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5 Parkview Drive, Sydney Olympic Park

Acoustic Assessment Report

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DOCUMENT CONTROL REGISTER

Project Number	20181377.1
Project Name	5 Parkview Drive, Sydney Olympic Park
Document Title	Acoustic Assessment Report
Document Reference	20181377.1/2501A/R5/MF
Issue Type	Email
Attention To	The Data Exchange Network Limited

Revision	Date	Document Reference	Prepared By	Checked By	Approved By
0	24/10/2018	20181377.1/2410A/R0/MF	MF		GW
1	5/11/2018	20181377.1/0511A/R1/MF	MF		GW
2	12/11/2018	20181377.1/1211A/R2/MF	MF		GW
3	22/11/2018	20181377.1/2211A/R3/MF	MF		MF
4	20/12/2018	20181377.1/2012A/R4/MF	MF		MF
5	25/01/2019	20181377.1/2501A/R5/MF	MF		MF

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1 INTRODUCTION

Acoustic Logic Consultancy (ALC) have been engaged to conduct an acoustic assessment of potential noise impacts associated with the proposed data exchange centre to be constructed at 5 Parkview Drive, Sydney Olympic Park.

This document addresses noise impacts associated with the following:

- Noise emissions from mechanical plant to service the development; and
- Vibration emissions from the operation of mechanical plant to service the development.

ALC have utilised the NSW Environmental Protection Authority (EPA) document – *'Noise Policy for Industry (NPfI) 2017'*.

This assessment has been conducted using the POC+P Architects architectural drawings for D.A Submission, see details below.

Table 1-1 – Architectural Sheet Information

Drawing Owner	Drawing No.	Drawing Title	Revision	Date
POC+P Architects	06	Site Plan Proposed	E	20-11-2018

2 SITE DESCRIPTION / PROPOSED REDEVELOPMENT

Onsite acoustic investigation has been carried out by this office in regard to the surrounding acoustic environment around the proposed development, which has been detailed below:

- Murray Rose Avenue along the northern boundary of the site with an open plan car park located along the northern side of Murray Rose Avenue;
- NSW Rural Fire Service headquarters (currently under construction) located to the east of the site;
- South/south east of the site is Parkview Drive with existing commercial buildings located across Parkview Drive; and
- Soka Gakkai international Australia Buddhist Centre located along the western boundary of the site.

In addition to the above, we note that as part of the Sydney Olympic Park Master Plan 2030 (2018 Review) residential development may potentially be located to the east, south and west of the site.

The proposed development consists of alterations and additions to the existing warehouse / office buildings at the site for use as a Data Centre and associated offices. The existing office areas of the building shall be refitted to cater for the requirements of the proposed Data Centre use. The existing warehouse shall be used as the server storage areas (the data hall). Prefabricated server containers shall be installed within the data hall, with chillers above. External plant proposed to be located outside the data hall (north-eastern corner of the building) includes up to eleven (11) cooling tower units to service the server containers, to be installed in stages. Located between the cooling tower units is a loading dock. External plant proposed to be located within the south-western carpark of the site includes up to seven (7) backup power generators, to be installed in stages. Typically, there would be 10-15 staff members employed at the facility.

The nearest noise receivers around the project site include:

- Receiver 1 – NSW Rural Fire Service Headquarters (Currently under construction) located to the east of the site situated at 4 Murray Rose Avenue Sydney Olympic Park;
- Receiver 2 – Commercial buildings located to the south east of the site, situated at 8-10 Parkview Avenue, Sydney Olympic Park;
- Receiver 3 – Soka Gakkai international Australia Buddhist Centre located to the west of the site situated at 3 Parkview Avenue, Sydney Olympic Park;
- Receiver 4 – Commercial buildings located at 3-5 Murray Rose Avenue, Sydney Olympic Park, situated to the north east of the site.
- Receiver 5 – Residential apartment building located at 11 Australia Avenue, Sydney Olympic Park situated to the south west of the site.
- Receiver 6 – Future residential building to be located at 1 Murray Rose Avenue, Sydney Olympic Park situated to the north east of the site. This is under the Sydney Olympic Park 2030 Masterplan.
- Receiver 7 – Future residential building to be located at 2 Murray Rose Avenue, Sydney Olympic Park situated to the east of the site. This is under the Sydney Olympic Park 2030 Masterplan.

A site map, measurement description and surrounding receivers are presented in Figure 2-1 below.

