



AirTrunk SYD2 – Operational Noise Monitoring

EMKC Cubed Management Pty Ltd

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1 INTRODUCTION

This report provides the results of onsite noise surveys undertaken by Pulse White Noise Acoustics Pty Ltd (PWNA) of the AirTrunk SYD2 data centre at 1 Sirius Road, Lane Cove, between the 9th of March 2023 and the 17th of March 2023, and between the 17th of April 2023 and the 20th of April 2023. Specifically, this report details the noise assessment of the mechanical equipment on the roof of the data centre development.

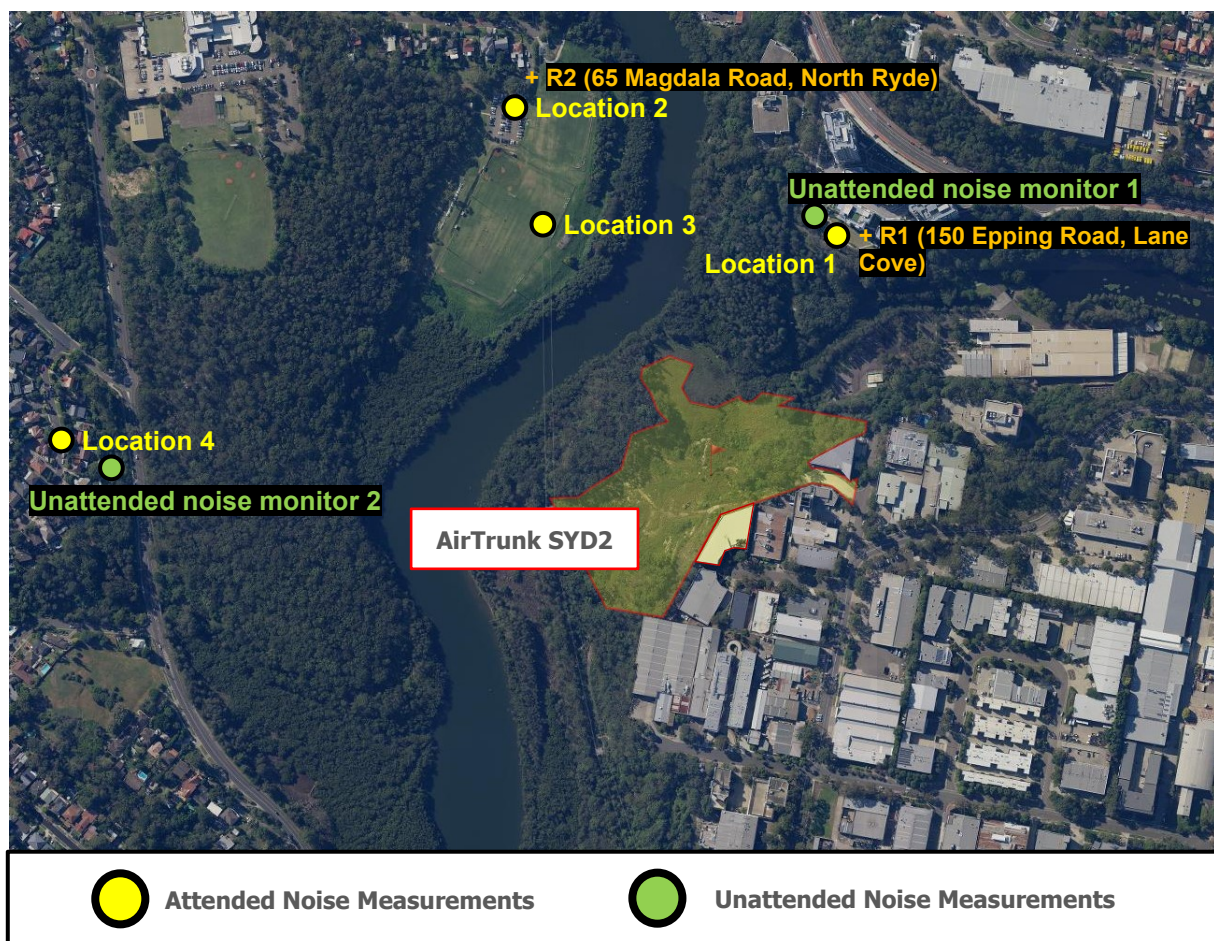
The noise emissions from the operation of mechanical plant have been assessed against the requirements contained in the *Acoustic Assessment* prepared by Pulse White Noise Acoustics Pty Ltd (ref: 220364 - Acoustic Assessment Airtrunk Data Centre - 1 Sirius Road, Lane Cove West – R7, dated 1 May 2023).

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 are shown in Figure 1 below.

The location of the AirTrunk SYD2 project site, nearest sensitive receivers, and attended and unattended noise level measurements are shown in Figure 1 below.

A glossary of acoustic terminology used in this memorandum is presented in Appendix A.

Figure 1 Site location, locations of the nearest receivers, and measurement locations – sourced from SIX Maps NSW



2 OPERATIONAL NOISE EMISSION CRITERIA

Noise criteria applicable to the operation of the data centre have been established by Pulse White Noise Acoustics Pty Ltd (PWNA) in the *Acoustic Assessment* (ref 220364 - Acoustic Assessment Airtrunk Data Centre - 1 Sirius Road, Lane Cove West – R7, dated 1 May 2023).

This PWNA established project criteria for mechanical plant and equipment have been reproduced below.

2.1 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.

2.1.1 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.

2.1.2 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.

2.2 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 1 below.

Table 1 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
<p><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></p> <p><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></p>			

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.

