



Acoustic Assessment AirTrunk Data Centre – 1 Sirius Road, Lane Cove West

EMKC Cubed Management Pty Ltd

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1 INTRODUCTION

Pulse White Noise Acoustics has been engaged to undertake a Noise Impact Assessment (NIA) of the Proposed S4.55 Modification Application for the AirTrunk SYD2 Datacentre, located at 1 Sirius Road, Lane Cove West. This Noise Impact Assessment specifically analyses the modified DA scheme which includes the following proposed changes:

DA CHANGE SCHEDULE:

MODIFICATIONS TO EXTERNAL WORK

1. Omit 3x parking lots (Parking lots West of Northern gantry)
2. Omit 1x parking lot (Parking lots West of Shell A/B)
3. Parking lots in new location (Parking lots South of Shell A)
4. Add 8x parking lots (Parking lots North West of Apollo)
5. Update parking lot configuration (Parking lots south of Shell C)
6. Omit 1x mini-bus parking bay
7. Omit 26x parking lots (Southern Tank Yard)
8. Additional water tanks (Southern Tank Yard)
9. Additional pump room (Southern Tank Yard)
10. Reduce landscape area, modify fence line and retaining wall location (Site East)

MODIFICATIONS TO BUILDING

1. Additional passenger lift (L2 - L5, South-East of Shell A)
2. Waste Room labelled (Waste Room on L4)
3. Change phase sequencing (Shell C & D)
4. Omit blade feature to North Elevation
5. Update Roof Chiller Layout

MODIFICATIONS TO WESTERN GANTRY

1. Additional Vertical Baffle (West elevation of Western Gantry)

MODIFICATIONS TO NORTHERN GANTRY

1. Additional excavation (L1 of Northern Gantry)
2. Additional HV Switchroom (L1 of Northern Gantry)
3. Proposed tank yard area (L1 of Northern Gantry)
4. Show external equipment (L2 - 5 of Northern Gantry)
5. Additional storey to Northern Gantry (L7 - L8 Northern Gantry)
6. Additional Vertical Baffle (North elevation of Northern Gantry)
7. Additional external hoist lift

MODIFICATIONS TO EASTERN GANTRY

1. Relocate External Steel Stair (both external steel stairs)
2. Additional MV Switchroom (L1 & L2 Eastern Gantry)
3. Additional storey to Eastern Gantry (L7 - L8 Eastern Gantry)
4. Additional Vertical Baffle (East elevation of Eastern Gantry)
5. Additional external hoist lift

MODIFICATIONS TO APOLLO

1. Add 1x parking lot (Apollo basement)
2. Omit 3x parking lots (Apollo lower-ground level)

Pulse White Noise Acoustics has previously undertaken noise impact assessments and noise surveys for earlier stages of the development (under the banner of Pulse Acoustics). Relevant and applicable information and data have been adopted as part of this assessment, specifically from the *Noise Impact Assessment* (reference number 2020-1-21 Airtrunk – Noise Impact Assessment, dated 22 January 2020).

This report assesses the potential operational noise and vibration impacts at the surrounding receivers. The results of background noise monitoring at the nearest receivers is presented. Project criteria have been derived with respect to the NSW Noise Policy for Industry (EPA, 2017), Assessing Vibration: A Technical Guideline (DEC, 2006), British Standard 7385-2: 1993 and British Standard 6472: 1992. The predicted operational noise scenarios have been modelled in the iNoise 2022.01 software.

This report assesses the predicted operational impacts of the proposed Datacentre against the derived noise criteria. This report provides recommended noise mitigation measures to address potential noise and vibration impacts where relevant.

1.1 Site Description

The AirTrunk SYD2 Datacentre is located at 1 Sirius Road, Lane Cove West, formally known as Lot 15 DP 1179953. The site is zoned IN2 Light Industrial and is located in the Lane Cove local government area. Commercial receivers are located to the east of the site off Apollo Place and Sirius Road, while the Lane Cove Bushwalk is located to the west of the site. The closest residential receivers are located to the north of the site within the Arise by Meriton complex, to the northwest off Magdala Road and to the west off Jeanette Street. The subject site and surrounding area is shown in Figure 1 below.

Figure 1 Site location – sourced from SixMaps NSW



1.2 Site Description & Operational Conditions

The subject site is proposed to house the AirTrunk SYD2 Datacentre. The site will feature a multi-storey building, with externally housed generators, chillers and transformers. The development proposes to include air cooled chiller units that do not require cooling towers. The modified scheme also includes low voltage generators and changes in external plant platforms, relocation of carparking and lifts.

The development is understood to include:

- 108 chillers located on the building roof
- Each chiller consists of 1 x TMA 3B1280B ES EC-34 K (1,500kW) unit (or equivalent)
- 121 generators located on the external platforms
- 121 transformers located on the external platforms

Figure 2 presents a 3D figure of the proposed site and Figure 3 shows the site layout from the rooftop level.

An aerial photograph of the University of Queensland St. Lawrence campus. The main building is a large, modern structure with a facade of vertical green and grey panels. It is surrounded by dense, lush green forest. In the background, other campus buildings and a city skyline are visible under a clear blue sky. A river flows along the bottom right of the image.

[illegible]

2 NEAREST SENSITIVE RECEIVERS

Several potentially impacted noise receivers are located in the vicinity of the subject site. The receivers in this report are considered representative of the closest off-site receivers. The considered receivers are listed in Table 1 and presented in Figure 4.

Table 1 Nearest potentially affected receivers

Receiver ID	Address	Lot and DP	Type of Receiver
R1	150 Epping Road, Lane Cove	Lot 1 DP 1219702	Residential
R2	65 Magdala Road, North Ryde	Lot 1 DP 416781	Residential
R3	14 Jeanette Street, East Ryde	Lot 20 DP 26556	Residential
C1	3 Apollo Place, Lane Cove West	Lot 8 DP 241877	Commercial
C2	1 Apollo Place, Lane Cove West	SP 80721	Commercial
C3	5 Sirius Road, Lane Cove West	Lot 5 DP 241786	Commercial
C4	1A Sirius Road, Lane Cove West	Lot 16 DP 1179953	Commercial
P1	Sirius Road, Lane Cove West	Lot 7025 DP 93903	Passive Recreation

Figure 4 Location of nearest potentially affected receivers





3 ACOUSTIC SURVEY

3.1 Noise Descriptors and Terminology

Environmental noise constantly varies in level with time. Therefore, it is necessary to measure noise in terms of quantifiable time periods with statistical descriptors. Typically environmental noise is measured over 15 minute periods and relevant statistical descriptors of the fluctuating noise are determined to quantify the measured level.

Noise (or sound) consists of minute fluctuations in atmospheric pressure capable of detection by human hearing. Noise levels are expressed in terms of decibels, abbreviated as dB or dBA, the "A" indicating that the noise levels have been frequency weighted to approximate the characteristics of normal human hearing. Because noise is measured using a logarithmic scale, 'normal' linear arithmetic does not apply, e.g. adding two sound sources of equal values result in an increase of 3dB (i.e. 60 dBA plus 60 dBA results in 63 dBA). A change of 1 dB or 2 dB in the sound level is difficult for most people to detect, whilst a 3 dB – 5 dB change corresponds to a small but noticeable change in loudness. A 10 dB change roughly corresponds to a doubling or halving in loudness.

