RODNEY STEVENS ACOUSTICS
Acoustic Consultants
Member Australian Acoustical Society

Proposed Child Care Centre
Acoustic Impact Assessment

15 Hyacinth Street
Greystanes NSW 2145

REPORT R180318R2
Revision 1

Prepared for:
Baini Design
1B Villiers Street
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11 February 2019

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Acoustic Impact Assessment

15 Hyacinth Street, Greystanes NSW 2145

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DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
R180318R1	Revision 0	9 July 2018	Thomas Carney	Desmond Raymond	Rodney Stevens
R180318R2	Revision 1	11 February 2019	Thomas Carney	Desmond Raymond	Rodney Stevens

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1 INTRODUCTION

Rodney Stevens Acoustics Pty Ltd (RSA) has been commissioned by Baini Design to undertake an acoustical assessment of a proposed 30 place child care centre located at 15 Hyacinth Street, Greystanes NSW 2145. This assessment has been prepared to assist council's consideration of the submission.

This report details the results of ambient noise measurements, calculations of potential noise emissions and the assessment of operational noise emissions from the proposed facility upon surrounding potentially affected sensitive receivers. The report also addresses the impact of road traffic noise upon the proposed centre.

Council has requested additional information as part of the assessment and this has been included in this version of the report.

A glossary of the acoustical terminology used throughout this report is contained within **Appendix A**.

2 PROJECT DESCRIPTION

2.1 Proposed Development

The proposal is to build a child care centre to accommodate 30 children. The centre is proposed to operate between 7:00 am and 6:00 pm, Monday to Friday.

The proposed children age groups are:

- 2 years – 3 years: 10 children
- 3 years – 5 years: 20 children

A variety of activities will be provided throughout the day, these activities involve both indoor free-play and structured learning and play.

The times and the number of children engaged in play varies, however, conservative calculations have been based on the assumption that all children may be involved in play in the proposed play areas.

2.2 Site Location

The proposed child care centre (CCC) is located at 15 Hyacinth Street, Greystanes NSW.

The site will be exposed to contributions from local traffic. The surrounding premises are residential and Widemere Public School servicing the area.

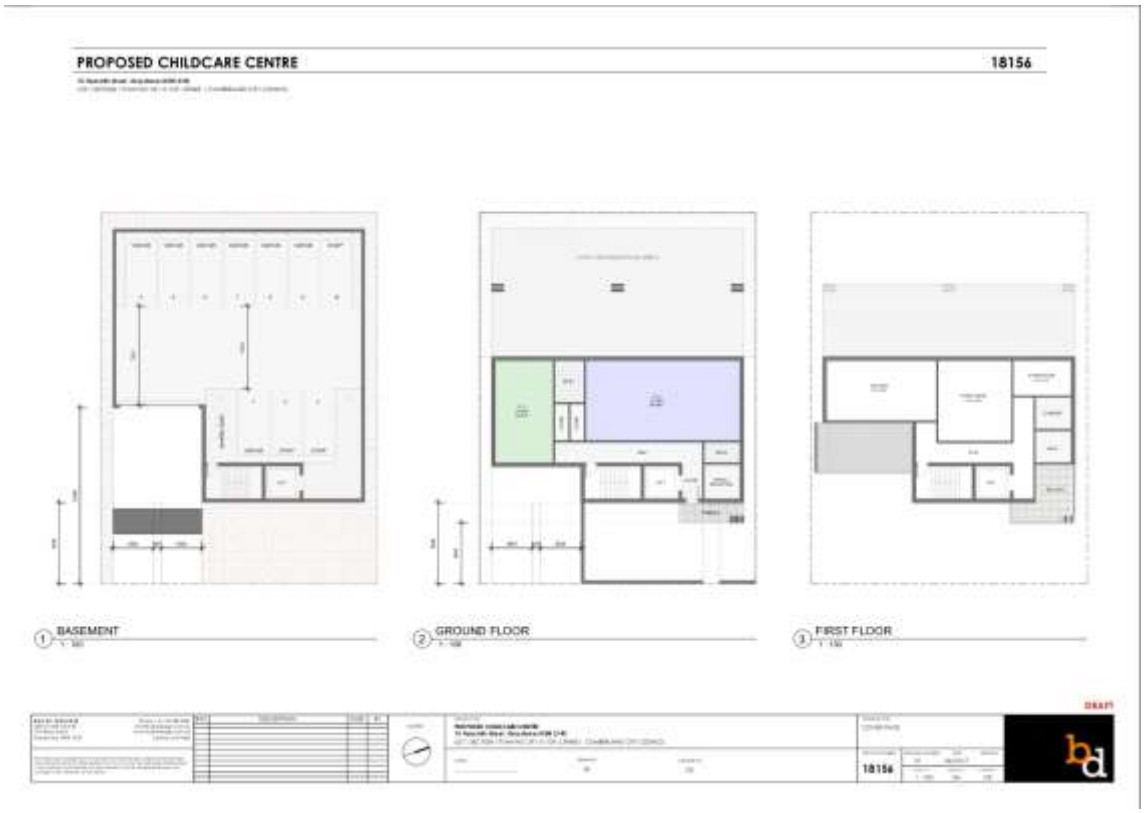
The site location is shown in Figure 2-1.

Figure 2-1 Site Location

Aerial image of courtesy of © 2018 nearmap ltd

The proposed site plan is presented in Figure 2-2.

Figure 2-2 Floor Plans



3 ASSESSMENT CRITERIA

3.1 Association of Australian Acoustical Consultants (AAAC)

A guideline for the assessment of noise from child care centres has been prepared by the Association of Australian Acoustical Consultants (AAAC) as a result of a NSW Australian Acoustical Society (AAS) Technical Meeting held in September 2007 on Child Care Noise. The document, *AAAC Guideline for Child Care Centre Acoustic Assessment*, *October 2013*, provides criteria for the assessment of noise intrusion into and noise emissions from child care centres and provides recommendations for treatment to minimise acoustical impacts upon neighbouring premises. The guideline has been placed before the Land and Environment Court during matters involving child care centre applications.

3.1.1 Indoor Activities, Mechanical Plant & On-Site Traffic

The AAAC recommended criterion is that the $L_{Aeq(15minute)}$ noise level emitted from the cumulative operation of indoor activities, mechanical plant and traffic on the site shall not exceed the background noise level by more than 5 dB at the assessment location. The assessment location is defined as the most affected point on or within any sensitive receiver property boundary.

The limiting criterion for continuous operational noise emissions, such as indoor activity noise and mechanical plant is “background noise level by not more than 5 dB” based upon the NPfI procedures. However in accordance with NPfI principles, where a noise source occurs over a limited duration throughout the day, adjustments are applied to the acceptable noise level at the receiver.

These adjustments generally apply where a single-event noise is continuous for a period less than two and a half hours in any 24-hour period. Applying such an adjustment to the assessment criterion for a CCC carpark operation would not seem unreasonable given the operation of the source of noise is mainly concentrated over a one-hour period (at most) during the morning arrival and afternoon departure periods.

