110-112 Mount Vernon Road, Mount Vernon

DA Acoustic Assessment

SYDNEY
A: 9 Sarah St
MASCOT 2020
T: (02) 8339 8000

SYDNEY MELBOURNE BRISBANE CANBERRA
LONDON DUBAI SINGAPORE GREECE

ABN: 11 068 954 343

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1 INTRODUCTION

Acoustic Logic Consultancy (ALC) have been engaged to conduct an acoustic assessment of potential noise impacts associated with the proposed new child care centre to be constructed at 110-112 Mount Vernon Road, Mount Vernon.

This document addresses noise impacts associated with the following:

- External noise intrusions into the project site:
  - Traffic noise impacts from the Mount Vernon Road; and
  - Noise impacts from aircraft fly overs from Western Sydney *"Badgerys Creek"* Airport.
- The impact of potential noise generation by the site:
  - Noise emissions from the indoor and outdoor playing areas;
  - Noise emissions from the operation of the on-grade carpark and driveway; and
  - Noise emissions from mechanical plant in principle.

ALC have utilised the following documents and regulations in the assessment of noise emanating from and into the development:

- Penrith City Council – '*Development Control Plan 2014'*;
- NSW Department of Planning & Environment document – '*State Environmental Planning Policy (Education Establishments and Child Care Centre Facilities) 2017';*
- NSW Department of Planning & Environment document – '*Child Care Planning Guideline, August 2017';*
- Association of Australian Acoustical Consultants (AAAC) document – *'Technical Guideline Child Care Centre Noise Assessment 2013';*
- Australian Standard AS2021-2015 *"Aircraft Noise Intrusion – Building siting and Construction";*
- NSW Environmental Protection Authority (EPA) document – *'NSW EPA Noise Policy for Industry (NPfI) 2017'*;
- Australian/New Zealand Standard AS/NZS: 2107:2016 – *"Acoustics – Recommended design sound levels and reverberation time for building interiors"; and*
- NSW Environmental Protection Authority (EPA) document – *'NSW Road Noise Policy 2011'* (RNP).

This assessment has been conducted using the Project Works Design architectural drawings, see below for details.

Table 1-1 – Architectural Drawing Information

Prepared By	Drawing Number	Drawing Title	Date	Revision
Project Works Design	DA01	Proposed Site Plan	25.03.20	A
	DA02	Site Analysis and Management Plan	31.10.19	-
	DA03	Proposed Floor Plan	25.03.20	A
	DA04	Proposed Roof Plan		
	DA06	Proposed Elevations & Section	31.10.19	-

2 SITE DESCRIPTION

The proposed development consists of on grade car parking along the southern boundary of the development (used for drop off and pick up) with ground floor management areas/offices, internal and external education spaces.

Onsite acoustic investigations have been carried out by this office in relation to the surrounding receivers and the existing acoustic environment, the findings of our investigations have been summarised below:

- North of the project site is an existing single storey residential dwelling. The existing single storey dwelling has windows which face along the northern boundary (towards the site).
- South of the project site is an existing single storey residential dwelling. The existing single storey dwelling has windows which face along the southern boundary (towards the site), across Mount Vernon Road, which carriers a low volume of traffic movements.
- East of the site is an existing single storey residential dwelling. The existing dwelling has windows which face along the eastern boundary (towards the site).
- West of the site is existing single storey residential dwellings. The existing dwelling has windows which face along the western boundary (towards the site).

The nearest noise receivers around the project site include:

- Receiver 1: Residential receiver located at 108 Mount Vernon Road, Mount Vernon to the North. Residential receiver is single storey.
- Receiver 2: Residential receiver located at 106 Mount Vernon Road, Mount Vernon to the North-West. Residential receiver is single storey.
- Receiver 3: Residential receiver located at 100 Mount Vernon Road, Mount Vernon to the West. Residential receiver is single storey.
- Receiver 4: Residential receiver located at 122 Mount Vernon Road, Mount Vernon to the North-East. Residential receiver is single storey.
- Receiver 5: Residential receiver located at 114 Mount Vernon Road, Mount Vernon to the East. Residential receiver is single storey.
- Receiver 6: Residential receiver located at 105 Mount Vernon Road, Mount Vernon to the South, across Mount Vernon Road. Residential receiver is single storey.

A site map has been provided below, Figure 2-1 is a site map, measurement locations and surrounding receivers.

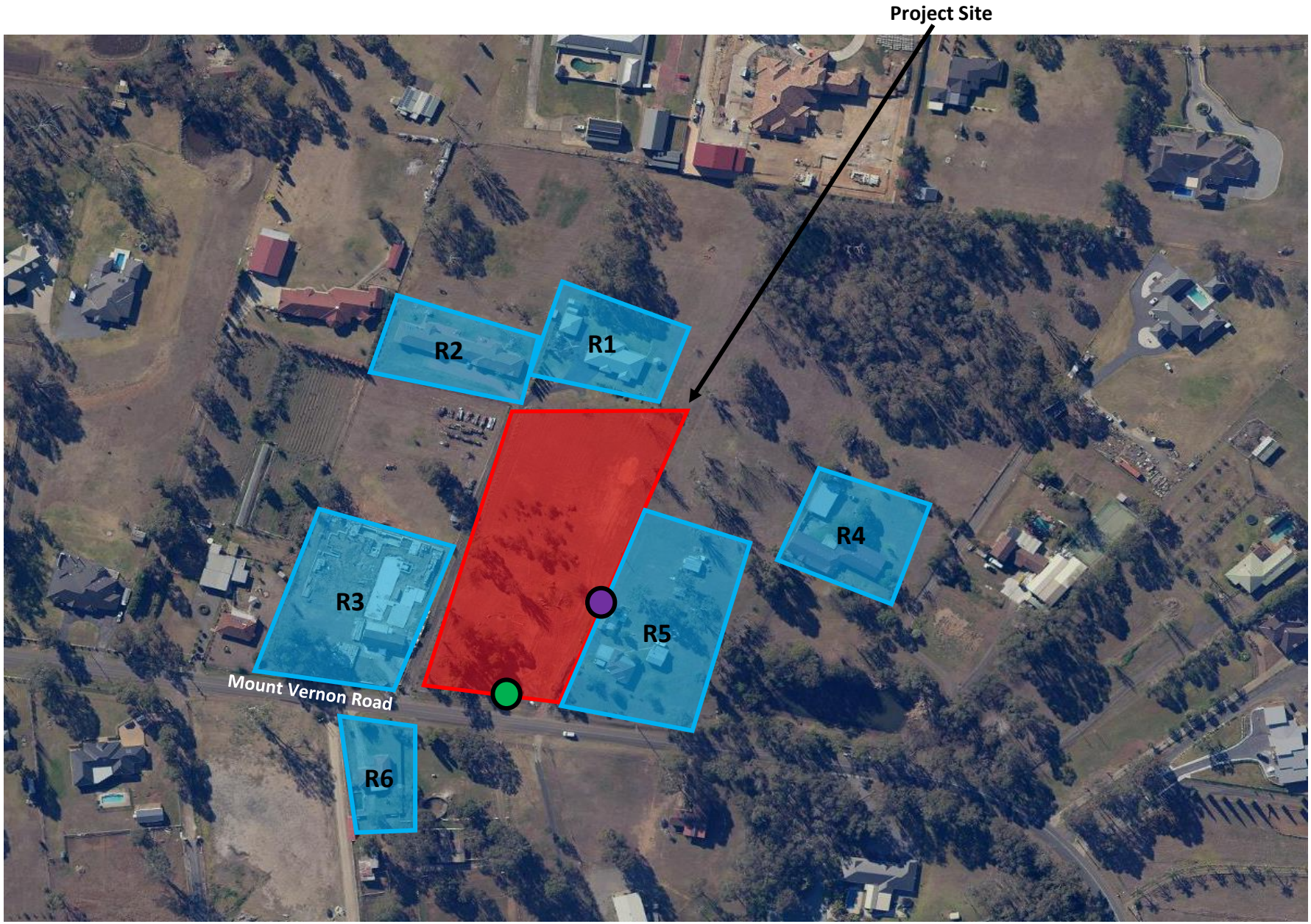

Figure 2-1: Site Survey and Monitoring Positions
Sourced from SixMaps NSW

3 PROPOSED OPERATION OF THE CHILD CARE FACILITY

Acoustic Logic has been advised that the Child Care Centre will operate based on the following parameters:

- Operation of the facility is 7:00am - 6:00pm Monday to Friday;
- Drop off and pick up to take place within the on-grade car park;
- Development proposal is for a facility capable of holding 96 children at any one time, with the following breakdown:
    - 16 x 0-2-year-old;
    - 20 x 2-3-year-old; and
    - 60 x 3-5-year-old
- No amplified speaker system for music or the like is proposed to be utilised in any of the outdoor spaces.
- No centre events except for typical childcare centre operation are to be undertaken.

4 ENVIRONMENTAL 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-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 environmental noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

5 RATING BACKGROUND NOISE MONITORING

5.1 BACKGROUND NOISE MONITORING

Details regarding the unattended noise monitoring carried out around the site are discussed below.

5.2 MEASUREMENT LOCATION

One unattended background noise monitor was installed along the eastern facade of the proposed project site located at 110-112 Mount Vernon Road, as indicated in Figure 1 above.

5.3 MEASUREMENT EQUIPMENT

Equipment used consisted of an Acoustic Research Laboratories Pty Ltd noise logger. The logger was set to A-weighted fast response and was programmed to store 15-minute statistical noise levels throughout the monitoring period. The monitor was calibrated at the start and end of the monitoring period using a Rion NC-73 calibrator. No significant drift was noted. Noise logger data is provided in Appendix A.