The most relevant environmental noise descriptors are the LAeq, LA1, LA10 and LA90 noise levels. The LAeq noise level represents the "equivalent energy average noise level". This parameter is derived by integrating the noise level measured over the measurement period. It represents the level that the fluctuating noise with the same acoustic energy would be if it were constant over the measured time period.

The LA1, LA10 and LA90 levels are the levels exceeded for 1%, 10% and 90% of the sample period. These levels can be considered as the maximum noise level, the average repeatable maximum and average repeatable minimum noise levels, respectively.

Specific acoustic terminology is used in this assessment report. An explanation of common acoustic terms is included in Appendix A.

3.2 Arup Noise Survey

An acoustic survey of the existing ambient noise levels around the site were undertaken within the Arup Report (Acoustic Assessment_LCWDC-SSDA) in order to establish the noise emission criteria for the proposed development.

The Arup noise survey comprised of long term measurements over 4 days at Receiver 3 (14 Jeanette Street, East Ryde). The measured levels are given Table 3 of the Arup report, and copied below for ease of reference.

Table 2 Long term noise monitoring results, dBA

Location	Time Period ¹	Rating Background Level, dBA LA90	Ambient dB LAeq noise levels
14 Jeanette Street	Day	42 dBA	57 dBA
	Evening	42 dBA	57 dBA
	Night	31 dBA	49 dBA
<i>Note 1: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am</i> <i>Note 2: As required by the NPI, the external ambient noise levels presented are free-field noise levels</i>			

Additional spot noise measurements were made at 2 other locations over single 15 min periods at each location (see below).

**Table 3 Short term noise monitoring results, dBA**

Location	Time Period	Rating Background Level, dBA LA90	Ambient dB LAeq noise levels	Comments
150 Epping Road	14:55-15:10	47 dBA	49 dBA	Traffic noise, child crying, occasional aeroplane pass-by
65 Magdala Road	16:31-16:46	53 dBA	56 dBA	Traffic noise, car pass-by, children playing sports, birds and insects
14 Jeanette Street	17:09-17:25	46 dBA	50 dBA	Traffic noise, birds and insects, car pass-by

In reviewing the daytime background noise levels at around 3 pm at Location 1 (150 Epping Road – the closest residential at 250m) and location 3 (the long term noise monitoring location), it can be seen that the closest residential location has a daytime noise level that is 5 dBA higher than the level given at the long term noise monitoring location.

On this basis it was hypothesised that the noise criteria used in the Arup report may be too conservative by approximately 5 dBA the nearest affected residences at 150 Epping Road. Additional unattended noise logging was therefore conducted by Pulse Acoustics, with the results presented in section 3.3 below.

3.3 Pulse Acoustic Noise Monitoring

3.3.1 Monitoring Details

To validate the estimated background noise levels at Location 1, long term unattended noise monitoring was conducted at the residences located at 150 Epping Road. Unattended noise levels were measured at ground level and are therefore likely to be lower than if the noise monitor was placed on a residential balcony, where traffic noise levels are expected to be higher. The noise logger was positioned in the garden area in front of the apartment buildings, with direct line of sight to the Lane Cove West Industrial Park.

The noise logger recorded noise levels that are thought to be typical of the lower level apartments that face the Industrial Park. The noise monitoring results at this location are therefore representative of the background noise levels currently experienced by the potential receivers of noise emissions from the development.

The location of the unattended noise logging survey is shown in Figure 5 below.

3.3.2 Monitoring Instrumentation

Instrumentation used for the noise survey comprised a Svantek 971 sound level meter / analysers (serial numbers 39165) fitted with a microphone windshield. Calibration of the logger was checked prior to and following the measurements. Drift in calibration did not exceed ± 0.5 dBA. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

Charts presenting summaries of the measured daily noise data are attached in Appendix B. These charts, representing each 24 hour period, show the LA1, LA10, LAeq and LA90 noise levels measured over 15 minute time periods.

The measurement results have been filtered to remove data affected by adverse weather conditions, such as excessively windy or rainy time periods, as recorded by the Bureau of Meteorology weather station at Darling Harbour.

The noise monitoring location is shown in the image contained in Figure 5 below. Detailed noise logging results are shown in Appendix B.

Figure 5 Logging Location - front yard of 150 Epping Road development

3.4 Environmental Noise Monitoring Results

The measured background noise data of the logger was processed in accordance with the recommendations contained in the NSW Environment Protection Authority's (EPA) *Noise Policy for Industry* (NPI).

The Rating Background Noise Level (RBL) is the background noise level used for assessment purposes at the nearest potentially affected receiver. It is the 90th percentile of the daily background noise levels during each assessment period, being day, evening and night. The RBL LA90 (15minute) and LAeq noise levels are presented in Table 4.

The results of the measurement survey provide ambient noise levels that are considered to be representative of the levels to be expected at the nearest and most affected residences to the proposed development (i.e. the apartments located at 150 Epping Road).

Table 4 Measured Ambient Noise Levels corresponding to the NPI's Assessment Time Periods

Measurement Location	Daytime ¹ 7:00 am to 6:00 pm		Evening ¹ 6:00 pm to 10:00 pm		Night-time ¹ 10:00 pm to 7:00 am	
	RBL ²	LAeq ³	RBL ²	LAeq ³	RBL ²	LAeq ³
150 Epping Road	46 dBA	53 dBA	46 dBA	50 dBA	41 dBA	47 dBA

Note 1: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am

Note 2: 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 3: The LAeq is the energy 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 OPERATIONAL NOISE EMISSION CRITERIA

4.1 NSW Noise Policy for Industry

In NSW, the control of noise emissions is the responsibility of Local Governments and the NSW Environment Protection Authority (NSW EPA).

The NSW EPA has recently released a document titled *Noise Policy for Industry* (NSW NPI) which provides a framework and process for determining external noise criteria for the assessment of noise emission from industrial developments. The NSW NPI criteria for industrial noise sources have two components:

- Controlling the intrusive noise impacts for residents and other sensitive receivers in the short term; and
- Maintaining noise level amenity of particular land uses for residents and sensitive receivers in other land uses.

4.1.1 Intrusive Noise Impacts (Residential Receivers)

The NSW NPI states that the noise from any single source should not intrude greatly above the prevailing background noise level. Industrial noises are generally considered acceptable if the equivalent continuous (energy-average) A-weighted level of noise from the source (LAeq), measured over a 15 minute period, does not exceed the background noise level measured in the absence of the source by more than 5 dB(A). This is often termed the Intrusiveness Criterion.

The 'Rating Background Level' (RBL) is the background noise level to be used for assessment purposes and is determined by the methods given in the NSW NPI. Using the rating background noise level approach results in the intrusiveness criterion being met for 90% of the time. Adjustments are to be applied to the level of noise produced by the source that is received at the assessment point where the noise source contains annoying characteristics such as tonality or impulsiveness.

4.1.2 Protecting Noise Amenity (All Receivers)

To limit continuing increases in noise levels, the maximum ambient noise level within an area from industrial noise sources should not normally exceed the acceptable noise levels specified in Table 2.2 of the NSW NPI. That is, the ambient LAeq noise level should not exceed the level appropriate for the particular locality and land use. This is often termed the 'Background Creep' or Amenity Criterion.

