window/doors have been constructed and installed in a manner equivalent to the tested samples.

4.4 POTENTIAL FUTURE INCREASE IN RAIL TRAFFIC

We note that rail movements on the northern line are predicted to increase. The acoustic treatments discussed above have been designed such that a comparatively large increase in rail movements (a doubling) can occur while still achieving compliance with Department of Planning recommended internal noise levels.

5 RAIL INDUCED VIBRATION

Trains induce ground borne vibration that is transmitted through the subsoil. This vibration can be perceptible close to railways.

5.1 PROJECT VIBRATION OBJECTIVES

5.1.1 Tactile Vibration

The RIC's and SRA's Interim Guidelines recommend that habitable rooms should comply with the criteria in British Standard BS 6472:1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)".

British Standard BS 6472:1992 "Evaluation of Human Exposure to Vibration in Buildings (1Hz to 80Hz)" is recommended by the RIC's and SRA's Interim Guidelines for Councils "Consideration of rail noise and vibration in the planning process" as this standard includes guidance for the assessment of human response to building vibration including intermittent vibrations such as that caused by trains.

Human response to vibration has been shown to be biased at particular frequencies, which are related to the orientation of the person. This standard provides curves of equal annoyance for various orientations. These curves are applied as correction filters such that an overall weighted acceleration level is obtained. As the orientation of the resident is unknown or varying the weighting filter used is based on the combined base curve as given in ISO 2631 & Australian Standard 2670 "Evaluation of Human Exposure to Vibration and Shock in

Buildings (1 to 80Hz)" which represents the worst case of the X, Y and Z axes. Filtered measurements are made in all three co-ordinate axes and the highest value axis used.

This standard assesses the annoyance of intermittent vibration by using the Vibration Dose Value (VDV). Alternatively the VDV may be estimated by the eVDV which is derived by a simpler calculation using an empirical factor. The VDV or eVDV is calculated for the two periods of the day being the "Daytime" (6am-10pm) and "Night time" (10pm-6am). The overall value is then compared to the levels in Table 5. For this project the aim will be for a low probability of adverse comment.

Table 8 - Vibration Dose Values ($m/s^{1.75}$) above which various degrees of adverse comment may be expected in residential buildings.

PLACE	LOW PROBABILITY OF ADVERSE COMMENT	ADVERSE COMMENT POSSIBLE	ADVERSE COMMENT PROBABLE
Residential buildings 16hr day (Daytime)	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8hr night (Night time)	0.13	0.26	0.51

We note that the objectives referred to above are also consistent with the DECCW document "Assessing Vibration: A Technical Guideline".

5.1.2 Regenerated Noise (Structure Borne Vibration)

The rail structure borne noise level objective will be based on the noise level recommended by RIC guidelines. Where developments are located over rail tunnels (and hence airborne noise from the rail is not audible), resulting structure borne noise level within proposed residential spaces should not exceed 40 dB(A) L_{max} . At this level, structure radiated noise levels would be audible but not excessively intrusive.

As the railway line affecting the development is above ground, airborne noise associated with a train passby will mask structure borne noise and treatment of airborne noise will comply with the internal noise level criteria.

5.2 VIBRATION MEASUREMENTS

Rail noise measurements were conducted in line with the future proposed eastern façade which is the potentially worst affected façade nearest to the railway lines.

Attended train noise measurements were conducted on 8th October 2010. A Svan 958 Sound and Vibration Analyser was used for the vibration measurements. The analyser was connected to a four channel input module fitted with a Dytran triaxial accelerometer.

The measured vibration levels, duration of train passby and the number of rail movements per hour were used to determine the overall vibration dose (VDV) at the proposed development for both daytime and night time periods. The results are presented the table below

Table 9 - Vibration Dose Values

Time Period	Calculated VDV $m/s^{1.75}$	Criteria VDV $m/s^{1.75}$	Complies
Day (6am – 10pm)	<0.1	0.2 to 0.4	Yes
Night (10pm -6am)	<0.07	0.13	Yes

5.3 COMMENTS / RECOMMENDATIONS

The Vibration Dose Values were found to be less than the “low probability of adverse comment” criteria (the most stringent criteria) for the subject site.