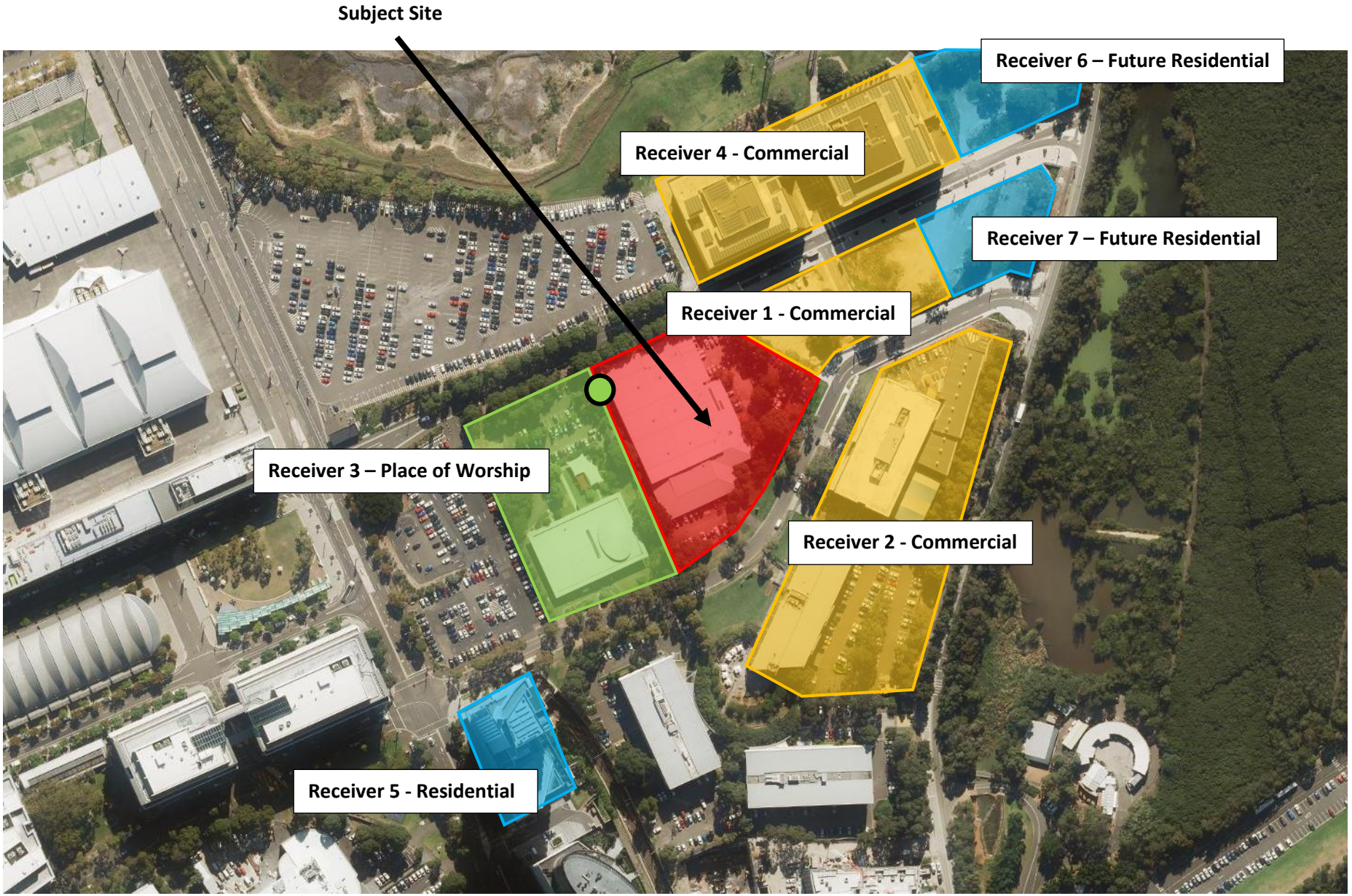


Figure 2-1: Site Survey and Monitoring Positions
Sourced from SixMaps NSW

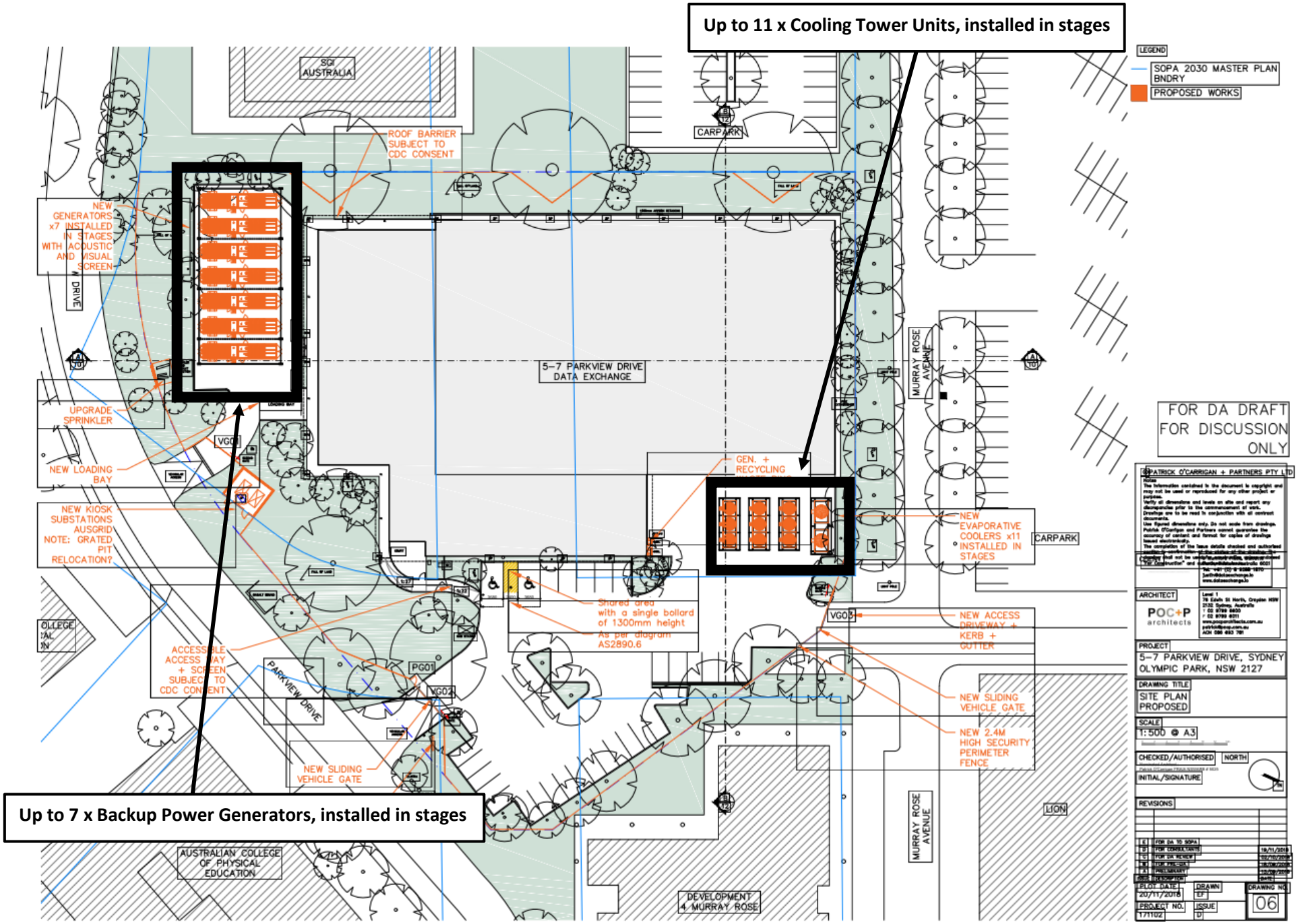


Figure 2-2: Site Layout Plan

3 EXISTING ACOUSTIC ENVIRONMENT

Acoustic monitoring was conducted near the site to establish the background noise levels which will be used as basis for this assessment.

3.1 ENVIRONMENTAL NOISE DESCRIPTORS

Environmental noise constantly varies. Accordingly, it is not possible to accurately determine prevailing environmental noise conditions by measuring a single, instantaneous noise level.

To accurately determine the environmental noise a 15-minute measurement interval is utilised. Over this period, noise levels are monitored on a continuous basis and statistical and integrating techniques are used to determine noise description parameters.

In analysing environmental noise, three-principle measurement parameters are used, namely L_{10}, L_{90} and L_{eq}.

The L_{10} and L_{90} measurement parameters are statistical levels that represent the average maximum and average minimum noise levels respectively, over the measurement intervals.

The L_{10} parameter is commonly used to measure noise produced by a particular intrusive noise source since it represents the average of the loudest noise levels produced by the source.

Conversely, the L_{90} level (which is commonly referred to as the background noise level) represents the noise level heard in the quieter periods during a measurement interval. The L_{90} parameter is used to set the allowable noise level for new, potentially intrusive noise sources since the disturbance caused by the new source will depend on how audible it is above the pre-existing noise environment, particularly during quiet periods, as represented by the L_{90} level.

The L_{eq} parameter represents the average noise energy during a measurement period. This parameter is derived by integrating the noise levels measured over the 15-minute period. L_{eq} is important in the assessment of environmental noise impact as it closely corresponds with human perception of a changing noise environment; such is the character of environmental noise.

3.2 BACKGROUND NOISE LEVELS

Background noise levels which will be used as a basis for this assessment are detailed in the following sections.

3.2.1 Measurement Equipment

Unattended noise monitoring was conducted using one Rion NL42 noise logger. The logger was programmed to store 15-minute statistical noise levels throughout the monitoring period. The equipment was calibrated at the beginning and the end of each measurement using a Rion NC-73 calibrator; no significant drift was detected. All measurements were taken on A-weighted fast response mode. Calibration certificate has been provided in Appendix B.

3.2.2 Measurement Location

An unattended noise monitor was installed along the north western boundary of the project site (5 Parkview Avenue, Sydney Olympic Park), as indicated by Figure 2-1 above. A noise monitor installation photo has been provided in Appendix C.

This location was selected as it would provide shielding from the 4 Murray Rose construction site, as well as shielding from Parkview drive which carries a higher level of traffic which would increase the background noise level.

3.2.3 Measurement Period

Unattended noise monitoring was conducted from Friday 21st September 2018 to Friday 28th September 2018.

3.2.4 Measured Background Noise Levels

The background noise levels established from the unattended noise monitoring are detailed in the Table below.

3.2.4.1 Unattended Noise Measurements

NSW EPA's RBL assessment procedure requires determination of background noise level for each day (the ABL) then the median of the individual days as set out for the entire monitoring period.

Appendix A – Unattended Noise Monitoring Data provides detailed results of the unattended noise monitoring. Weather affected data was excluded from the assessment. The processed Rating Background Noise Levels (lowest 10th percentile noise levels during operation time period) are presented in Table below.

Table 3-1 – Unattended Noise Monitor – Logger Location 1 – Rating Background Noise Level

Date	dB(A)$L_{90(Period)}$		
	Day (7am-6pm)	Evening (6pm-10pm)	Night (10pm-7am Next Day)
Friday, 21st September, 2018		44	42
Saturday, 22nd September, 2018	44	44	41
Sunday, 23rd September, 2018	47	46	42
Monday, 24th September, 2018	48	43	38
Tuesday, 25th September, 2018	44	42	40
Wednesday, 26th September, 2018	46	44	40
Thursday, 27th September, 2018	44	44	42
Friday, 28th September, 2018	44	-	-
Median	**44**	**44**	**41**

3.2.4.2 Summarised Rating Background Noise Levels

Site investigations, attended and unattended noise measurements indicate that the acoustic environment for the project site are as below.

Table 3-2 – Summarised Rating Background Noise Level

Location	Time of day	Rating Background Noise Level (dB(A)$L_{90(Period)}$)
5 Parkview Drive, Sydney Olympic Park (See Figure 2-1)	Day (7:00am-6:00pm)	44
	Evening (6:00pm-10:00pm)	44
	Night (10:00pm-7:00am)	41

4 NOISE EMISSION ASSESSMENT

A noise emission assessment has been carried out to ensure noise emitted from the use of the site is in accordance with the requirements outlined below.

4.1 NOISE EMISSION CRITERIA

Noise emission criteria have been summarised into two areas; general operation and backup power plant. General operations cover the noise from vehicle activities and mechanical services. backup power plant is the operation of the seven proposed power generators located in the south west of the site.

4.1.1 General Operations

General operation of the site (loading dock, vehicles and mechanical plant) must comply with the requirements of the NSW Environmental Protection Authority (EPA) document – *'Noise Policy for Industry (NPfI)'.* This has been outlined below. **(Note this excludes the operation of backup power plant – refer to section 4.1.2).**

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

The NPfI provides guidelines for assessing noise impacts from developments. The recommended assessment objectives vary depending on the potentially affected receivers, the time of day, and the type of noise source. The NPfI has two requirements which both have to be complied with, namely an amenity criterion and an intrusiveness criterion.

4.1.1.1.1 Intrusiveness Criterion

The guideline is intended to limit the audibility of noise emissions at residential receivers and requires that noise emissions measured using the L_{eq} descriptor not exceed the background noise level by more than 5 dB(A).

Table 4-1 – NPfI Intrusiveness Criteria

Receiver	Time of day	Background Noise Level dB(A)$L_{90(Period)}$	Intrusiveness Criteria (Background + 5dB(A)$L_{eq(Period)}$)
Residential	Day (7am-6pm)	44	49
	Evening (6pm-10pm)	44	49
	Night (10pm-7am)	41	46

4.1.1.1.2 Amenity Criterion

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

The Industrial Noise Policy sets out acceptable noise levels for various land uses. Table 2.2 on page 11 of the policy has four categories to distinguish different residential areas. They are rural, suburban, urban and urban/industrial interface.

For the purposes of a conservative assessment, ALC will assess noise emissions in accordance with the 'Urban' category.

Table 4-2 – NPfI Project Amenity Criteria

Type of Receiver	**Time of day**	**Recommended Project Acceptable Noise Level dB(A)$L_{eq(15minutes)}$***
Residential (Urban)	Day (7am-6pm)	58
	Evening (6pm-10pm)	48
	Night (10pm-7am)	46
Commercial	When in Use	65
Place of Worship	When in Use	40 **(Internal Noise Level Only)**

*Adjusted based on amenity noise levels as a 15-minute interval.

4.1.1.1.3 Sleep Arousal Assessment

Potential sleep arousal impacts should be considered for noise generated after 10pm.

Sleep arousal is a function of both the noise level and the duration of the noise.

As recommended in the NPfI, to assess potential sleep arousal impacts, a two-stage test is carried out:

- Step 1 – Section 2.5 *Maximum noise level event assessment* from the NPfI states the following:

  Where the subject development/premises night-time noise levels at a residential location exceed:

  - *$L_{Aeq,15min}$ 40dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or*
  - *L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is greater,*

  a detailed maximum noise level event assessment should be undertaken.

Based on the above the following noise objectives apply:

Table 4-3 – Sleep Arousal Criteria (*Average*/L_{eq} Noise Levels)

Location	Rating Background Level dB(A)$L_{90(Period)}$	Rating Background Level + 5dB(A)	Governing Criteria dB(A)$L_{eq(15mins)}$
Residential Receivers	41	46	46

Table 4-4 – Sleep Arousal Criteria (*Maximum*/L_{Max} Noise Events)

Location	Rating Background Level dB(A)$L_{90(Period)}$	Rating Background Level + 15dB(A)	Governing Criteria dB(A)$L_{(Max)}$
Residential Receivers	41	56	56

- Step 2 - If there are noise events that could exceed the average/maximum criteria detailed in the tables above, then an assessment of sleep arousal impact is required to be carried out taking into account the level and frequency of noise events during the night, existing noise sources, etc. This test takes into account the noise level and number of occurrences of each event with the potential to create a noise disturbance. As is recommended in the explanatory notes of the EPA NPfI, this more detailed sleep arousal test is conducted using the guidelines in the EPA Road Noise Policy (RNP). Most relevantly, the Road Noise Policy (RNP) states:

  For the research on sleep disturbance to date it can be concluded that:

  - *Maximum internal noise levels below 50-55dB(A) are unlikely to awaken people from sleep.*
  - *One to two noise events per night with maximum internal noise levels of 65-70dB(A) are not likely to affect health and wellbeing significantly.*

4.1.1.2 Summarised Plant Noise Emission Criteria for General Operation.

Summary for noise emission criteria for all plant associated with the development has been summarised below.

