AirTrunk SYD2

Apollo Place Development Acoustic Impact

AirTrunk Lane Cove Pty Ltd as trustee for AirTrunk Lane Cove Trust (ABN 36 170 853 530)

Report Reference: 220364-16 – SYD2 Apollo Place Impact – R1

Date: 8 August 2024

Revision: R1

Project Number: 220364-16

PULSE WHITE NOISE ACOUSTICS Suite 601, L6, 32 Walker St, North Sydney NSW 2060
P 1800 4 PULSE (1800 478 573) **E** info@pwna.com.au **pwna.com.au** ABN 95 642 886 306

DOCUMENT CONTROL

Project Name:	AirTrunk SYD2
Project Number:	220364-16
Report Reference:	220364-16 – SYD2 Apollo Place Impact – R1
Client:	AirTrunk Lane Cove Pty Ltd as trustee for AirTrunk Lane Cove Trust (ABN 36 170 853 530)

Revision	Description	Reference	Date	Prepared	Checked	Authorised
0	For information	220364-16 - SYD2 Apollo Place Impact - R0	25/07/24	Alex Danon	Alex Danon	Matthew Harrison
1	Issue 1	220364-16 - SYD2 Apollo Place Impact – R1	08/08/24	Alex Danon	Alex Danon	Matthew Harrison

PREPARED BY:

Pulse White Noise Acoustics Pty Ltd
ABN: 95 642 886 306
Address: Suite 601, Level 6, 32 Walker Street, North Sydney, 2060
Phone: 1800 4 PULSE

CONTENTS

Figures

Tables

1 INTRODUCTION

Pulse White Noise Acoustics Pty Ltd (PWNA) have been engaged to undertake further 3D noise modelling of the SYD2 AirTrunk Data Centre located at 1 Sirius Road, Lane Cove West, for the purpose of determining the acoustic impacts of the proposed Apollo Place Data Centre future development. Specifically, the previously generated 3D noise model has been updated to include the Apollo Place building structure, which includes a façade with precast panels with a structural steel gantry.