2.2.1 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 2 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
<p><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></p> <p><i>Note 2: LA90 Background Noise or Rating Background Level (RBL)</i></p> <p><i>Note 3: Intrusive criterion is equal to the RBL + 5 dB</i></p> <p><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></p> <p><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></p> <p><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></p>							

2.3 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.

3 NOISE ASSESSMENT

The mechanical plant of interest includes Chillers and transformers located on the roof of the AirTrunk SYD2 data centre development. Attended measurements took place over a number of days and times, from the 9th of March 2023 to the 17th of March 2023, and between the 17th of April 2023 and the 20th of April 2023, when the rooftop mechanical plant was operating under typical operational load.

3.1 Noise Descriptors and Terminology

Environmental noise constantly varies in level with time. Therefore, it is necessary to measure environmental noise in terms of quantifiable time periods and 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' arithmetic does not apply, e.g., adding two sound sources of equal values result in an increase of 3 dB (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 and is used to quantify the level of noise emitted by the source under investigation. 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. LA90 level is used to quantify the "background" noise level of the environment.

A glossary of acoustic terminology used in this memorandum is presented in Appendix A.

3.2 Attended Noise Measurements

The noise level surveys were performed using a Brüel & Kjær Type 2250 sound level meter (serial number 2709757). Calibration of the sound level meter was checked with a Brüel & Kjær Type 4231 acoustical calibrator (serial number 3009148) prior to and following the measurements. Drift in calibration did not exceed ± 0.5 dBA. All equipment carried current NATA calibration certificates. Attended measurements took place over a number of days and times, from the 9th of March 2023 to the 17th of March 2023.

Measurements were undertaken at several locations representative of the most affected sensitive receivers; see Figure 1.

Note that the contribution of the rooftop mechanical plant at the measurement locations was calculated by logarithmically subtracting the measured LA90 ambient levels (without mechanical plant operating; that is, based on measurements conducted before the data centre was built) from the LAeq measurement with the mechanical plant running.

The table below summarises the noise measurement results made during the measurement period.

Table 3 Summary of Attended Noise Measurements at Receivers

Measurement Location (see Figure 1)	Time of Measurement ¹	Measured Noise Level (LA90(15 min))	Measured Noise Level (LAeq(15 min))	Criteria	Compliance?	Commentary
Measurement Location 1 (R1)	11:00pm to 11:15pm on Thursday 9 th March 2023	44dBA LA90 ³	45dBA LAeq ² (Contribution ⁴ = 40dBA LAeq)	43 dBA LAeq(15 min)	Compliant	Operation of rooftop mechanical equipment was barely audible above the background noise level.
Measurement Location 1 (R1)	12:00am to 12:15am on Friday 10 th March 2023	42dBA LA90 ³	43dBA LAeq ² (Contribution ⁴ = 39dBA LAeq)	43 dBA LAeq(15 min)	Compliant	Operation of rooftop mechanical equipment was barely audible above the background noise level.
Measurement Location 3 (Magdala Park)	5:30pm to 5:45pm on Friday 10 th March 2023	50dBA LA90 ³	51dBA LAeq ² (Contribution ⁴ = 45dBA LAeq)	48 dBA LAeq(15 min)	Compliant	Operation of rooftop mechanical equipment was barely audible above the background noise level.
Measurement Location 1 (R1)	10:45pm to 11:00pm on Monday 13 th 2023	45dBA LA90 ³	47dBA LAeq ² (Contribution ⁴ = 42dBA LAeq)	43 dBA LAeq(15 min)	Compliant	Operation of rooftop mechanical equipment was audible above the background noise level.
Measurement Location 2 (R2)	11:00pm to 11:15pm on Monday 13 th 2023	42dBA LA90 ³	44dBA LAeq ² (Contribution ⁴ = 41dBA LAeq)	43 dBA LAeq(15 min)	Compliant	Operation of rooftop mechanical equipment was audible above the background noise level.
Measurement Location 1 (R1)	11:50pm to 12:05am on Thursday 16 th March 2023	44dBA LA90 ³	47dBA LAeq ² (Contribution ⁴ = 42dBA LAeq)	43 dBA LAeq(15 min)	Compliant	Operation of rooftop mechanical equipment was audible above the background noise level.

Measurement Location 2 (R2)	12:15am to 12:30am on Friday 17 th March 2023	44dBA L_{A90} ³	45dBA L_{Aeq} ² (Contribution ⁴ = 41dBA L_{Aeq})	43 dBA $L_{Aeq}(15 \text{ min})$	Compliant	Operation of rooftop mechanical equipment was barely audible above the background noise level.
Measurement Location 4 (R3)	11:30pm to 11:45pm on Monday 17 th April 2023	32dBA L_{A90} ³	43dBA L_{Aeq} ² (Contribution ⁴ = <25dBA L_{Aeq})	36 dBA $L_{Aeq}(15 \text{ min})$	Compliant	Operation of rooftop mechanical equipment was inaudible above the background noise level.
Measurement Location 4 (R3)	1:10pm to 1:25pm on Tuesday 18 th April 2023	44dBA L_{A90} ³	49dBA L_{Aeq} ² (Contribution ⁴ = 41dBA L_{Aeq})	47 dBA $L_{Aeq}(15 \text{ min})$	Compliant	Operation of rooftop mechanical equipment was inaudible above the background noise level.
Measurement Location 4 (R3)	10:30pm to 10:45pm on Wednesday 19 th April 2023	37dBA L_{A90} ³	41dBA L_{Aeq} ² (Contribution ⁴ = 33dBA L_{Aeq})	36 dBA $L_{Aeq}(15 \text{ min})$	Compliant	Operation of rooftop mechanical equipment was perhaps audible above the background noise level. Measurements were paused during aircraft overflight, which were recorded at 60-70dBA (i.e., significantly above the measured background noise level).