Although it could be argued that this is not a single event noise (since it occurs over two separate periods throughout the day) the essentially (and expected) short duration nature of the activity does not warrant the application of an intrusiveness-based criterion. In consultation with the NPfI procedures, a more reasonable criterion against which to compare and assess noise emissions associated with a carpark of this nature is an additional 5 dBA increase in the acceptable noise level at the receptor, (ie L_{A90} + 5 dBA).

3.1.2 Outdoor Play

Since the time in which children are involved in outdoor play is limited, the potential impact associated with these noise emissions is minimised. The AAAC consider a total limit of 2 hours outdoor play per day (typically 1 hour in the morning and 1 hour in the afternoon) reasonable to apply a criterion that the $L_{Aeq(15minute)}$ noise level emitted from the outdoor play area not exceed the background noise level by more than 5 dB at the assessment location. A "background + 5 dBA" criterion has also been applied in other local government areas within the Sydney Metropolitan area and has been found acceptable within Land and Environment Court hearings.

3.1.3 Noise Intrusion to Child Care Centres

The AAAC child care centre guideline also presents recommendations for external noise impact upon children in child care centres.

- The $L_{Aeq(1\ hour)}$ intrusive noise level from road traffic or industry at any location within an outdoor play area should not exceed 55 dBA.

- The $L_{Aeq(1\ hour)}$ intrusive noise level from road traffic or industry within the indoor play or sleeping areas should not exceed 40 dBA.

3.2 Operational Noise Criteria

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the EPA. The EPA oversees the Noise Policy for Industry (NPfI) October 2017 which provides a framework and process for deriving noise criteria. The NPfI criteria for industrial noise sources have two (2) components:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term; and

- Maintaining noise level amenity for particular land uses for residents and sensitive receivers in other land uses.

Intrusiveness Criterion

For assessing intrusiveness, the background noise generally needs to be measured. The intrusiveness criterion essentially means that the equivalent continuous noise level (LAeq) of the source should not be more than 5 dB(A) above the measured Rated Background Level (RBL), over any 15 minute period.

Amenity Criterion

The amenity criterion is based on land use and associated activities (and their sensitivity to noise emission). The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. The criteria relate only to other industrial-type noise sources and do not include road, rail or community noise. The existing noise level from industry is measured.

If it approaches the criterion value, then noise levels from new industrial-type noise sources, (including air-conditioning mechanical plant) need to be designed so that the cumulative effect does not produce total noise levels that would significantly exceed the criterion.

Area Classification

The NPfI characterises the "Suburban" noise environment as an area with an acoustical environment 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

The area surrounding the proposed development falls under the "Suburban" area classification.

Project Specific Noise Levels

Having defined the area type, the processed results of the attended noise monitoring have been used to determine project specific noise criteria. The intrusive and amenity criteria for nearby residential premises are presented in Table 3-1.

These criteria are nominated for the purpose of assessing potential noise impacts from the proposed development.

In this case, the ambient noise environment is not controlled by industrial noise sources and therefore the project amenity noise level are assigned as per Table 2.2 of the NPfI (Recommended Amenity Noise Levels). For each assessment period, the lower (i.e. the more stringent) of the amenity or intrusive criteria are adopted.

These are shown in bold text in Table 3-1.

Table 3-1 Operational Project Trigger Noise Levels

Receiver	Time of Day	ANL [1] $L_{Aeq(15min)}$	Measured		Criteria for New Sources	
			RBL [2] $L_{A90(15min)}$	L_{Aeq} Noise Level)	Intrusive $L_{Aeq(15min)}$	Amenity $L_{Aeq(15min)}$
Residential	Day	55	34	49	**39**	55
School Classroom	When in use					**35**
School Play Areas	When in use					**55**

Note 1: ANL = "Amenity Noise Level" for residences in Suburban Areas.
Note 2: RBL = "Rating Background Level".

In summary, the project specific noise level for the assessment of (continuous $L_{Aeq(15minute)}$) operational noise emissions between 7:00 am and 6:00 pm, based upon the procedures documented within the NSW NPfL, is **39 dBA**. The operational noise emissions for school classrooms when in use, based upon the procedures documented within the NSW NPfI is **35 dBA** inside the classroom. The operational noise emissions for school play areas when in use, based upon the procedures documented within the NSW NPfI is **55 dBA**.

4 EXISTING NOISE ENVIRONMENT

4.1 Surrounding Environment

The surrounding community consists of residential properties and Widemere Public School. The acoustical environment is generally controlled by noise emissions from vehicular movements largely associated with through and local traffic and other activities associated with residential activity in the area along with activities associated with the aforementioned public school.

The nearest potentially sensitive receiver locations in relation to noise emissions from the proposed development are the properties to the north (13 Hyacinth Street), east (16 Hyacinth Street), south (17 Hyacinth Street) and west (Widemere Public School).

4.2 Ambient Noise Survey

In order to quantify the existing ambient noise environment of the area, noise monitoring was conducted at the proposed development site and is shown in Figure 2-1. This location was selected after a detailed inspection of the project area giving consideration to other noise sources which may influence the readings, the proximity of noise-sensitive receivers, security issues for the noise monitoring device and gaining permission for access from the residents or landowners.

Unattended environmental noise monitoring was conducted between 28 June 2018 and 5 July 2018.

Instrumentation for the survey comprised a Rion NL42 Environmental Noise Logger (serial number 546394) fitted with microphone and windshield. Calibration of the logger 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 measured data was processed according to the NSW EPA's *Noise Policy for Industry* (NPfI) and the NSW *SEPP (Infrastructure) 2007* assessment time periods. The processed noise monitoring results (based upon noise levels recorded during the weekday daytime period) are presented in Table 4-1.

Table 4-1 Measured Ambient Noise Levels Corresponding to NSW NPfI 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
15 Hyacinth Street	34	49	34	49	32	43

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.

5 NOISE IMPACT ASSESSMENT

5.1 Noise Emissions from Mechanical Plant

Precise mechanical plant selection has not been determined. It is recommended the selection and its acoustic impact to the nearby sensitive receivers is to be determined prior to the installation of any mechanical plant before the issuing of a Construction Certificate.

Precise size, location and type of mechanical plant has not been finalised. It has been indicated that the external mechanical plant items will be located towards the northern boundary of the development site. The mechanical plant is proposed to consist of ducted air conditioning and other components necessary for the building development type.

The criteria for mechanical plant has been established, any mechanical plant equipment must comply with **39 dB(A)** at the nearest sensitive receiver.

5.2 Noise Emissions from Indoor Activities

Noise level predictions for internal noise emissions at the site have been predicted by utilising NSW EPA recognised and approved computer noise model SoundPlan 8 software. SoundPlan is a fully integrating software suite that specialises in computer simulations of noise situations incorporating over 50 calculation standards. The model calculates overall noise levels at receiver locations considering distance, atmospheric absorption, barriers effects of intervening ground types, source levels, source and receiver locations and topography.

Based on an internal reverberant sound pressure level of 90 dBA within the largest internal play areas, the predicted cumulative $L_{Aeq(15minute)}$ noise level at the residential receivers adjacent to the proposed centre with the proposed internal configuration and associated capacity, is **52 dBA** with **windows open**. Noise emissions to the level at the residential receiver is predicted to be **42 dBA** with the **glazing closed**.

The recommended assessment criterion of **39 dBA** will be achieved with the windows closed at all sensitive receivers with recommendations in this report.