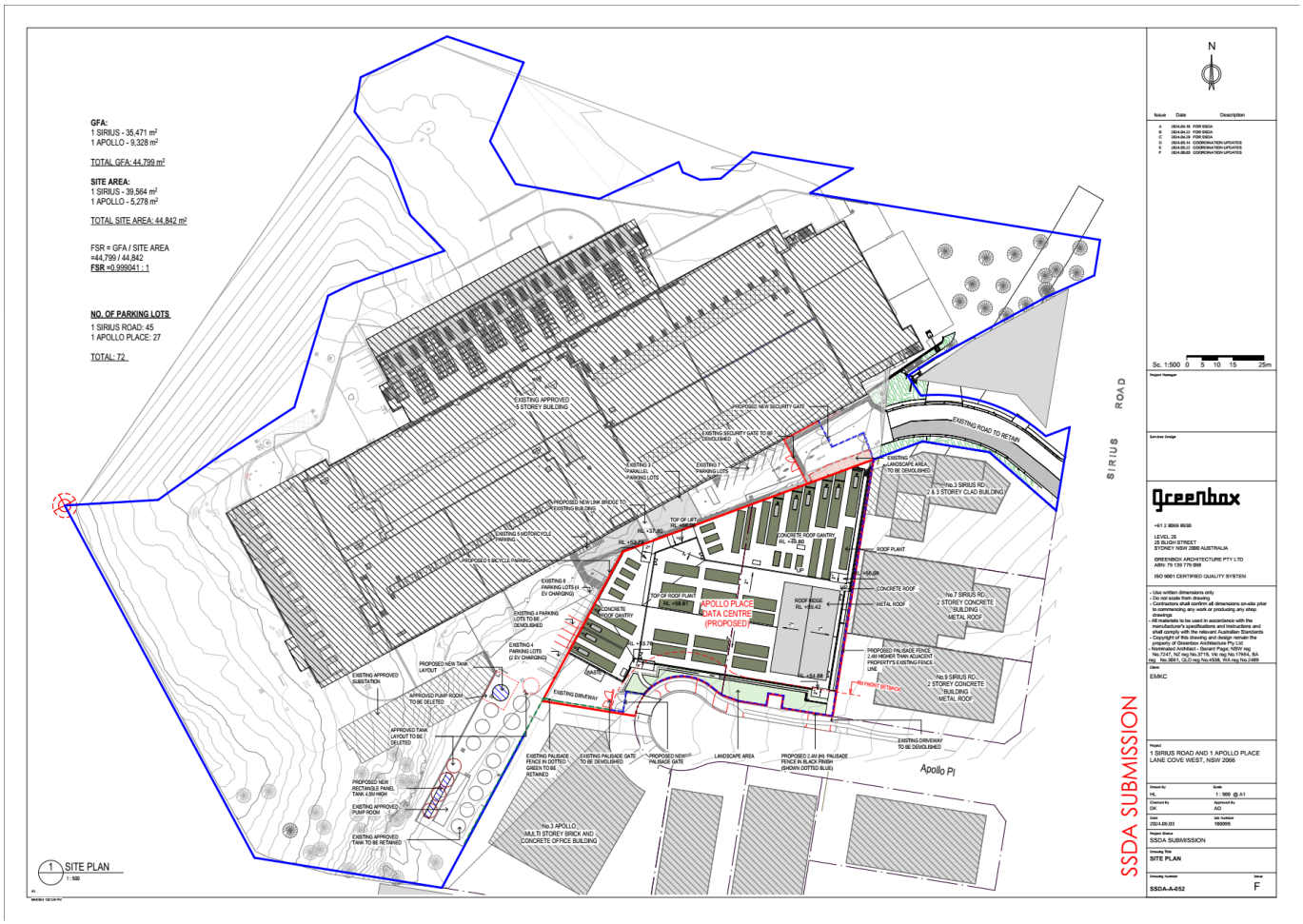
Given that the expansion building sits at a higher elevation than the main building, reflections off the building façade will increase the operational noise levels at the surrounding residential receivers (without including any additional chiller units or mechanical plant).

Treatments in the form of sound absorptive finishes to the Apollo Place building façade have been recommended where the operational noise levels have increased by more than 1 dB as a result of including the Apollo Place building structure in the modelling.

A list of acoustic terminology used in this report is included in Appendix A.

A site plan of the proposed development, indicating its proximity to the existing SYD2 AirTrunk Data Centre, is shown in Figure 1 below.

Figure 1 Proposed Apollo Place Data Centre – Site Plan



2 NOISE MODELLING RESULTS

This section of the report summarises the predicted noise levels resulting from the operational emissions of the AirTrunk SYD2 data centre. Specifically, this report provides the predicted noise levels from modelling using the results of sound power measurements conducted at SYD2 of both Geothermal and Trithermal chillers, on the 26th of February 2024 and the 27th of June 2024.

This section of the report provides the predicted noise levels resulting from the inclusion of the Apollo Place building structure, which includes a façade with precast panels with a structural steel gantry.