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 $L_{Aeq,15min}$ 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.

Note 3: The $L_{A90,15min}$ is level of noise exceeded for 90% of the time. It is used to quantify the Background Noise Level.

Note 4: Contribution is calculated by logarithmically subtracting the measured L_{A90} ambient levels (without mechanical plant operating) from the L_{Aeq} measurement with the mechanical plant running.

Based on the results presented above, measured noise levels at all considered sensitive receivers are compliant with the acoustic objectives, based on the nominated acoustic criteria by Pulse White Noise Acoustics and attended noise measurements undertaken on site.

In addition, it is understood that testing of generators and use of all generators in a power outage will not tally over 200 hours per year. Therefore, compliance testing of generators and load banks falls outside the framework of the POEO Act and the Noise Policy for Industry and was not assessed as part of this engagement.

3.3 Unattended Noise Monitoring

In addition to the attended noise surveys discussed in the above section, unattended noise monitoring was undertaken at 150 Epping Road, Lane Cove to quantify the change in the acoustic environment during all times of the day. This data could then be compared back to the unattended noise monitoring conducted by Pulse Acoustics in 2019 to quantify the increase in background noise levels due to the introduction of the data centre. This assessment assumes that the traffic noise and other surrounding noise sources have not changed in nature between 2019 and 2023, which we believe to be a reasonable assumption over this period.

The unattended noise survey was conducted between Friday 10th March 2023 and Monday 13th March 2023 at the location shown in Figure 1 above.

Data affected by adverse meteorological conditions and by spurious and uncharacteristic events have been excluded from the results. Meteorological information has been obtained from the Observatory Hill weather station (ID 066214).

Instrumentation for the survey comprised one Norsonic Nor139 Environmental Noise Meter with serial number 1393013. Calibration of the logger was checked prior to and following the measurements. Drift in calibration did not exceed ± 0.5 dB. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

3.3.1 Results in accordance with the NSW EPA Noise Policy for Industry (NPI) 2017 (RBL's)

In order to assess the acoustical implications of the data centre development at nearby noise sensitive receivers, the measured background noise data of the unattended noise loggers was processed in accordance with the NSW EPA's *Noise Policy for Industry* (NPI, 2017).

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. RBL LA90 (15minute) and LAeq noise levels are presented in Table 4.

Data affected by adverse meteorological conditions and by spurious and uncharacteristic events have been excluded from the results. Meteorological information has been obtained from the Observatory Hill weather station.

Table 4 Measured Ambient Noise Levels Corresponding to EPA Noise Policy for Industry Assessment Time Periods

Measurement Location	Daytime ¹		Evening ¹		Night-time ¹	
	LA90 ² (dBA)	LAeq ³ (dBA)	LA90 ² (dBA)	LAeq ³ (dBA)	LA90 ² (dBA)	LAeq ³ (dBA)
Logger Location 1 (R1) – 150 Epping Road, Lane Cove – see Figure 1	47	54	45	52	43	47
Logger Location 2 (R3) – 11 Jeanette Street, East Ryde – see Figure 1	49	61	43	58	34	54
<p><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></p> <p><i>Note 2: The LA90 noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.</i></p> <p><i>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.</i></p>						

Charts presenting summaries of the measured daily noise data for Logger Location 1 are provided below. The charts present each 24-hour period and show the LA1, LA10, LAeq and LA90 noise levels for the corresponding 15-minute periods. This data has been filtered to remove periods affected by adverse weather conditions based on weather information.

Charts from the unattended noise survey conducted by Pulse Acoustics in 2019 are also presented below the PWNA results to compare data from different days of the week.

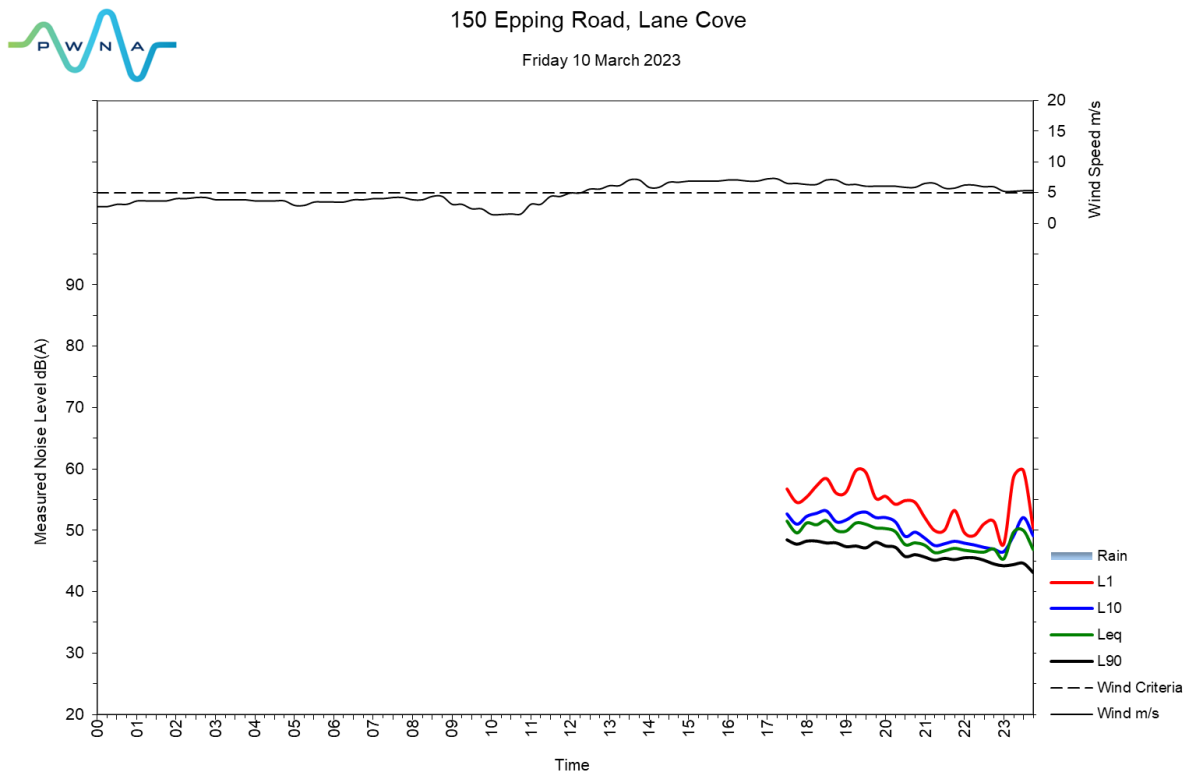
Figure 2 PWNA Unattended Monitoring at 150 Epping Road, Lane Cove – Friday 10 March 2023


