RODNEY STEVENS ACOUSTICS
Acoustic Consultants
Member Australian Acoustical Society

Proposed Residential Development

56 Beane Street, Gosford

Construction Noise and Vibration Management Plan

REPORT R190587R1

Revision 0

Prepared for:

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25 November 2019

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DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
R190587R1	Revision 0	25 November 2019	Dani Awad	Desmond Raymond	Rodney Stevens

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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (RSA) has been engaged by McNally Management Pty Ltd. to prepare a construction noise and vibration management plan for the proposed development located at 56 Beane Street, Gosford NSW.

McNally Management requires a statement addressing construction noise and vibration management to accompany the latest submission to council. The primary purpose of the assessment is to provide a management plan of potential impact of noise and vibration emissions from the construction of the proposed development to the nearby sensitive receivers.

Specific acoustic terminology is used in this report. An explanation of common acoustic terms is provided in Appendix C.

2 PROJECT OVERVIEW

2.1 Proposed Development

The proposed development is located at 56 Beane Street, Gosford NSW. The project area (red) it's surrounding environment and potential sensitive receivers (orange) are presented in Figure 2-1 below.

Figure 2-1 Project Area and Surrounding Environment

Aerial image courtesy of © 2019 Nearmap Ltd

3 EXISTING NOISE ENVIRONMENT

Attended noise measurements for the proposed residential development were carried out on Friday 22nd November.

The location was selected after a detailed inspection of the project area and taking into consideration other noise sources that may influence the readings, the proximity of noise-sensitive receivers and security issues for the noise monitoring device and gaining permission for access from the residents or landowners. The results of the ambient noise monitoring are shown in Table 3-1.

Instrumentation for the survey comprised a Svantek 979 Sound Level Meter (Serial number: 34079) fitted with microphone windshield. Calibration of the meter was checked prior to and following measurements. Drift in calibration did not exceed ±0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The meter continuously sampled noise levels over the entire survey period, and calculated relevant statistical indices for each 15-minute interval. Data measured during periods of adverse weather established through consultation with historical weather reports provided by the Bureau of Meteorology (BOM), has been excluded.

Table 3-1 Measured Existing Noise Levels Corresponding Assessment Time Periods

Logger Location	Noise Level – dBA re 20 µPa					
	Daytime 7.00 am – 6.00 pm		Evening 6.00 pm – 10.00 pm		Night-time 10.00 pm – 7.00 am	
	RBL [1]	LAeq [2]	RBL	LAeq	RBL	LAeq
56 Beane Street	43	51	-	-	-	-

Note 1: The RBL noise level is representative of the average minimum background sound level (in the absence of the source under consideration), or simply the background level.

Note 2: The LAeq is essentially the average sound level. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound.

4 ASSESSMENT CRITERIA

4.1 Construction Noise and Vibration Criteria

4.1.1 Construction Noise

Noise criteria for construction works are established in accordance with the EPA *Interim Construction Noise Guidelines* (ICNG).

All construction works are to be undertaken during daytime core hours of 7 am–6 pm Monday to Friday and 7 am - 1 pm Saturdays. No construction works are anticipated to be required outside of the standard daytime standard construction hours unless otherwise approved.

The ICNG provides recommended construction (airborne) noise management levels for residential receivers as detailed in Table 4-1. Site-specific noise management levels (NML) have been established adopting the background noise levels (L_{A90}) measured within the project site.

The noise management levels are designed as a trigger for the project to investigate feasible and reasonable noise management and mitigation measures to reduce noise impacts at nearest noise-affected receivers.

Table 4-1 Recommended Residential Construction Noise Criteria

Time of construction	Noise Management level $L_{Aeq, 15min}$	Adopted noise NML $L_{Aeq, 15min}$ at neighbouring residences
Standard construction hours Monday to Friday 7 am – 6 pm Saturday 7 am-1 pm No work on Sundays or public holidays Rock breaking Monday to Friday 9 am – 5 pm ONLY	Noise affected receivers RBL + 10 dB(A)	53 dB(A)

Note: RBL rating background level, the measured L_{A90} noise level.