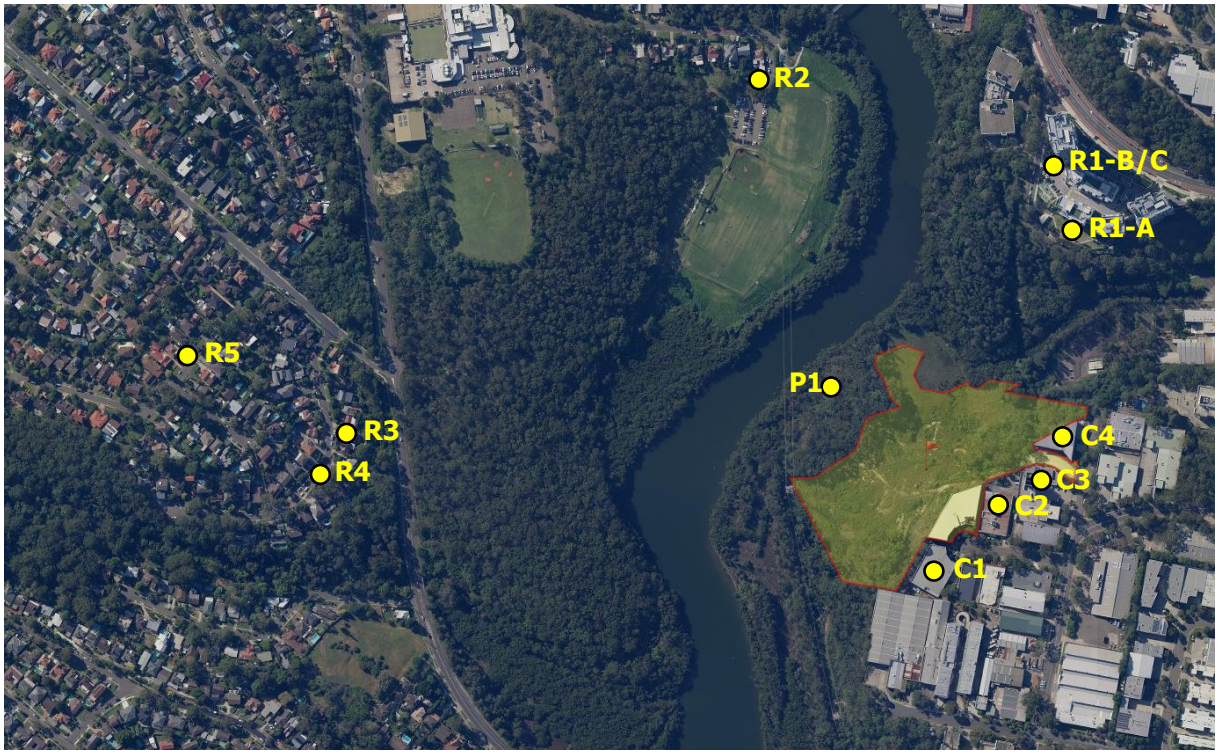
2.1 Nearest Sensitive Receivers

Several potentially impacted noise sensitive 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 are shown in Figure 2.

Table 1 Nearest potentially affected receivers

Receiver ID	Address	Lot and DP	Type of Receiver
R1-A (5 m)	150 Epping Road, Lane Cove (Lower Floors)	Lot 1 DP 1219702	Residential
R1-B (30 m)	150 Epping Road, Lane Cove (Middle Floors)	Lot 1 DP 1219702	Residential
R1-C (60 m)	150 Epping Road, Lane Cove (Upper Floors)	Lot 1 DP 1219702	Residential
R2 (4.5 m)	65 Magdala Road, North Ryde	Lot 1 DP 416781	Residential
R3 (4.5 m)	14 Jeanette Street, East Ryde	Lot 20 DP 26556	Residential
R4 (4.5 m)	20 Jeanette Street, East Ryde	Lot 13 DP 236893	Residential
R5 (4.5 m)	12 Wolfe Road, East Ryde	Lot 9 DP 24622	Residential
C1 (1.5 m)	3 Apollo Place, Lane Cove West	Lot 8 DP 241877	Commercial
C2 (1.5 m)	1 Apollo Place, Lane Cove West	SP 80721	Commercial
C3 (1.5 m)	5 Sirius Road, Lane Cove West	Lot 5 DP 241786	Commercial
C4 (1.5 m)	1A Sirius Road, Lane Cove West	Lot 16 DP 1179953	Commercial
P1 (1.5 m)	Sirius Road, Lane Cove West	Lot 7025 DP 93903	Passive Recreation

Figure 2 Location of nearest potentially affected receivers – sourced from Six Maps



2.2 Operational Noise Emission Criteria

The operational noise emission criteria have previously been established in the *Acoustic Assessment* written by PWNA, dated 6 September 2023, ref *220364 - Acoustic Assessment Airtrunk Data Centre - 1 Sirius Road, Lane Cove West – R22*.