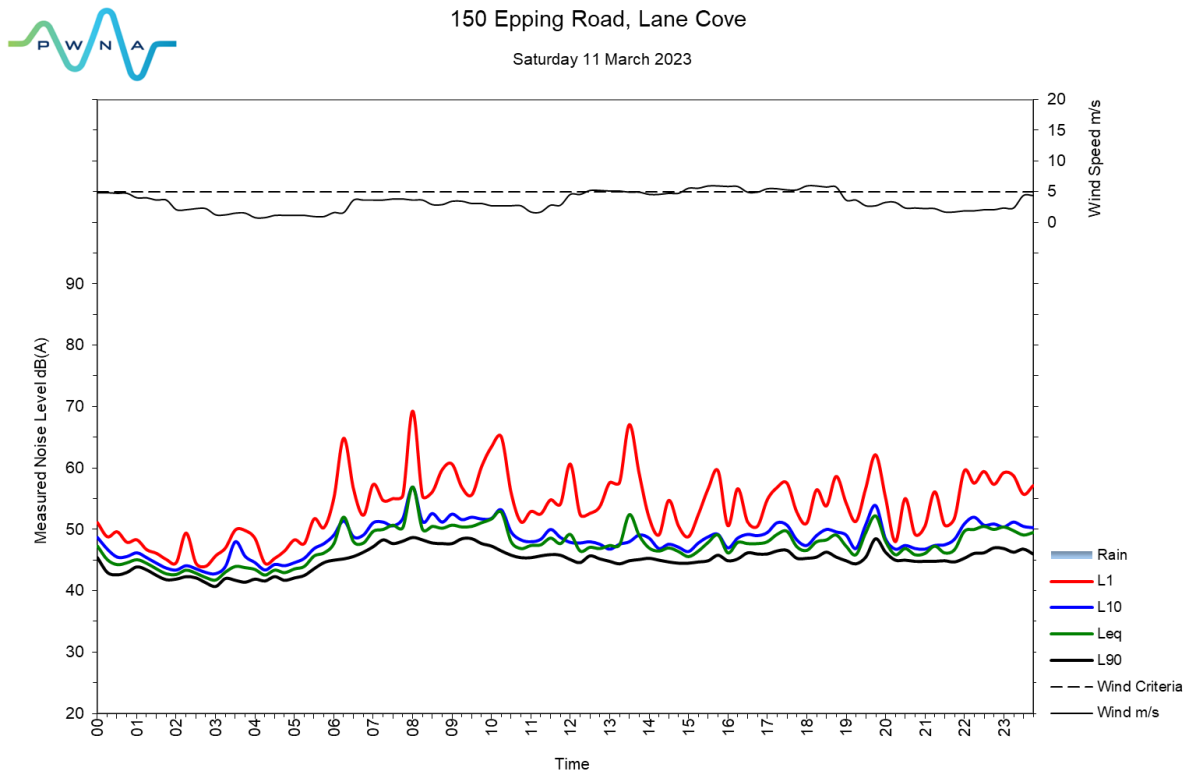
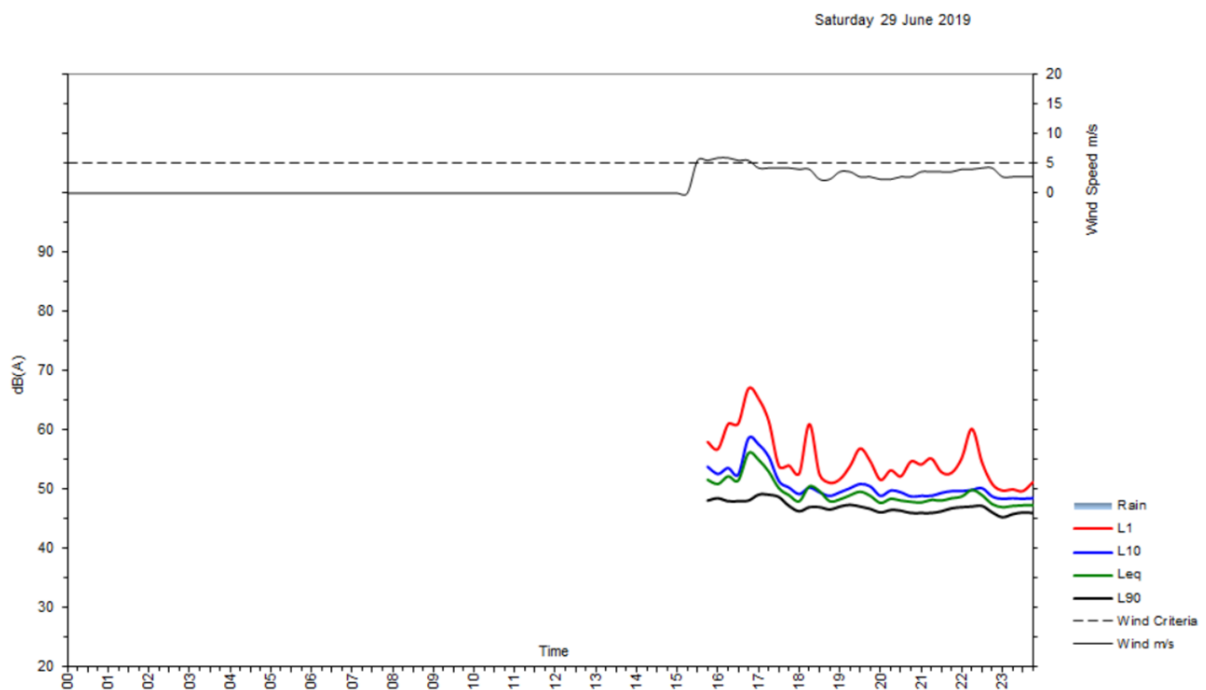
Figure 3 PWNA Unattended Monitoring at 150 Epping Road, Lane Cove – Saturday 11 March 2023