The amenity assessment is based on noise criteria specified for a particular land use and corresponding sensitivity to noise. The cumulative effect of noise from industrial sources needs to be considered in assessing the impact. These criteria relate only to other continuous industrial-type noise and do not include road, rail or community noise. If the existing (measured) industrial-type noise level approaches the criterion value, then the NSW NPI sets maximum noise emission levels from new sources with the objective of ensuring that the cumulative levels do not significantly exceed the criterion.

4.2 Area Classification

The NSW NPI characterises the "Urban Residential" noise environment as an area with an acoustical environment which shows the following:

- It is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable sources, consisting mostly of traffic and/or industrial related sounds
- Has through traffic with characteristically heavy and continuous traffic flows during peak periods
- is near commercial districts or industrial districts
- It has a combination of any of the above

In addition, the RBLs at 150 Epping Road are > 45 during the day, > 40 during the evening and > 35 during the night period, corresponding to the Urban receiver category. While it is noted that the Arup report had 150 Epping Road as a 'suburban receiver', from the noise logging conducted at this specific receiver as well as the characteristics mentioned above, the Urban receiver category is selected.

For other residences located to the west of the proposed development, these areas are classified as “Suburban” areas, as per the Arup report. The suburban category is an area that has local traffic with characteristic intermittent traffic flows or with some limited commerce or industry. The suburban area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.

Therefore for residential receivers in either “Urban” or “Suburban” areas as well as non-residential receivers, the recommended amenity criteria are shown in Table 5 below.

Table 5 NSW NPI – Recommended LAeq Noise Levels from Industrial Noise Sources

Type of Receiver	Indicative Noise Amenity Area	Time of Day ¹	Recommended Amenity Noise Level (LAeq, period) ²
Residence	Urban	Day	60
		Evening	50
		Night	45
	Suburban	Day	55
		Evening	45
		Night	40
Area reserved for passive recreation (e.g., national parks)	All	When in use	50
Commercial	All	When in use	65
<i>Note 1: For Monday to Saturday, Daytime 7:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 7:00 am. On Sundays and Public Holidays, Daytime 8:00 am – 6:00 pm; Evening 6:00 pm – 10:00 pm; Night-time 10:00 pm – 8:00 am</i> <i>Note 2: The LAeq is the energy 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.</i>			

When the existing noise level from industrial noise sources is close to the recommended “Amenity Noise Level” (ANL) given above, noise from the new source must be controlled to preserve the amenity of the area in line with the requirements of the NSW NPI.

4.2.1 Project Trigger Noise Levels

Generally speaking the noise criteria is determined by both the intrusiveness and amenity criteria. The intrusive and amenity criteria for industrial noise emissions, derived from the measured data, are presented in the below table. The criteria are nominated for the purpose of determining the operational noise limits for mechanical plant associated with the development which can potentially affect noise sensitive receivers.

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 the below table.

**Table 6 External noise level criteria in accordance with the NSW NPI**

Location	Time of Day	Project Amenity Noise Level, LAeq, period ¹ (dBA)	Measured LA90, 15 min (RBL) ² (dBA)	Measured LAeq, period Noise Level (dBA)	Intrusive LAeq, 15 min Criterion ³ for New Sources (dBA)	Amenity LAeq, 15 min Criterion for New Sources (dBA) ^{4,5}	Noise Criterion (lower of the intrusiveness and amenity criteria ⁶)
150 Epping Road – Pulse data from Sat. 29-06-2019 and Tues. 02-07-2019 (R1)	Day	55	46	53	51	58	51
	Evening	45	46	50	51	48	48
	Night	40	41	47	46	43	43
150 Epping Road - Arup data at 2:55-3:10pm (R1)	Day	50	47	49			
	Evening	40					
	Night	35					
65 Magdala Rd - Arup data at 4:30-4:45pm (R2)	Day	50	53	56			
	Evening	40					
	Night	35					
14 Jeanette St East Ryde - Arup data (R3)	Day	50	42	57	47	50	47
	Evening	40	42	57	47	50	47
	Night	35	31	49	36	42	36
Commercial (C1-C4)	When in use	60	N/A	N/A	N/A	63	63
Passive recreation (P1)	When in use	45	N/A	N/A	N/A	48	48
<i>Note 1: Project Amenity Noise Levels corresponding to "Suburban" areas, equivalent to the Recommended Amenity Noise Levels (from the NPI) minus 5 dBA</i> <i>Note 2: LA90 Background Noise or Rating Background Level (RBL)</i> <i>Note 3: Intrusive criterion is equal to the RBL + 5 dB</i> <i>Note 4: Where the project amenity noise levels is 10 dB below the existing industrial LAeq noise level, the amenity criteria can be set at 10 dB below the existing LAeq noise level. Where the project amenity noise levels is 15 dB below the existing traffic noise level, the amenity criteria can be set at 15 dB below the existing LAeq noise level. This is based on the assumption that the existing noise levels are unlikely to decrease in the future.</i> <i>Note 5: According to Section 2.2 of the NSW NPI, the LAeq, 15 minutes is equal to the LAeq, period + 3 dB</i> <i>Note 6: The lower of the amenity and the intrusiveness level is typically used as the applicable overall noise criterion for the day, evening and nighttime periods.</i>							

4.3 Criteria for Emergency Generators

Section 1.4 of the Noise Policy for Industry is shown below:

Noise Policy for Industry

1.4 What noise sources does the policy apply to?

The policy applies to industrial noise sources from activities listed in **Schedule 1 of the POEO Act** and regulated by the EPA. All scheduled activities require an environment protection licence issued under the POEO Act. The policy is also an appropriate reference document for DP&E when assessing major development proposals under the EP&A Act.

Local government is an independent regulator for noise under the legislation, and has discretion in dealing with noise within its area of responsibility.

The policy is designed for large industrial and agricultural sources and specifies substantial monitoring and assessment procedures that may not always be applicable to the types of sources councils need to address. However, local government may find the policy helpful in assessing noise from premises it regulates and in the carrying-out of its land-use planning responsibilities as outlined in Section 1.1.1. Information on noise management for local government is also provided in the EPA's [Noise guide for local government 2013](#).

In general, the types of premises dealt with in the policy include:

As can be seen above, the Noise Policy for Industry clearly states that "The policy applies to industrial noise sources from activities listed in Schedule 1 of the Protection of the Environment Operations (POEO) Act and regulated by the EPA". Schedule 1 of the POEO Act is highlighted in bold for emphasis. Schedule 1 of the POEO Act, Section 17 (1A) is shown below

17 Electricity generation

(1) This clause applies to the following activities—

electricity works (wind farms), meaning the generation of electricity by means of wind turbines.

general electricity works, meaning the generation of electricity by means of electricity plant that, wherever situated, is based on, or uses, any energy source other than wind power or solar power.

metropolitan electricity works (gas turbines), meaning the generation of electricity by means of electricity plant—

(a) that is based on, or uses, a gas turbine, and

(b) that is situated in the metropolitan area or in the local government area of Port Stephens, Maitland, Cessnock, Singleton, Wollondilly or Kiama.

metropolitan electricity works (internal combustion engines), meaning the generation of electricity by means of electricity plant—

(a) that is based on, or uses, an internal combustion engine, and

(b) that is situated in the metropolitan area or in the local government area of Port Stephens, Maitland, Cessnock, Singleton, Wollondilly or Kiama.