As construction works for the proposed development will only be carried out during the daytime period, a standard daytime construction noise management level for the neighbouring residential receivers of 53 dB(A) $L_{Aeq, 15min}$ has been adopted in accordance with the ICNG. NMLs for the evening and night periods are not applicable to this assessment.

A 75 dB(A) $L_{Aeq,15min}$ highly noise affected construction noise management level will be applied as a trigger for the application of additional construction noise controls such as respite periods or restriction of construction hours of operation. This trigger would apply to noise impacts on residential receivers only.

The recommended noise management levels are planning goals only. Factors such as the social benefits of the activity, economic constraints, and the nature and duration of the proposed construction program need to be considered when assessing potential noise impacts from construction works.

4.1.2 Construction Vibration

Vibration during construction works is considered an intermittent source associated with two main types of impact; disturbance at receivers and potential architectural/structural damage to buildings. Generally, if disturbance issues are controlled, there is limited potential for structural damage to buildings.

Detailed in Table 4-2, the ICNG guidance adopts the *Environmental Noise Management Assessing Vibration: a technical guideline* (2006) for the assessment of human annoyance due to construction vibration. German Standard DIN 4150: Part 3-1999, provides guidelines for evaluating the effects of vibration on structures.

Dependent upon the dominant frequency of vibration, assessed in Hertz (Hz), structural vibration limits are established at the foundation of nearest buildings.

Table 4-2 Adopted Vibration Constriction Criteria

Receiver	Annoyance VDV criteria, $m/s^{1.75}$		Structural PPV criteria, mm/s
	Preferred	Maximum	
Residential	0.2	0.4	5 - 20

Notes: Structural vibration goals established for < 10 – 100 Hz dominant frequency of vibration.

VDV = vibration dose value; PPV = peak particle velocity

5 CONSTRUCTION NOISE & VIBRATION MANAGEMENT PLAN

5.1 Noise Control

The following noise mitigation measures will be implemented if required. The contractor, where feasible, will apply best practice noise mitigation measures, including:

- Maximising the offset distance between noisy plant items and nearby noise sensitive receivers.
- Avoiding the coincidence of noisy plant working simultaneously close together and adjacent to sensitive receivers.
- Minimising consecutive works in the same locality.
- Orienting equipment away from noise sensitive areas.
- Carrying out loading and unloading away from noise sensitive areas.

In order to minimise noise impacts during the works, the construction contractor will take all reasonable and feasible measures to mitigate noise effects.

The contractor will also take reasonable steps to control noise from all plant and equipment. Examples of appropriate noise control include efficient silencers and low noise mufflers.

Silenced air compressors, fitted with noise labels indicating a maximum (L_{Amax}) sound pressure level of not more than 70 dB(A) at 7 m will be used on site. The sound pressure level of noise emitted from a compressor used will comply with noise label requirements.

5.2 Vibration Control

The contractor must implement the following vibration mitigation measures:

- Relocate any vibration generating plant and equipment to areas within the site in order to lower the vibration impacts.
- Investigate the feasibility of rescheduling the hours of operation of major vibration generating plant and equipment.
- Use lower vibration generating items of excavation plant and equipment e.g. smaller capacity rock breaker hammers.
- Minimise consecutive works in the same locality (if applicable).
- Schedule a minimum respite period of at least 0.5 hours before activities commence which are to be undertaken for a continuous four-hour period.

5.3 Summary of Mitigation Measures

The noise and vibration mitigation measures to be implemented by the construction contractor are listed in Table 5-1.