Figure 4 Pulse Acoustics Unattended Noise Monitoring at 150 Epping Road, Lane Cove – Saturday 29 June 2019


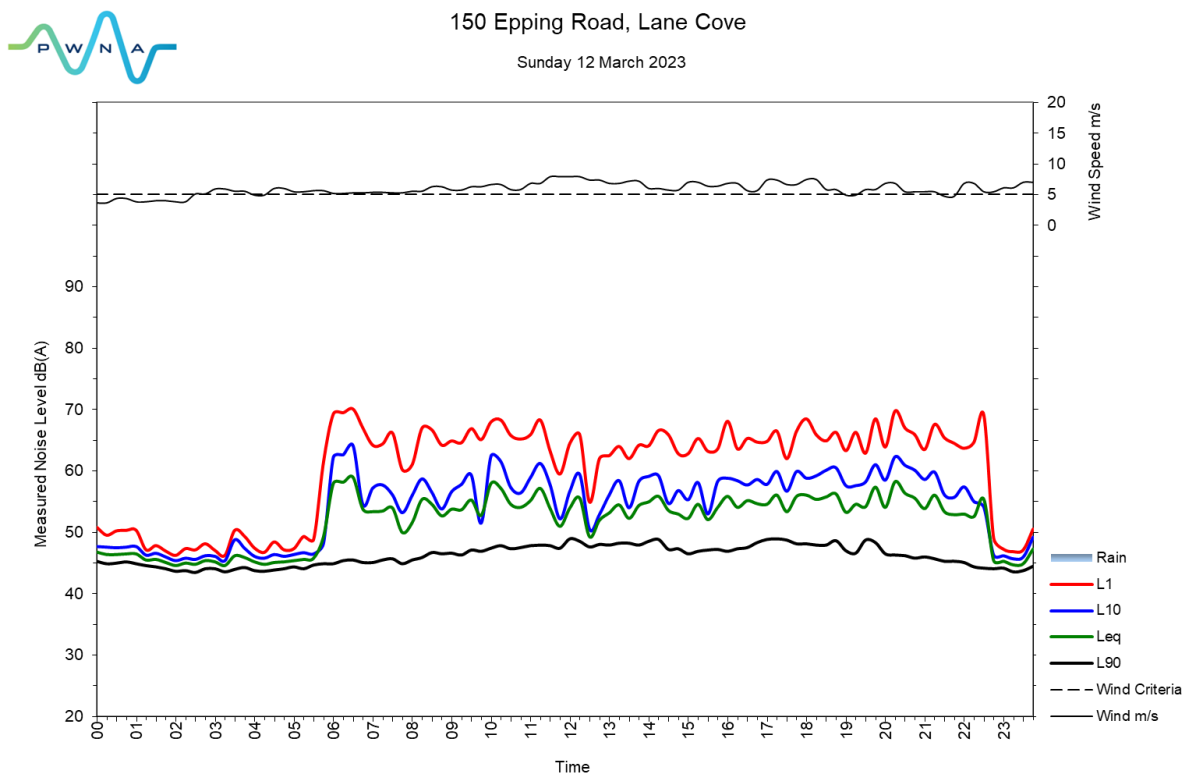
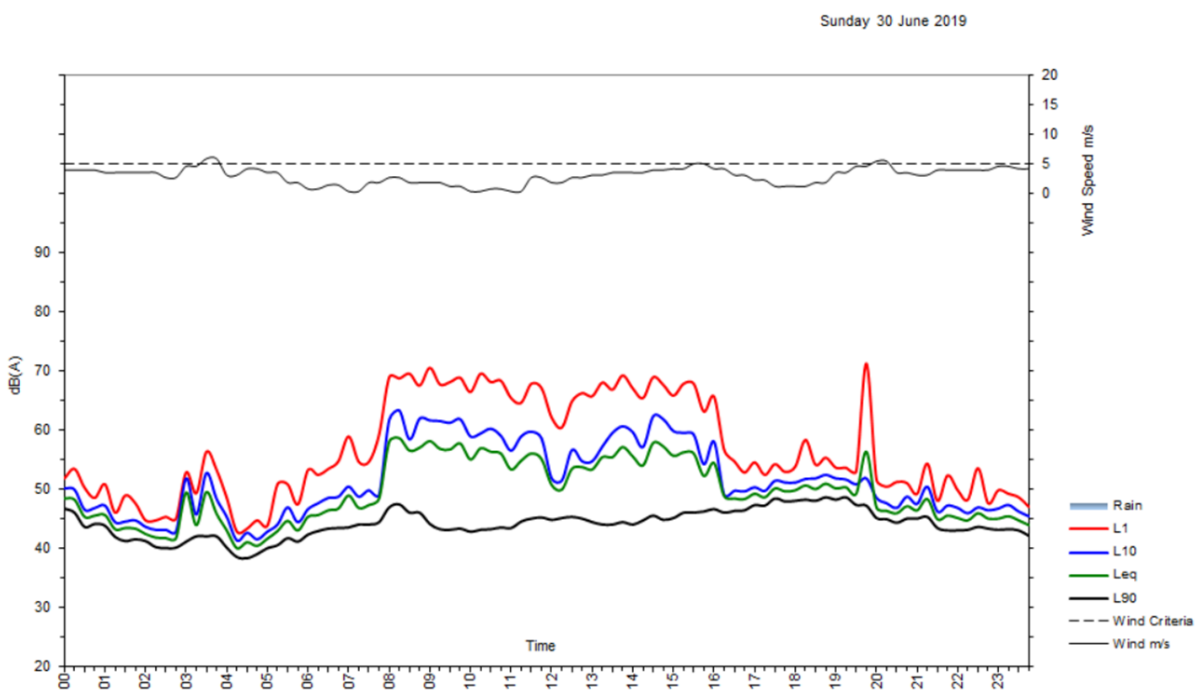
