

INFINITE BLUE ENERGY

ARROWSMITH HYDROGEN PLANT WIND FARM

ARROWSMITH GREEN

BACKGROUND NOISE MONITORING

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BACKGROUND NOISE MONITORING
ARROWSMITH GREEN

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FOR

INFINITE BLUE ENERGY

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1. INTRODUCTION

Herring Storer Acoustics were commissioned by Infinite Blue Energy to carry out background noise monitoring for the proposed Arrowsmith Hydrogen Energy Plant – specifically, the wind farm associated with the proposed development.

The proposed development site is located 30km south of Dongara between the Brand Highway and Indian Ocean Drive.

The project produces hydrogen through an electrolysis process, with the energy for this process supplied by onsite solar and wind farms.

The proposed wind farm consists of 17 wind turbines.

Background noise monitoring was commissioned to enable the results to be used in the noise impact assessment, carried out in accordance with the following documentation;

- South Australia EPA – Wind Farm Environmental Noise Guidelines 2019.
- Australian Standard 4959-2010 Acoustics – Measurement, prediction and assessment of noise from wind turbine generators.

This report presents the results of the monitoring and analysis.

2. SUMMARY

Based on the results of background noise monitoring within the proposed wind farm development area, the applicable criteria for each location are as listed in Table 2.1

TABLE 2.1 – NOISE CRITERIA BASED ON BACKGROUND NOISE LEVELS, dB(A)

Location	WIND SPEED AT 125m ABOVE GROUND LEVEL (m/s)						
	3	4	5	6	7	8	9
1	40	35	35	35	35	41	40
2	43	44	47	45	46	46	45

3. METHODOLOGY

Background noise levels were monitored at one location within the proposed development area in accordance with the Guidelines and AS4959-2010. Locations are detailed in Table 3.1, the monitoring location map is attached in Appendix A.

TABLE 3.1 – MONITORING LOCATION DETAILS

Location	Easting	Northing
1	311513.91	6735775.02
2	307199.08	6737718.68
Wind Monitor	309022.09	6735776.54

Monitored noise levels were then paired with corresponding wind data, provided by the wind monitoring station located within the development by Infinite Blue Energy.

The monitored noise levels were paired with wind speed data at the proposed hub height – being 125m above ground level.

Rain affected data was removed from the collected data using weather information provided by the Bureau of Meteorology weather station, located at Port Denison.

Background noise levels were plotted against the corresponding wind speed measurement (see Appendix C).

Data analysis was then performed in wind speed bins, consistent with International Standard IEC 61400-11. The measured sound pressure levels were segregated into integer wind speed bins (0.5 m/s either side) and the logarithmic average of the background noise level of each wind speed bin calculated as the background noise level at that wind speed.

The relevant noise criteria for the wind farm development, which should not exceed whichever is the greater of;

- 35 dB(A), or
- The background noise ($L_{A90,10 \text{ minutes}}$) by more than 5 dB(A).

Calibration certificates for meters used are attached in Appendix E.

4. RESULTS

Background noise monitoring results are presented in Appendix C, with time history charts presented in Appendix D.

Refer to Appendix A and B for location information for the noise logger.

Based on the wind speed bin analysis, Table 4.1 summarises the background noise at each location for each integer wind speed.

TABLE 4.1 – BACKGROUND NOISE LEVELS, $L_{A90,10 \text{ minutes}}$ [dB(A)]

Location	WIND SPEED AT 125m ABOVE GROUND LEVEL (m/s)						
	3	4	5	6	7	8	9
1	35	31	32	30	32	36	35
2	38	39	42	40	41	41	40

5. CRITERIA

The noise criteria for new wind farm developments, based on the Guidelines, is for the predicted noise level to not exceed whichever is the greater of;

- 35 dB(A) or,
- the background noise ($L_{A90,10 \text{ minute}}$) by more than 5 dB(A).

Hence the applicable criteria for the proposed wind farm development based on the background noise monitoring are listed below in Table 5.1.