Table 5-1 Summary of Noise & Vibration Mitigation Measures

Item	Description
Construction Hours	Works will be carried out within the standard construction hours.
Deliveries	Deliveries will be carried out within the standard construction hours.
Site Layout	Where possible, plant and equipment will be located and orientated to direct noise away from sensitive receivers.
Quietest Suitable Equipment	Plant and equipment will be selected to minimise noise emission, where possible, whilst maintaining efficiency of function. Residential grade silencers will be fitted and all noise control equipment will be maintained in good order.
Hammer Equipment	Maximise hammer penetration (and reduce blows) by using sharp hammer tips. Keep stocks of sharp profiles at site, and monitor the profiles in use.
Reversing Alarms	Mobile plant and trucks operating on site for a significant portion of the project will have reversing alarm noise emissions minimised, where possible, recognising the need to maintain occupational safety standards.
PA System	No public address system will be used at this site.
Truck Noise (off site)	All trucks regularly used for the project are to have mufflers, and any other noise control equipment, maintained in good working order. Trucking routes will use main roads, where feasible.
Construction Hours	Works will be carried out within the standard construction hours.

5.4 Identifying and Managing Future Noise & Vibration Issues

If additional activities or mechanical plants are found to be necessary that will emit noise and/or vibration emissions significantly exceeding those assumed for this assessment, the Acoustical Consultant on a case-by-case basis will if required, assess these and appropriate mitigation measures will be implemented.

5.5 Complaint Handling

The construction contractor will adopt the following protocol for handling complaints. This protocol is intended to ensure that the issues are addressed and that appropriate corrective action is identified and implemented as necessary:

- The project manager will record all verbal and telephone complaints in writing and will forward all complaints to the contractor, together with details of the circumstance leading to the complaint and all subsequent actions.
- Complaints received by the contractor, will initially be referred to the project manager who will respond as described above.
- The contractor will investigate the complaint in order to determine whether a criterion exceedance has occurred or whether noise and/or vibration have occurred unnecessarily.
- If excessive or unnecessary noise and/or vibration has been caused, corrective action will be planned and implemented by the project manager.
- Complainants will be informed by contractor that their complaints are being addressed, and (if appropriate) that corrective action is being taken.

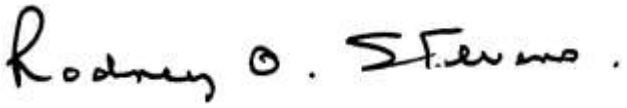
- Complainants will be informed of the implementation of the corrective action that has been taken to mitigate the adverse effects.

6 CONCLUSION

Rodney Stevens Acoustics has conducted a construction noise and vibration management plan for the proposed development site at 56 Beane Street, Gosford NSW.

The assessment has been conducted to satisfy regulatory criteria. Requirements within neighbouring, sensitive residential receivers will be achieved in conjunction with the recommendations set out in this report.