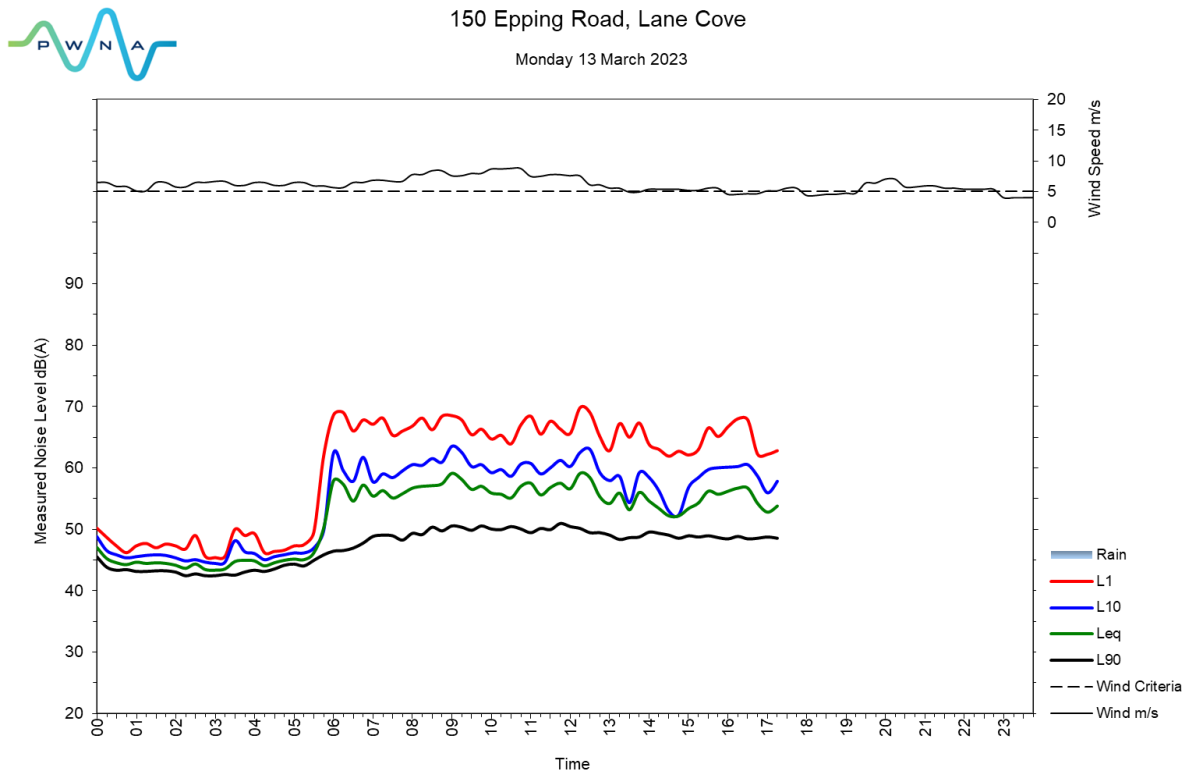
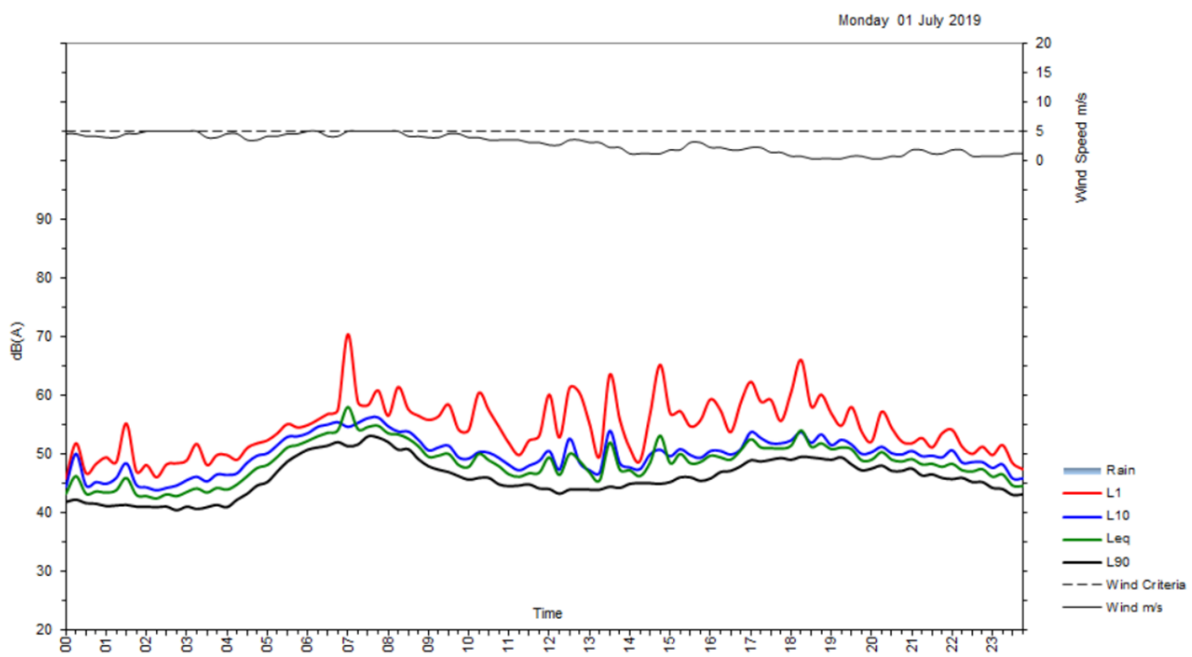
Figure 5 PWNA Unattended Monitoring at 150 Epping Road, Lane Cove – Sunday 12 March 2023