Condition B14 of the SSDA Consolidated Consent, dated October 2023 (Application Number SSD-9741-Mod-3), reproduced below, details the relevant operational noise emission criteria.

Operational Noise Limits

B14. The Applicant must ensure that noise generated by operation of the development does not exceed the noise limits in Table 2.

Table 2 *Noise Limits (dB(A))*

Location	Day $L_{Aeq(15\ minute)}$	Evening $L_{Aeq(15\ minute)}$	Night $L_{Aeq(15\ minute)}$
R1	51	48	43
C1	63	N/A	N/A
P1	48	N/A	N/A
Any residence to the west of Pittwater Road, East Ryde	45	40	35
R2	46	42	36

2.3 Operational Noise Assessment

2.3.1 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 more realistically 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 may 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.

At the request of the DoPE, a modification was also 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 ensures that a consistently verifiable approach to ground absorption, air absorption and barrier attenuation has been chosen with the added advantage of the consideration of noise enhancing weather conditions for sensitive receivers at distances greater than 100m. The approach taken in this assessment has been chosen to provide a conservative prediction of noise levels for the most affected sensitive receiver locations.

It should be noted that the predictive noise modelling software used for this assessment, iNoise V2022.01, is the same as that used by PWNA throughout the Development Application stage of the project, for consistency. Namely, see the Acoustic Assessment written by PWNA, dated 6 September 2023, ref *220364 - Acoustic Assessment Airtrunk Data Centre - 1 Sirius Road, Lane Cove West – R22.*

2.3.2 Equipment Sound Power Levels

The modelled chillers have been based on the sound power measurements conducted at the SYD2 data centre on the 26th of February 2024 and 27th of June 2024. The chillers measured, and, therefore, modelled in this report were fitted with acoustic treatment to the intake and compressor components on the sides of each chiller (internal acoustic panelling and external sheet metal blanking off chiller ports where possible). The measured sound power levels are presented in report reference: *220364-12 - SYD2 Chiller SWL Measurements – R2*, written by PWNA, dated 3 May 2024, as well as in report reference: *220364-15 - SYD2 Chiller SWL Measurements & Updated Treatments - R1*, dated 10 July 2024, written by PWNA. These chillers will be referred to herein as 'treated' chillers.

Two types of air-cooled chillers are to be installed on the rooftop of the Data Centre; namely, Geoclima Chillers and Trithermal Chillers. The location and extent of each is indicated in report reference: *220364-15 - SYD2 Chiller SWL Measurements & Updated Treatments - R1*, dated 10 July 2024, written by PWNA.

The measured treated chiller sound power levels for each chiller face and octave band data, based on the testing conducted on the 26th of February 2024 and 27th of June 2024, are documented in report reference: *220364-12 - SYD2 Chiller SWL Measurements – R2*, written by PWNA, dated 3 May 2024, as well as in report reference: *220364-15 - SYD2 Chiller SWL Measurements & Updated Treatments - R1*, dated 10 July 2024, written by PWNA.

2.3.3 Modelling Assumptions

In this assessment, the following assumptions have been incorporated:

- Noise generating scenarios are modelled on a worst case 15-minute period.
- Terrain on site has been sourced from the site survey.

- Terrain off site has been taken from the NSW Land and Property Information database SixMaps.
- Receivers are modelled at a height of 1.5 m for single storey dwellings and 4.5 m above the ground for double storey dwellings, except where indicated in the result Tables (such as for Receiver 1, which is modelled to represent the lower floors of the apartment building, a middle floor of the apartment building, and the highest floor of the apartment building which has direct line of sight to the proposed development).
- Ground Absorption has been included in the model with the industrial and water areas having an absorption factor of 0 (hard), suburban areas having an absorption of 0.25 and bushland having an absorption factor of 0.7 (soft).
- On site structures and surrounding buildings have been included in the noise model, including the proposed Apollo Place building structure, which includes a façade with precast panels with a structural steel gantry.
- The height of noise sources, including the chillers, transformers and generators has been based on architectural drawings of the proposed development.
- The assessment of the proposed equipment is based on the sound power levels listed in report reference: *220364-12 - SYD2 Chiller SWL Measurements – R2*, written by PWNA, dated 3 May 2024, as well as in report reference: *220364-15 - SYD2 Chiller SWL Measurements & Updated Treatments - R1*, dated 10 July 2024, written by PWNA.
- 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.*

- Note also that the ISO9613 algorithm also includes moderate source to receiver winds by default resulting in slightly adverse conditions and higher noise levels than standard weather conditions would predict.