Table 4-5 – Summary of Noise Emission Criteria – General Operation

Receiver	Time of day	Background Noise Level dB(A)$L_{90(Period)}$	Project Amenity Criteria dB(A)$L_{eq(Period)}$	Intrusiveness Criteria (Background + 5dB(A)$L_{eq(period)}$)
Residential Receivers	Day (7am-6pm)	44	58	49
	Evening (6pm-10pm)	44	48	49
	Night (10pm-7am)	41	43	46
Commercial Receivers	When in use	-	65	-
Place of Worship	When in Use	-	40 **(Internal Noise Level Only)**	-

Table 4-6 – Sleep Arousal Criteria (*Average*/L_{eq} Noise Levels)

Location	Rating Background Level dB(A)$L_{90(Period)}$	Rating Background Level + 5dB(A)	Governing Criteria dB(A)$L_{eq(15mins)}$
Residential Receivers	41	46	46

Table 4-7 – Sleep Arousal Criteria (*Maximum*/L_{Max} Noise Events)

Location	Rating Background Level dB(A)$L_{90(Period)}$	Rating Background Level + 15dB(A)	Governing Criteria dB(A)$L_{(Max)}$
Residential Receivers	41	56	56

4.1.2 Backup Power Plant (Power Generators)

As part of the development proposal seven (7) power generators are proposed to be installed in the existing south west car park.

The operation of these generators to residential receivers must comply with the following.

Rating Background Level + 10dB(A)$L_{eq(15\text{-}minute)}$.

The operation of these generators to commercial receivers must comply with 65dB(A)$L_{eq(15\text{-}minute)}$.

The operation of these generators to Place of Worship receivers must comply with 45dB(A)$L_{eq(15\text{-}minute)}$.

This criterion has been adopted based on other previously projects. Summary of applicable criteria for the operation of power generators.

Table 4-8 – Summary of Noise Emission Criteria – Backup Power Plant

Receiver	Time of day	Background Noise Level dB(A)$L_{90(Period)}$	Criteria (Background + 10dB(A)$L_{eq(period)}$)
Residential Receivers	Day (7am-6pm)	44	54
	Evening (6pm-10pm)	44	54
	Night (10pm-7am)	41	51
Commercial Receivers	When in use	-	65
Place of Worship	When in Use	-	40 **(Internal Noise Level Only)**

4.2 ASSESSMENT

Operational noise impacts of the site have been assessed below, these include the operation of the following:

- Mechanical Noise;
    - Mechanical noise from the operation of the eleven (11) external cooling towers.
    - Mechanical noise from the operation of the seven (7) backup power generators.
- Vehicle Noise;
    - Vehicle noise from the loading dock.
    - Vehicle noise from the staff car park.

4.2.1 Assessment Noise Data

The following table presented the adopted Sound Power Levels (SWL) for each of the assessment items identified above. Also refer to Appendix D.

4.2.1.1 Cooling Towers

The proposal includes the installation and operation of eleven cooling towers located just outside the main warehouse near the loading dock. Associated noise levels for the cooling towers are shown below, this has been provided to this office from the proposed manufacturers. There are two types of cooling towers proposed; two Evapco USS17-3K12 and nine Evapco USS 192I8. Also see Appendix D.

Table 9 – Sound Power Level of Cooling Towers

Model	Hz	63	125	250	500	1k	2k	4k	8k
Evapco USS17-3K12 (100%)	Sound Power Level (SWL)	97	92	83	80	81	77	74	73
Evapco USS19-2I8 (100%)		91	86	79	77	77	75	72	71

4.2.1.2 Power Generators

The proposal includes the installation and operation of seven power generators located in the existing south west car park. Associated noise levels for the power generators are shown below, this has been provided to this office from proposed manufacturers. Also see Appendix D.

Table 10 – Sound Power Level of Power Generators

Model	Hz	63	125	250	500	1k	2k	4k	8k
Cummins KTA50G3 (100%)	Sound Power Level (SWL)	99	102	101	89	83	97	102	106

4.2.1.3 Vehicles

Sound power levels for vehicles on the site are:

- 84 dB(A) for a car engine, idling/driving at 5km/h.
- 94 dB(A) for a small rigid truck engine, idling/driving at 5km/h

4.2.2 Assumed Façade Constructions

For receiver 3 (Soka Gakkai International Australia Buddhist Centre) we have assumed a 10mm single fixed glazing for the façade construction of the main hall. This information has been adopted from acoustic report prepared by *The Acoustic Group, titled Review of Acoustic Logic Assessment, dated 11th January 2019* by a Mr Steven Cooper.

4.2.3 Predicted Noise Levels

Based on the proposed locations of plant, vehicles, surrounding receivers and sound power levels above, the following predicted noise levels have been calculated.

4.2.3.1 General Operation

Predicted noise levels for the general operation of the site are outlined below. Predicted noise levels below include the operation of cooling towers and vehicle noise.

For internal noise predictions we have assumed a noise reduction of R_w 33 for a 10mm glass.

Table 11 – Predicted Noise Levels – General Operation

Receiver	Predicted Noise Level dB(A)$L_{eq(15minute)}$	Criteria dB(A)$L_{eq(15minute)}$	Additional Acoustic Treatments	Compliance
Receiver 1 - NSW RFS Headquarters	62	65	No additional treatments required.	Yes
Receiver 2 - 8-10 Parkview Avenue	52	65		Yes
Receiver 3 - Soka Gakkai International Australia Buddhist Centre	<30	45 (Internal)		Yes
Receiver 4 - Commercial 3-5 Murray Rose Avenue	59	65		Yes
Receiver 5 - Residential 11 Australia Avenue	42	43		Yes
Receiver 6 Residential – 1 Murray Rose Avenue	38	43		Yes
Receiver 7 Residential – 1 Murray Rose Avenue	41			Yes

4.2.3.2 Backup Power Plant

Predicted noise levels for the Backup Power Plant are outlined below. Manufacturers Data Sheets can be found in Appendix D of this report.

Table 12 – Predicted Noise Levels – Backup Power Plant

Receiver	Predicted Noise Level dB(A)$L_{eq(15minute)}$	Criteria dB(A)$L_{eq(15minute)}$	Additional Acoustic Treatments	Compliance
Receiver 1 - NSW RFS Headquarters	45	65	**Indicative Acoustic Treatment** Enclose the power plant on all sides including the top with 1 x 9mm Fibre Cement Sheeting **OR** where ventilation is required a 300mm deep High Performance Acoustic Louvre. (see insertion loss below) (In the event an alternate solution can be determined for reducing the noise impacts from the Backup Power Plant to the neighbouring properties. It would need to achieve the noise emission objectives as outlined in section 4.1.2 of this report.)	Yes
Receiver 2 - 8-10 Parkview Avenue	60	65		Yes
Receiver 3 - Soka Gakkai International Australia Buddhist Centre	39 (Including a 5-point penalty for low frequency)	45 (Internal)		Yes
Receiver 4 - Commercial 3-5 Murray Rose Avenue	43	65		Yes
Receiver 5 - Residential 11 Australia Avenue	51	51		Yes
Receiver 6 Residential – 1 Murray Rose Avenue	41	51		Yes
Receiver 7 Residential – 1 Murray Rose Avenue	42			Yes

4.2.3.3 Maximum Noise Level Assessment

Maximum noise level assessment for the operation of the cooling towers and power generators have been presented below.

Table 13 – Predicted Noise Levels – Cooling Towers - L_{Max}

Receiver	Predicted Noise Level dB(A)L_{Max}	Criteria dB(A)L_{Max}	Compliance
Receiver 5 - Residential 11 Australia Avenue	42	56	Yes
Receiver 6 Residential – 1 Murray Rose Avenue	38		Yes
Receiver 7 Residential – 1 Murray Rose Avenue	41		Yes

Table 14 – Predicted Noise Levels – Power Generator - L_{Max}

Receiver	Predicted Noise Level dB(A)L_{Max}	Criteria dB(A)L_{Max}	Compliance
Receiver 5 - Residential 11 Australia Avenue	51	56	Yes
Receiver 6 Residential – 1 Murray Rose Avenue	41		Yes
Receiver 7 Residential – 1 Murray Rose Avenue	42		Yes

4.2.4 Recommended Treatments

Based on the predicted noise levels above, acoustic treatments are required. These have been outlined below.

- All mechanical plant and backup power plant are to be vibration isolated to minimise vibration transmission to receivers.

- The power generators will need to be enclosed on all sides (including the top), this enclosure should be constructed from either 1 x 9mm Fibre Cement Sheeting lined by Martini Absorb HD 50 facing equipment where non-ventilation openings are required **OR** where ventilation openings are required a 300mm deep High Performance Acoustic Louvre with the following insertion loss. Also see picture below.

Table 15 – 300mm Deep Acoustic Louvre Insertion Loss

Hz	63	125	250	500	1k	2k	4k	8k
Insertion Loss	4	7	10	12	15	15	15	14

Please note: In the event an alternate solution can be determined for reducing the noise impacts from the Backup Power Plant to the neighbouring properties. It would need to achieve the noise emission objectives as outlined in section 4.1.2 of this report.

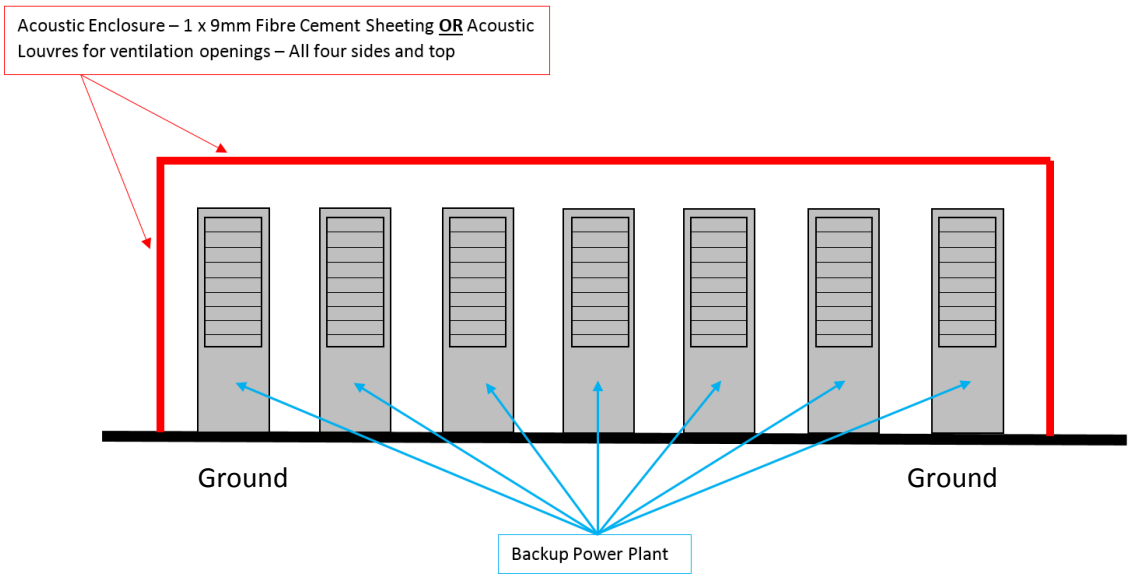


Figure 4-1: Section View of the Indicative Backup Power Plant Enclosure

- Ongoing maintenance of all machinery is to be undertaken to ensure all plant are operating within the manufacturers design.