Approved: -



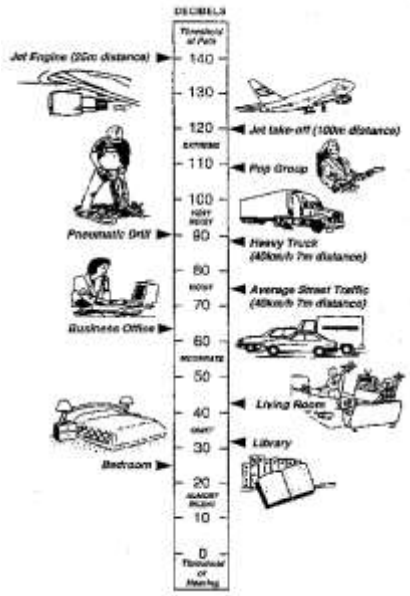
Rodney Stevens - MAAS

Appendix A – Acoustic Terminology

A-weighted sound pressure	The human ear is not equally sensitive to sound at different frequencies. People are more sensitive to sound in the range of 1 to 4 kHz (1000 – 4000 vibrations per second) and less sensitive to lower and higher frequency sound. During noise measurement an electronic '*A-weighting*' frequency filter is applied to the measured sound level *dB(A)* to account for these sensitivities. Other frequency weightings (B, C and D) are less commonly used. Sound measured without a filter is denoted as linear weighted dB(linear).
Ambient noise	The total noise in a given situation, inclusive of all noise source contributions in the near and far field.
Community annoyance	Includes noise annoyance due to: ▪ character of the noise (e.g. sound pressure level, tonality, impulsiveness, low-frequency content) ▪ character of the environment (e.g. very quiet suburban, suburban, urban, near industry) ▪ miscellaneous circumstances (e.g. noise avoidance possibilities, cognitive noise, unpleasant associations) ▪ human activity being interrupted (e.g. sleep, communicating, reading, working, listening to radio/TV, recreation).
Compliance	The process of checking that source noise levels meet with the noise limits in a statutory context.
Cumulative noise level	The total level of noise from all sources.
Extraneous noise	Noise resulting from activities that are not typical to the area. Atypical activities may include construction, and traffic generated by holiday periods and by special events such as concerts or sporting events. Normal daily traffic is not considered to be extraneous.
Feasible and reasonable measures	Feasibility relates to engineering considerations and what is practical to build; reasonableness relates to the application of judgement in arriving at a decision, considering the following factors: ▪ Noise mitigation benefits (amount of noise reduction provided, number of people protected). ▪ Cost of mitigation (cost of mitigation versus benefit provided). ▪ Community views (aesthetic impacts and community wishes).

- Noise levels for affected land uses (existing and future levels, and changes in noise levels).

Impulsiveness	Impulsive noise is noise with a high peak of short duration or a sequence of these peaks. Impulsive noise is also considered annoying.
Low frequency	Noise containing major components in the low-frequency range (20 to 250 Hz) of the frequency spectrum.
Noise criteria	The general set of non-mandatory noise levels for protecting against intrusive noise (for example, background noise plus 5 dB) and loss of amenity (e.g. noise levels for various land use).
Noise level (goal)	A noise level that should be adopted for planning purposes as the highest acceptable noise level for the specific area, land use and time of day.
Noise limits	Enforceable noise levels that appear in conditions on consents and licences. The noise limits are based on achievable noise levels, which the proponent has predicted can be met during the environmental assessment. Exceedance of the noise limits can result in the requirement for either the development of noise management plans or legal action.
Performance-based goals	Goals specified in terms of the outcomes/performance to be achieved, but not in terms of the means of achieving them.
Rating Background Level (RBL)	The rating background level is the overall single figure background level representing each day, evening and night time period. The rating background level is the 10^{th} percentile min L_{A90} noise level measured over all day, evening and night time monitoring periods.
Receptor	The noise-sensitive land use at which noise from a development can be heard.
Sleep disturbance	Awakenings and disturbance of sleep stages.
Sound and decibels (dB)	Sound (or noise) is caused by minute changes in atmospheric pressure that are detected by the human ear. The ratio between the quietest noise audible and that which should cause permanent hearing damage is a million times the change in sound pressure. To simplify this range the sound pressures are logarithmically converted to decibels from a reference level of 2 x 10-5 Pa. The picture below indicates typical noise levels from common noise sources.



dB is the abbreviation for decibel – a unit of sound measurement. It is equivalent to 10 times the logarithm (to base 10) of the ratio of a given sound pressure to a reference pressure.

Sound Power Level (SWL)

The sound power level of a noise source is the sound energy emitted by the source. Notated as SWL, sound power levels are typically presented in *dB(A)*.

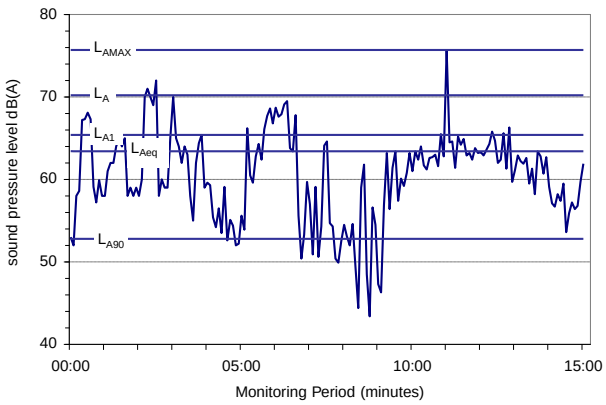
Sound Pressure Level (SPL)

The level of noise, usually expressed as SPL in *dB(A)*, as measured by a standard sound level meter with a pressure microphone. The sound pressure level in *dB(A)* gives a close indication of the subjective loudness of the noise.