5.3 Noise Emissions from Outdoor Play Areas

5.3.1 Outdoor Activity Noise Levels

Noise generated by the children outside in the play area will occur generally after morning arrival, continuing until commencement of the indoor programme (likely to be around 9:00 am), possibly for short periods during the day after morning tea and lunch and again in the later afternoon prior to departure. The number of children involved in outdoor activities outside these main free-play times may vary and would be generally be in smaller groups managed by the centre staff.

The AAAC Child Care Centre guideline recommends the following range of sound power levels for groups of 10 children playing:

- 10 Children aged 2 to 3 years 83 to 87 dBA
- 10 Children aged 3 to 6 years 84 to 90 dBA

Based upon the results of extensive measurements of noise levels associated with a wide range of vocal efforts and of noise emissions from child care centres, it is extremely unlikely that these sound power levels could be sustained over a 15 minute period by a child between the ages of 3 and 6 years, particularly given the Department of Community Services (DOCS) requirements in relation to the management of child care centres and the typical behaviour patterns observed of young children engaged in outdoor play.

Notwithstanding this consideration, we have used these guideline source noise levels in the calculation of noise emissions from the outdoor play area of the CCC.

5.3.2 Assessment of Noise Emissions from Outdoor Play Area

Noise level predictions for external noise emissions at the site have been predicted by utilising NSW EPA recognised and approved computer noise model SoundPlan 8 software. SoundPlan is a fully integrating software suite that specialises in computer simulations of noise situations incorporating over 50 calculation standards. The model calculates overall noise levels at receiver locations considering distance, atmospheric absorption, barriers effects of intervening ground types, source levels, source and receiver locations and topography.

Calculations have been conducted to determine the expected typical (maximum) noise levels ($L_{Aeq(15minute)}$) from the outdoor play area at the neighbouring residential properties to the north (13 Hyacinth Street), east (16 Hyacinth Street), south (17 Hyacinth Street) and west (Widemere Public School).

Using the noise levels applied to groups of children located across the overall outdoor play area, the expected maximum $L_{Aeq(15minute)}$ noise levels have been predicted to the nearest neighbouring residential receivers, including the shielding loss provided by the proposed building itself. The noise source locations representing each group of children have been distributed across the playground area and the cumulative emissions from all children have been calculated to each of the neighbouring residential properties.

With 30 children engaged in outdoor play on the site, the predicted maximum $L_{Aeq(15minute)}$ noise levels are expected to be in the order of **57 dBA** to the north and south, **47 dBA** to the west (public school play area) and **below 30 dBA** to the east site boundaries and school classrooms. Actual levels may at times be expected to vary from these projected levels depending upon the locations of the children and the activities in which they are engaged.

The assessment criterion relative to emissions to residential receivers, based upon the recommendations of the AAAC, is that the $L_{Aeq(15minute)}$ noise level emitted from the outdoor play area not exceed the background noise level by more than 5 dB at the assessment location. The weekday background level at the site, based upon the ambient noise survey results was 34 dBA during the daytime. The criterion for the assessment of noise emissions from the proposed outdoor play area therefore becomes **39 dBA**. The proposed outdoor play area shows exceedance with criteria with all children engaged in outdoor play at some of the sensitive receivers with 1.8m standard fencing. The proposed outdoor play area will achieve criteria with recommendations in this report.

5.4 External Noise Intrusion

5.4.1 Indoor Spaces

Based on a daytime road traffic (and other environmental sources) noise level $L_{Aeq(15\ hour)}$ of 49 dBA, predicted noise intrusion to the indoor play area is **39 dBA** with windows open and **below 30 dBA** with windows closed (assuming standard 4mm glass and seals). The proposed development will meet the recognised criteria for external noise intrusion with windows closed.

5.4.2 Outdoor Spaces

A design limit of 55 dBA is recommended at outdoor play areas and based upon the ambient noise survey results, this level will be achieved with the design proposed. Based on a daytime road traffic (and other environmental sources) noise level $L_{Aeq(1\ hour)}$ was 49 dBA, predicted noise intrusion to the outdoor play area is **39 dBA**.

5.5 Carpark and Road Traffic

Given the location and the times at which vehicles can be expected to arrive (and leave), vehicle and traffic noise is not considered likely to constitute an adverse impact upon the acoustical amenity of neighbouring residents. Vehicular movements associated with the centre will begin to occur around 6:30 am when the first staff arrive and the morning drop-offs commence and will then continue, likely in regular intervals across the period until around 9:00 am.

A similar traffic flow is expected during the afternoon period, commencing from around 3:00 pm with the majority of children likely to be picked up between 4:00 pm and 6:00pm. On-site parking is in the basement. In context with the existing environment, vehicles arriving and leaving the site are comparable with any typical situation and on-street events will not be discernible above the prevailing vehicular activity.

Typical sound power levels for low speed vehicle activities are included in Table 5-1 along with the corresponding predicted noise levels at the identified residential dwellings.

Table 5-1 Typical Vehicle Related Noise Emissions at Nearby Noise Sensitive Receiver

Location	Typical Maximum Sound Power Level Lw (dBA)			Predicted Noise Impact	Criteria	Compliance
	Car Accelerating	Car Starting	Car Door Closing			
Adjacent residents on Hyacinth Street	93 – 98	91 – 97	88 – 93	35 – 39	39	Compliance

The additional traffic generated due to contribution from the proposed centre will result in compliance at all the nearby sensitive receivers. There will be no appreciable change to existing traffic noise levels currently experienced at the other receivers in the vicinity. The maximum noise levels due to individual vehicular events currently received at surrounding properties will remain unchanged.

5.6 Assessment of Noise from Activities Not Associated with Child Care

Council has requested an additional assessment of the noise impact associated with activities that are not associated with child care. This would include staff meetings and cleaning.

Calculations of the amount of noise transmitted to these receivers from the proposed boarding house have been based on voice levels as referenced in the Handbook of Acoustical Measurements and Noise Control by Cyril M. Harris. This handbook provides voice spectrums for males and females as well as different vocal efforts. The spectrum is given in Table 5-2.

The spectra have been scaled based upon the overall amount of patrons expected to be in the communal areas at any given time

Table 5-2 Speech Spectrums - Handbook of Acoustical Measurements and Noise Control.

Type	Noise Level (dB) at Octave Band Centre Frequency (Hz)							Overall dB(A)
	125	250	500	1 k	2 k	4 k	8 k	
Male (Normal)	49	55	58	51	47	43	37	58
Female (Normal)	37	51	54	49	44	43	38	54

Cleaners will clean the centre after closing time for approximately one hour. Based on a worst case scenario of 2 people cleaning (inside and outside) the centre at one time the predicted noise impact is **33 dB(A)** to the north and **below 30 dB(A)** to all the remaining receivers.

Meetings will take place inside the centre during operating hours once a week. Based on a worst case scenario of 6 people in the meeting at one time the predicted noise impact is **below 30 dB(A)** to all sensitive receivers.

6 RECOMMENDATIONS

The following measures are recommended to be incorporated in the design of the proposed centre in order for the child care centre to operate in an acoustically compliant manner.