(1A) However, this clause does not apply to the generation of electricity by means of electricity plant that is emergency stand-by plant operating for less than 200 hours per year.

As seen above, Schedule 1, Section 17 (1A) of the POEO Act, states that

"this clause does not apply to the generation of electricity by means of electricity plant that is emergency stand-by plant operating for less than 200 hours per year".

Therefore, under the POEO Act, the Noise Policy for Industry is only applicable to generator events that occur more than 200 hours a year. Note that the Noise Policy for Industry is applicable to the assessment of all other noise sources.

It is understood that as part of this proposal, a number of generators are proposed to be located on external platforms. The generators are proposed to be used in the event of a power blackout. Additionally, the generators are proposed to be tested periodically, one at a time during the day period.

Testing of generators one by one is not expected to tally over 200 hours per year. The use of all generators in a power outage will also not exceed 200 hours per year. Therefore, use of all generators at once is outside the Noise Policy for Industry. Testing of one generator at a time is within the framework of the Noise Policy for Industry and is analysed in this report as an operational scenario.

5 OPERATIONAL NOISE ASSESSMENT

5.1 Predictive Noise Modelling Equipment

Predictive noise modelling in this report was carried out using the ISO 9613 algorithm within iNoise V2022.01. The iNoise software package was specifically used, as the 3D computational model of the site and surrounding area allows the terrain undulations, building heights and locations and noise source positions to be specifically modelled. In addition to terrain, buildings and noise sources, the iNoise model also includes ground absorption and receiver locations.

All modelling algorithms have their advantages and disadvantages. Each software package also notably interprets the modelling algorithms differently. A clear advantage of ISO9613 is that it offers ISO17534-3 compliance. This standard ensures conformity between modelling software packages, improving the repeatability of noise predictions. ISO9613 is often considered the international industry standard noise modelling approach.

The approach taken in this assessment has been chosen to optimise the outcome for the most affected sensitive receivers. Noise modelling was completed using iNoise and incorporating the ISO9613 algorithm. A modification was included to use the CONCAWE approach for temperature effects at distances greater than 100m. Class F weather conditions with wind speeds of 2m/s were selected in accordance with the requirements of the NPfI. This approach has ensured that a consistently verifiable approach to ground absorption, air absorption and barrier attenuation has been chosen with the added advantage of the consideration of adverse weather conditions for sensitive receivers at distances greater than 100m.

A notable disadvantage of the CONCAWE noise model is that it applies from 100m to 2000m. The nearest sensitive receiver for this project is within 100 m from the site. Given the very small distance to sensitive receivers, weather effects, air absorption and ground absorption have very little influence on the noise mitigation recommendations.

5.2 Equipment Sound Power Levels

In order to ensure compliance with the Project Trigger Noise Levels summarised in 4.2.1, the proposed chiller and transformer plant have been assessed at the nearest residences, located at 150 Epping Road as follows:

- The assessment for the proposed equipment is based on the sound levels listed for the chillers in Table 7, and the transformers and generators in Table 8 below.
- The chiller sound power levels for the day, evening and night-time periods have been based on the data provided by Geoclima for the proposed TMA 3B1280B ES EC-34 K (1,500kW_r) Circlemiser models.
- **The chiller sound power levels for the day, evening and night-time periods are to be confirmed by Geoclima.**
- The sound power levels for the Transformers and Generators are based on the sound power levels within the Arup Memorandum dated 17 January 2020 and the Arup noise report LWCDC – SSDA Acoustic Assessment.
- As mentioned in section 4.3, testing of one generator at a time is within the framework of the Noise Policy for Industry. The use of all generators at once for emergency situations is not within the framework of section 1.4 of the Noise Policy for Industry as per Schedule 1 of the POEO Act, Section 17 (1A). Therefore, a single generator in the worst case location is included in the day situation only.

Table 7 Sound power level for Chiller and correction levels without any attenuators

Condition	Temp	Unit	SWL (dB) in Octave Band Centre Frequencies (Hz)								
			63	125	250	500	1000	2000	4000	8000	dBA
Max	44 (100% load)	Circlemiser TMA 3B 1280B ES EC-34 K (1,500kW _r)	76	83	84	90	94	93	86	80	98
Day	35 (35% fans)	Circlemiser TMA 3B 1280B ES EC-34 K (1,500kW _r)	68	78	77	83	87	85	79	73	91
Evening	30 (35% fans)	Circlemiser TMA 3B 1280B ES EC-34 K (1,500kW _r)	66	78	75	81	85	83	77	72	89
Night	25 (34% fans)	Circlemiser TMA 3B 1280B ES EC-34 K (1,500kW _r)	64	78	73	79	82	81	75	70	86

Table 8 Sound power level for transformers and diesel generators

Equipment	No of units	SWL (dB) in Octave Band Centre Frequencies (Hz)								
		63	125	250	500	1000	2000	4000	8000	dBA
Transformers	121	71	73	68	68	62	57	52	45	68
Generators	1	118	114	99	96	98	99	91	87	105

5.3 Modelling Assumptions

In this assessment, the following assumptions have been incorporated:

- Noise generating scenarios are modelled on a worst case 15 minute period;
- Terrain has been sourced from the NSW Land and Property Information database Six Maps;
- Receivers are modelled 1.5m above the ground, except for Receiver 1, which is modelled 16.5m above the ground to represent the highest floor of the apartment building, which has direct line of sight to the proposed development;
- On site and surrounding buildings have been included in the model;
- The height of noise sources, including the chillers, transformers and generators has been based on architectural drawings of the proposed development;
- The assessment for the proposed equipment is based on the sound levels listed in Table 7 and Table 8;
- Generators are to be tested during the day period only;
- Generator testing is assumed to take place using a single generator at a time;
- Noise-enhancing weather conditions have been accounted for in the modelling. In line with Fact Sheet D of the NPfI, Option 1 has been selected to consider meteorological effects (see below extract); this represents a conservative assessment methodology.

*Adopt the **noise-enhancing meteorological conditions** for all assessment periods for noise impact assessment purposes without an assessment of how often these conditions occur – a conservative approach that considers source-to-receiver wind vectors for all receivers and F class temperature inversions with wind speeds up to 2 m/s at night.*

5.4 Modelled Scenarios

Three noise generating scenarios are modelled in this report, for the day, evening and night periods, as follows

- Daytime: 108 chillers operating in the day condition, 121 transformers and 1 generator
- Evening: 108 chillers operating in the evening condition and 121 transformers
- Night: 108 chillers operating in the night condition and 121 transformers

5.5 Predicted Noise Levels

The predicted L_{Aeq} results of the modelled operational scenarios are presented in the below tables for the day, evening and night periods.