Statistical noise levels

Noise levels varying over time (e.g. community noise, traffic noise, construction noise) are described in terms of the statistical exceedance level.

A hypothetical example of A weighted noise levels over a 15 minute measurement period is indicated in the following figure:



Key descriptor

- LAmax Maximum recorded noise level.

- LA1 The noise level exceeded for 1% of the 15 minute interval.
- LA10 Noise level present for 10% of the 15 minute interval. Commonly referred to the average maximum noise level.
- LAeq Equivalent continuous (energy average) A-weighted sound pressure level. It is defined as the steady sound level that contains the same amount of acoustic energy as the corresponding time-varying sound.
- LA90 Noise level exceeded for 90% of time (background level). The average minimum background sound level (in the absence of the source under consideration).

Threshold	The lowest sound pressure level that produces a detectable response (in an instrument/person).
Tonality	Tonal noise contains one or more prominent tones (and characterised by a distinct frequency components) and is considered more annoying. A 2 to 5 dBA penalty is typically applied to noise sources with tonal characteristics.

Appendix B - Calibration Certificate

NATacoustic
Acoustic Calibration & Testing Laboratory
Level 1, 418A Elizabeth Street, Surry Hills NSW 2010 AUSTRALIA
Ph: (02) 8218 0578 email: service@natacoustic.com.au website: www.natacoustic.com.au
A division of Renzo Tonin & Associates (NSW) Pty Ltd ABN 29 117 462 861

Certificate of Calibration
Sound Level Meter

Calibration Date	29/11/2017	Job No	R88588	Operator	AM
Client Name	RODNEY STEVENS ACOUSTICS PTY LTD				
Client Address	PO BOX 552, WAHROONGA, NSW 2076				

Test Item

Instrument Make	SVANTEK	Model	979	Serial No	#34075
Microphone Make	GRAS	Model	40AE	Serial No	#178253
Preamplifier Make	SVANTEK	Model	SV17	Serial No	#25290
Ext'n Cable Make	NI	Model	N/A	Serial No	N/A
Accessories	NI			Firmware	1.39.3

SLM Type	1
Filters Class	1

Environmental Conditions	Measured	
	Start	End
Air Temp. (°C)	24.1	22.8
Rel. Humidity (%)	53.5	55.4
Air Pressure (kPa)	101.3	100.5

Applicable Standards:
Periodic tests were performed in accordance with procedures from IEC 61672-3: 2013

Applicable Work Instruction:
WI-08: SLM & Calibrator Verification

Laboratory Equipment :
B&K4226 Multifunction Acoustic Calibrator SN 2288472
Agilent Function Generator Model 33220A SN MY43004013
Agilent Digital Multimeter Model 34401A SN MY41004366

Traceability:
Accredited for compliance with ISO/IEC 17025.
The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards. This document shall not be reproduced, except in full.

Scope:
This certificate is issued on the basis that the instrument complies with the manufacturer's specification. See "Sound Level Meter Verification - Summary of Tests" page for an itemised list of results for each test.

Uncertainty:
The uncertainty is stated at a confidence level of 95% using a k factor of 2.

Calibration Statement:
The sound level meter submitted for testing has successfully completed the periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent testing organization responsible for approving the results of pattern evaluation tests performed in accordance with AS IEC 61672-2:2013, to demonstrate that the mode of sound level meter fully conformed to the class 1 specifications in AS IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 specifications of AS IEC 61672-1:2013.

NATA
WORLD RECOGNISED ACCREDITATION

NATA Accredited Laboratory Number 14366

Authorised Signatory:

Print Name: Renzo Tonin Date: 4 Dec 2017

Template Document Name: R07-03 (rev 4) SLM ISO Verification

R88588703 (rev 4) NATA CALIBRATION OF SVANTEK TYPE 979 #34075 1 of 25 Certificate