- Precise size, location and type of mechanical plant has not been finalised. It has been indicated that the external mechanical plant items will be located towards the northern boundary of the development site. The mechanical plant is proposed to consist of ducted air conditioning and other components necessary for the building development type.

  It is recommended a mechanical plant noise assessment for the proposed air conditioning system(s) and site specific plant equipment should be carried out for the proposed development before the issuing of a Construction Certificate.

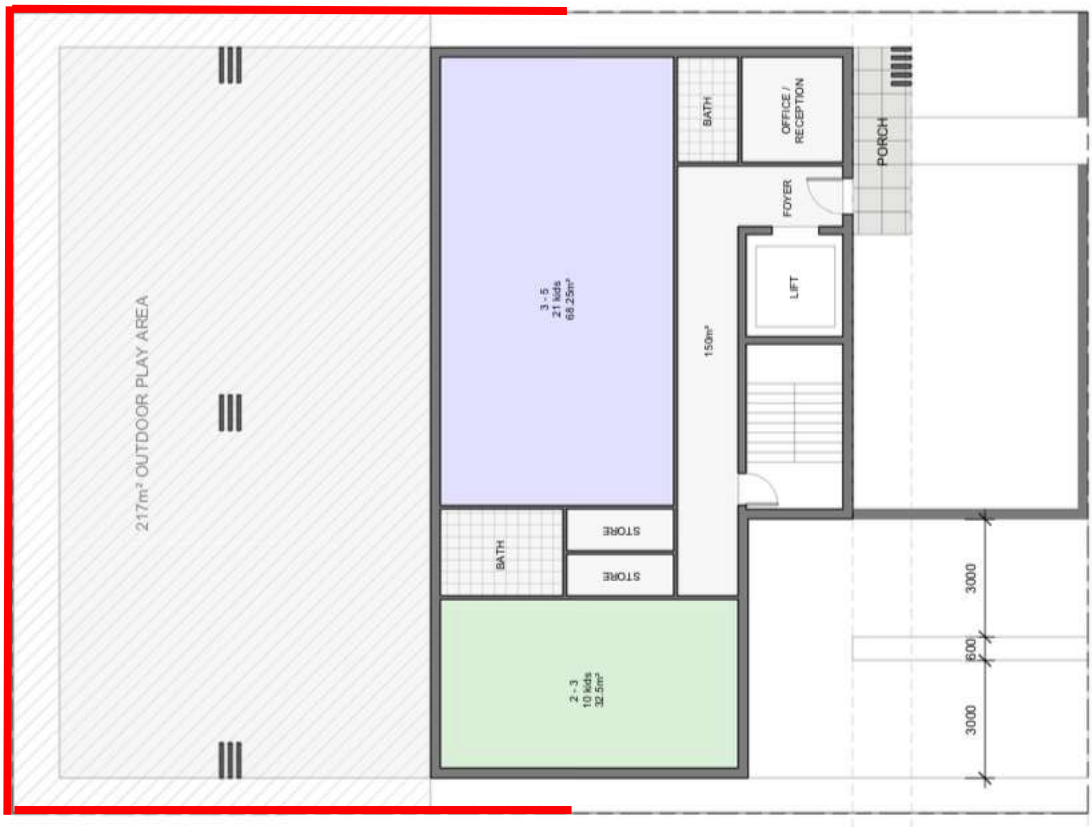
  The accumulative noise impact of all mechanical plant operating at one time cannot exceed the criteria level of **39 dB(A)** @ the boundary of the proposed development site.

- The mechanical plant should not be used, or left on, after the centre's hours of operation (excluding a window period before and after opening hours) in order to minimise any adverse impacts to nearby sensitive receivers.

- Windows to be upgraded to minimum Rw 26 glazing.
- Windows to be closed to control noise emissions from the centre to nearby sensitive receivers.
- The following rules should be incorporated into the centre's management plan in order to achieve acoustic compliance:
    - A contact phone number for the centre's director should be made available to parents and neighbours.
    - Crying children should be taken inside the centre and comforted.
    - The behaviour of children should be monitored and modified as required by adequately trained child care workers.

    Parents and guardians should be informed of the importance of noise minimisation when entering the site, dropping off or picking up children.
- A 2.1m barrier should be constructed around the proposed external play area. The barrier(s) should be of solid continuous construction (ie free of gaps) and of masonry or SlimWall type construction. The location of the proposed wall is shown in red below.

    Allowance for stormwater openings in the proposed barrier will not have a significant detrimental impact on the performance of the barrier.

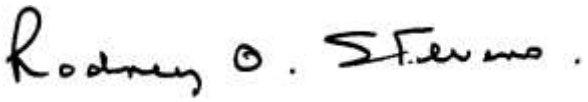


7 CONCLUSION

Rodney Stevens Acoustics has conducted an acoustical assessment of a proposed child care centre at 15 Hyacinth Street, Greystanes NSW. The assessment has included acoustical measurements to characterise the ambient noise environment of the area, establishment of noise criteria, and a comparison of predicted noise levels with regard to guidelines established by council.

Noise emissions associated with the proposed development to the surrounding nearest sensitive receivers have been calculated with the noise criteria as established in accordance with the council criteria if recommendations in this report are followed.

Approved:-



Rodney Stevens – MAAS.

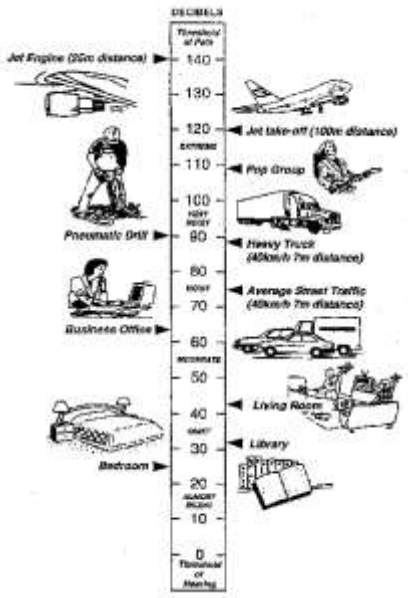
Principal/Manager

Appendix A – Acoustical 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, taking into account 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)*.

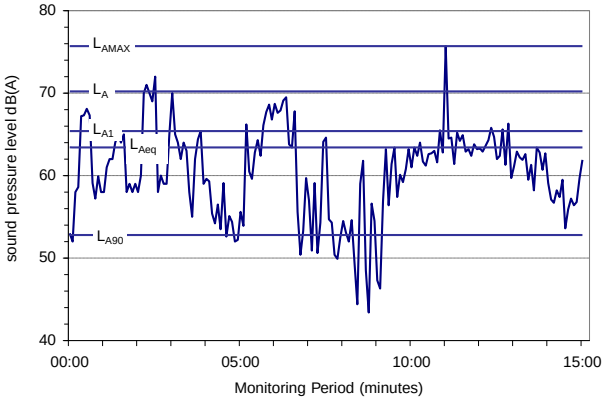
Sound pressure level (SPL)

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 descriptors:

L_{Amax} Maximum recorded noise level.

L_{A1} The noise level exceeded for 1% of the 15 minute interval.