Weather affected data was excluded from the assessment in accordance with the NSW EPA *Noise Policy for Industry (NPfI) 2017*.

5.4 MEASURED NOISE LEVELS

The results of the unattended noise measurements have been summarised below.

Table 5-1 – Measured Rating Background Noise Level (RBL)

Date	Measured Rating Background Noise Level (RBL) dB(A)$L_{90(Period)}$
	7:00am-6:00pm
Friday, 1st March 2019	-
Saturday, 2nd March 2019	36
Sunday, 3rd March 2019	35
Monday, 4th March 2019	34
Tuesday, 5th March 2019	35
Wednesday, 6th March 2019	40
Resultant Median	**35**

6 EXTERNAL NOISE INTRUSION ASSESSMENT

Based on site surveys, the main source of external noise intrusion into the proposed facility are the following:

- Traffic movements along Mount Vernon Road; and
- Noise impacts from aircraft fly overs from the Western Sydney *"Badgerys Creek"* Airport.

External noise assessment has been assessed in accordance with the following documents:

- Penrith City Council – '*Development Control Plan 2014'*;
- NSW Environmental Protection Authority (EPA) document – *'NSW Road Noise Policy 2011'* (RNP);
- NSW Department of Planning & Environment document – '*State Environmental Planning Policy (Education Establishments and Child Care Centre Facilities) 2017';*
- NSW Department of Planning & Environment document – '*Child Care Planning Guideline, August 2017';*
- Association of Australian Acoustical Consultants (AAAC) document – *'Technical Guideline Child Care Centre Noise Assessment 2013';*
- Australian Standard AS2021-2015 *"Aircraft Noise Intrusion – Building siting and Construction";*
- Australian/New Zealand Standard AS/NZS: 2107:2016 – *"Acoustics – Recommended design sound levels and reverberation time for building interiors"; and*
- NSW Environmental Protection Authority (EPA) document – *'NSW EPA Noise Policy for Industry (NPfI) 2017'*.

6.1 NOISE INTRUSION CRITERIA

6.1.1 Penrith City Council '*Development Control Plan 2014'*

The Penrith DCP states that for childcare centres; outside playing areas shall be designed and located to minimise noise impact on any noise sensitive adjacent properties.

Sections 12.1 and 12.4 of the Penrith DCP address noise impacts associated with industrial development, each noting the importance of maintaining residential amenity.

Section 12.1 deals with noise from traffic associated with a site and refers to the guidelines of relevant state government authorities. In this case, this will be the EPA Road Noise Policy (discussed below).

Section 12.4 refers to the EPA Industrial Noise Policy (now the Noise Policy for Industry) in the assessment of plant and equipment noise generated by the site.

6.1.2 NSW Department of Environment and Heritage, Environmental Protection Authority document – *'NSW Road Noise Policy 2011'* (RNP)

The NSW EPA RNP states that child care centres being affected by development or existing roads should be designed to the requirements of Table 4 on page 12 of the RNP. The design criteria of 4 from the RNP is summarised below.

Table 6-1 – NSW EPA RNP Design Criteria

Existing sensitive land use	Assessment Criteria – dB(A)		Additional considerations
	Day (7am-10pm)	Night (10pm-7am)	
Childcare facilities	Sleeping rooms $L_{Aeq, (1hour)}$ 35 (Internal)	-	Multi-purpose spaces, e.g. shared indoor play/sleeping rooms should meet the lower of the respective criteria. Measurements for sleeping rooms should be taken during designated sleeping times for the facility, or if these are not known, during the highest hourly traffic noise level during the opening hours of the facility.
	Indoor play areas $L_{Aeq, (1hour)}$ 40 (Internal)		
	Outdoor play areas $L_{Aeq, (1hour)}$ 55 (External)		

6.1.3 NSW Department of Planning & Environment document – *'State Environmental Planning Policy (Education Establishments and Child Care Centre Facilities) 2017'*

Section 3.6 Noise and air pollution

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An acoustic report should identify appropriate noise levels for sleeping areas and other non-play areas and examine impacts and noise attenuation measures where a child care facility is proposed in any of the following locations:

- *on industrial zoned land*
- *where the ANEF contour is between 20 and 25, consistent with AS 2021 – 2000*
- *along a railway or mass transit corridor, as defined by State Environmental Planning Policy (Infrastructure) 2007*
- *on a major or busy road*
- *other land that is impacted by substantial external noise.*

Principle 6 – Amenity

- *Good design positively influences internal and external amenity for children, staff and neighbours. Achieving good amenity contributes to positive learning environments and the well-being of students and staff.*

- *Good amenity combines appropriate and efficient indoor and outdoor learning spaces, access to sunlight, natural ventilation, outlook, visual and acoustic privacy, storage, service areas and ease of access for all age groups and degrees of mobility.*
- *Well-designed child care facilities provide comfortable, diverse and attractive spaces to learn, play and socialise.*

6.1.4 Association of Australian Acoustical Consultants (AAAC) document – *'Technical Guideline Child Care Centre Noise Assessment 2013'*

The $L_{eq(1hour)}$ intrusive noise level from road, rail traffic or industry at any location within the indoor play or sleeping areas of the Centre during the hours when the centre is operating shall not exceed 40 dB(A).

Aircraft noise should have a L_{ASmax} noise level from aircraft at any location within the indoor play or sleeping areas of the centre during the hours when the Centre is operating shall not exceed 50 dB(A) in accordance with Australian Standard AS2021.

The noise level $L_{Aeq(1hour)}$ from road, rail or industry at any location within the outdoor play or activity area during the hours when the Centre is operating shall not exceed 55 dB(A).

6.1.5 Australian Standard AS: 2021:2015 – *"Acoustics – Aircraft Noise Intrusion Building Siting and Construction"*

AS2021 states that a full evaluation of internal noise levels should be carried out for locations with an aircraft noise exposure close to or exceeding ANEF 20. This full evaluation requires an examination of likely levels of internal noise from aircraft flyovers.

Critically, AS2021 does not have specific noise intrusion criteria for child care centres.

In the absence of any criteria ALC have recommended the most suitable internal performance requirement from which is listed. These levels will be used to assess aircraft noise intrusion into the specific areas of the development.

Table 6-2 – Aircraft Noise Levels inside Buildings

Activity	Indoor Design Sound Level from Aircraft Flyover, dB(A)$L_{Max(Slow)}$
Sleeping areas	50 dB(A)
Teaching Areas	55 dB(A)
Bathrooms, toilets, laundries	60 dB(A)
Offices	55 dB(A)
Staff Room	65 dB(A)

6.1.6 Australian/New Zealand Standard AS/NZS: 2107:2016 – *"Acoustics – Recommended design sound levels and reverberation time for building interiors"*

AS2107-2016: Recommended design sound levels and reverberation times for building interiors specifies allowable internal noise levels for internal spaces within different types of buildings. Table 1, in Section 5 of AS2107-2016, gives the following internal noise.

Table 6-3 – Recommended Design Sound Level

Space /Activity Type	Design Sound Level
Bathrooms	<55dB(A)$L_{eq(When\ in\ Use)}$
Offices	40-45dB(A)$L_{eq(When\ in\ Use)}$
Staff Room	40-45dB(A)$L_{eq(When\ in\ Use)}$

*Assumed based on similar use.

6.1.7 Summarised Internal Noise Criteria

Table 4 – Summarised Internal Noise Criteria

Space	Aircraft Flyover, dB(A)$L_{Max(Slow)}$	Traffic Noise dB(A)$L_{eq,\ 1\ hour}$
Sleeping areas	50 dB(A)	35 dB(A)
Teaching Areas	55 dB(A)	40 dB(A)
Bathrooms, toilets, laundries	60 dB(A)	55 dB(A)
Offices	55 dB(A)	45 dB(A)
Staff Room	65 dB(A)	45 dB(A)

6.2 TRAFFIC NOISE MEASUREMENTS

This section of the report details noise measurements conducted around the project site to establish traffic and surrounding environmental noise levels impacting on the development.

6.2.1 Measurement Equipment

Attended noise measurements were conducted using a Norsonic 140 Sound Analyser. The analyser was set to fast response and calibrated before and after the measurements using a Norsonic Sound Calibrator type 1251. No significant drift was noted.

6.2.2 Measurement Location

Attended traffic noise measurements were conducted along Mount Vernon Road located along the southern boundary of the 110-112 Mount Vernon Road project site. Attended noise measurements were undertaken at a distance of 3m from the kerb. See figure 1 for a detailed measurement location.

6.2.3 Measurement Period

Attended noise measurements were undertaken on Friday, 1st March 2019.

6.2.4 Measured Traffic Noise Measurements

Results from the attended traffic noise measurements have been summarised below for each location.

Table 6-5 – Attended Traffic Noise Measurements

Location	Date and Time of Measurement	Measured Noise Level $dB(A)L_{eq(1\text{-}hour)}$
Mount Vernon Road (See Figure 1) 3m from kerb 180° view of the road	Friday, 1st March 2019 (3:00pm – 4:00pm	63

6.3 PREDICTED AIRCRAFT NOISE LEVEL

Aircraft noise levels at the site were determined using the procedures outlined in AS 2021:2015. The standard gives aircraft noise levels for aircraft landing and taking off for locations near airports. The location of the runways was obtained from the Western Sydney airport, 2017 ANEC contour maps, Prefer 05 direction as detailed in the Australian Government, Department of Infrastructure, Regional Development and Cities Online Noise Modelling Tool. (Refer to Figure 6-2 below)

Based on the distance from the site to the runway, the flight path and the site elevation, AS 2021 predicts that the loudest typical aircraft movement will be from a 747-400 Short Range aircraft taking-off from Western Sydney Airport. The noise level at the site as indicated by the standard is $62dB(A)L_{max(Slow)}$. This noise level will be used to predict the resultant internal noise levels.