Table 9 Predicted Noise Levels, Day Operational Scenario, L_{Aeq} (15 minute)

Receiver (Height from ground)	Criteria Day	Predicted Noise Levels			Compliance
		Day (as approved)	Day (as modified under S4.55)	Difference	
R1 (16.5m)	51	50	50	-	Yes
R2 (1.5m)	47	43	43	-	Yes
R3 (1.5m)	47	37	37	-	Yes
C1 (1.5m)	63	54	54	-	Yes
C2 (1.5m)	63	54	54	-	Yes
C3 (1.5m)	63	61	61	-	Yes
C4 (1.5m)	63	63	62	-1	Yes
P1 (1.5m)	48	48	48	-	Yes

Table 10 Predicted Noise Levels, Evening Operational Scenario, L_{Aeq} (15 minute)

Receiver (Height from ground)	Criteria Evening	Predicted Noise Levels			Compliance
		Evening (as approved)	Evening (as modified under S4.55)	Difference	
R1 (16.5m)	48	45	45	-	Yes
R2 (1.5m)	47	39	38	-1	Yes
R3 (1.5m)	47	34	34	-	Yes
C1 (1.5m)	63	52	52	-	Yes
C2 (1.5m)	63	51	51	-	Yes
C3 (1.5m)	63	53	54	+1	Yes
C4 (1.5m)	63	48	48	-	Yes
P1 (1.5m)	48	43	43	-	Yes

Table 11 Predicted Noise Levels, Night Operational Scenario, L_{Aeq} (15 minute)

Receiver (Height from ground)	Criteria Night	Predicted Noise Levels			Compliance
		Night (as approved)	Night (as modified under S4.55)	Difference	
R1 (16.5m)	43	43	43	-	Yes
R2 (1.5m)	36	36	36	-	Yes
R3 (1.5m)	36	32	32	-	Yes
C1 (1.5m)	63	50	50	-	Yes
C2 (1.5m)	63	48	49	+1	Yes
C3 (1.5m)	63	51	52	+1	Yes
C4 (1.5m)	63	47	47	-	Yes
P1 (1.5m)	48	41	41	-	Yes

Noise contours of the modelled operational scenarios are shown below in Figure 6 to Figure 8. Note that the contour maps are set to receiver level heights of 1.5m, while the noise sources are at rooftop height.