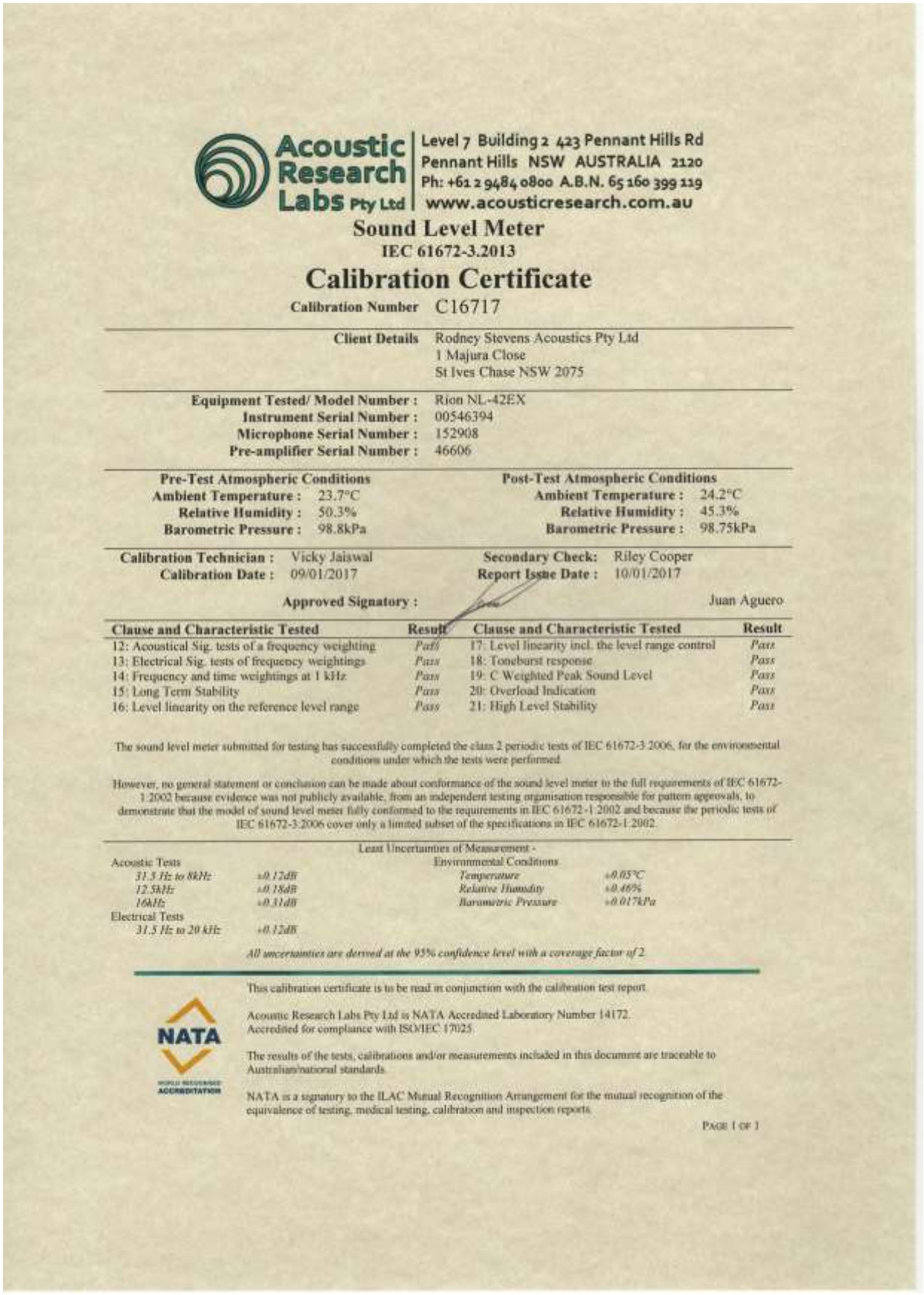
L_{A10} Noise level present for 10% of the 15 minute interval. Commonly referred to the average maximum noise level.

L_{Aeq} 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.

L_{A90} 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



Acoustic Research Labs Pty Ltd
Level 7 Building 2 423 Pennant Hills Rd
Pennant Hills NSW AUSTRALIA 2120
Ph: +61 2 9484 0800 A.B.N. 65 160 399 119
www.acousticresearch.com.au

Sound Level Meter
IEC 61672-3.2013

Calibration Certificate

Calibration Number C16717

Client Details	Rodney Stevens Acoustics Pty Ltd 1 Majura Close St Ives Chase NSW 2075
Equipment Tested/ Model Number :	Rion NL-42EX
Instrument Serial Number :	00546394
Microphone Serial Number :	152908
Pre-amplifier Serial Number :	46606

Pre-Test Atmospheric Conditions		Post-Test Atmospheric Conditions	
Ambient Temperature :	23.7°C	**Ambient Temperature :**	24.2°C
Relative Humidity :	50.3%	**Relative Humidity :**	45.3%
Barometric Pressure :	98.8kPa	**Barometric Pressure :**	98.75kPa

Calibration Technician :	Vicky Jaiswal	**Secondary Check:**	Riley Cooper
Calibration Date :	09/01/2017	**Report Issue Date :**	10/01/2017

Approved Signatory : Juan Aguero

Clause and Characteristic Tested	Result	Clause and Characteristic Tested	Result
12: Acoustical Sig. tests of a frequency weighting	*Pass*	17: Level linearity incl. the level range control	*Pass*
13: Electrical Sig. tests of frequency weightings	*Pass*	18: Toneburst response	*Pass*
14: Frequency and time weightings at 1 kHz	*Pass*	19: C Weighted Peak Sound Level	*Pass*
15: Long Term Stability	*Pass*	20: Overload Indication	*Pass*
16: Level linearity on the reference level range	*Pass*	21: High Level Stability	*Pass*

The sound level meter submitted for testing has successfully completed the class 2 periodic tests of IEC 61672-3 2006, for the environmental conditions under which the tests were performed.

However, no general statement or conclusion can be made about conformance of the sound level meter to the full requirements of IEC 61672-1:2002 because evidence was not publicly available, from an independent testing organisation responsible for pattern approvals, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2002 and because the periodic tests of IEC 61672-3:2006 cover only a limited subset of the specifications in IEC 61672-1:2002.

Least Uncertainties of Measurement -

Acoustic Tests		Environmental Conditions	
31.5 Hz to 8kHz	*±0.12dB*	*Temperature*	*±0.05°C*
12.5kHz	*±0.18dB*	*Relative Humidity*	*±0.46%*
16kHz	*±0.31dB*	*Barometric Pressure*	*±0.017kPa*
Electrical Tests			
31.5 Hz to 20 kHz	*±0.12dB*		

All uncertainties are derived at the 95% confidence level with a coverage factor of 2.

This calibration certificate is to be read in conjunction with the calibration test report.

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
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.

NATA is a signatory to the ILAC Mutual Recognition Arrangement for the mutual recognition of the equivalence of testing, medical testing, calibration and inspection reports.