6.3.1 Requirements by Council

It is noted that the Penrith Council Development Control Plan 2014, C.12 Noise and Vibration, Section 12.3 “Aircraft Noise” details an ANEF Contour map (Figure 6-1). This contour map has been superseded by the 2017 Noise Modelling ANEC Tool supplied by the Australia Government, Department of Infrastructure, Regional Development and Cities.

The current 2017 ANEC map in (Figure 6-2) shows that the project site location (110-112 Mt Vernon Road, Mount Vernon) has an ANEC of ≤20 with the 2030 prefer 05 runway option. Therefore; the current 2017 ANEC map has been used in this assessment.

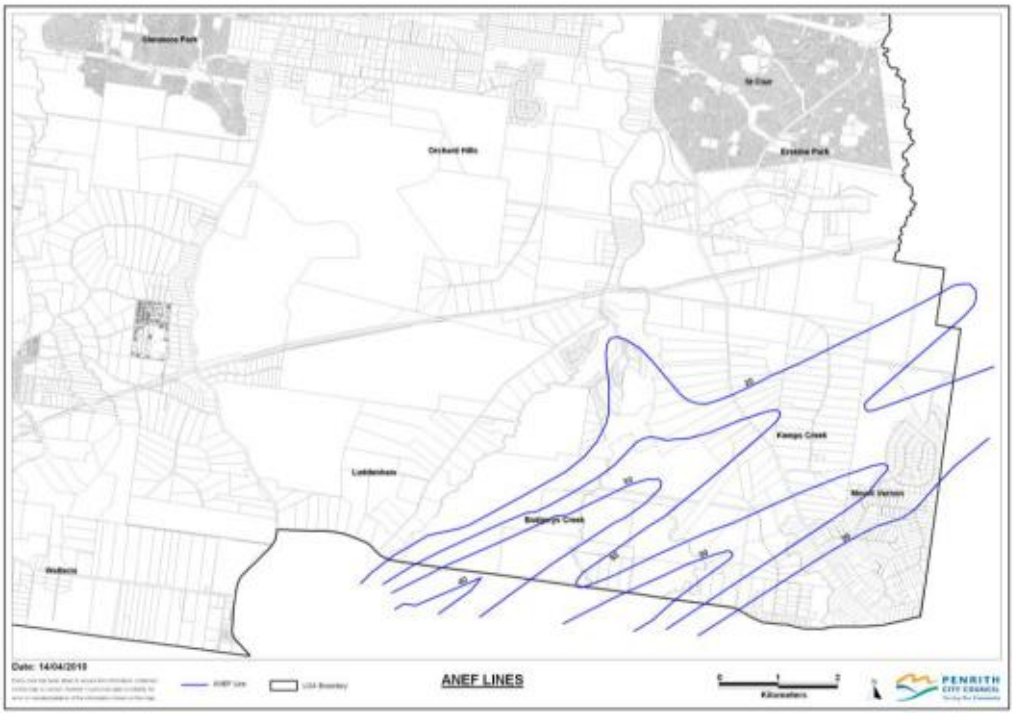

Figure 6-1 - Penrith Council DCP 2014 ANEF Map Dated: 14/04/2010

Figure 6-2 – Site Location Map 2 (Current ANEC Map & Project Site Location)

6.4 ANALYSIS / RECOMMENDATIONS

Internal noise levels from external traffic/aircraft movements into the proposed development has been assessed using the external measured or predicted noise levels which have been detailed above and the noise criteria listed in section 6.1 of this report.

6.4.1 Internal Noise Levels

Calculations were performed taking into account the orientation of windows, the total area of glazing, facade transmission loss and room sound absorption characteristics. In this way, the likely interior noise levels can be predicted.

The building shell acoustic treatment required to ensure compliance with the assessment criteria are detailed in Section 8.

6.4.2 External Noise Levels within Outdoor Play Areas

6.4.2.1 Traffic Noise – Outdoor Play Areas

Northern Outdoor Play Area and Western Outdoor Babies Play Area

Based on detailed distance and barrier calculations we can confirm that the external noise levels from traffic movements around the site will be compliant with the NSW EPA Road Noise Policy for noise levels in external play areas (i.e. $L_{Aeq, (1hour)}$ 55).

7 NOISE EMISSION ASSESSMENT

7.1 NOISE EMISSION CRITERIA

Based on the acoustic review conducted by this office, the primary sources of noise generated by the site will be as follows:

- Noise associated with the outdoor play spaces;
- Noise-associated with the indoor learning spaces;
- Noise associated with the operation of the driveway/on-grade carpark; and
- Noise from the mechanical plant in principle.

This noise emission assessment has been assessed in accordance with the following documents:

- Penrith City Council – '*Development Control Plan 2014'*;
- NSW Department of Planning & Environment document – '*State Environmental Planning Policy (Education Establishments and Child Care Centre Facilities) 2017';*
- Association of Australian Acoustical Consultants (AAAC) document – *'Technical Guideline Child Care Centre Noise Assessment 2013';*
- NSW Environmental Protection Authority (EPA) document – *'NSW EPA Noise Policy for Industry (NPfI) 2017'*; and
- NSW Environmental Protection Authority (EPA) document – *'NSW Road Noise Policy 2011'* (RNP).

7.1.1 Penrith City Council – '*Development Control Plan 2014*'

Penrith City Council Development Control Plan (DCP) 2014 does not contain any applicable criteria.

7.1.2 NSW Department of Planning & Environment document – *'State Environmental Planning Policy (Education Establishments and Child Care Centre Facilities) 2017'*

Section 3.5 Visual and Acoustic Privacy

Considerations

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A suitably qualified acoustic professional should prepare an acoustic report which will cover the following matters:

- *identify an appropriate noise level for a child care facility located in residential and other zones*
- *determine an appropriate background noise level for outdoor play areas during times they are proposed to be in use*
- *determine the appropriate height of any acoustic fence to enable the noise criteria to be met.*

7.1.3 Association of Australian Acoustical Consultants (AAAC) document – *'Technical Guideline Child Care Centre Noise Assessment 2013'*

Residential Receptors

Outdoor Play Area

For most centres as the duration of time that children are allowed to play outside is reduced than the overall noise impacts reduce. Therefore, it is reasonable to allow a higher level of noise impact for shorter duration of outdoor play. AAAC members regard that a total time limit of approximately 2 hours outdoor play per day (e.g. 1 hour in the morning and 1 hour in the afternoon) should allow an additional emergence above the background of 5dB. ***We note that as per the plan of management, outdoor play is proposed to occur more than 2 hours.***

More than 2 hours per day – *The L_{eq},15minute noise level emitted from the outdoor play area 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 residential receiver property boundary. Examples of this location may be:

- *1.5m above ground level;*
- *On a balcony at 1.5 above floor level;*
- *Outside a window on the ground on higher floors.*

Indoor Play Area, Mechanical Plant, Pick-up and Drop Off

The $L_{eq,15minute}$ noise level emitted from the cumulative noise impact of children playing indoors, mechanical plant and traffic on the site shall not exceed the background noise level by more than 5 dB(A) at the assessment location.

7.1.4 NSW Environmental Protection Authority (EPA) document – *'NSW EPA Noise Policy for Industry (NPfI) 2017'*

The NSW EPA NPfI, has two criteria which need to be satisfied namely Intrusiveness and Amenity. These are described below:

- *Intrusiveness Criteria* - This guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5 dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

- *Amenity Criteria* - This guideline is intended to limit the absolute noise level from all "industrial" noise sources such as mechanical plant to a level that is consistent with the general environment.

The EPA's NPfI sets out acceptable noise levels for various localities. Table 2.2 on page 11 of the policy indicates 4 categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

Noise levels are to be assessed at the property boundary.

7.1.4.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor do not exceed the background noise level by more than 5dB(A). Where applicable, the intrusive noise level should be penalised (increased) to account for any annoying characteristics such as tonality.

Background noise levels adopted are presented in Section 5. Noise emissions from the site should comply with the noise levels presented below when measured at nearby property boundary.

Table 7-1 - Intrusiveness Noise Emission Goals

Location	Period/Time	Intrusiveness Noise Emission Goal dB(A) $L_{eq(15min)}$
Residential Receivers	Day (7:00am-6:00pm)	40

7.1.4.2 Amenity Criterion

The guideline is intended to limit the absolute noise level from all noise sources to a level that is consistent with the general environment.

The NSW EPA NPfI sets out acceptable noise levels for various localities. Table 2.2 on page 11 of the policy indicates 4 categories to distinguish different areas. They are rural, suburban, urban and urban/industrial interface. This site is categorised by rural receivers.

For the purposes of this condition:

- Day is defined as the period from 7am to 6pm Monday to Saturday and 8am to 6pm Sundays and Public Holidays.

Table 7-2 – Project Amenity Noise Emission Goals

Location	Period/Time	Project Amenity Noise Emission Goals dB(A)$L_{eq(15mins)}$
Nearby Residences – Rural Receiver	Day (7:00am-6:00pm)	48

7.1.5 Summary of Noise Emission Criteria

The following table presents the noise emission objectives for the proposed child care centre.