No vibration attenuation treatment to the development is required.

Measured vibration levels are significantly lower than acoustic criteria. Even a very significant increase in rail traffic in the future (more than three times current levels) could be accommodated without the need for any vibration isolation of the building.

6 NOISE EMISSION ASSESSMENT

Noise emissions from the site will be assessed to ensure that the amenity of nearby land users (both new occupants in the development and residents in nearby properties) is not adversely affected.

The following noise sources will be assessed:

- Mechanical plant noise.
- Noise from retail/commercial tenancies within the development.

6.1 BACKGROUND NOISE MONITORING

Unattended noise monitoring was conducted between 8 and 13 October 2010 using an Acoustic Research Laboratories monitor set on A-weighted fast response mode. The monitor was calibrated before and after the measurements using a Rion Type NC-73 calibrator. No significant drift was recorded.

The monitor was installed on an east facing balcony in the adjacent residential development see figure 1). Background noise levels measured at this location will be indicative of the background levels that would be measured at the nearby residential properties (both within the development, and in the general vicinity).

Measured background noise levels are presented below.

Table 10 – Measured Background Noise Levels

Location	Background noise level dB(A) _{L₉₀}		
	Daytime (7am-6pm)	Evening (6pm-10pm)	Night time (10pm-7am)
Walker Street, Rhodes	50	48	38

6.2 NOISE EMISSION OBJECTIVES

Noise emissions generated by the site should comply with the acoustic requirements of the Industrial Noise Policy Objectives, (both Amenity and Intrusiveness Criteria).

Intrusiveness criteria are calculated with reference to the background noise levels presented above.

The Intrusiveness and Amenity Criteria are presented below.

Table 11 – Noise Emission Requirements – Residential Receivers

Receiver Type	Time of Day	Intrusiveness Noise Objective $L_{eq(15min)}$ (Background + 5dB)	Amenity Noise Objective (Suburban Areas) $dB(A)L_{eq(Period)}$
All Potentially Affected Residential Properties	Day Time (7am – 6pm)	55	55
	Evening (6pm – 10pm)	53	45
	Night (10pm-7am)	43	40

6.3 NOISE EMISSION ANALYSIS / COMMENTS

6.3.1 Mechanical Plant

Detailed review of all external mechanical plant will be undertaken at construction certificate stage (once plant selections and locations are finalised). Acoustic treatments should be determined in order to control plant noise emissions to the levels set out in section 6.2 of this report.

All plant items can be satisfactorily attenuated to levels complying with Industrial Noise Policy criteria through appropriate location and (if necessary) acoustic treatments such as screens, enclosures and in-duct treatments (attenuators or lining).

6.3.2 Noise from Commercial/Retail Tenancies

Loading docks, mechanical plant (kitchen exhaust fans) and the outdoor dining areas have the potential to disturb residents of nearby residential units.

We assume that the use of any of the tenancies with the potential to create significant amounts of noise would be the subject of a development application from the proposed tenant.

Noise emission impacts on residents within the development can be suitably addressed through control of patron numbers and trading times to ensure reasonable amenity of future tenants.

7 CONCLUSION

Potential noise impacts of the proposed residential / commercial development at sites 2A and 3a at Walker Street, Rhodes have been assessed.

In this report, acoustic concerns raised by the Department of Planning, Railcorp and the DECCW have been addressed. In particular:

- As required by DGR 6, noise impacts from nearby noise sources (rail) on future occupants or tenants have been assessed in accordance with Interim Guidelines for Development Near Rail Corridors and Busy Roads". The acoustic treatments necessary to achieve these objectives have been set out in sections 4 and 5.
- As required by DGR 4, noise emissions from the operational noise from the site (in particular mechanical plant noise and noise from commercial tenancies) have been assessed against the DECCW Industrial Noise Policy. Compliance with noise emissions goals is achievable provided that the recommendations set out in section 6 of this report are adopted.

Yours faithfully,

Acoustic Logic Consultancy Pty Ltd
Glen Campbell