Figure 6 Operational Scenario 1 – Day Activities

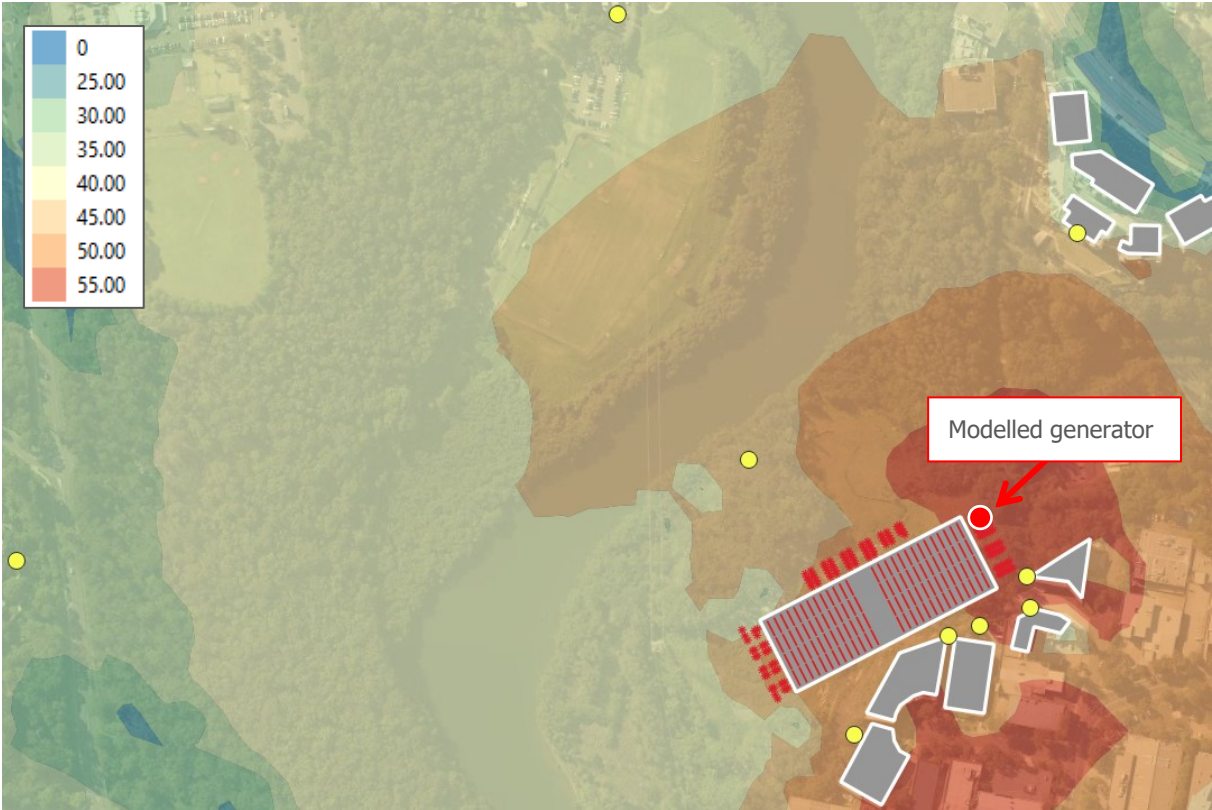


Figure 7 Operational Scenario 2 – Evening Activities

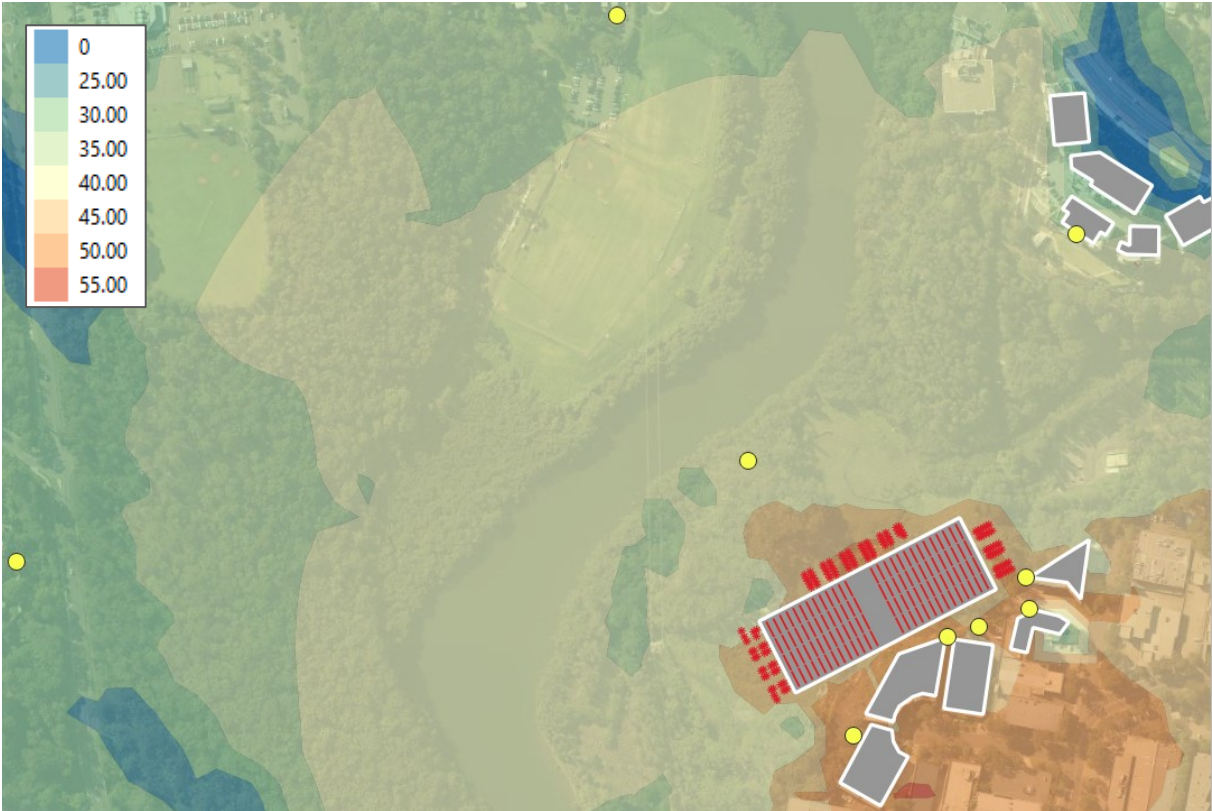
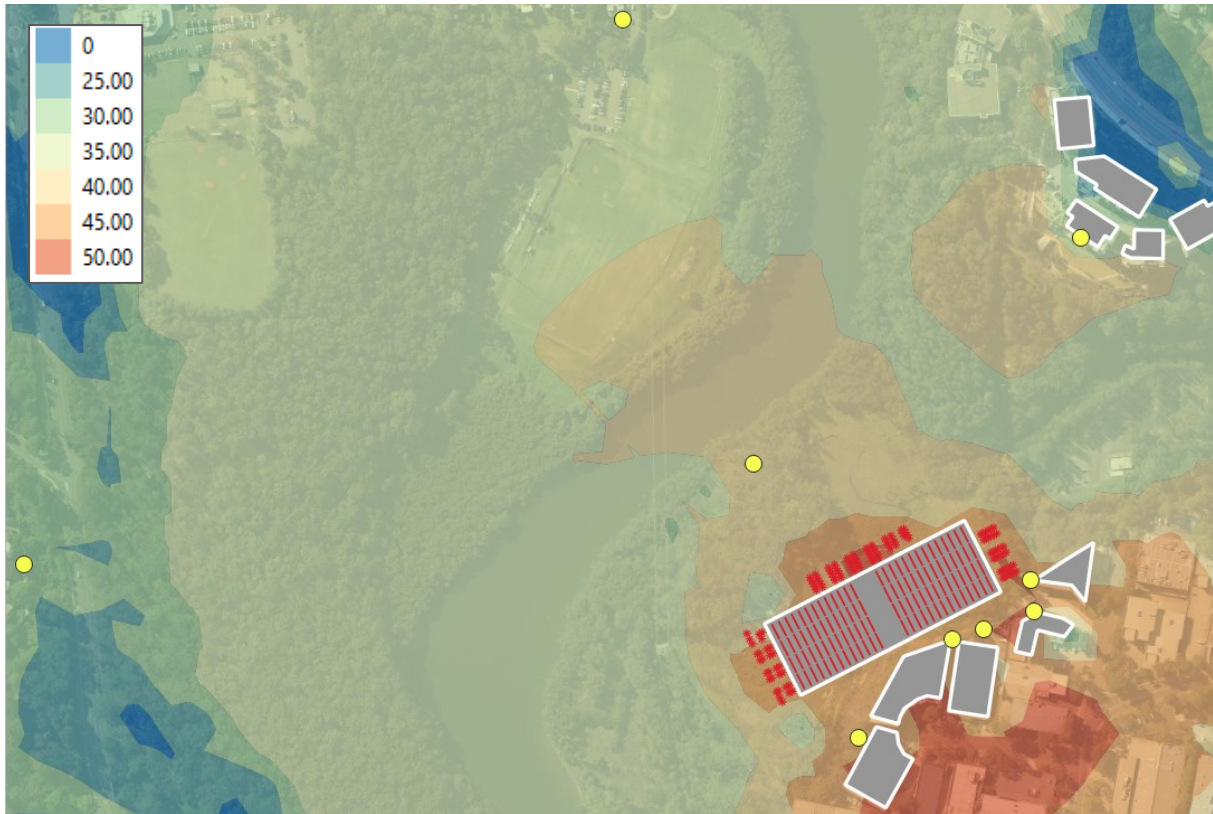


Figure 8 Operational Scenario 3 – Night Activities

The results from Table 9 and the figures above show that the L_{Aeq} noise levels are predicted to comply with the noise criteria at all surrounding residential and non-residential receivers during all time periods. No further mitigation measures are recommended beyond the assumptions already included within this report.

6 CONCLUSIONS

Pulse White Noise Acoustics has been engaged to undertake a Noise Impact Assessment (NIA) of the Proposed S4.55 Modification Application for the AirTrunk SYD2 Datacentre, located at 1 Sirius Road, Lane Cove West. This Noise Impact Assessment specifically analyses the modified DA scheme as discussed throughout this report.

This report assesses the potential operational noise and vibration impacts at the surrounding receivers. The results of background noise monitoring at the nearest receivers is presented. Project criteria have been derived with respect to the NSW Noise Policy for Industry (EPA, 2017), Assessing Vibration: A Technical Guideline (DEC, 2006), British Standard 7385-2: 1993 and British Standard 6472: 1992. The predicted operational noise scenarios have been modelled in the iNoise 2022.01 software.

The operational activities for the day, evening and night periods were modelled in iNoise V2022.01 modelling software. The 3D modelling software specifically allows the site and surrounding area allows the terrain undulations of the site and surrounds, the building heights and locations as well as the noise source positions to be specifically modelled. Additionally, noise modelling considers the nearest commercial and passive recreation receivers.

This report considers day, evening and night scenarios in which all chillers and transformers are operational, with an additional one generator considered to be testing during the day scenario. This approach is consistent with section 1.4 of the Noise Policy for Industry and Schedule 1 of the POEO Act, Section 17 (1A).

Operational noise controls in this report include the following

- The chiller sound power levels for the day, evening and night-time periods are to be no higher than the data provided by Geoclima for the proposed TMA 3B 1280B ES EC-34 K (1,500kW) Circlemiser models.
- Testing of generators takes place during the day period only with a single generator at a time;
- The sound power levels for the generators and transformers are no higher than the levels quoted in Table 8 of this report.

Following the adoption of the noise control measures and assumptions listed in this report, the operational noise generating scenarios are predicted to be compliant with the Noise Policy for Industry.

Regards,

A handwritten signature in black ink, appearing to read 'Alex Danon'.