2.3.4 Modelled Scenarios

The noise generating scenarios modelled in this report for the night-time period is as follows. Note that scenario Night-001 corresponds exactly to the scenario modelled in report *220364-15 - SYD2 Chiller SWL Measurements & Updated Treatments - R1*, dated 10 July 2024, written by PWNA. Scenarios Night-001A and Night-001B are variations of this model, whereby the proposed Apollo Place building structure is included, without and with sound absorptive finishes to the building façade, respectively.

- Night-001: 108 chillers (as per the arrangement in report ref: *220364-15 - SYD2 Chiller SWL Measurements & Updated Treatments - R1*) operating in the night condition and 121 transformers. All chillers modelled are assumed to be acoustically treated (as outlined in report ref: *220364-12 - SYD2 Chiller SWL Measurements – R2*). Installation of 1.2 m acoustic baffles to select chillers (acoustic baffle design detailed in report ref: *220364-12 - SYD2 Chiller SWL Measurements – R2*).
- Night-001A: 108 chillers (as per the arrangement in report ref: *220364-15 - SYD2 Chiller SWL Measurements & Updated Treatments - R1*) operating in the night condition and 121 transformers. All chillers modelled are assumed to be acoustically treated (as outlined in report ref: *220364-12 - SYD2 Chiller SWL Measurements – R2*). Installation of 1.2 m acoustic baffles to select chillers (acoustic baffle design detailed in report ref: *220364-12 - SYD2 Chiller SWL Measurements – R2*). Model includes the proposed Apollo Place building structure, which includes a façade with precast panels with a structural steel gantry.
- Night-001B: 108 chillers (as per the arrangement in report ref: *220364-15 - SYD2 Chiller SWL Measurements & Updated Treatments - R1*) operating in the night condition and 121 transformers. All chillers modelled are

assumed to be acoustically treated (as outlined in report ref: *220364-12 - SYD2 Chiller SWL Measurements – R2*). Installation of 1.2 m acoustic baffles to select chillers (acoustic baffle design detailed in report ref: *220364-12 - SYD2 Chiller SWL Measurements – R2*). Model includes the proposed Apollo Place building structure, which includes a façade with precast panels with a structural steel gantry, as well as treatments in the form of sound absorptive finishes.