- During the detailed design we would expect other mechanical systems will be required for the operation of the data hall. It is recommended that a mechanical services review is undertaken to ensure compliance with the criteria outlined in section 4.1.1 of this report.

5 CONCLUSION

This report presents an acoustic assessment of noise impacts associated with the proposed data centre to be located at 5 Parkview Drive, Sydney Olympic Park. Based on the information provided above we conclude the following;

Provided that the treatments set out in section 4 of this report are employed, noise emissions from the site will comply with the requirements of the NSW Environmental Protection Authority (EPA) document – *'Noise Policy for Industry (NPfI) 2017'.*

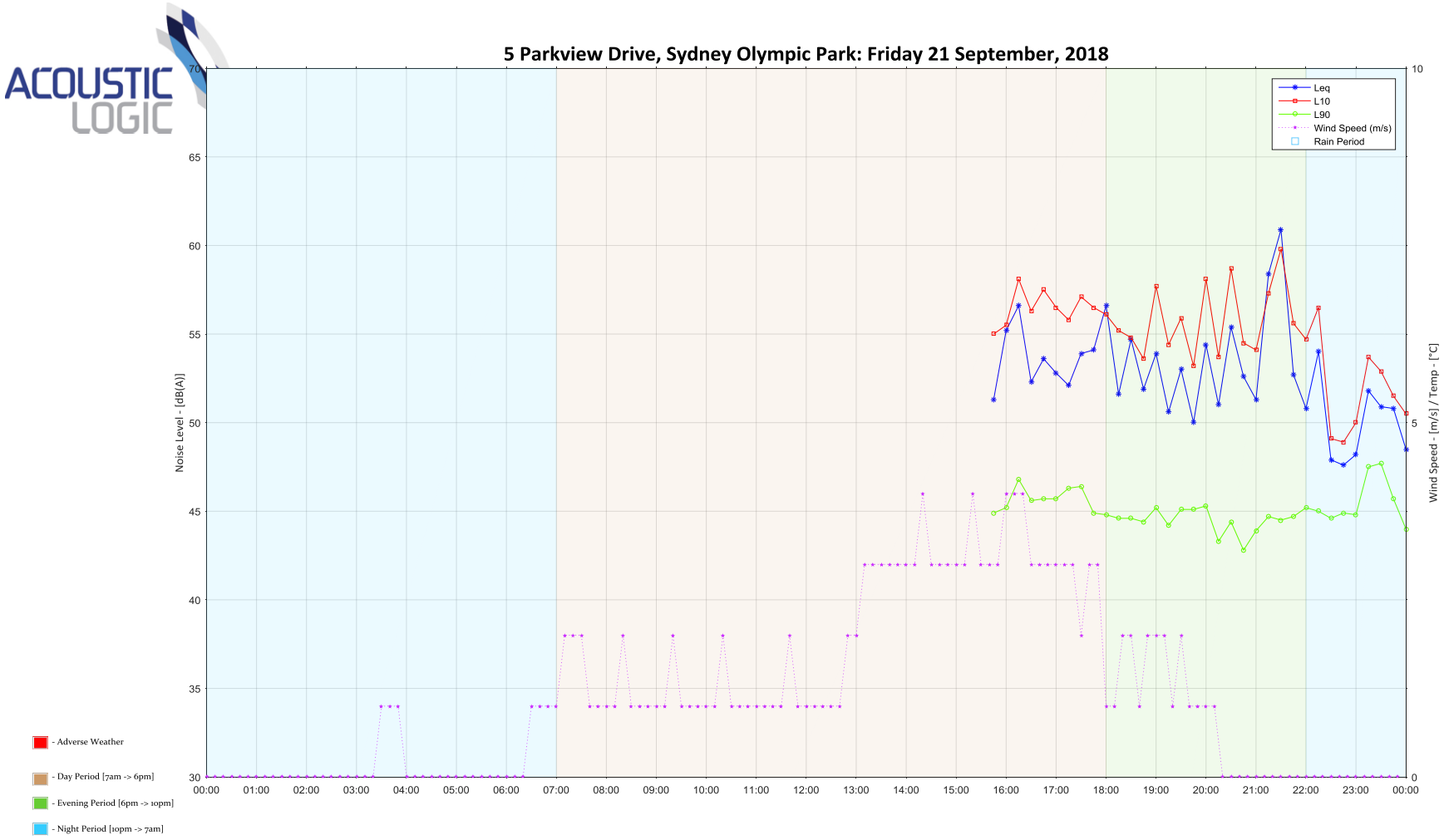
A detailed review of all mechanical services is recommended prior to installation.

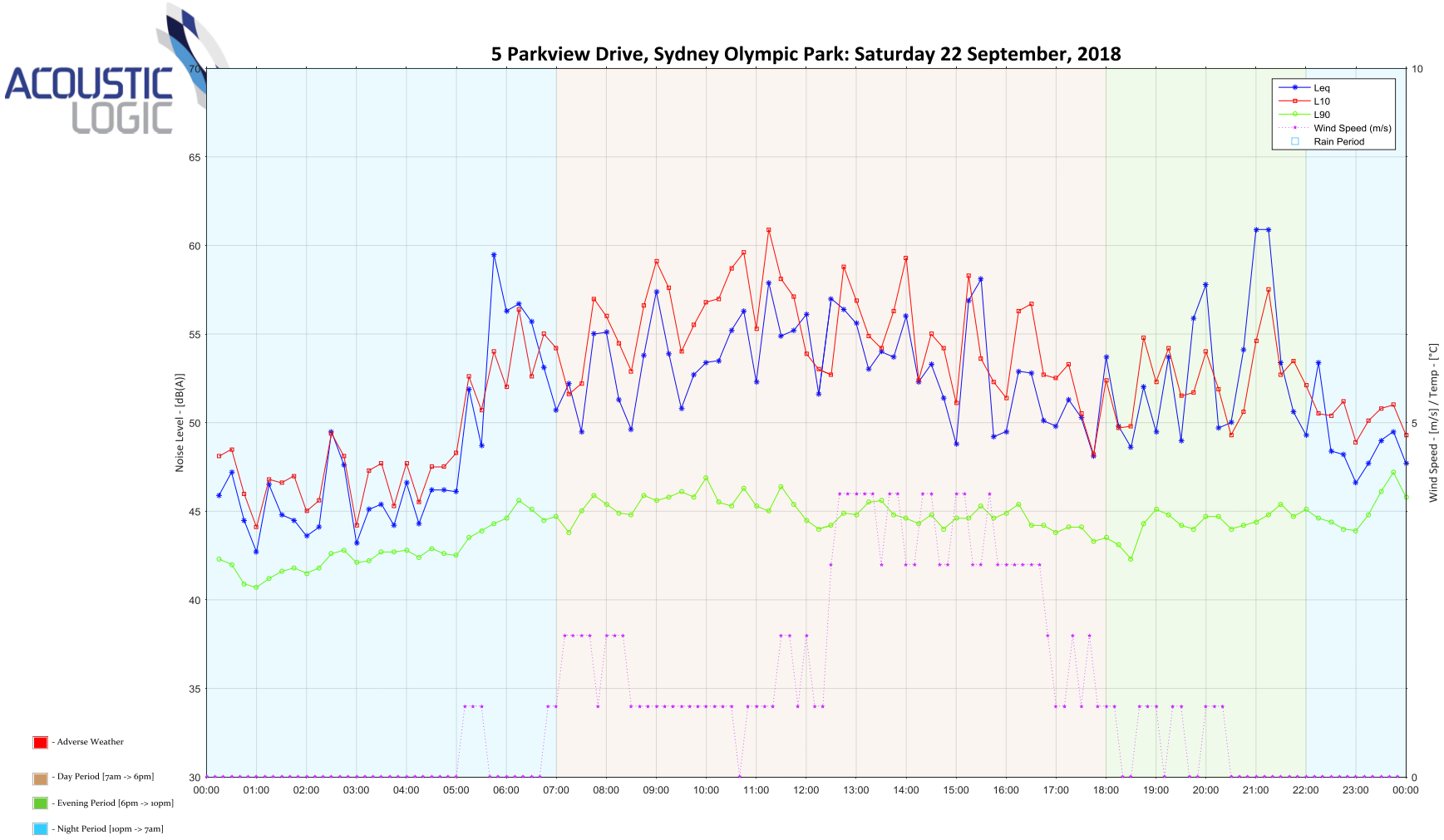
We trust this information is satisfactory. Please contact us should you have any further queries.