Alex Danon

Acoustic Engineer

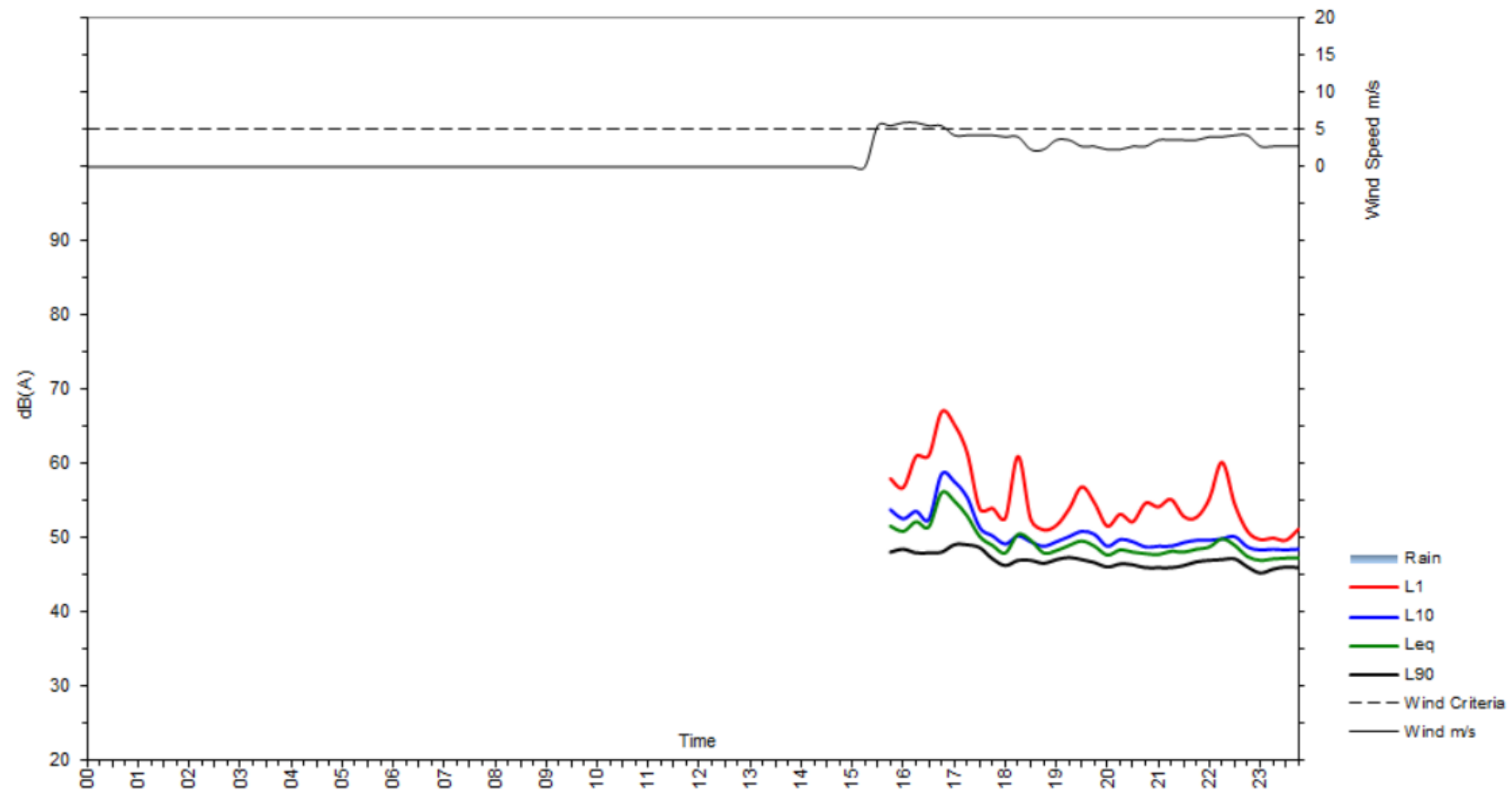
PULSE WHITE NOISE ACOUSTICS PTY LTD

APPENDIX A: ACOUSTIC GLOSSARY

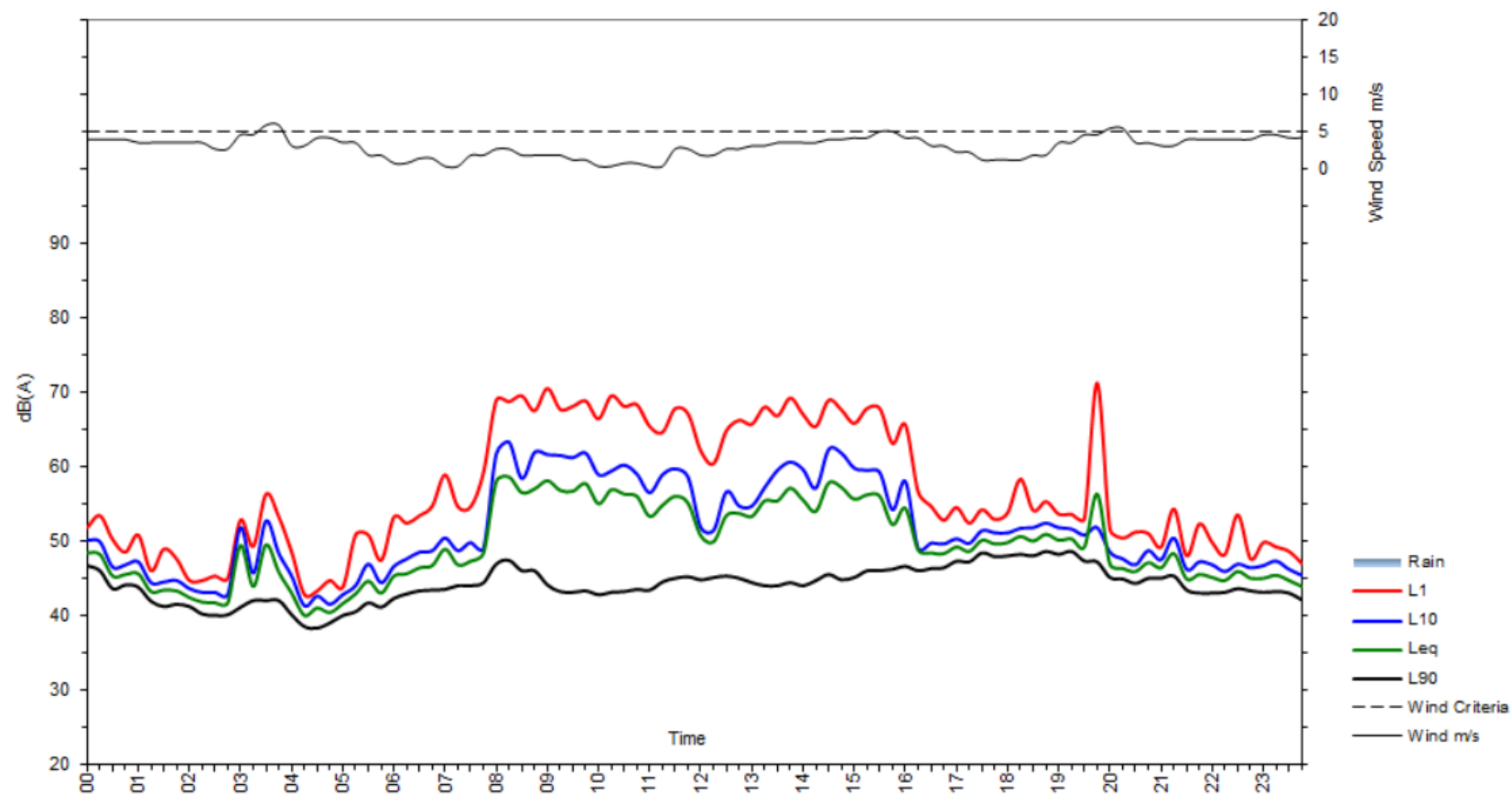
<i>Ambient Sound</i>	The totally encompassing sound in a given situation at a given time, usually composed of sound from all sources near and far.
<i>Audible Range</i>	The limits of frequency which are audible or heard as sound. The normal ear in young adults detects sound having frequencies in the region 20 Hz to 20 kHz, although it is possible for some people to detect frequencies outside these limits.
<i>Character, acoustic</i>	The total of the qualities making up the individuality of the noise. The pitch or shape of a sound's frequency content (spectrum) dictate a sound's character.
<i>Decibel [dB]</i>	The level of noise is measured objectively using a Sound Level Meter. The following are examples of the decibel readings of every day sounds; 0dBA the faintest sound we can hear 30dBA a quiet library or in a quiet location in the country 45dBA typical office space. Ambience in the city at night 60dBA Martin Place at lunch time 70dBA the sound of a car passing on the street 80dBA loud music played at home 90dBA the sound of a truck passing on the street 100dBA the sound of a rock band 115dBA limit of sound permitted in industry 120dBA deafening
<i>dB(A)</i>	<i>A-weighted decibels</i> The ear is not as effective in hearing low frequency sounds as it is hearing high frequency sounds. That is, low frequency sounds of the same dB level are not heard as loud as high frequency sounds. The sound level meter replicates the human response of the ear by using an electronic filter which is called the "A" filter. A sound level measured with this filter switched on is denoted as dB(A). Practically all noise is measured using the A filter. The sound pressure level in dB(A) gives a close indication of the subjective loudness of the noise.
<i>Frequency</i>	Frequency is synonymous to <i>pitch</i> . Sounds have a pitch which is peculiar to the nature of the sound generator. For example, the sound of a tiny bell has a high pitch and the sound of a bass drum has a low pitch. Frequency or pitch can be measured on a scale in units of Hertz or Hz.
<i>Loudness</i>	A rise of 10 dB in sound level corresponds approximately to a doubling of subjective loudness. That is, a sound of 85 dB is twice as loud as a sound of 75 dB which is twice as loud as a sound of 65 dB and so on
<i>LMax</i>	The maximum sound pressure level measured over a given period.
<i>LMin</i>	The minimum sound pressure level measured over a given period.
<i>L1</i>	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
<i>L10</i>	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
<i>L90</i>	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L ₉₀ noise level expressed in units of dB(A).
<i>Leq</i>	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.
<i>Background Sound Level</i>	The average of the lowest levels of the sound levels measured in an affected area in the absence of noise from occupants and from unwanted, external ambient noise sources. Usually taken to mean the LA90 value
<i>Sound Isolation</i>	A reference to the degree of acoustical separation between any two areas. Sound isolation may refer to sound transmission loss of a partition or to noise reduction from any unwanted noise source. The term "sound isolation" does not specify any grade or performance quality and requires the units to be specified for any contractual condition
<i>Sound Pressure Level, LP dB</i>	A measurement obtained directly using a microphone and sound level meter. Sound pressure level varies with distance from a source and with changes to the measuring environment. Sound pressure level equals 20 times the logarithm to the base 10 of the ratio of the rms sound pressure to the reference sound pressure of 20 micro Pascals.
<i>Sound Power Level, Lw dB</i>	Sound power level is a measure of the sound energy emitted by a source, does not change with distance, and cannot be directly measured. Sound power level of a machine may vary depending on the actual operating load and is calculated from sound pressure level measurements with appropriate corrections for distance and/or environmental conditions. Sound power levels is equal to 10 times the logarithm to the base 10 of the ratio of the sound power of the source to the reference sound power of 1 picoWatt