Table 7-3 – Summarised Noise Emission Criteria (Residential Criteria)

Receiver Location	Noise Source	Time of Day	Noise Emission Criteria
Residential Receivers	Operational Noise	Day (7:00am-6:00pm)	BG+5dB(A) = 35dB(A)L_{90} + 5dB(A) = **40dB(A)$L_{eq(7am-6pm)}$** (AAAC Criteria)

7.2 NOISE EMISSION ANALYSIS

7.2.1 Outdoor Play Noise Emissions

Typical sound power levels generated by children playing have been detailed in the AAAC Child Care Guideline 2013 which is presented below:

Table 1 – Effective Sound Power Levels for groups of 10 children playing

10 Children aged 0 to 2 years	77 to 80 dB(A)
10 Children aged 2 to 3 years	83 to 87 dB(A)
10 Children aged 3 to 6 years	84 to 90 dB(A)

The outdoor play noise has been predicted based on the following information provided to this office below:

- The operation of the external play areas will use a staggered system.

0-2yrs age group

A maximum of 5 children are to play in the Western outdoor babies play area at any one time.

2-5yrs age group

A maximum of 30 children are to play in the Northern outdoor play area at any one time.

- Recommended acoustic treatments in Section 8 of this report are implemented.
- Noise from each outdoor area is calculated assuming the children evenly distributed throughout the space.

7.2.2 Indoor Play / Teaching Sound Pressure Level (SPL)

Noise levels generated from indoor activities (i.e. lessons) are 75dB(A)L_{eq} Sound Pressure Level based on our measurement results of similar sites.

Noise from indoor spaces is significantly less than from outdoor spaces given activities which are typically undertaken inside are passive learning activities which would have a lower overall noise level. For completeness, the cumulative impact of both indoor and outdoor noise will be assessed in section 7.3.

The indoor play noise has been predicted based on assumptions below:

- Recommended acoustic treatments in Section 8 of this report are implemented.
- A cumulative result for outdoor and indoor has been presented in 7.3 of this report.

7.2.3 Predicted Noise Levels

Predicted noise levels which are presented below.

For the purpose of this assessment ALC have undertaken analysis of multiple scenarios with different aged children utilising the outdoor areas and other remaining children located inside indoor classrooms. The scenario which is presented below is the worst case (i.e. nosiest). This scenario includes the following:

- 30 x 2-5yrs old children playing within the Northern Outdoor Play Area;
- 5 x 0-2yrs old children playing within the Western Babies Outdoor Play Area; and
- Remaining children inside classrooms with external doors/windows closed.

Table 7-4 – Predicted Noise Level to Receivers

Assessment Location	Predicted Worst Case Noise Level	Children Activity	Criteria- Day	Compliance
Receiver 1: 108 Mount Vernon Road, Mount Vernon (Figure 2-1)	≤35	• 30 x 2-5yrs old children playing within the Northern Outdoor Play Area; • 5 x 0-2yrs old children playing within the Western Babies Outdoor Play Area; and • Remaining children inside classrooms with external doors/ windows closed.	**40dB(A)$L_{eq(Period)}$** (AAAC Criteria) BG+5dB(A) = 35dB(A)L_{90} + 5dB(A)	Refer to Section 8 for recommendations
Receiver 2: 106 Mount Vernon Road, Mount Vernon (Figure 2-1)	≤35			
Receiver 3: 100 Mount Vernon Road, Mount Vernon (Figure 2-1)	40			
Receiver 4: 122 Mount Vernon Road, Mount Vernon (Figure 2-1)	≤35			
Receiver 5:114 Mount Vernon Road, Mount Vernon (Figure 2-1)	39			
Receiver 6: 105 Mount Vernon Road, Mount Vernon (Figure 2-1)	≤35			

7.3 MECHANICAL PLANT NOISE EMISSIONS

At this stage, no mechanical plant has been selected.

It is therefore recommended that prior to the issue of the Construction Certificate an acoustic review of the proposed equipment selections is to be reviewed to ensure all acoustic treatments for mechanical plant are documented.

As a minimum the mechanical plant are to be designed and installed to comply with the requirements summarised of section 7.1 of this report.

7.4 NOISE GENERATED BY ADDITIONAL TRAFFIC ON PUBLIC ROADS

The NSW EPA '*Road Noise Policy*' provides a target noise abatement levels for existing roads not subject to redevelopment, in which should be adopted in the assessment of additional noise associated with traffic increase. The noise abatement levels are set out in table 8 of the policy and are provided below.

Table 7-5 – NSW EPA *Road Noise Policy – Target noise abatement levels (Table 8, page 30)*

Existing road category	Target noise level – dB(A)	
	Day (7 a.m.-10 p.m.)	Night (10 p.m.- 7 a.m.)
Freeway/arterial/sub-arterial road (Mount Vernon Road)	$L_{Aeq, (1\ hour)}$ 60 (External)	$L_{Aeq, (1\ hour)}$ 55 (External)

Traffic associated with the childcare centre is proposed to access the site via Mount Vernon Road which is defined as a sub-arterial road.

Predicted noise levels have been determined based on the following:

- 95dB(A) sound power for a car driving on a public road (50-60km/h).
- Traffic engineer explained that the "96" children centre would generate 77 peak trips between 7am and 9am. However; given the centre will provide a minibus which has capacity of 22 children and undertake 1 trip during the AM period, this would reduce the peak hour vehicle trips to approximately 59 peak trips in the AM period.
- That there is a total of 59 trips between 7am-9am:
    - 7am-8am – 29-30 cars.
    - 8am-9am – 29-30 cars.

Noise emissions are predicted at the façade of the nearest residences and are inclusive of a 2dB(A) façade reflection (as is consistent with EPA Road Noise Policy practice).

The predicted noise levels at the nearby receivers are presented in the table below. It is noted that if noise emissions generated from the additional traffic along Mount Vernon Road are compliant to the nearest receivers being receiver 3,5 and 6, then noise emissions to the remaining receivers will also be satisfactory.

Table 7-6 – Noise from Additional Traffic Movements – Mount Vernon Road

Location	Time of Day	Predicted Noise Level dB(A)$L_{eq(1hour)}$ (External)	Target Noise Level dB(A)$L_{eq(1hour)}$ (External)	Compliance
Receiver 3: 100 Mount Vernon Road, Mount Vernon (Figure 2-1)	Day 7:00am-6:00pm	<50	60	Yes
Receiver 5:114 Mount Vernon Road, Mount Vernon (Figure 2-1)		<50		Yes
Receiver 6: 105 Mount Vernon Road, Mount Vernon (Figure 2-1)		<51		Yes

7.5 DRIVEWAY AND ONGRADE CARPARK NOISE EMISSIONS

A noise emission assessment of the on-grade carpark and driveway has been completed during the following times;

- A worst 1-hour period when children are being dropped off (7am to 9am); and
- The following noise data provided by the AAAC Childcare Guideline:

Table 3 – Sound Power Levels for Traffic (30 second L_{eq})

Car	85 to 90 dB(A)
Delivery Van	85 to 95 dB(A)

The traffic noise from the proposed car park has been predicted based on the assumption as below.

- Traffic engineer explained that the "96" children centre would generate 77 peak trips between 7am and 9am. However; given the centre will provide a minibus which has capacity of 22 children and undertake 1 trip during the AM period, this would reduce the peak hour vehicle trips to approximately 59 peak trips in the AM period.
- Vehicles drive in/out at 10km/hour speed with typical Sound Power Level 87dB(A).
- Garbage/Delivery Trucks drive in/out at 10km/hour speed with typical Sound Power Level 99dB(A).
- Recommendations in Section 8 are implemented.

The predicted noise levels at the nearby receivers are presented in the table below. It is noted that if noise emissions from the carpark/driveway are compliant to the nearest receivers being receiver 3,5 and 6, then noise emissions to the remaining receivers will also be satisfactory.

Table 7-7 - Predicted Noise Levels from Car Park/Driveway – Parents Drop Off

Noise at Affected Receivers (External Boundary)	Predicted Noise Level (dB(A)$L_{eq, 15min}$)	Time of Day	Criteria (dB(A)$L_{eq, 15min}$)	Compliance
Receiver 3: 100 Mount Vernon Road, Mount Vernon (Figure 2-1)	39	Day (7am-6pm)	40dB(A)	Yes
Receiver 5:114 Mount Vernon Road, Mount Vernon (Figure 2-1)	40			Yes
Receiver 6: 105 Mount Vernon Road, Mount Vernon (Figure 2-1)	38			Yes

Table 7-8 - Predicted Noise Levels from Car Park/Driveway – Garbage/Delivery Truck

Noise at Affected Receivers (External Boundary)	Predicted Noise Level (dB(A)$L_{eq, 15min}$)	Time of Day	Criteria (dB(A)$L_{eq, 15min}$)	Compliance
Receiver 3: 100 Mount Vernon Road, Mount Vernon (Figure 2-1)	35	Day (7am-6pm)	40dB(A)	Yes
Receiver 5:114 Mount Vernon Road, Mount Vernon (Figure 2-1)	36			Yes
Receiver 6: 105 Mount Vernon Road, Mount Vernon (Figure 2-1)	≤30			Yes

8 RECOMMENDED TREATMENTS – BUILDING AND MANAGEMENT

The following building and management controls are required in order to control:

- Traffic noise intrusion from Mount Vernon Road;
- Aircraft noise intrusion from flights departing Western Sydney Airport; and
- Noise emission from the operation of the facility.

8.1 BUILDING CONSTRUCTION

8.1.1 External Glazing

The following table presents the recommended glazing.

Table 8-1 – Recommended Glazing Construction

Space	Glazing Construction	R_w Rating	Acoustic Seals
All	6.38mm Laminated	31	Yes. All Windows and Doors

Note: The following constructions are recommended to comply with the project noise objectives. Aluminium framed/sliding glass doors and windows will be satisfactory provided they meet the following criteria. All external windows and doors listed are required to be fitted with Q-lon type acoustic seals. (**Mohair Seals are unacceptable**).