Figure 6 Pulse Acoustics Unattended Noise Monitoring at 150 Epping Road, Lane Cove – Sunday 30 June 2019


Figure 7 PWNA Unattended Monitoring at 150 Epping Road, Lane Cove – Monday 13 March 2023**Figure 8 Pulse Acoustics Unattended Noise Monitoring at 150 Epping Road, Lane Cove – Monday 1 July 2019**

The unattended noise monitoring results from Saturday and Sunday for both logging periods (Pre-development of the data centre building 2019, and post-completion of the data centre 2023) have been compared in the below table.

Table 5 Measured Ambient Noise Levels Corresponding to EPA Noise Policy for Industry Assessment Time Periods – Saturday and Sunday Comparison between 2019 and 2023

Measurement Location / Time	Daytime ¹		Evening ¹		Night-time ¹	
	LA ₉₀ ² (dBA)	LA _{eq} ³ (dBA)	LA ₉₀ ² (dBA)	LA _{eq} ³ (dBA)	LA ₉₀ ² (dBA)	LA _{eq} ³ (dBA)
Saturday						
Pulse Acoustics Unattended Noise Monitoring 2019	47	52	46	49	40	46
PWNA Unattended Monitoring 2023	45	50	45	48	43	48
Increase in Background Noise Level	-2		-1		+3	
Sunday						
Pulse Acoustics Unattended Noise Monitoring 2019	43	55	44	50	41	48
PWNA Unattended Monitoring 2023	47	55	45	55	43	50
Increase in Background Noise Level	+4		+1		+2	
<p><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></p> <p><i>Note 2: The LA₉₀ noise level is representative of the "average minimum background sound level" (in the absence of the source under consideration), or simply the background level.</i></p> <p><i>Note 3: The LA_{eq} 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></p>						

Comparing the background noise levels recorded during the night-time period over both the Saturday and the Sunday, it can be seen that the levels have increased following the data centre being built. It cannot be declared, however, that this increase is solely a result of the erection of the data centre, and may be due to increases in traffic volumes, other developments in the vicinity, etc.

Nevertheless, the contribution of the rooftop mechanical plant at the monitoring location at 150 Epping Road can be predicted by logarithmically subtracting the measured LA₉₀ ambient levels (without mechanical plant operating; that is, based on measurements conducted before the data centre was built) from the LA₉₀ measurement with the mechanical plant running.

By this methodology, the noise contribution of the SYD2 mechanical plant at the monitoring location is predicted to be 40 dBA for the Saturday night-time assessment, and 39 dBA for the Sunday night-time assessment, which are both compliant with the criteria established in Table 2.

The noise monitoring results at Logger Location 2 (Receiver 3, at Jeanette Street East Ryde) show that the background noise measured by PWNA (2023) during the night-time period has increased by 3 dB when compared to the noise monitoring conducted by ARUP in 2019. It should be noted, however, that the logger installed by PWNA was located at the rear of the Jeanette Street properties, such that noise from Martins Creek was audible. In addition, the logger was closer to Pittwater Road. These are the likely reasons for the increase in the measured background noise, given that noise from the data centre development was not audible during attended measurements at R3.



4 CONCLUSION

This report provides the results of an onsite noise survey undertaken by Pulse White Noise Acoustics Pty Ltd (PWNA) at the AirTrunk SYD2 data centre at 1 Sirius Road, Lane Cove, between the 9th of March 2023 and the 17th of March 2023. Specifically, this report details the noise assessment of the mechanical equipment on the roof of the data centre development.

The results of our assessment found the operation of the mechanical plant servicing the data centre to be compliant.