TABLE 5.1 – NOISE CRITERIA BASED ON BACKGROUND NOISE LEVELS, dB(A)

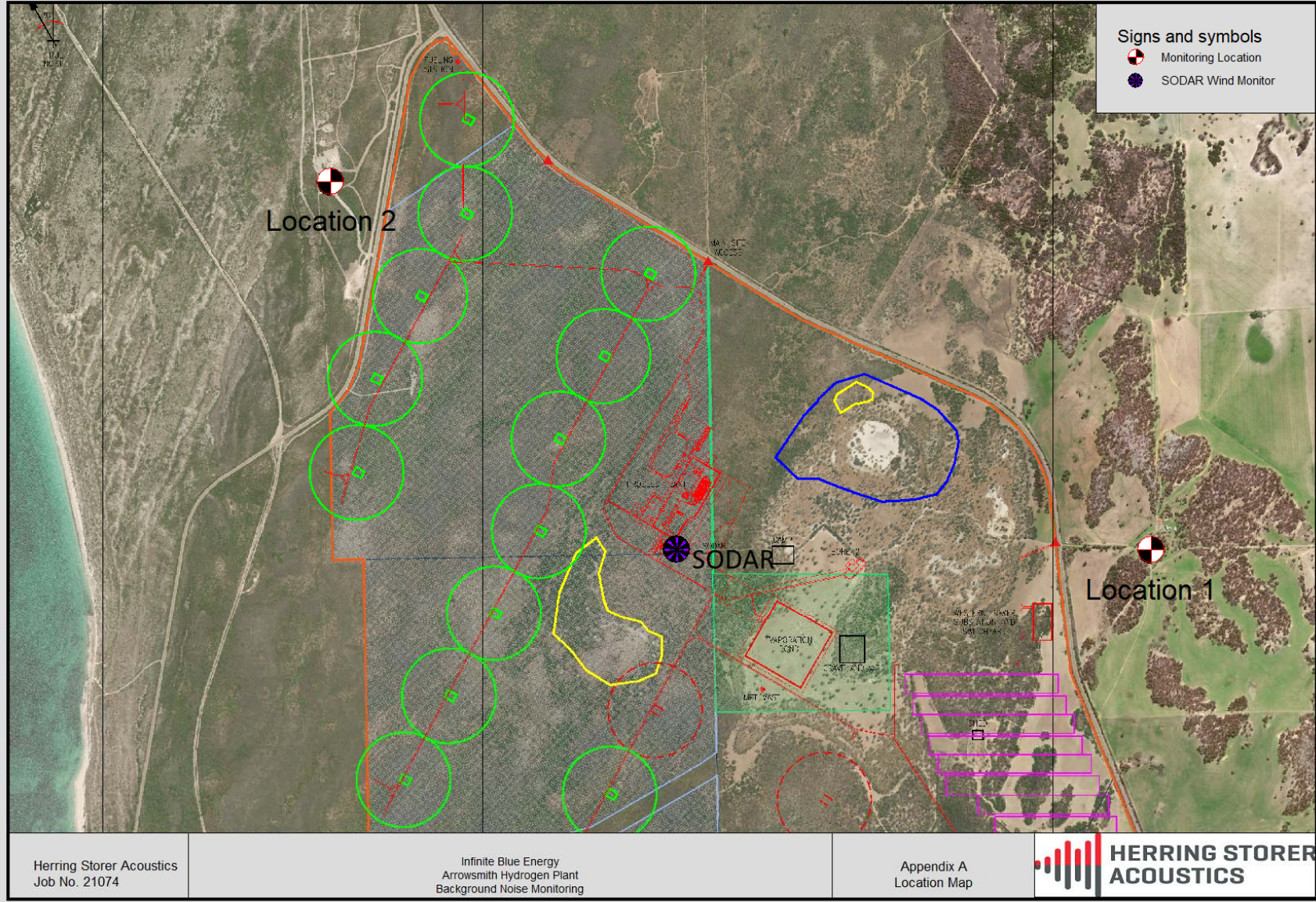
Location	WIND SPEED AT 125m ABOVE GROUND LEVEL (m/s)						
	3	4	5	6	7	8	9
1	40	35	35	35	35	41	40
2	43	44	47	45	46	46	45

It is noted that the noise criteria has been referenced to wind speeds at the proposed wind turbine generator hub height (125m), as stated in AS 4959-2010. This ensures a conservative result in the determination of the noise criterion, as the hub height wind speeds are generally higher than those at 1.5m above ground level (microphone height), which results in measured noise levels being related to those that are higher than what is being encountered at microphone height.