8.1.2 External Wall Construction

The following table presents the recommended external wall construction.

Table 8-2 – External Wall Construction

Space	External Lining	Stud System	Internal Lining
All	Blockwork, Masonry Brick or Concrete	64mm Steel Stud with 75mm thick 11kg/m^3 glasswool insulation	1x13mm Standard Plasterboard
	9mm Thick Fibre-Cement Sheeting	92mm Steel Stud with 75mm thick 11kg/m^3 glasswool insulation	1x13mm Standard Plasterboard

8.1.3 External Roof and Ceiling Construction

The following table presents the recommended external roof and ceiling construction.

Table 8-3 – External Roof and Ceiling Construction

Space	External Lining	Truss System	Internal Lining
All	Sheet Metal	Minimum 250mm airgap with 11kg/m^3 glasswool insulation	1x13mm Standard Plasterboard

8.1.4 Acoustic Barrier

The acoustic barrier proposed below is based on information provided to this office, that land between the yellow line (marked up below) and Mount Vernon Road is non-construction land. A solid fence constructed from 16mm thick plywood, 9mm thick fibre cement sheet or similar with all gaps sealed must be installed. See Figure 8-1 below for a mark-up of the boundary fence and Figures 8-2 and 8-3 for section details provided to this office.

1.8m High Solid Fence

2.4m High Solid Fence

Figure 8-1: Boundary Fence Mark-up

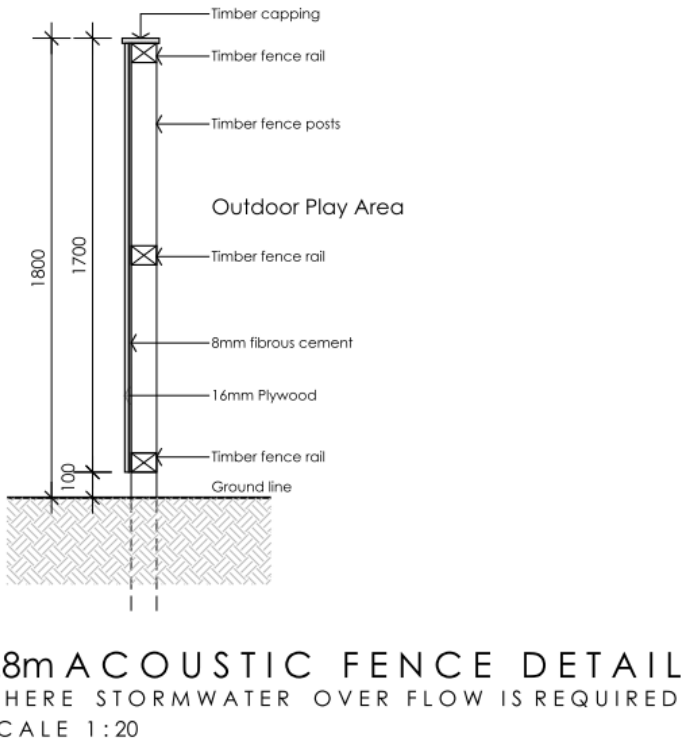


Figure 8-2: 1.8m High Acoustic Fence Detail (Provided to this office from Project Works Design)

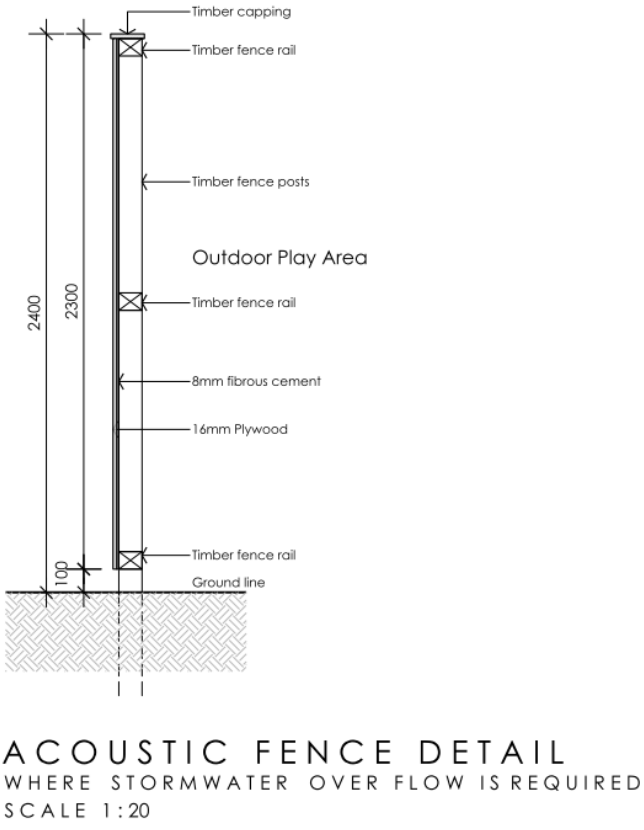


Figure 8-3: 2.4m High Acoustic Fence Detail (Provided to this office from Project Works Design)

Acoustic analysis indicates that the noise reduction will be increased by 4 dB(A) at 1kHz if the fence height is increased from 1.8m to 2.4m.

8.2 MANAGEMENT CONTROLS

- No more than 96 children inside the Child Care Centre at any one time.
- External and Internal play regulated as follows:
  - Maximum of 5 x 0-2yrs old within the Western Babies Outdoor Play area at any time.
  - Maximum of 30 x 2-5yrs old within the Northern Outdoor Play area at any time.
  - All remaining children will be undertaking indoor activities when not outside.
- All windows and external doors must be closed except for ingress and egress.
- Child Care Centre to operate only Monday to Friday 7:00am to 6:00pm.
- Carpark must not be used prior to 7:00am.
- All cleaning activities are permitted to operate after centres hours however must be completed prior to 10pm. All facades are to be closed during cleaning activities.
- All deliveries are to be between 10:00am and 2:00pm, Monday to Friday.
- No garbage collection before 7:00am or after 6:00pm.
- No centre events except for typical childcare centre operation are to be undertaken.
- Additional general management controls as follow:
  - Signs reminding staff and visitors to minimise noise at all times shall be installed at ingress/egress points from the child care centre (including car park).
  - All staff are to be given appropriate training in relation to the acoustic impacts and requirements in terms of operation of the facility.
  - Management is to ensure children are supervised at all times to minimise noise generated by the children whenever practical and possible.
  - Install a contact phone number at the front of the centre so that any complaints regarding centre operation can be made.
  - No music systems are to be used outside at any time.
  - Mechanical Plant only to operate between 7:00am and 6:00pm.

9 CONSTRUCTION NOISE AND VIBRATION IMPACTS

9.1 SENSITIVE RECEIVERS

The nearest sensitive receivers in the vicinity of the project site are as follows below:

- Receiver 1: Residential receiver located at 108 Mount Vernon Road, Mount Vernon to the North. Residential receiver is single storey.
- Receiver 2: Residential receiver located at 106 Mount Vernon Road, Mount Vernon to the North-West. Residential receiver is single storey.
- Receiver 3: Residential receiver located at 100 Mount Vernon Road, Mount Vernon to the West. Residential receiver is single storey.
- Receiver 4: Residential receiver located at 122 Mount Vernon Road, Mount Vernon to the North-East. Residential receiver is single storey.
- Receiver 5: Residential receiver located at 114 Mount Vernon Road, Mount Vernon to the East. Residential receiver is single storey.
- Receiver 6: Residential receiver located at 105 Mount Vernon Road, Mount Vernon to the South, across Mount Vernon Road. Residential receiver is single storey.

9.2 NOISE MANAGEMENT LEVEL

Establishment of criteria for construction noise requirements will be in accordance with the NSW Environmental Protection Authority 'Interim Construction Noise Guideline'.

9.2.1 NSW EPA Interim Construction Noise Guideline

Given the scale of the proposed works, the "quantitative" assessment procedure, as outlined in the Interim Construction Noise Guideline (ICNG) will be used (as opposed to the simpler "qualitative" assessment method outlined in the guidelines). The quantitative assessment method requires:

- Determination of noise generation management levels (based on background noise levels on site).
- Prediction of operational noise levels at nearby development.
- If necessary, recommendation of noise controls strategies in the event that compliance with noise emission management levels is not possible.

9.2.1.1 At Residential Receivers

EPA guidelines adopt differing strategies for noise control depending on the predicted noise level at the nearest residences:

- *"Noise affected" level*. Where construction noise is predicted to exceed the "noise affected" level at a nearby residence, the proponent should take reasonable/feasible work practices to ensure compliance with the "noise affected level". For residential properties, the "noise affected" level occurs when construction noise exceeds ambient levels by more than 10dB(A)$L_{eq(15min)}$.

- "*Highly noise affected level"*. Where noise emissions are such that nearby properties are "highly noise affected", noise controls such as respite periods should be considered. For residential properties, the "highly noise affected" level occurs when construction noise exceeds 75dB(A)$L_{eq(15min)}$ at nearby residences.

Table 9-1 – Construction Noise Management Levels to Residential Receivers

Location	"Noise Affected" Level - dB(A)$L_{eq(15min)}$	"Highly Noise Affected" Level - dB(A)$L_{eq(15min)}$
Residential Receivers	BG 35+10 = 45	75

9.2.2 Summarised Noise Management Levels

The summarised noise management levels for the proposed construction activities are presented in the table below.