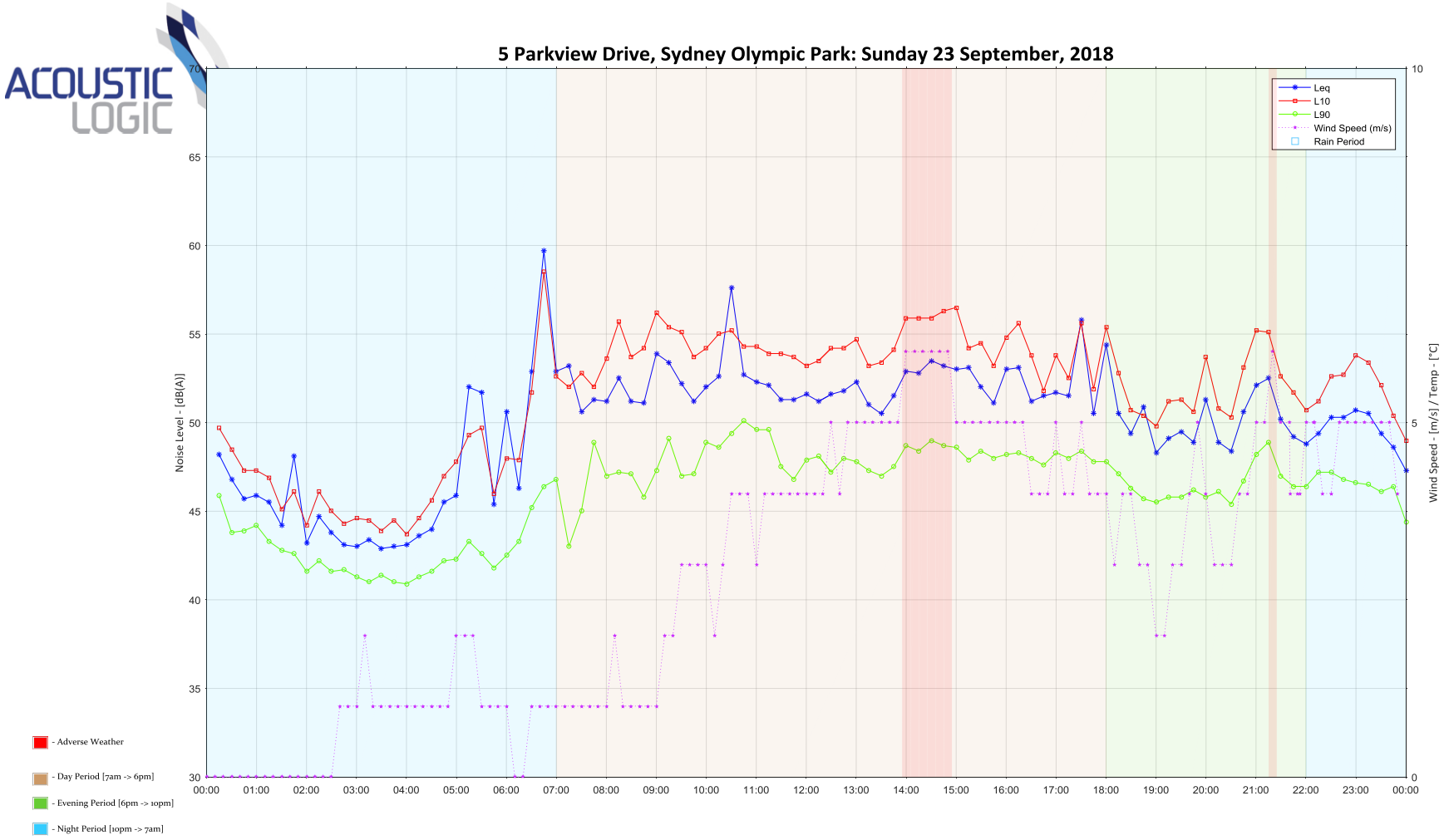
Yours faithfully,

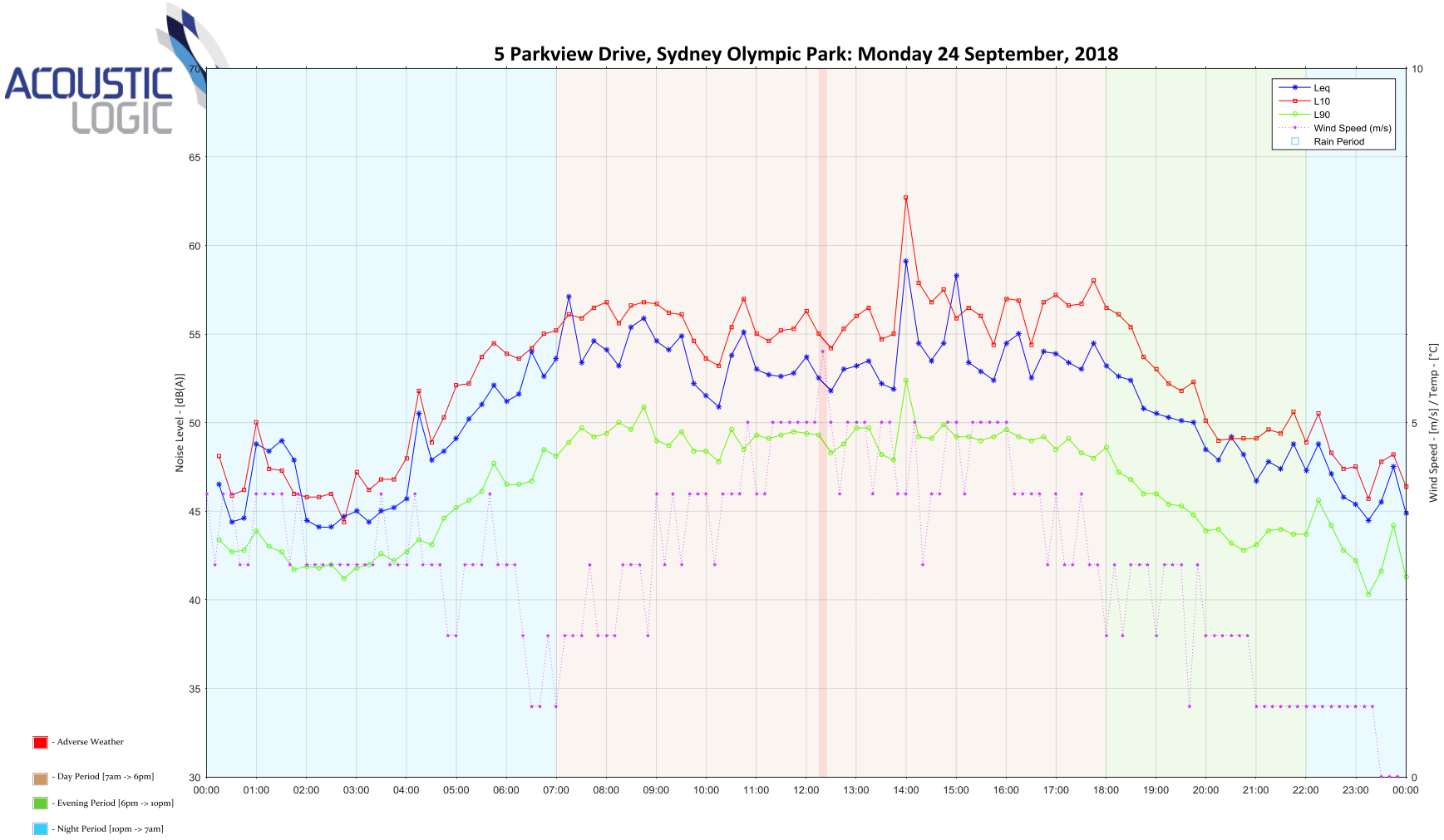
Acoustic Logic Consultancy Pty Ltd
Matthew Furlong

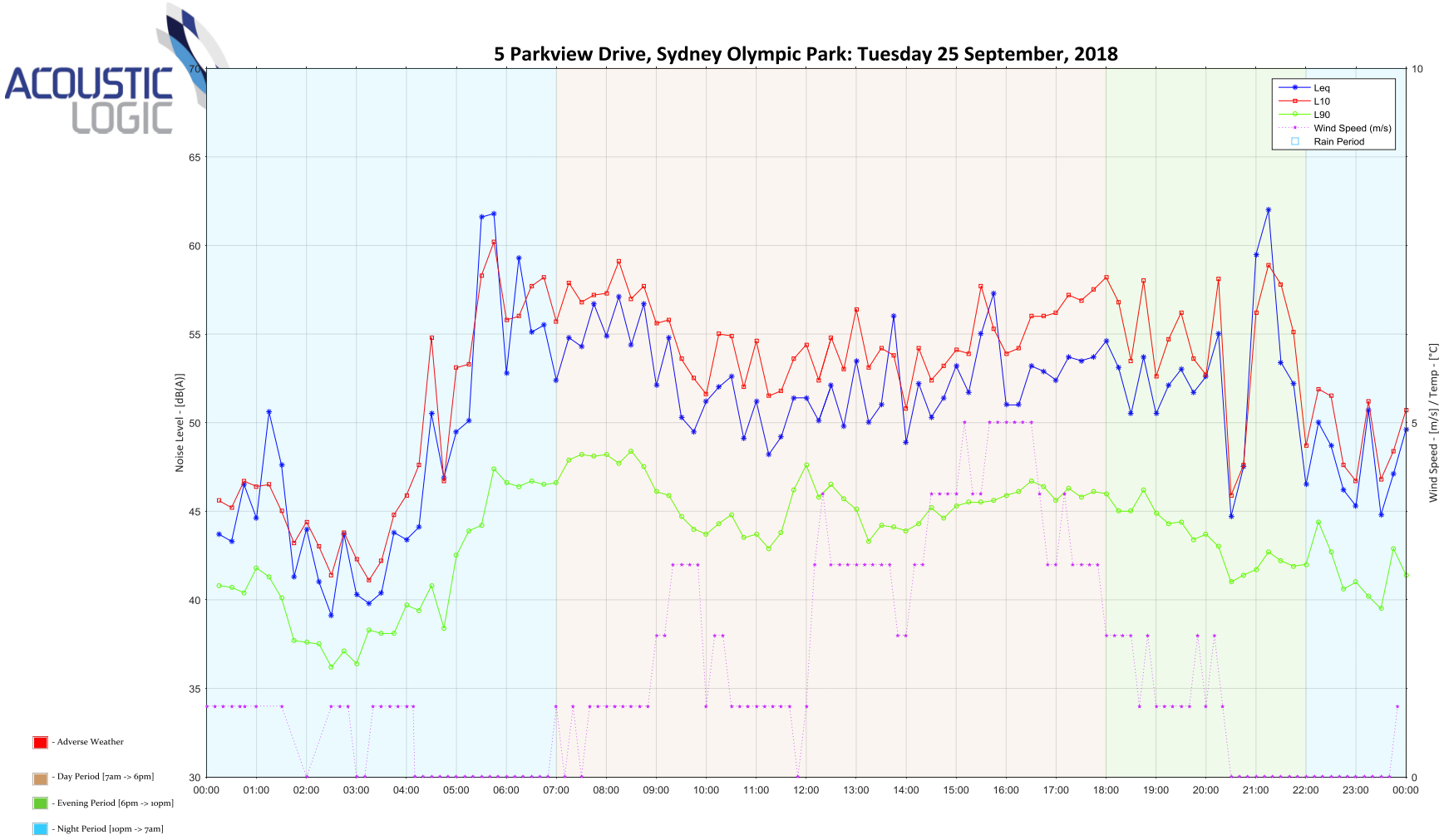
APPENDIX A – UNATTENDED NOISE MONITORING DATA – LOGGER LOCATION 1 – 5 PARKVIEW DRIVE, SYDNEY OLYMPIC PARK