This can be visually observed in the charts contained in Appendix C, where at some locations there is a large number of low noise data points at all windspeeds (at 125m). This can be explained by the low wind speeds at microphone height compared to the high wind speeds at the proposed hub height.

APPENDIX A

MONITORING LOCATIONS



APPENDIX B

MONITORING LOCATION DETAILS

LOCATION 1

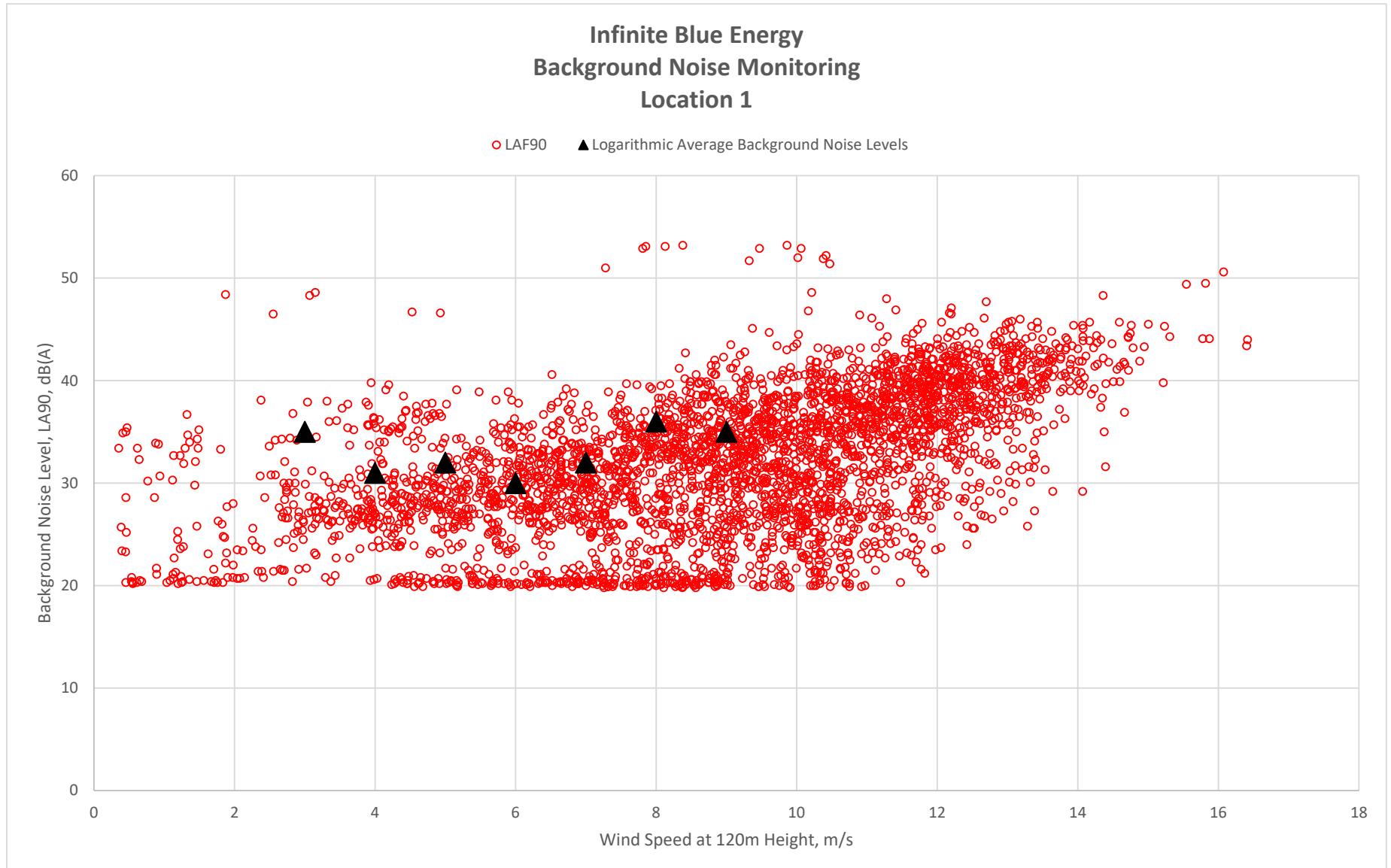


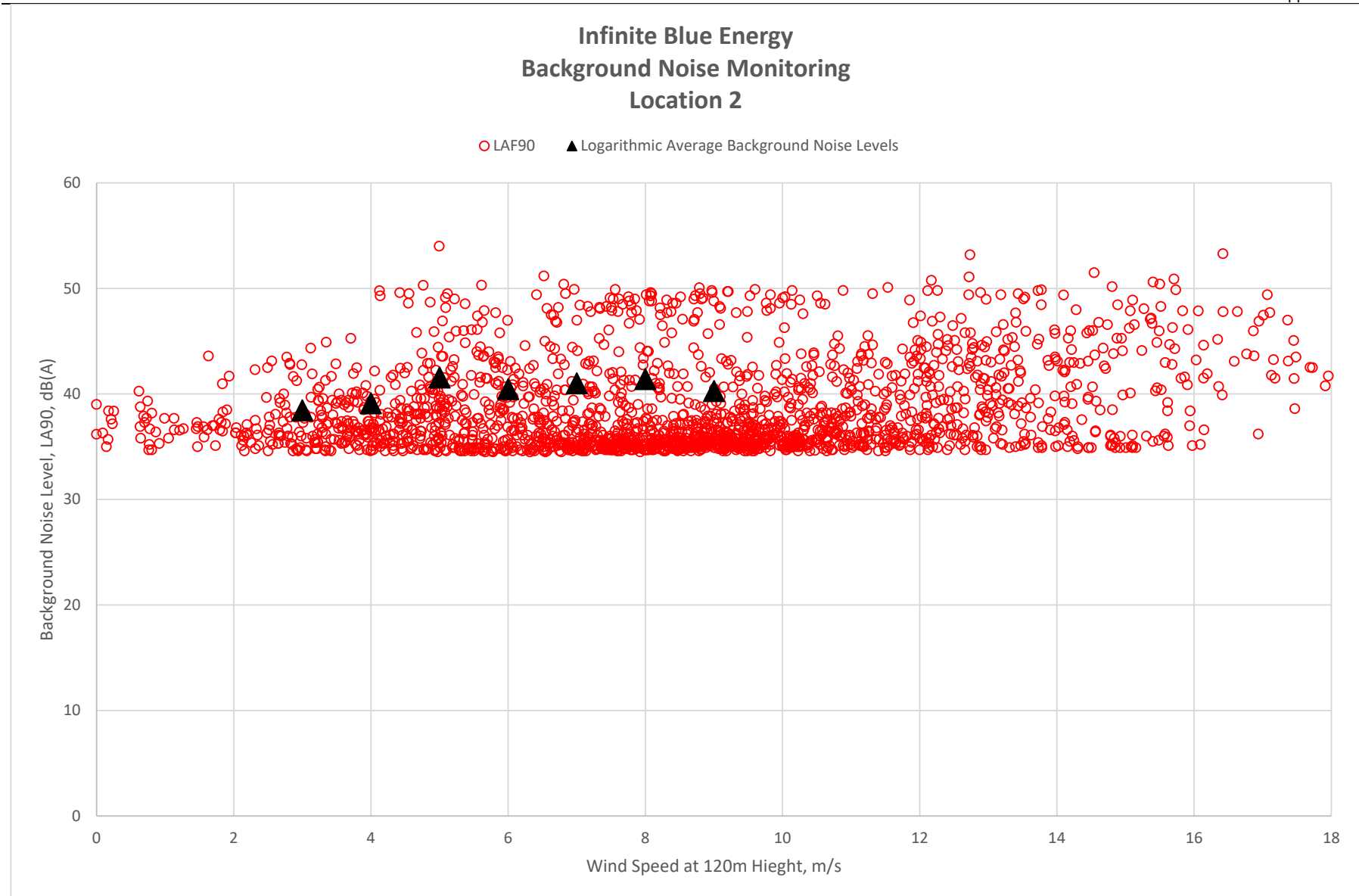
LOCATION 2



APPENDIX C

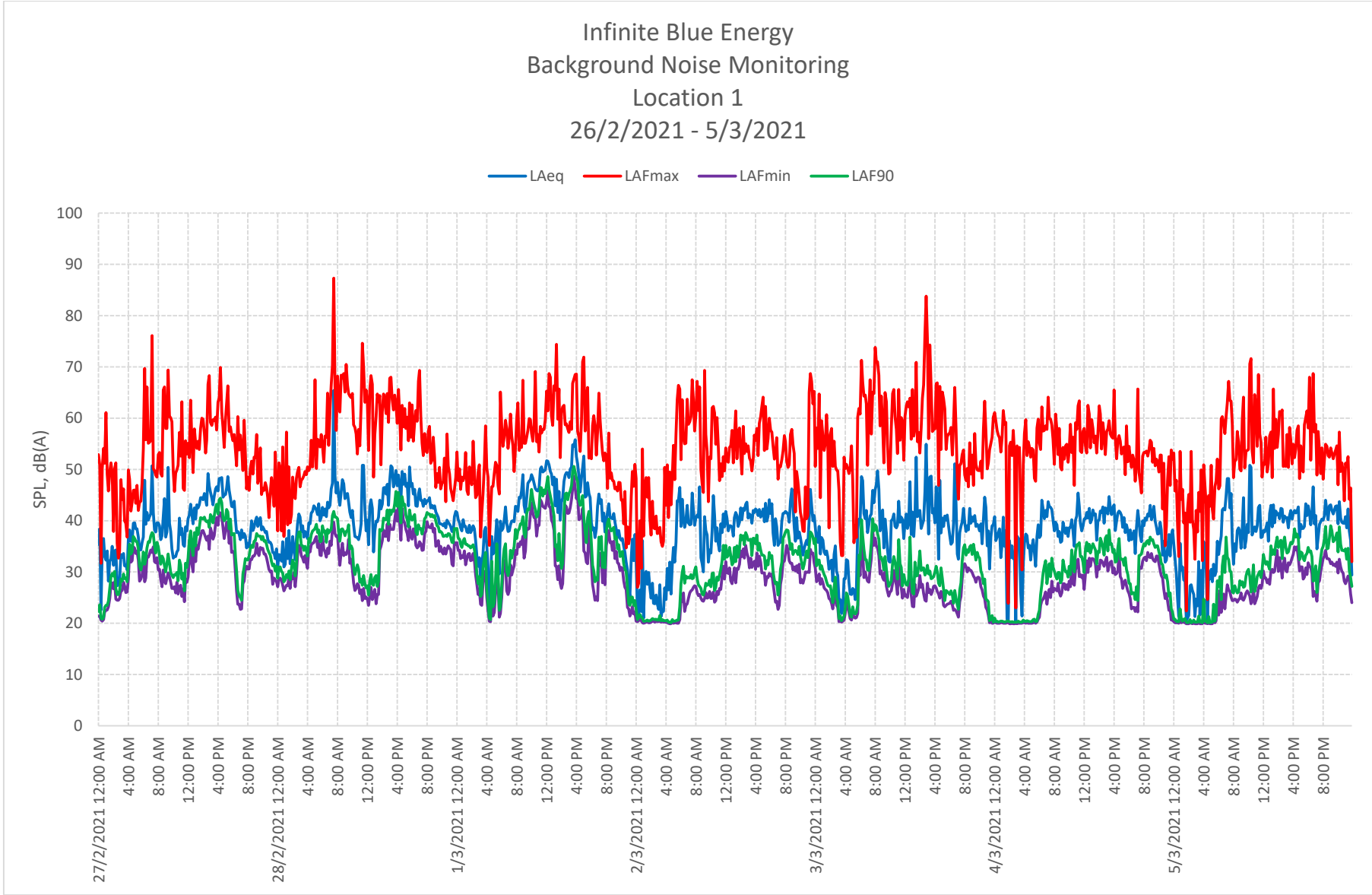
BACKGROUND NOISE LEVELS vs WIND SPEED PLOTS