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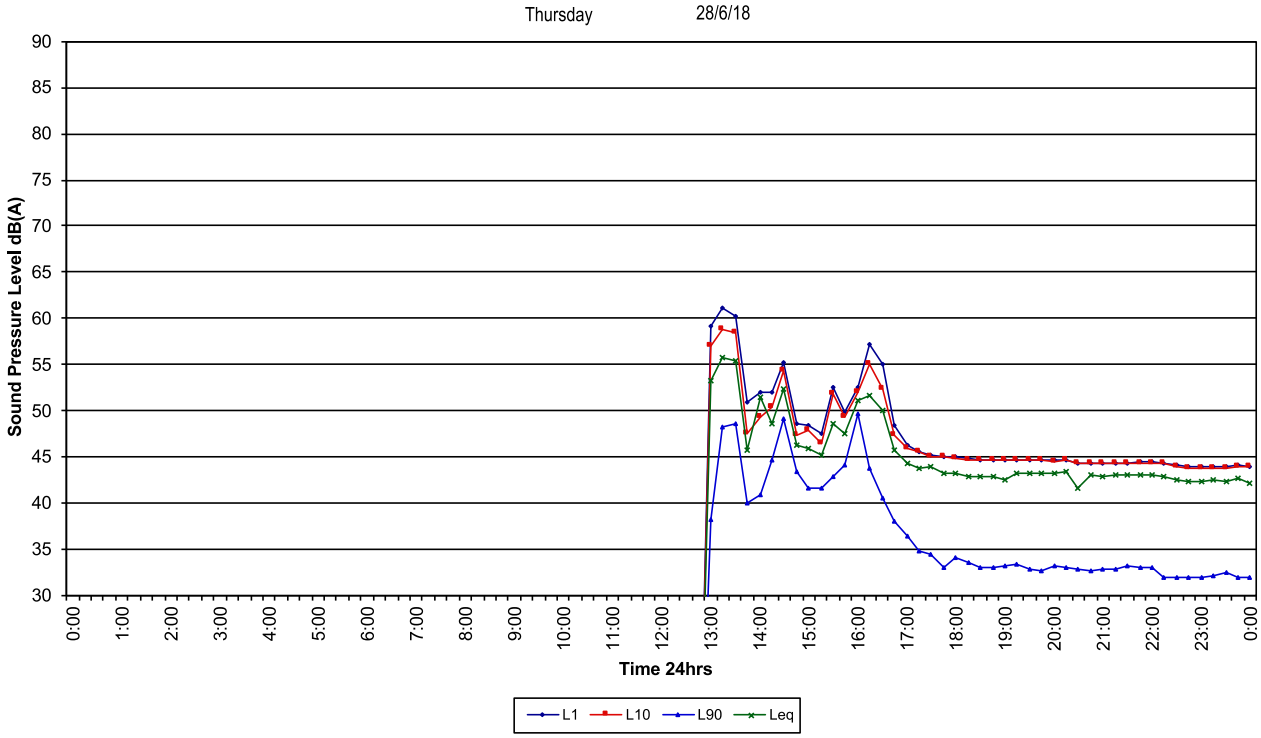
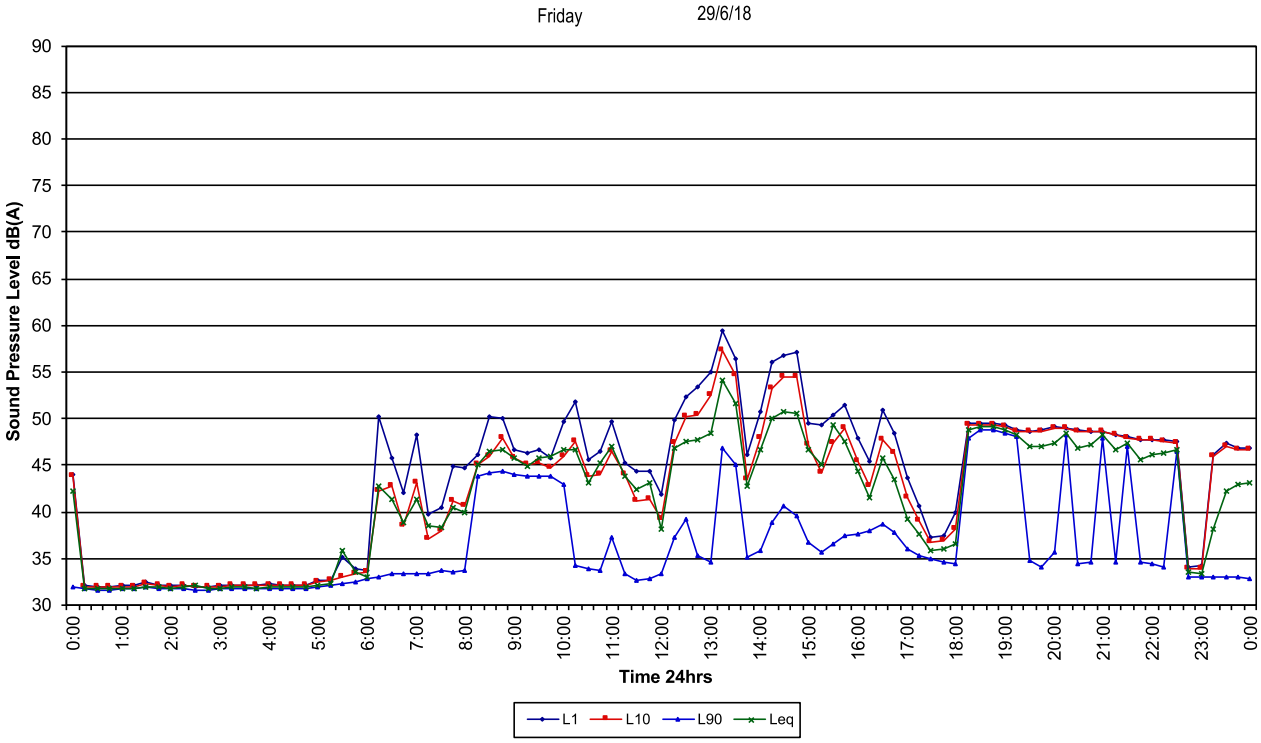
Appendix C – Unattended Noise Monitoring Results