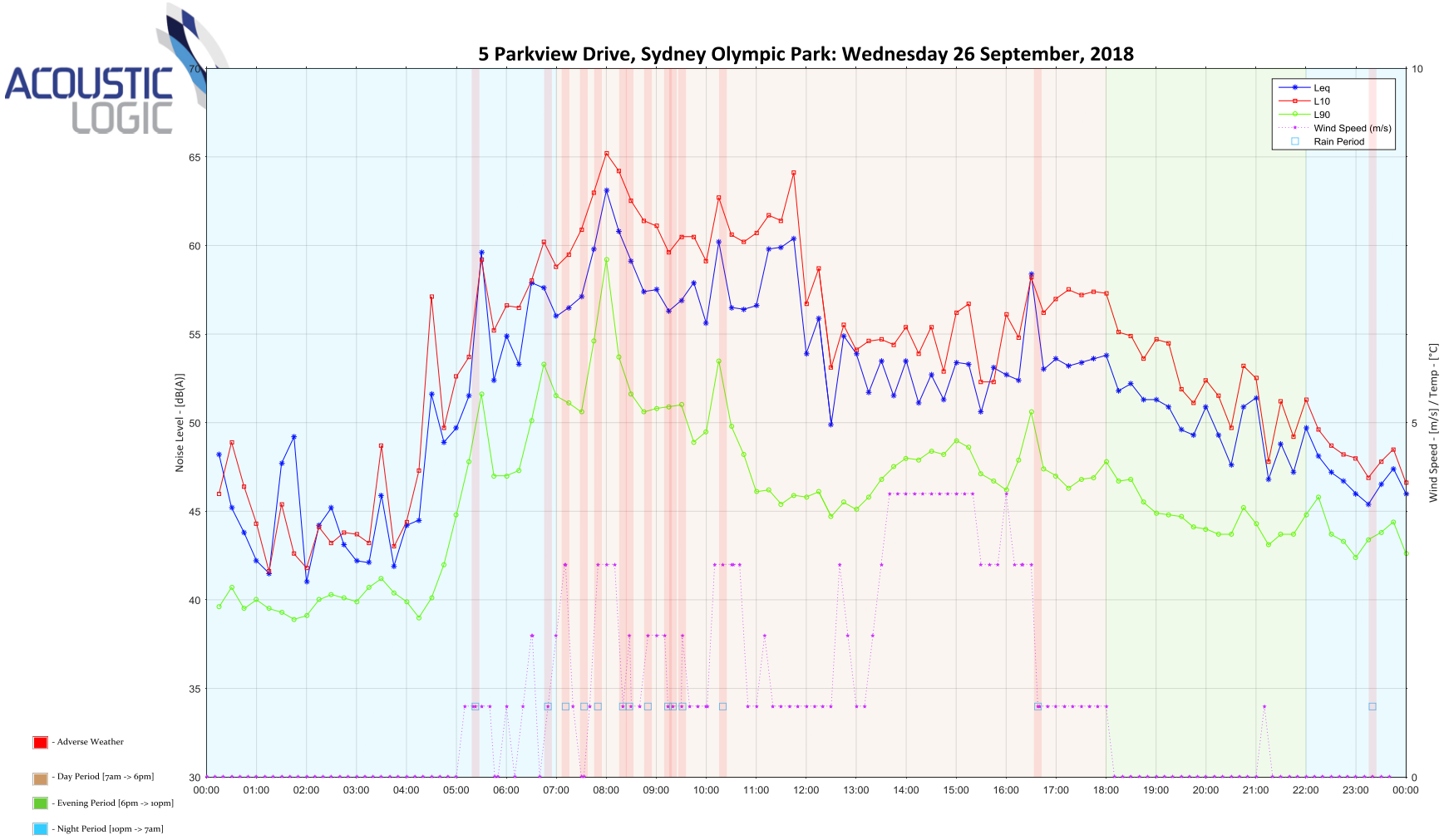

5 Parkview Drive, Sydney Olympic Park: Friday 21 September, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

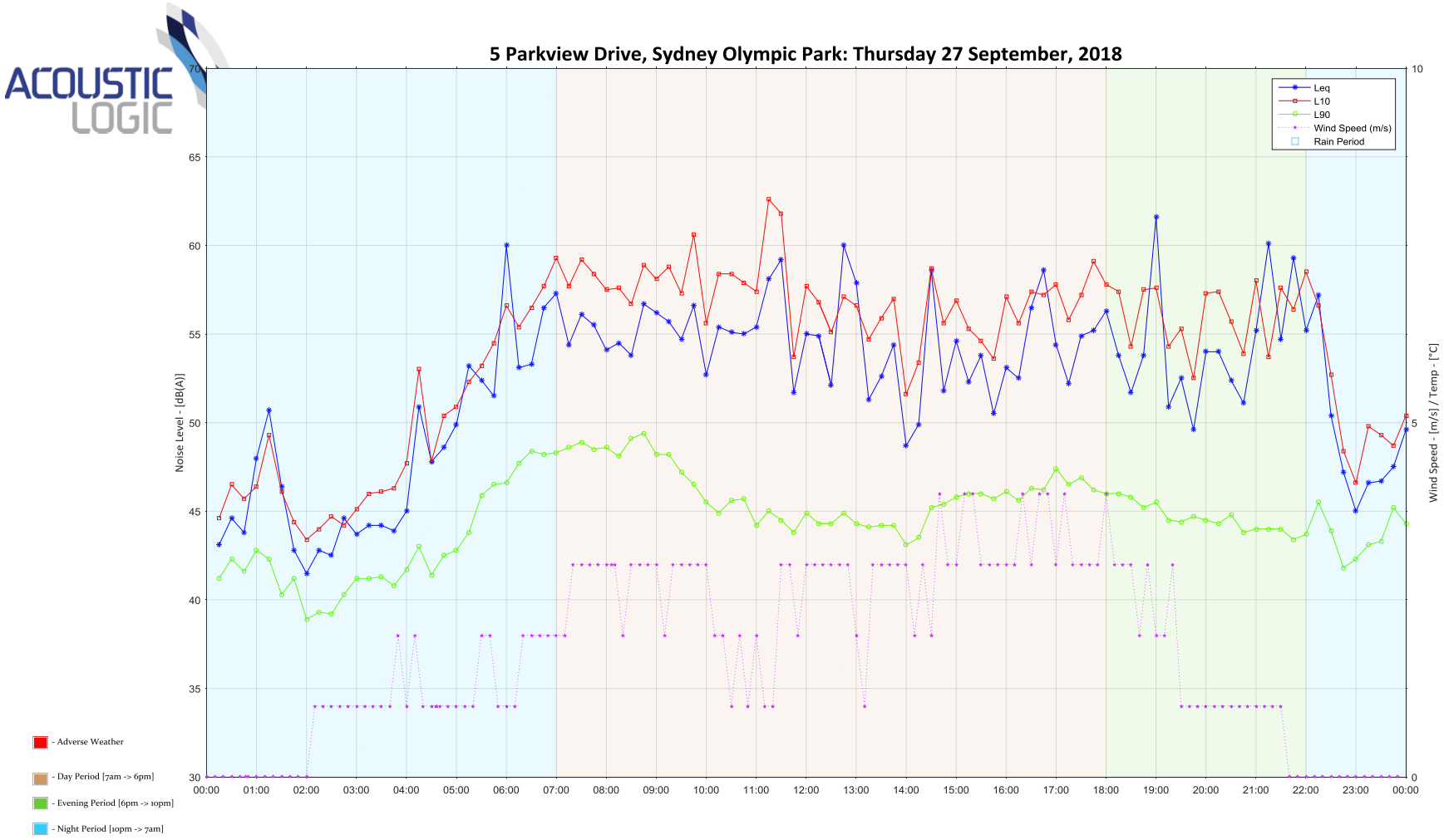

5 Parkview Drive, Sydney Olympic Park: Saturday 22 September, 2018
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

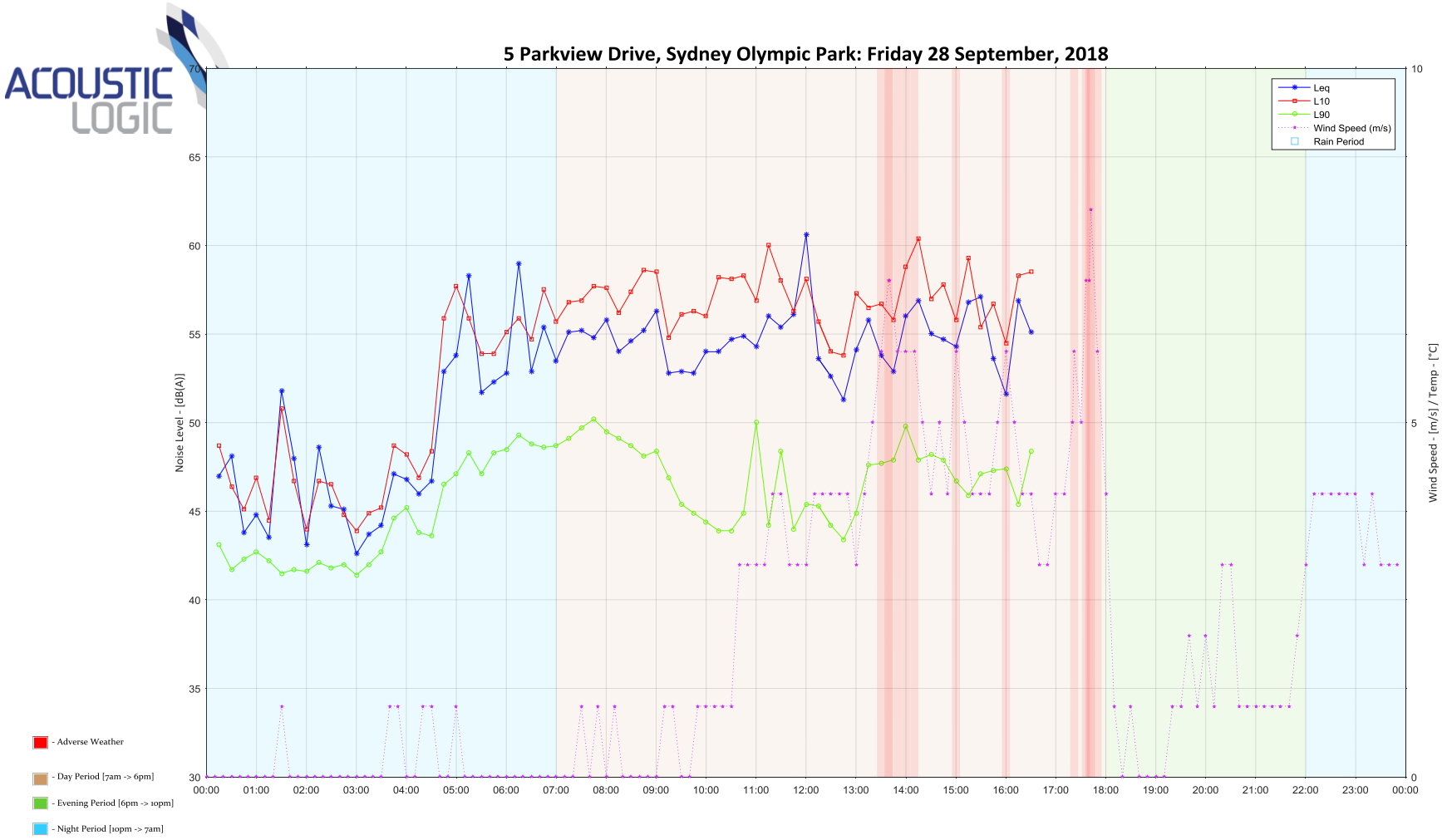

5 Parkview Drive, Sydney Olympic Park: Sunday 23 September, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


5 Parkview Drive, Sydney Olympic Park: Monday 24 September, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

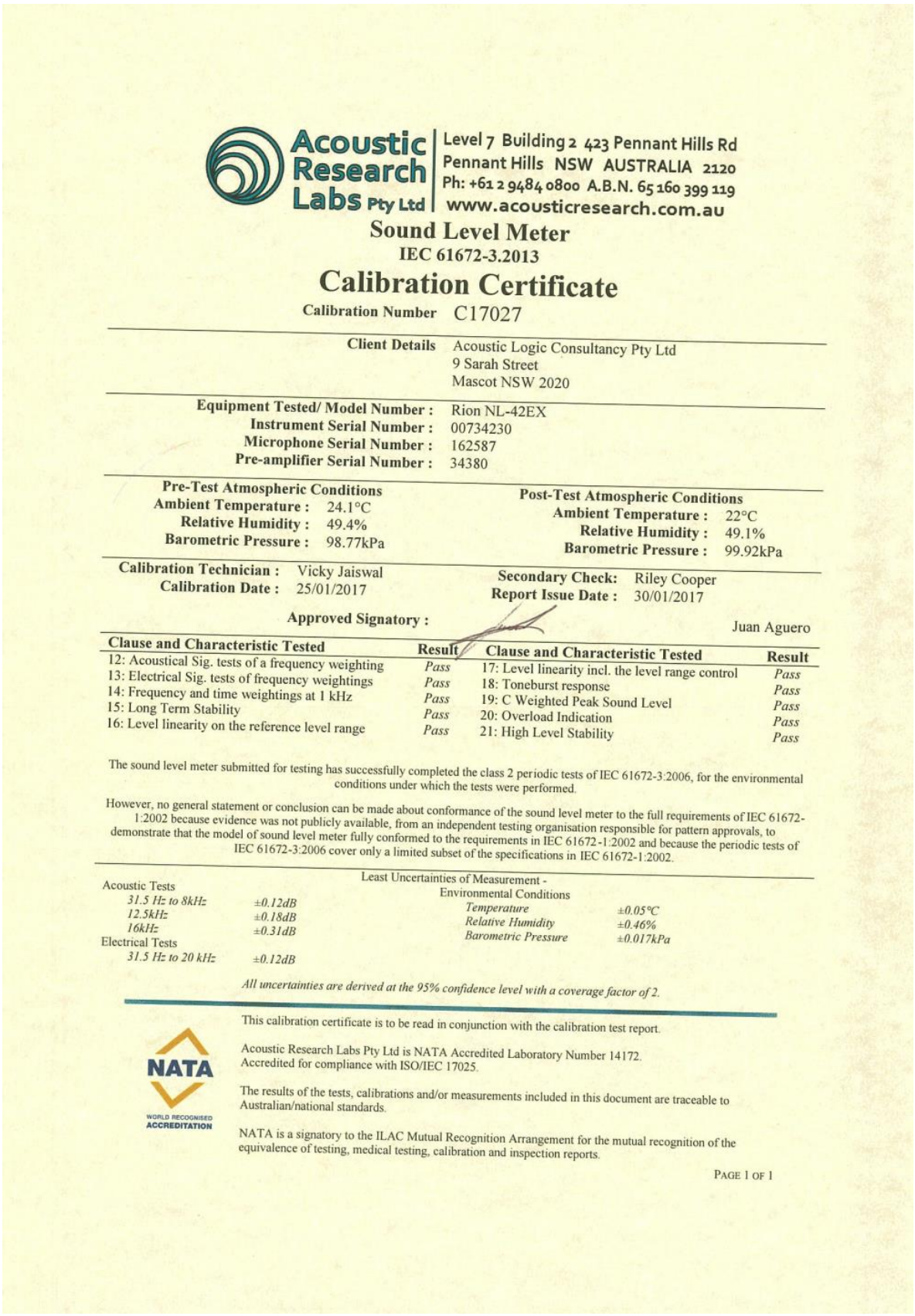

5 Parkview Drive, Sydney Olympic Park: Tuesday 25 September, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


5 Parkview Drive, Sydney Olympic Park: Wednesday 26 September, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


5 Parkview Drive, Sydney Olympic Park: Thursday 27 September, 2018
Leq
L10
L90
Wind Speed (m/s)
Rain Period
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]


5 Parkview Drive, Sydney Olympic Park: Friday 28 September, 2018
Noise Level - [dB(A)]
Wind Speed - [m/s] / Temp - [°C]
Leq
L10
L90
Wind Speed (m/s)
Rain Period
- Adverse Weather
- Day Period [7am -> 6pm]
- Evening Period [6pm -> 10pm]
- Night Period [10pm -> 7am]

APPENDIX B – CALIBRATION CERTIFICATE OF NOISE MONITOR



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Sound Level Meter
IEC 61672-3.2013

Calibration Certificate

Calibration Number C17027

Client Details Acoustic Logic Consultancy Pty Ltd
9 Sarah Street
Mascot NSW 2020

Equipment Tested/ Model Number : Rion NL-42EX
Instrument Serial Number : 00734230
Microphone Serial Number : 162587
Pre-amplifier Serial Number : 34380

Pre-Test Atmospheric Conditions
Ambient Temperature : 24.1°C
Relative Humidity : 49.4%
Barometric Pressure : 98.77kPa

Post-Test Atmospheric Conditions
Ambient Temperature : 22°C
Relative Humidity : 49.1%
Barometric Pressure : 99.92kPa

Calibration Technician : Vicky Jaiswal
Calibration Date : 25/01/2017

Secondary Check: Riley Cooper
Report Issue Date : 30/01/2017

Approved Signatory : Juan Aguero

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

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

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

Least Uncertainties of Measurement -

Acoustic Tests
31.5 Hz to 8kHz ±0.12dB
12.5kHz ±0.18dB
16kHz ±0.31dB
Electrical Tests
31.5 Hz to 20 kHz ±0.12dB