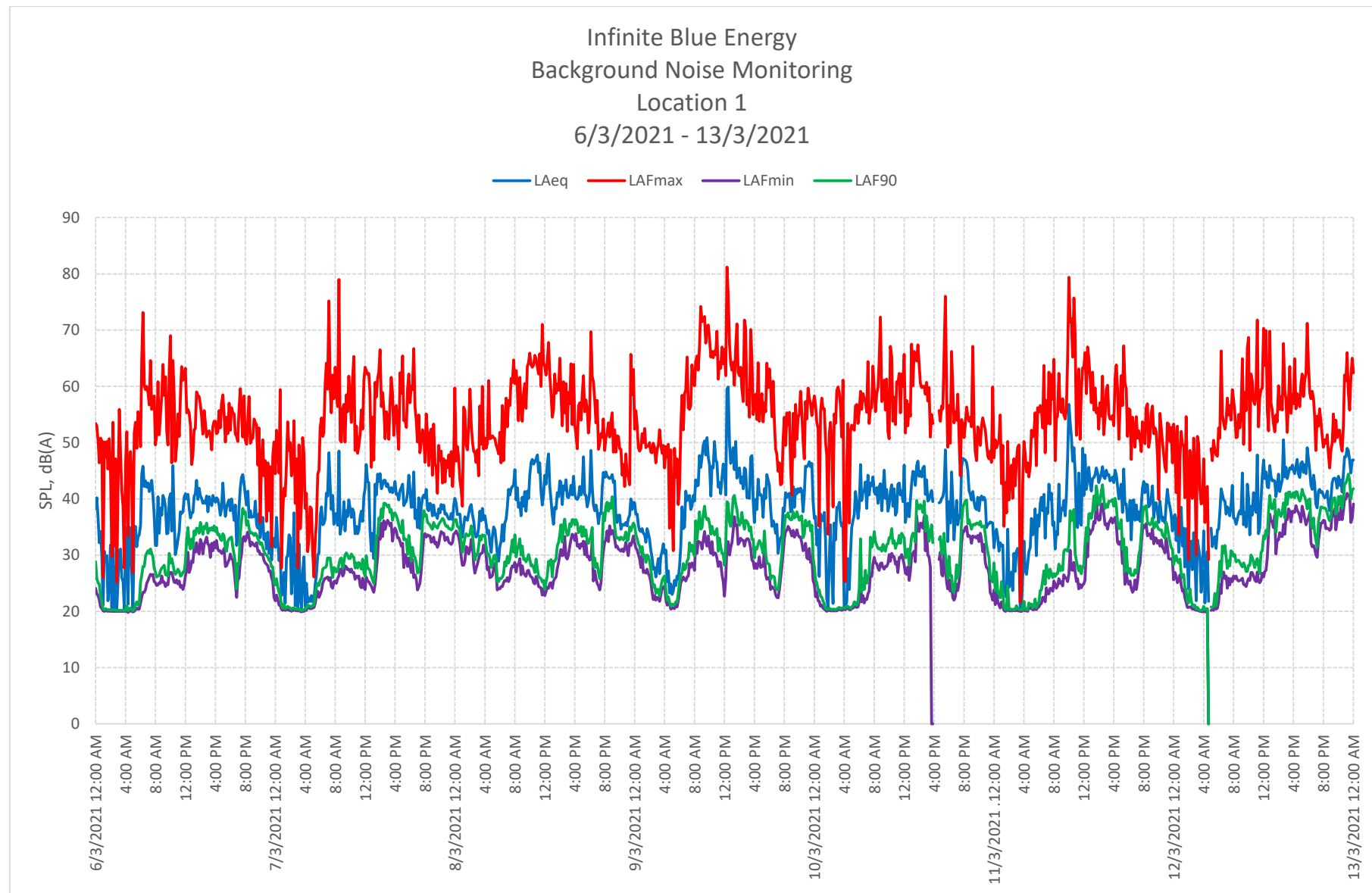