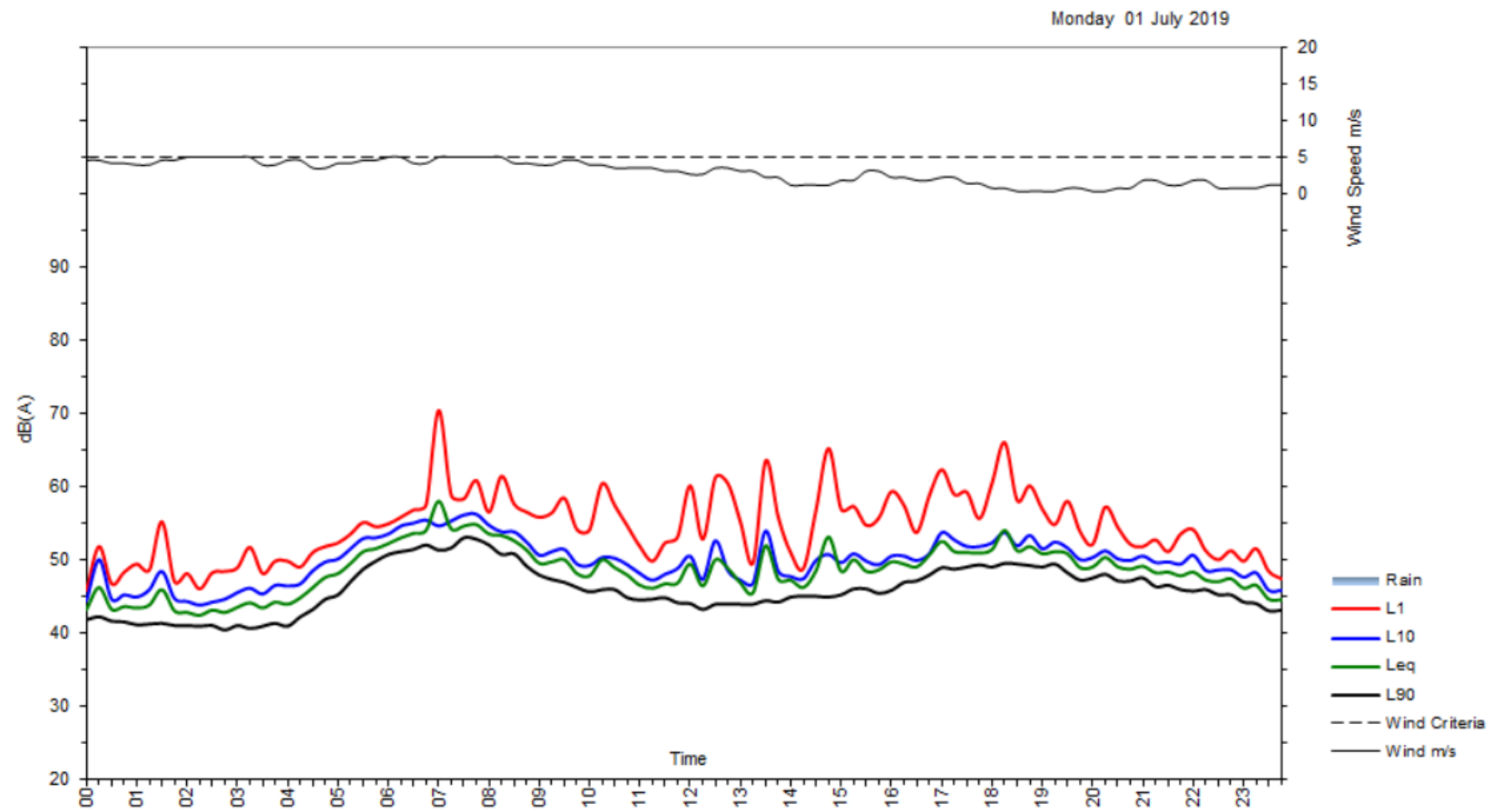
APPENDIX B: NOISE MONITORING RESULTS

Saturday 29 June 2019



Sunday 30 June 2019





Tuesday 02 July 2019