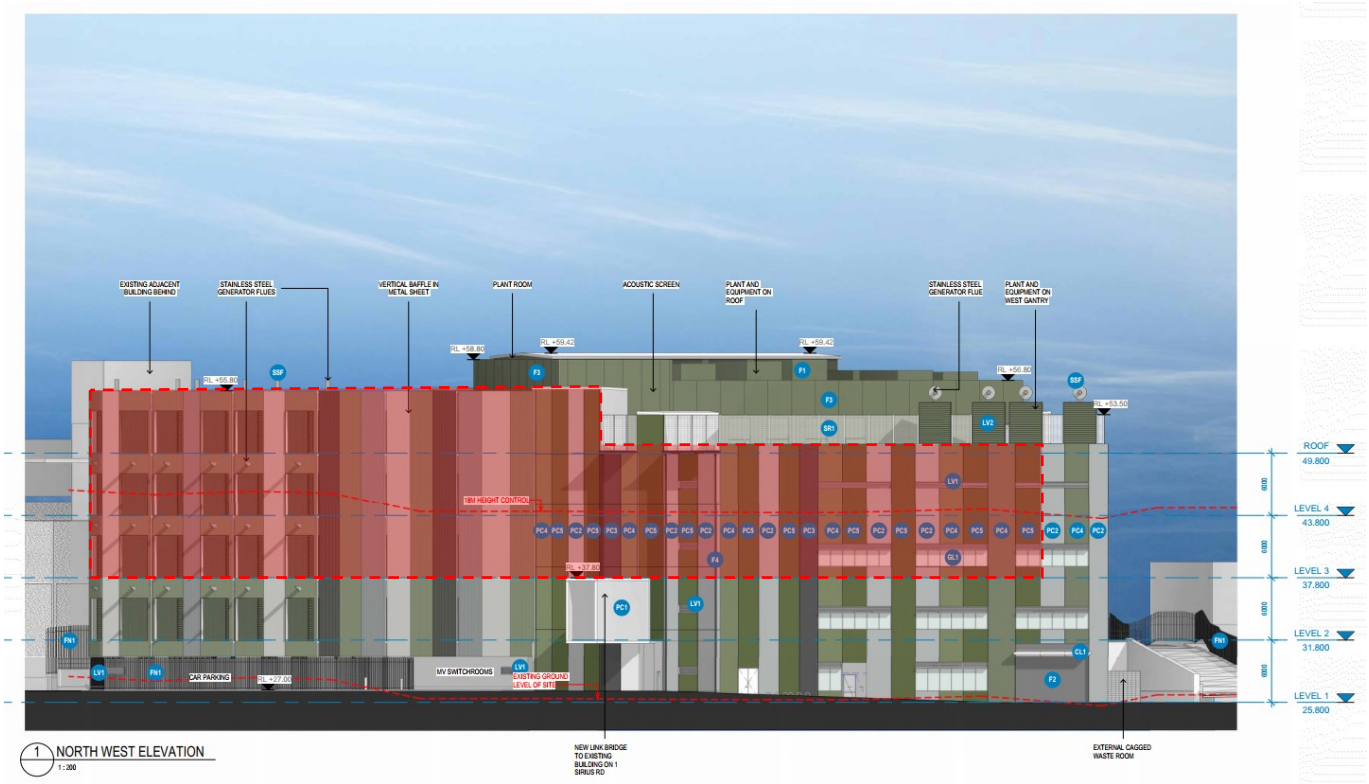
2.3.4.1 Sound Absorptive Treatment to Apollo Place Building Façade

Sound absorptive treatment is recommended to be installed to the Apollo Place building façade as per the indicative markups in Figure 3 and Figure 4 below.

Where treatment areas have been recommended, sound absorptive material should be installed to all possible and practical surfaces within this region. On the basis 90% of the highlighted area can be covered, acoustic panelling with NRC 0.90 or greater should be installed to these areas. This could include perforated panels with acoustic insulation enclosed in Mylar filling the cavity.

Figure 3 Recommended location of sound absorptive finishes to Apollo Place building façade – Roof Site Plan view

Figure 4 Recommended location of sound absorptive finishes to Apollo Place building façade – North-West Elevation view



2.3.5 Predicted Noise Levels

The predicted L_{Aeq} results of the modelled operational scenarios are presented in the below table for the night-time period, being the most critical operational condition (i.e., the noise criteria are the most stringent during the night-time period).

Note: 'Treated chillers' refers to the internal and external acoustic treatments previously applied to the Trithermal and Geoclima chillers, as detailed in the report ref: *220364-12 - SYD2 Chiller SWL Measurements – R2*, written by PWNA, dated 3 May 2024.

Table 2 Night-001A - Predicted Noise Levels, Night Operational Scenario, 108 treated chillers operating in the night condition and 121 transformers, including installation of 1.2 m acoustic baffles to select chillers $L_{Aeq\ (15\ minute)}$ + Apollo Place building structure

Receiver (Height from ground)	Criteria Night (dBA)	Predicted Noise Levels (dBA) Night (as modified under S4.55) 'Noise-enhancing' Weather Conditions		Difference (dB)	Compliance
		Without Apollo Place building structure	With Apollo Place building structure		
R1-A (5m)	43	40	40	0	Yes
R1-B (30m)	43	42	43	+1	Yes
R1-C (60m)	43	43	45	+2	No
R2 (4.5m)	36	36	38	+2	No
R3 (4.5m)	35	33	35	+2	Yes
R4 (4.5m)	35	33	35	+2	Yes
R5 (4.5m)	35	35	37	+2	No
P1 (1.5m)	48	43	43	0	Yes