Table 9-2 – Summarised Noise Management Levels

Location	Management Level dB(A)$L_{eq\ (15\ min)}$
Residential Receivers	"Noise Affected" Level - 45 "Highly Noise Affected" Level - 75

9.3 CONSTRUCTION NOISE EMISSION ASSESSMENT

Detailed construction methodology are not available at this stage, acoustic analysis will be carried out at CC stage based on requirements above to work out noise mitigation solutions.

10 CONSTRUCTION VIBRATION CRITERIA

Vibration criteria for the nearest receivers will be based on the following documents:

- DIN 4150-3 (1999-02); and
- EPA "Assessing Vibration: A technical guideline"

10.1.1 DIN 4150

German Standard DIN 4150-3 (1999-02) provides vibration velocity guideline levels for use in evaluating the effects of vibration on structures. The criteria presented in DIN 4150-3 (1999-02) are presented in the table below.

It is noted that the peak velocity is the absolute value of the maximum of any of the three orthogonal component particle velocities as measured at the foundation, and the maximum levels measured in the x- and y-horizontal directions in the plane of the floor of the uppermost storey.

Table 10-1 – DIN 4150-3 (1999-02) Safe Limits for Building Vibration

	TYPE OF STRUCTURE	PEAK PARTICLE VELOCITY (mms^{-1})			
		At Foundation at a Frequency of			Plane of Floor of Uppermost Storey
		< 10Hz	10Hz to 50Hz	50Hz to 100Hz	All Frequencies
1	Buildings used in commercial purposes, industrial buildings and buildings of similar design	20	20 to 40	40 to 50	40
2	Dwellings and buildings of similar design and/or use	5	5 to 15	15 to 20	15
3	Structures that because of their particular sensitivity to vibration, do not correspond to those listed in Lines 1 or 2 and have intrinsic value (e.g. buildings that are under a preservation order)	3	3 to 8	8 to 10	8

10.1.2 Assessing Amenity

Table 2.2 of EPA "Assessing Vibration: A technical guideline" specified the following vibration goal for human comfort:

Table 10-2 – Preferred and Maximum Weighted RMS Values for Vibration Acceleration (m/s^2) 1-80 Hz

Location	Assessment Period	Preferred Values Z-axis	Preferred Values X & Y-axis	Maximum Values Z-axis	Maximum Values X & Y-axis
Continuous Vibration					
Residences	Day time	0.010	0.0071	0.020	0.014
Impulsive Vibration					
Residence	Day time	0.3	0.21	0.6	0.42

Acceptable values for intermittent vibration shall comply with the requirements in Table 2.4 of EPA "Assessing Vibration: A technical guideline" detailed as below.

Table 10-3 - Acceptable Vibration Dose Values for Intermittent Vibration ($m/s^{1.75}$)

Location	Day time preferred value	Day time maximum value
Residences	0.20	0.40

10.1.3 Summarised Recommended Vibration Limits

The summarised vibration criteria are presented in the table below.

Table 10-4 – Recommended Vibration Limit

Vibration Receiver	Recommended Vibration Limits PPV (mm/s)
Residential Buildings	5

11 CONCLUSION

Environmental noise assessment for the proposed childcare centre to be located within 110-112 Mount Vernon Road, Mount Vernon has been carried out. Provided acoustic treatments in Section 8 of this report are adopted, the noise intrusion and noise emissions will satisfy the requirements of;

- Penrith City Council – '*Development Control Plan 2014'*;
- NSW Department of Planning & Environment document – '*State Environmental Planning Policy (Education Establishments and Child Care Centre Facilities) 2017';*
- NSW Department of Planning & Environment document – '*Child Care Planning Guideline, August 2017';*
- Association of Australian Acoustical Consultants (AAAC) document – *'Technical Guideline Child Care Centre Noise Assessment 2013';*
- Australian Standard AS2021-2015 *"Aircraft Noise Intrusion – Building siting and Construction";*
- NSW Environmental Protection Authority (EPA) document – *'NSW EPA Noise Policy for Industry (NPfI) 2017'*;
- Australian/New Zealand Standard AS/NZS: 2107:2016 – *"Acoustics – Recommended design sound levels and reverberation time for building interiors"; and*
- NSW Environmental Protection Authority (EPA) document – *'NSW Road Noise Policy 2011'* (RNP).

Based on the information provided above, we believe in our professional opinion that the proposal is capable of maintaining the acoustic amenity of the occupants and surrounding receivers, provided that the recommendation in section 8 of this report are adopted.

Construction noise emission management levels have been setup based on the requirements of the NSW Interim Construction Noise Guideline and detailed noise controls are to be determined at CC Stage.

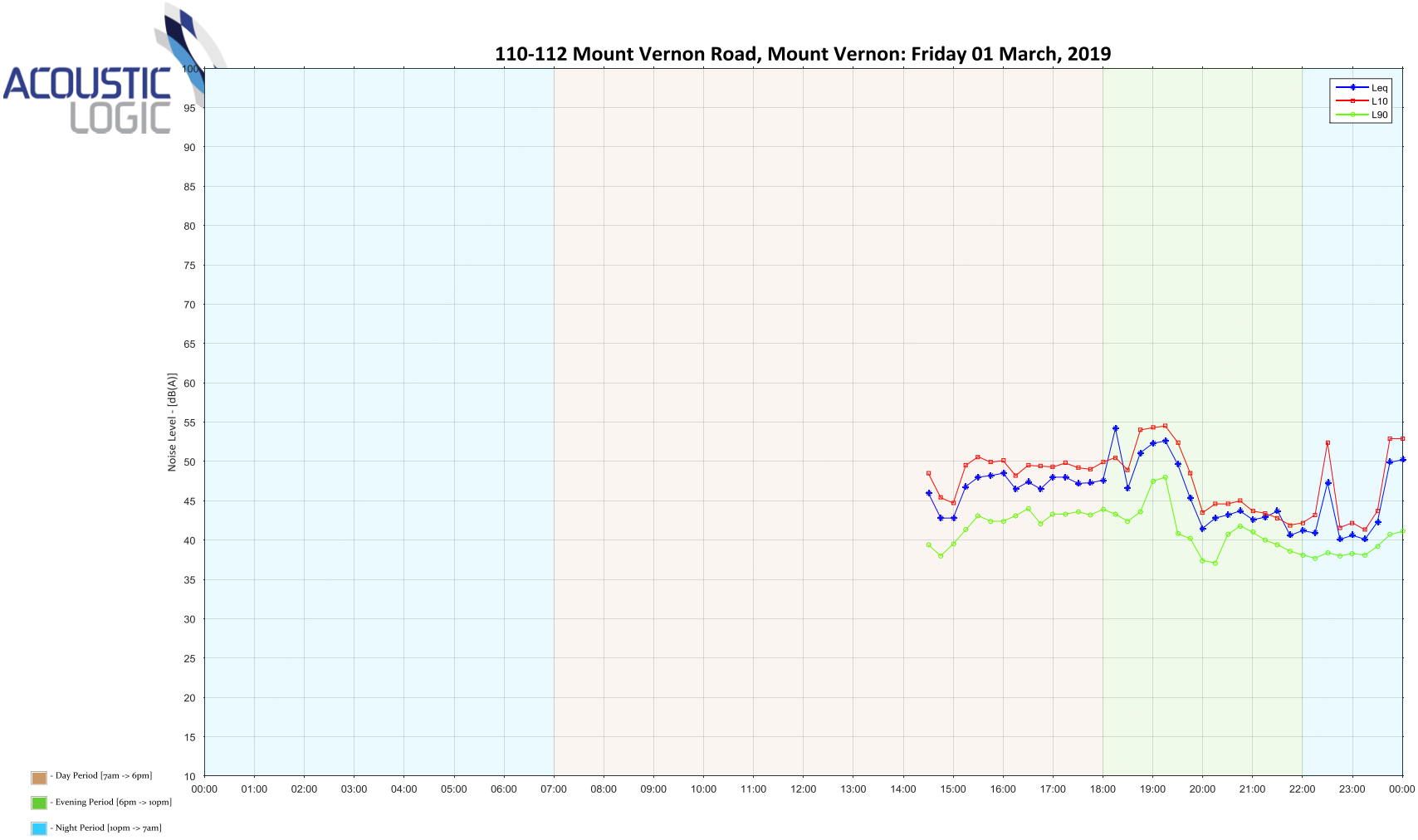
Construction vibration limits have been setup based on the requirements of DIN 4150, EPA document Assessing Vibration: A technical guideline. Detailed vibration safeguard system will be determined at CC Stage.