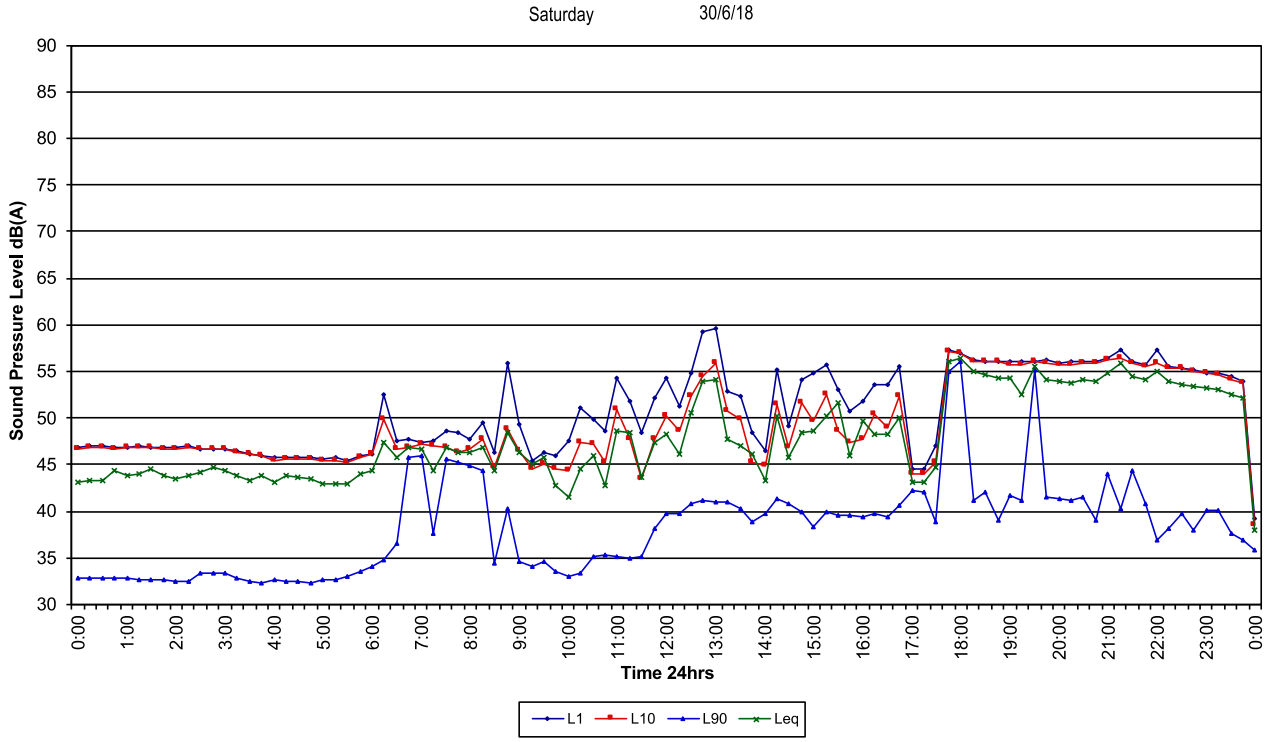
15 Hyacinth St, Greystanes



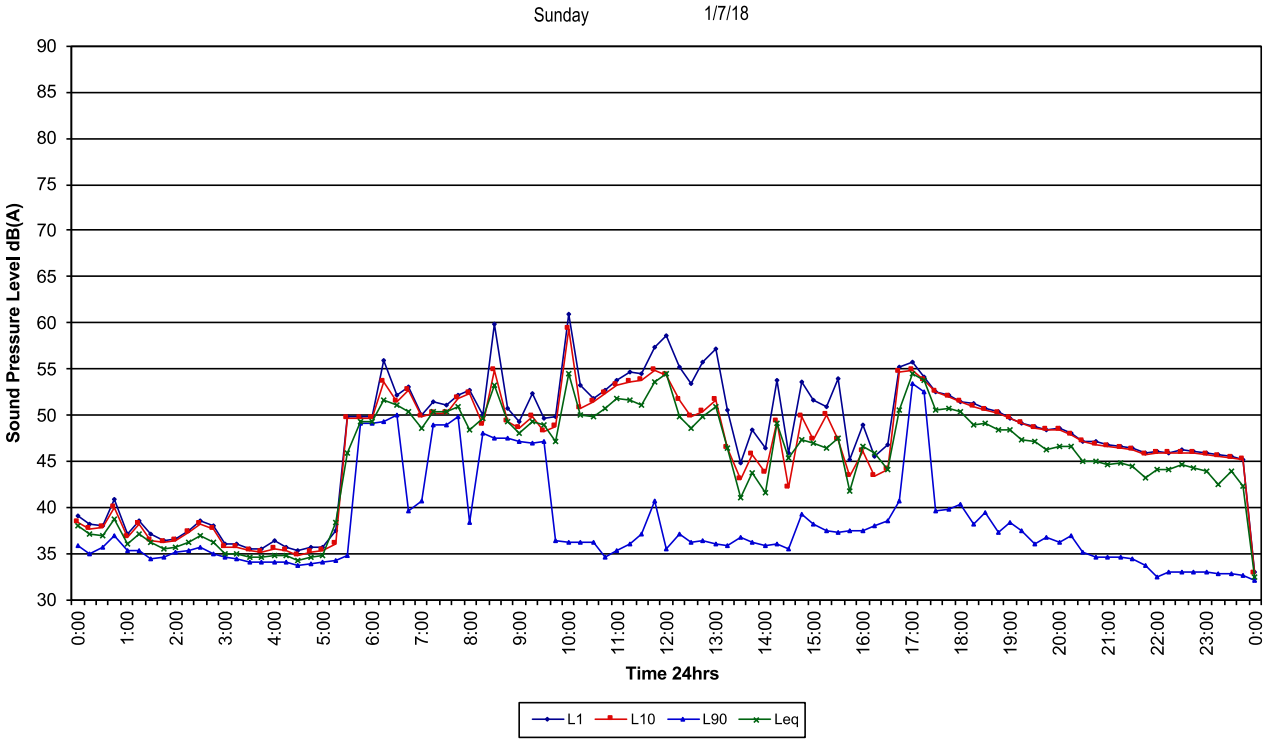
15 Hyacinth St, Greystanes



15 Hyacinth St, Greystanes



15 Hyacinth St, Greystanes