We trust this information is of assistance. If you have any further questions, please do not hesitate to contact the undersigned.

Yours sincerely,

A handwritten signature in black ink, appearing to read 'Alex Danon', with a stylized flourish at the end.

PULSE WHITE NOISE ACOUSTIC CONSULTANCY PTY LTD
Alex Danon
Acoustic Engineer



APPENDIX A: GLOSSARY OF ACOUSTIC TERMINOLOGY

The following is a brief description of the acoustic terminology used in this report.

Sound power level	The total sound emitted by a source																						
Sound pressure level	The amount of sound at a specified point																						
Decibel [dB]	The measurement unit of sound																						
A Weighted decibels [dB(A)]	The A weighting is a frequency filter applied to measured noise levels to represent how humans hear sounds. The A-weighting filter emphasises frequencies in the speech range (between 1kHz and 4 kHz) which the human ear is most sensitive to, and places less emphasis on low frequencies at which the human ear is not so sensitive. When an overall sound level is A-weighted it is expressed in units of dB(A).																						
Decibel scale	<p>The decibel scale is logarithmic in order to produce a better representation of the response of the human ear. A 3 dB increase in the sound pressure level corresponds to a doubling in the sound energy. A 10 dB increase in the sound pressure level corresponds to a perceived doubling in volume. Examples of decibel levels of common sounds are as follows:</p> <table> <tr><td>0dB(A)</td><td>Threshold of human hearing</td></tr> <tr><td>30dB(A)</td><td>A quiet country park</td></tr> <tr><td>40dB(A)</td><td>Whisper in a library</td></tr> <tr><td>50dB(A)</td><td>Open office space</td></tr> <tr><td>70dB(A)</td><td>Inside a car on a freeway</td></tr> <tr><td>80dB(A)</td><td>Outboard motor</td></tr> <tr><td>90dB(A)</td><td>Heavy truck pass-by</td></tr> <tr><td>100dB(A)</td><td>Jackhammer/Subway train</td></tr> <tr><td>110 dB(A)</td><td>Rock Concert</td></tr> <tr><td>115dB(A)</td><td>Limit of sound permitted in industry</td></tr> <tr><td>120dB(A)</td><td>747 take off at 250 metres</td></tr> </table>	0dB(A)	Threshold of human hearing	30dB(A)	A quiet country park	40dB(A)	Whisper in a library	50dB(A)	Open office space	70dB(A)	Inside a car on a freeway	80dB(A)	Outboard motor	90dB(A)	Heavy truck pass-by	100dB(A)	Jackhammer/Subway train	110 dB(A)	Rock Concert	115dB(A)	Limit of sound permitted in industry	120dB(A)	747 take off at 250 metres
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110 dB(A)	Rock Concert																						
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120dB(A)	747 take off at 250 metres																						
Frequency [f]	The repetition rate of the cycle measured in Hertz (Hz). The frequency corresponds to the pitch of the sound. A high frequency corresponds to a high pitched sound and a low frequency to a low pitched sound.																						
Ambient sound	The all-encompassing sound at a point composed of sound from all sources near and far.																						
Equivalent continuous sound level [L_{eq}]	The constant sound level which, when occurring over the same period of time, would result in the receiver experiencing the same amount of sound energy.																						
Reverberation	The persistence of sound in a space after the source of that sound has been stopped (the reverberation time is the time taken for a reverberant sound field to decrease by 60 dB)																						
Air-borne sound	The sound emitted directly from a source into the surrounding air, such as speech, television or music																						
Impact sound	The sound emitted from force of one object hitting another such as footfalls and slamming cupboards.																						
Air-borne sound isolation	The reduction of airborne sound between two rooms.																						
Sound Reduction Index [R] (Sound Transmission Loss)	The ratio the sound incident on a partition to the sound transmitted by the partition.																						

Weighted sound reduction index [R_w]	A single figure representation of the air-borne sound insulation of a partition based upon the R values for each frequency measured in a laboratory environment.
Level difference [D]	The difference in sound pressure level between two rooms.
Normalised level difference [D_n]	The difference in sound pressure level between two rooms normalised for the absorption area of the receiving room.
Standardised level difference [D_{nT}]	The difference in sound pressure level between two rooms normalised for the reverberation time of the receiving room.
Weighted standardised level difference [$D_{nT,w}$]	A single figure representation of the air-borne sound insulation of a partition based upon the level difference. Generally used to present the performance of a partition when measured in situ on site.
C_{tr}	A value added to an R_w or $D_{nT,w}$ value to account for variations in the spectrum.
Impact sound isolation	The resistance of a floor or wall to transmit impact sound.
Impact sound pressure level [L_i]	The sound pressure level in the receiving room produced by impacts subjected to the adjacent floor or wall by a tapping machine.
Normalised impact sound pressure level [L_n]	The impact sound pressure level normalised for the absorption area of the receiving room.
Weighted normalised impact sound pressure level [$L_{n,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in a laboratory.
Weighted standardised impact sound pressure level [$L'_{nT,w}$]	A single figure representation of the impact sound insulation of a floor or wall based upon the impact sound pressure level measured in situ on site.
C_i	A value added to an $L_{n,w}$ or $L'_{nT,w}$ value to account for variations in the spectrum.
Energy Equivalent Sound Pressure Level [$L_{A,eq,T}$]	'A' weighted, energy averaged sound pressure level over the measurement period T.
Percentile Sound Pressure Level [$L_{Ax,T}$]	'A' weighted, sound pressure that is exceeded for percentile x of the measurement period T.

*Definitions of a number of terms have been adapted from Australian Standard AS1633:1985 "Acoustics – Glossary of terms and related symbols"