Environmental Conditions
Temperature ±0.05°C
Relative Humidity ±0.46%
Barometric Pressure ±0.017kPa

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

NATA
WORLD RECOGNISED ACCREDITATION

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

Acoustic Research Labs Pty Ltd is NATA Accredited Laboratory Number 14172.
Accredited for compliance with ISO/IEC 17025.

The results of the tests, calibrations and/or measurements included in this document are traceable to Australian/national standards.

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

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Figure B-1 – Calibration Certificate of Noise Monitor (Rion NL-42)

APPENDIX C – NOISE MONITOR INSTALLATION PHOTO

Figure C-1 – Unattended Noise Monitor Installation Photo.

APPENDIX D – MANUFACTURER'S DATA SHEETS

Sound Data
Cummins KTA50G3
Stamford P1734D Alternator
50 Hz
40 Foot Sound Attenuated Enclosure
Free Field

Engine	Alternator	Standby kVA	Prime kVA	Pressure Level dB(A) @ 1M - 110% Load							
				dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
				SPL F	SPL F	SPL F	SPL F	SPL F	SPL F	SPL F	SPL F
				63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
KTA50	P734	1675	1400	76.7	79.5	79.1	66.4	61	74.5	80.1	84

Engine	Alternator	Standby kVA	Prime kVA	Pressure Level dB(A) @ 1M - 100% Load							
				dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
				SPL F	SPL F	SPL F	SPL F	SPL F	SPL F	SPL F	SPL F
				63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
KTA50	P734	1675	1400	75.9	78.7	78.3	65.6	60.2	73.7	79.3	83.2

Engine	Alternator	Standby kVA	Prime kVA	Pressure Level dB(A) @ 1M - 75% Load							
				dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)	dB(A)
				SPL F	SPL F	SPL F	SPL F	SPL F	SPL F	SPL F	SPL F
				63 Hz	125 Hz	250 Hz	500 Hz	1k Hz	2k Hz	4k Hz	8k Hz
KTA50	P734	1675	1400	76.8	79.6	79.2	66.5	61.1	74.6	80.2	84.1

POWER YOU CAN RELY ON
HEAD OFFICE: 24 Perrin Place, Salisbury QLD 4107 • PO Box 115 Archerfield QLD 4108 • ABN 40 095 032 385
BRISBANE
Phone: (07) 3277 8626 • Fax: (07) 3277 8627
PERTH
Phone: (08) 9300 6168 • Fax: (08) 9300 6471
PORT HEDLAND
Phone: 1300 305 912
Email: info@genelite.com.au • www.genelite.com.au

Figure D-1 – Power Generator Noise Data – Cummins KTA50G3

Full Speed Complete Sound Data

Kevin Irudaya Balan
TBD

AU
kbalan@evapco.com.au

Sound Pressure Levels (SPL) in dB RE 0.0002 Microbar
Sound Power Levels (PWL) in dB RE 10-12 Watt