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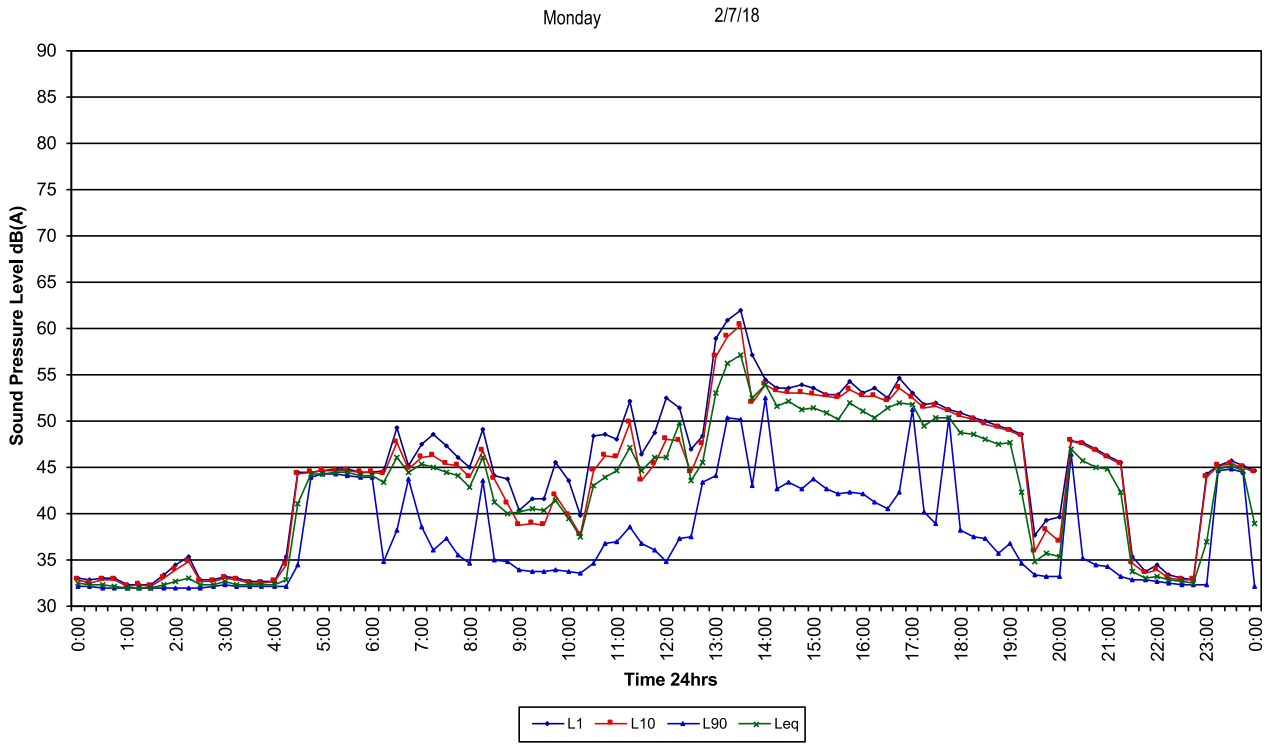
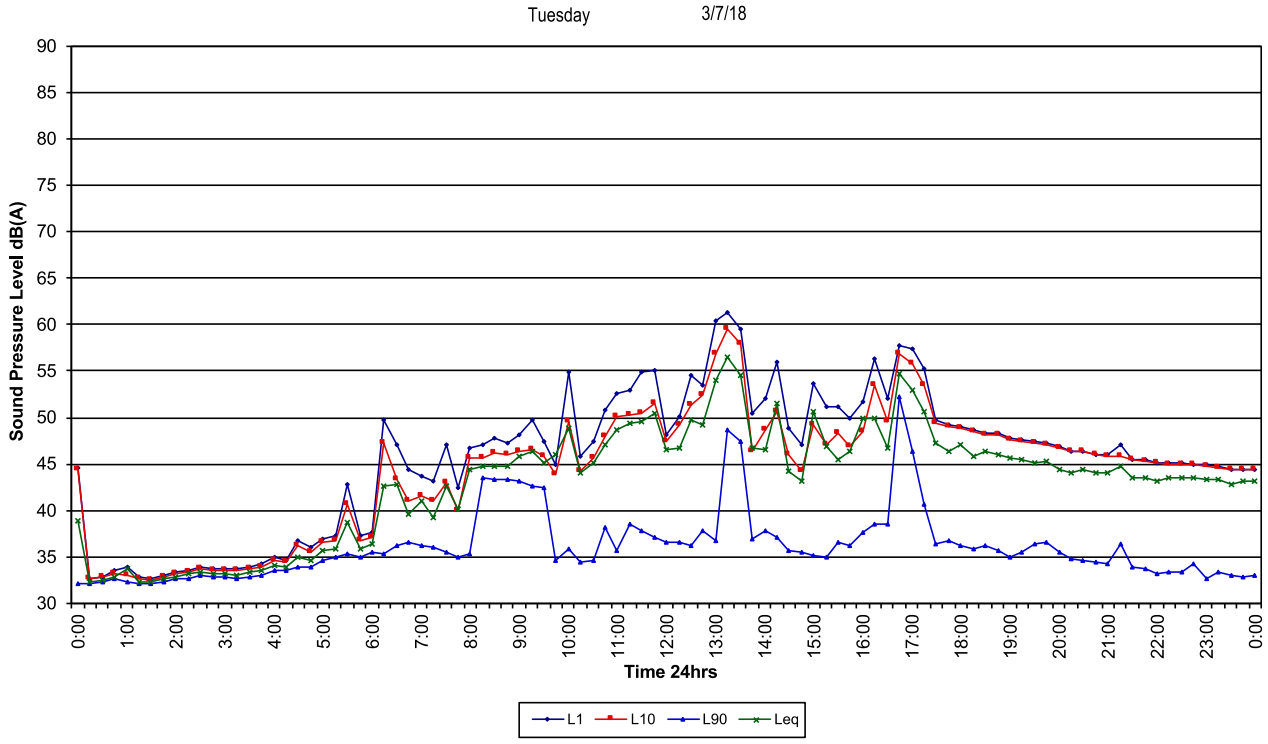
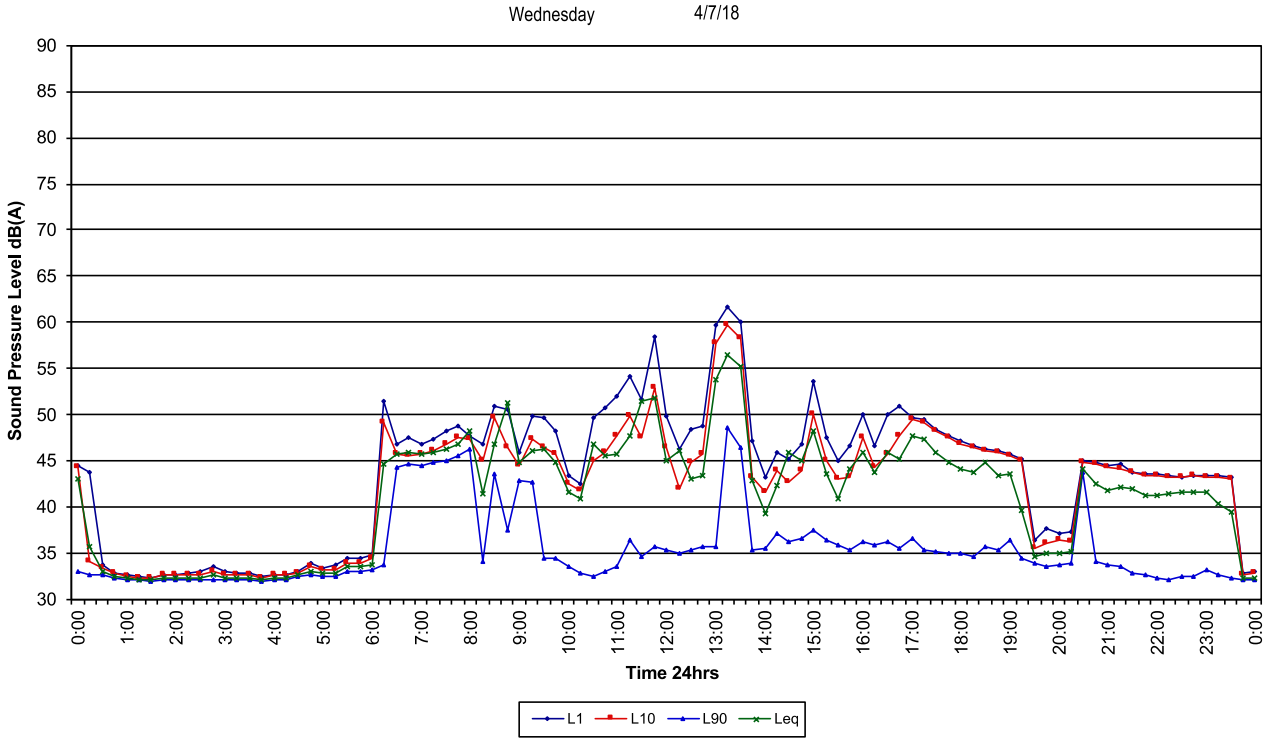


15 Hyacinth St, Greystanes



15 Hyacinth St, Greystanes



15 Hyacinth St, Greystanes