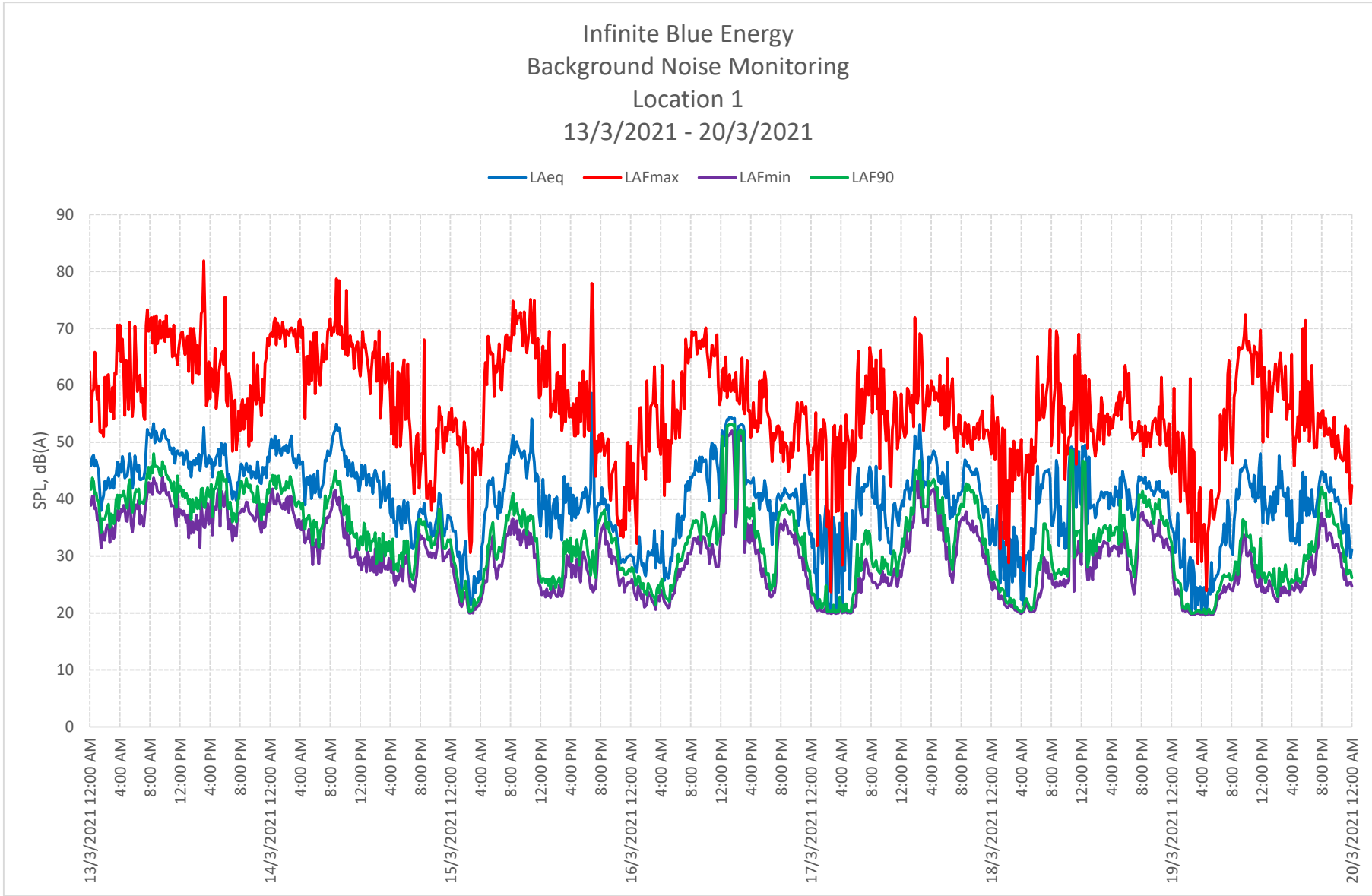