Model	USS 17-3K12
Motor	15.00 kW
# Motors	1
Speed	Full Speed

1 Cell Data

	Sound Pressure Level (dB)										
	End		Motor Side		Opp End		Opp Mtr. Side		Top		Sound
	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	Power
Band	(1.5m)	(15m)	(1.5m)	(15m)	(1.5m)	(15m)	(1.5m)	(15m)	(1.5m)	(15m)	Level (db)
63 HZ	74	61	73	67	74	61	77	68	74	61	97
125 HZ	68	60	74	60	68	60	70	57	75	61	92
250 HZ	65	50	66	51	65	50	64	51	63	53	83
500 HZ	62	48	67	49	62	48	64	48	57	48	80
1 KHZ	63	49	66	50	63	49	63	50	57	45	81
2 KHZ	61	44	65	47	61	44	61	47	53	43	77
4 KHZ	63	41	62	41	63	41	61	41	54	43	74
8 KHZ	64	41	64	39	64	41	64	39	56	44	73
Calc dBA	70	53	72	55	70	53	70	54	64	53	86

Sound option(s) selected: Discharge Attenuation, Super Low Sound Fan, Water Silencers

Remarks:

1. Sound Pressure Levels are according to CTI Standard ATC-128
2. Sound Power Levels are calculated according to the Small Units Section 8
3. Sound from free-field conditions over a reflecting plane with +/-2 db(A) tolerance
4. Noise levels can increase with variable frequency drives depending on the drive manufacturer and the drive configuration
5. Complete unit sound data with all fans operating

Figure D-2 – Cooling Tower Noise Data – Evapco USS 17-3K12

66% Speed Complete Sound Data

Kevin Irudaya Balan
TBD

AU
kbalan@evapco.com.au

Sound Pressure Levels (SPL) in dB RE 0.0002 Microbar
Sound Power Levels (PWL) in dB RE 10-12 Watt

Model	USS 17-3K12
Motor	15.00 kW
# Motors	1
Speed	2/3 Speed

1 Cell Data

	Sound Pressure Level (dB)										
	End		Motor Side		Opp End		Opp Mtr. Side		Top		Sound
	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	Power
Band	(1.5m)	(15m)	(1.5m)	(15m)	(1.5m)	(15m)	(1.5m)	(15m)	(1.5m)	(15m)	Level (db)
63 HZ	65	52	65	58	65	52	68	59	65	53	88
125 HZ	60	52	66	52	60	52	62	49	66	52	83
250 HZ	59	44	60	45	59	44	59	45	56	46	77
500 HZ	59	44	63	44	59	44	62	43	56	44	76
1 KHZ	62	45	63	46	62	45	62	46	57	44	77
2 KHZ	60	42	62	43	60	42	61	43	51	42	74
4 KHZ	63	40	61	40	63	40	61	40	54	43	73
8 KHZ	64	41	64	39	64	41	64	39	56	44	73
Calc dBA	69	50	69	50	69	50	69	50	62	51	82

Sound option(s) selected: Discharge Attenuation, Super Low Sound Fan, Water Silencers

Remarks:

1. Sound Pressure Levels are according to CTI Standard ATC-128
2. Sound Power Levels are calculated according to the Small Units Section 8
3. Sound from free-field conditions over a reflecting plane with +/-2 db(A) tolerance
4. Noise levels can increase with variable frequency drives depending on the drive manufacturer and the drive configuration
5. Complete unit sound data with all fans operating

Figure D-2 – Cooling Tower Noise Data – Evapco USS 17-3K12 (Cont.)

50% Speed Complete Sound Data

Kevin Irudaya Balan
TBD

AU
kbalan@evapco.com.au

Sound Pressure Levels (SPL) in dB RE 0.0002 Microbar
Sound Power Levels (PWL) in dB RE 10-12 Watt

Model	USS 17-3K12
Motor	15.00 kW
# Motors	1
Speed	50% Speed

1 Cell Data

	Sound Pressure Level (dB)										
	End		Motor Side		Opp End		Opp Mtr. Side		Top		Sound
	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	Power
Band	(1.5m)	(15m)	(1.5m)	(15m)	(1.5m)	(15m)	(1.5m)	(15m)	(1.5m)	(15m)	Level (db)
63 HZ	60	48	59	52	60	48	63	54	59	48	83
125 HZ	56	47	60	47	56	47	57	45	60	46	78
250 HZ	57	43	58	43	57	43	58	43	53	44	75
500 HZ	59	43	62	43	59	43	62	42	55	44	75
1 KHZ	62	45	62	45	62	45	62	45	57	44	77
2 KHZ	60	42	61	42	60	42	61	42	51	42	74
4 KHZ	63	40	61	39	63	40	61	39	54	43	73
8 KHZ	64	41	64	39	64	41	64	39	56	44	73
Calc dBA	69	49	69	49	69	49	69	49	61	50	82

Sound option(s) selected: Discharge Attenuation, Super Low Sound Fan, Water Silencers

Remarks:

1. Sound Pressure Levels are according to CTI Standard ATC-128
2. Sound Power Levels are calculated according to the Small Units Section 8
3. Sound from free-field conditions over a reflecting plane with +/-2 db(A) tolerance
4. Noise levels can increase with variable frequency drives depending on the drive manufacturer and the drive configuration
5. Complete unit sound data with all fans operating

Figure D-2 – Cooling Tower Noise Data – Evapco USS 17-3K12 (Cont.)

Sound Pressure Levels (SPL) in dB RE 0.0002 Microbar
Sound Power Levels (PWL) in dB RE 10-12 Watt

MODEL USS 19-2I8
MOTOR 7.50 kW
MOTORS 1
SPEED Full Speed

1 **CELL DATA**

	SOUND PRESSURE LEVEL (dB)										
	End		Motor Side		Opp End		Opp Mtr. Side		Top		SOUND
	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	POWER
BAND	(1.5m)	(15.2m)	(1.5m)	(15.2m)	(1.5m)	(15.2m)	(1.5m)	(15.2m)	(1.5m)	(15.2m)	LEVEL (dB)
63 HZ	69	55	68	61	69	55	72	62	69	56	91
125 HZ	63	54	69	54	63	54	65	51	70	55	86
250 HZ	60	45	62	46	60	45	60	45	59	48	78
500 HZ	59	45	63	46	59	45	61	45	56	45	77
1 KHZ	59	45	62	46	59	45	59	46	57	44	77
2 KHZ	57	41	60	44	57	41	57	44	52	42	75
4 KHZ	58	37	57	39	58	37	56	39	54	43	72
8 KHZ	58	36	59	36	58	36	58	36	56	44	71
CALC dBA	65	49	67	51	65	49	65	50	62	51	82

Sound option(s) selected: Super Low Sound Fan
Water Silencers
Discharge Sound Attenuation HDG

REMARKS:
1. Sound Pressure Levels are according to CTI Standard ATC-128
2. Sound Power Levels are calculated according to the Small Units Section 8
3. Sound from free-field conditions over a reflecting plane with +/-2 db(A) tolerance
4. Noise levels can increase with variable frequency drives depending on the drive manufacturer and the drive configuration
5. Complete unit sound data with all fans operating

Figure D-3 – Cooling Tower Noise Data – Evapco USS 19-2I8

Sound Pressure Levels (SPL) in dB RE 0.0002 Microbar
Sound Power Levels (PWL) in dB RE 10-12 Watt

MODEL USS 19-2I8
MOTOR 7.50 kW
MOTORS 1
SPEED 2/3 Speed

1 **CELL DATA**

	SOUND PRESSURE LEVEL (dB)										
	End		Motor Side		Opp End		Opp Mtr. Side		Top		SOUND
	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	POWER
BAND	(1.5m)	(15.2m)	(1.5m)	(15.2m)	(1.5m)	(15.2m)	(1.5m)	(15.2m)	(1.5m)	(15.2m)	LEVEL (dB)
63 HZ	61	47	60	52	61	47	64	54	60	48	82
125 HZ	55	46	61	47	55	46	57	45	61	47	78
250 HZ	55	41	57	41	55	41	56	41	54	44	74
500 HZ	57	43	60	43	57	43	60	43	55	44	75
1 KHZ	58	42	59	44	58	42	58	44	57	44	75
2 KHZ	57	40	57	42	57	40	57	42	51	42	73
4 KHZ	57	36	56	38	57	36	56	38	54	43	71
8 KHZ	58	36	58	35	58	36	58	35	56	44	71
CALC dBA	65	47	65	49	65	47	65	49	61	50	81

Sound option(s) selected: Super Low Sound Fan
Water Silencers
Discharge Sound Attenuation HDG

REMARKS:
1. Sound Pressure Levels are according to CTI Standard ATC-128
2. Sound Power Levels are calculated according to the Small Units Section 8
3. Sound from free-field conditions over a reflecting plane with +/-2 db(A) tolerance
4. Noise levels can increase with variable frequency drives depending on the drive manufacturer and the drive configuration
5. Complete unit sound data with all fans operating

Figure D-3 – Cooling Tower Noise Data – Evapco USS 19-2I8 (Cont.)

Sound Pressure Levels (SPL) in dB RE 0.0002 Microbar
Sound Power Levels (PWL) in dB RE 10-12 Watt

MODEL USS 19-2I8
MOTOR 7.50 kW
MOTORS 1
SPEED 50% Speed

1 **CELL DATA**

	SOUND PRESSURE LEVEL (dB)										
	End		Motor Side		Opp End		Opp Mtr. Side		Top		SOUND
	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	5 ft	50 ft	POWER
BAND	(1.5m)	(15.2m)	(1.5m)	(15.2m)	(1.5m)	(15.2m)	(1.5m)	(15.2m)	(1.5m)	(15.2m)	LEVEL (dB)
63 HZ	55	43	55	46	55	43	58	48	56	44	77
125 HZ	52	42	56	43	52	42	53	42	56	42	74
250 HZ	54	41	56	40	54	41	56	40	52	43	73
500 HZ	57	43	60	43	57	43	60	43	55	43	75
1 KHZ	58	42	58	44	58	42	58	44	57	44	75
2 KHZ	57	40	57	42	57	40	57	42	51	42	73
4 KHZ	57	36	56	38	57	36	56	38	54	43	71
8 KHZ	58	36	58	35	58	36	58	35	56	44	71
CALC dBA	64	47	65	48	64	47	65	48	61	50	80

Sound option(s) selected: Super Low Sound Fan
Water Silencers
Discharge Sound Attenuation HDG

REMARKS:
1. Sound Pressure Levels are according to CTI Standard ATC-128
2. Sound Power Levels are calculated according to the Small Units Section 8
3. Sound from free-field conditions over a reflecting plane with +/-2 db(A) tolerance
4. Noise levels can increase with variable frequency drives depending on the drive manufacturer and the drive configuration
5. Complete unit sound data with all fans operating

Figure D-3 – Cooling Tower Noise Data – Evapco USS 19-2I8 (Cont.)