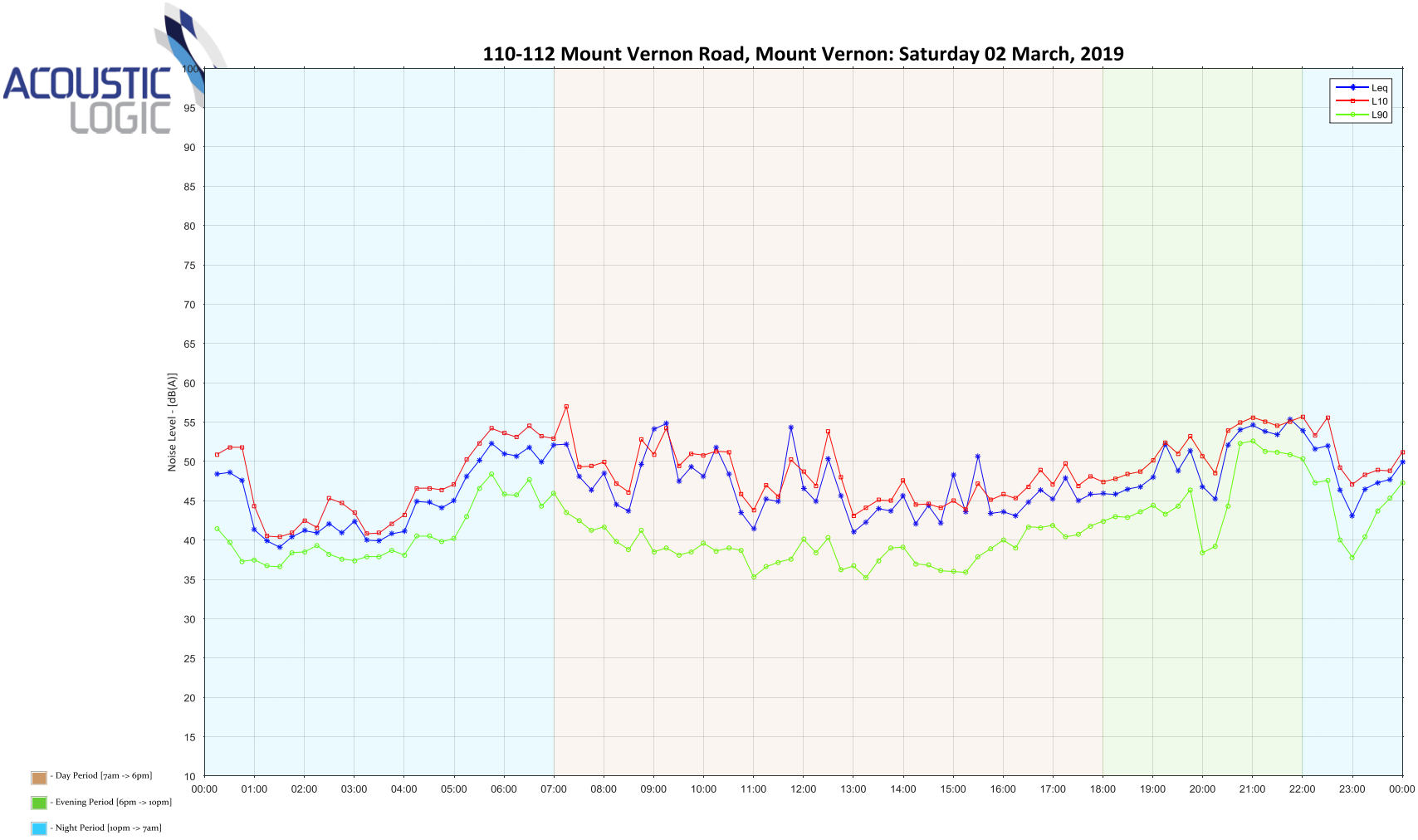
We trust this information is satisfactory. Please contact us should you have any further queries.

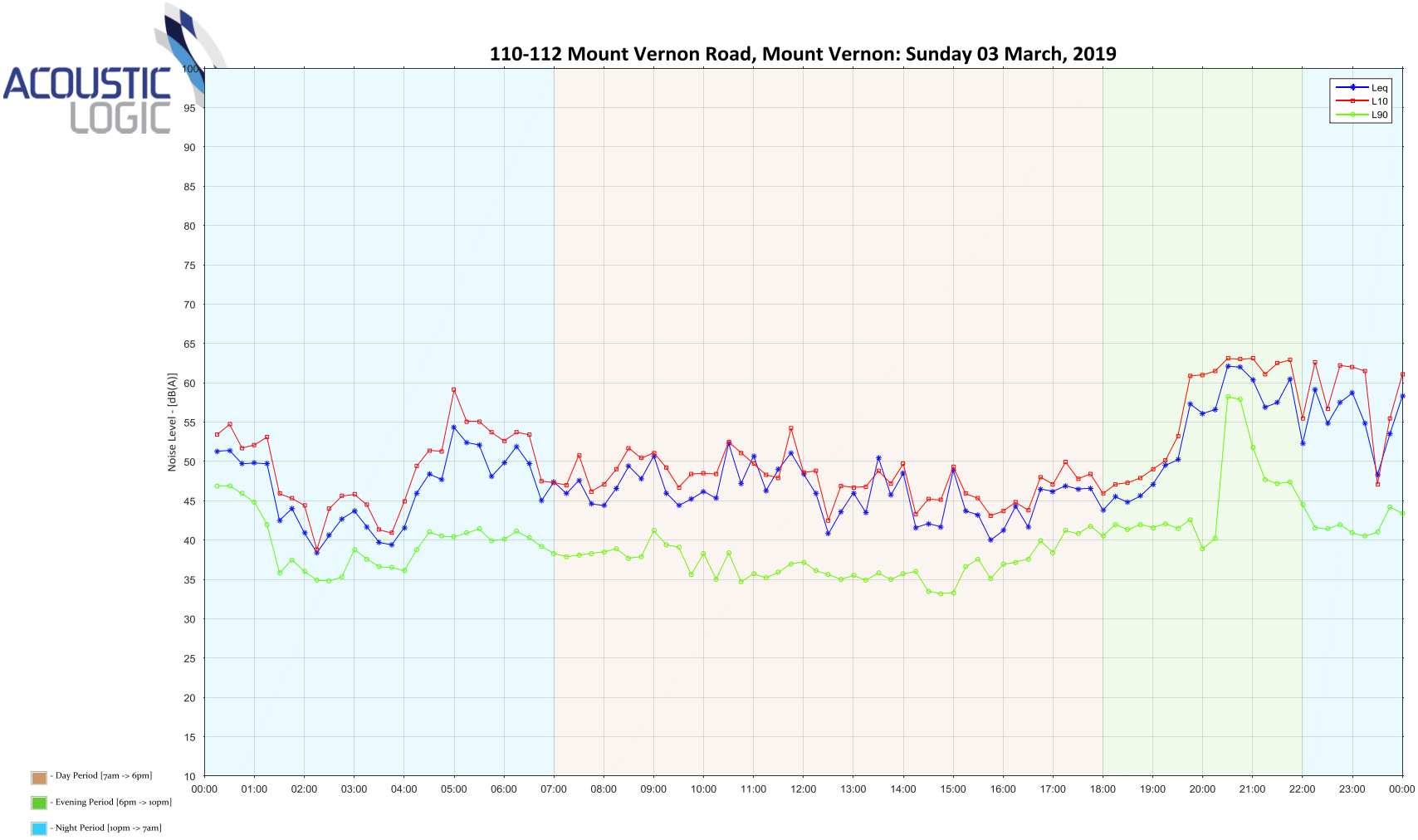
Yours faithfully,

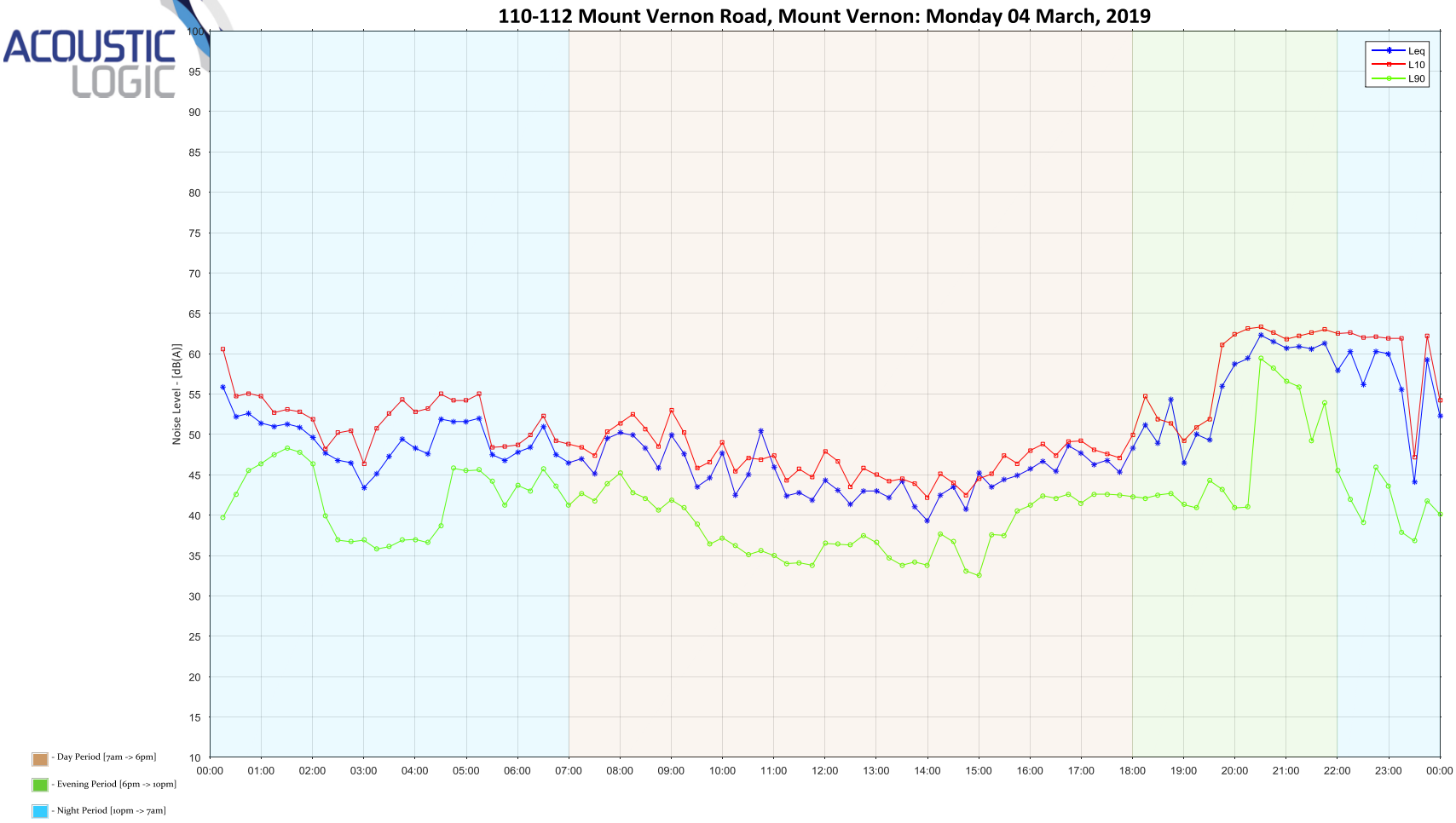
Acoustic Logic Consultancy Pty Ltd
Shane Nichols