Table 3 Night-001B - Predicted Noise Levels, Night Operational Scenario, 108 treated chillers operating in the night condition and 121 transformers, including installation of 1.2 m acoustic baffles to select chillers $L_{Aeq\ (15\ minute)}$ + Apollo Place building structure with sound absorptive finishes

Receiver (Height from ground)	Criteria Night (dBA)	Predicted Noise Levels (dBA) Night (as modified under S4.55) 'Noise-enhancing' Weather Conditions		Difference (dB)	Compliance
		Without Apollo Place building structure	With Apollo Place building structure + absorptive finishes		
R1-A (5m)	43	40	40	0	Yes
R1-B (30m)	43	42	42	0	Yes
R1-C (60m)	43	43	43	0	Yes
R2 (4.5m)	36	36	36	0	Yes
R3 (4.5m)	35	33	34	+1	Yes
R4 (4.5m)	35	33	34	+1	Yes
R5 (4.5m)	35	35	35	0	Yes
P1 (1.5m)	48	43	43	0	Yes

Based on the results tabulated above, reflections off the building façade are predicted to increase the operational noise levels at the surrounding residential receivers (without including any additional chiller units or mechanical plant). This increase in noise levels means that several non-compliances are predicted, as seen in Table 2.

Treatments in the form of sound absorptive finishes to the Apollo Place building façade have been recommended as per the details in 2.3.4.1. Provided these treatments are implemented into the design of the project, compliance with the noise criteria at all surrounding receivers is predicted.

3 CONCLUSIONS

Pulse White Noise Acoustics Pty Ltd (PWNA) have been engaged to undertake further 3D noise modelling of the SYD2 AirTrunk Data Centre located at 1 Sirius Road, Lane Cove West, for the purpose of determining the acoustic impacts of the proposed Apollo Place Data Centre future development. Specifically, the previously generated 3D noise model has been updated to include the Apollo Place building structure, which includes a façade with precast panels with a structural steel gantry.

Given that the expansion building sits at a higher elevation than the main building, reflections off the building façade will increase the operational noise levels at the surrounding residential receivers (without including any additional chiller units or mechanical plant).

Treatments in the form of sound absorptive finishes to the Apollo Place building façade have been recommended where the operational noise levels have increased by more than 1 dB as a result of including the Apollo Place building structure in the modelling.

For any additional information please do not hesitate to contact the person below.

Regards,

Alex Danon
Senior Acoustic Engineer
PULSE WHITE NOISE ACOUSTICS PTY LTD

APPENDIX A. APPENDIX TERMINOLOGY

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	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:
	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
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_{nW} 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.
Speech Privacy	A non-technical term but one of common usage. Speech privacy and speech intelligibility are opposites and a high level of speech privacy means a low level of speech intelligibility. It should be recognised that acceptable levels of speech privacy do not require that speech from an adjacent room is inaudible.
Sound Pressure Level, LP dB	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.
Sound Power Level, Lw dB	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
Noise Reduction	The difference in sound pressure level between any two areas. The term "noise reduction" does not specify any grade or performance quality unless accompanied by a specification of the units and conditions under which the units shall apply
Audible Range	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.
Background Sound Low	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
Character, acoustic	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.
Loudness	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
LMax	The maximum sound pressure level measured over a given period.
LMin	The minimum sound pressure level measured over a given period.
L1	The sound pressure level that is exceeded for 1% of the time for which the given sound is measured.
L10	The sound pressure level that is exceeded for 10% of the time for which the given sound is measured.
L90	The level of noise exceeded for 90% of the time. The bottom 10% of the sample is the L90 noise level expressed in units of dB(A).
Leq	The "equivalent noise level" is the summation of noise events and integrated over a selected period of time.