APPENDIX A – UNATTENDED NOISE MONITORING DATA


110-112 Mount Vernon Road, Mount Vernon: Friday 01 March, 2019
Noise Level - [dB(A)]
Leq
L10
L90
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


110-112 Mount Vernon Road, Mount Vernon: Saturday 02 March, 2019
Noise Level - [dB(A)]
Leq
L10
L90
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


110-112 Mount Vernon Road, Mount Vernon: Sunday 03 March, 2019
Noise Level - [dB(A)]
Leq
L10
L90
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


110-112 Mount Vernon Road, Mount Vernon: Monday 04 March, 2019
Leq
L10
L90
Noise Level - [dB(A)]
100
95
90
85
80
75
70
65
60
55
50
45
40
35
30
25
20
15
10
00:00
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13:00
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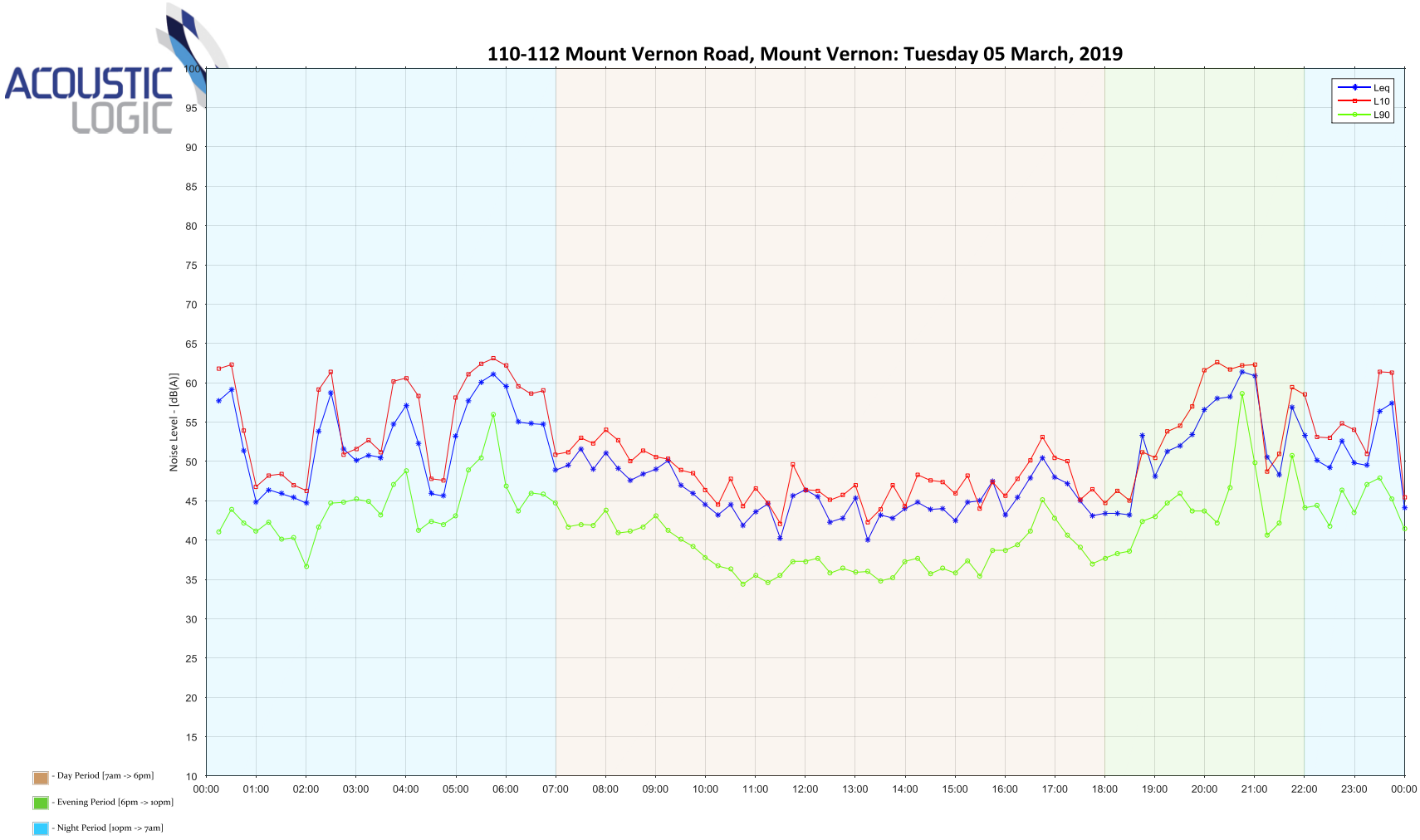
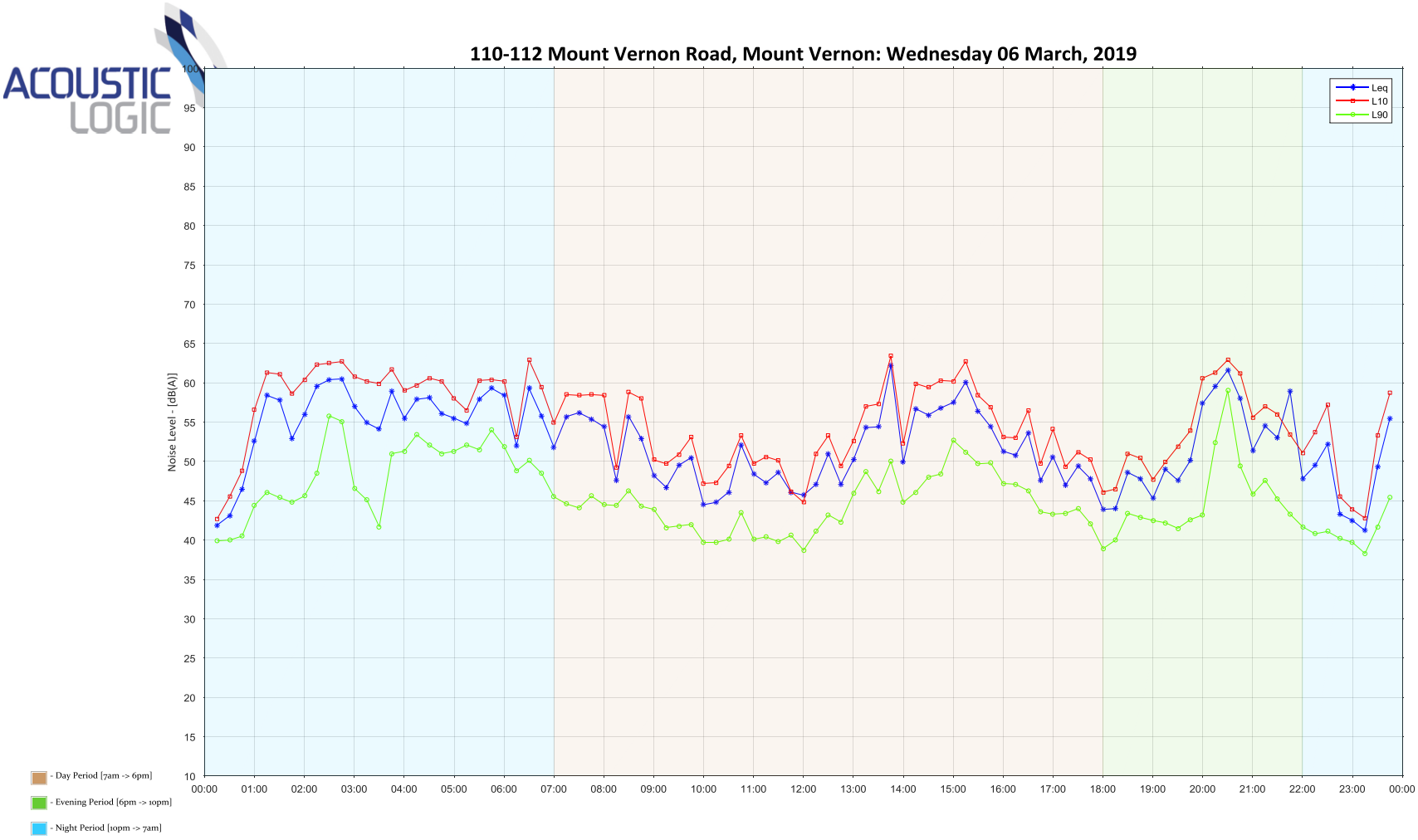
21:00
22:00
23:00
00:00
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


110-112 Mount Vernon Road, Mount Vernon: Tuesday 05 March, 2019
Noise Level - [dB(A)]
Leq
L10
L90
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


110-112 Mount Vernon Road, Mount Vernon: Wednesday 06 March, 2019
Noise Level - [dB(A)]
Leq
L10
L90
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]