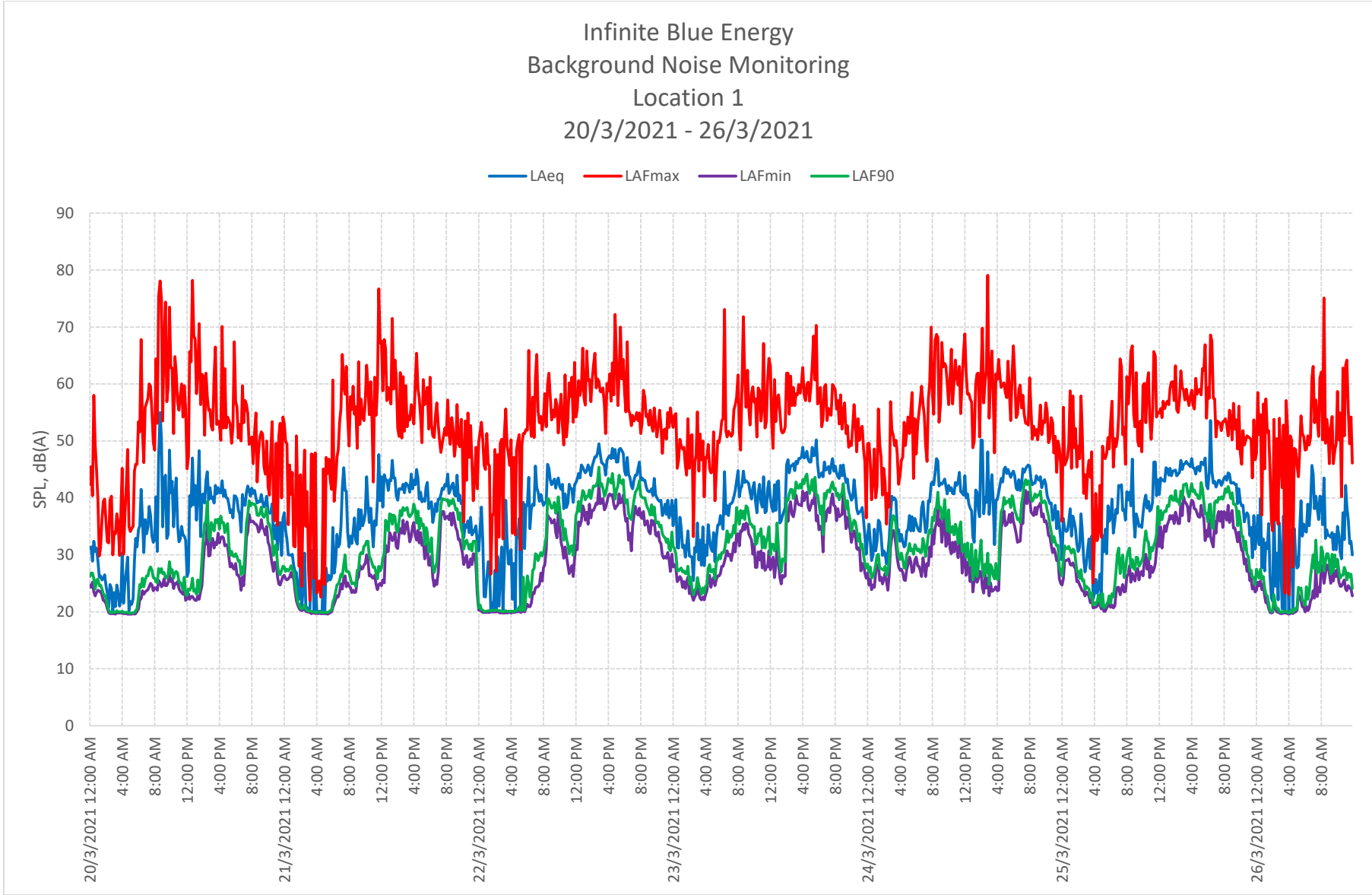
APPENDIX D

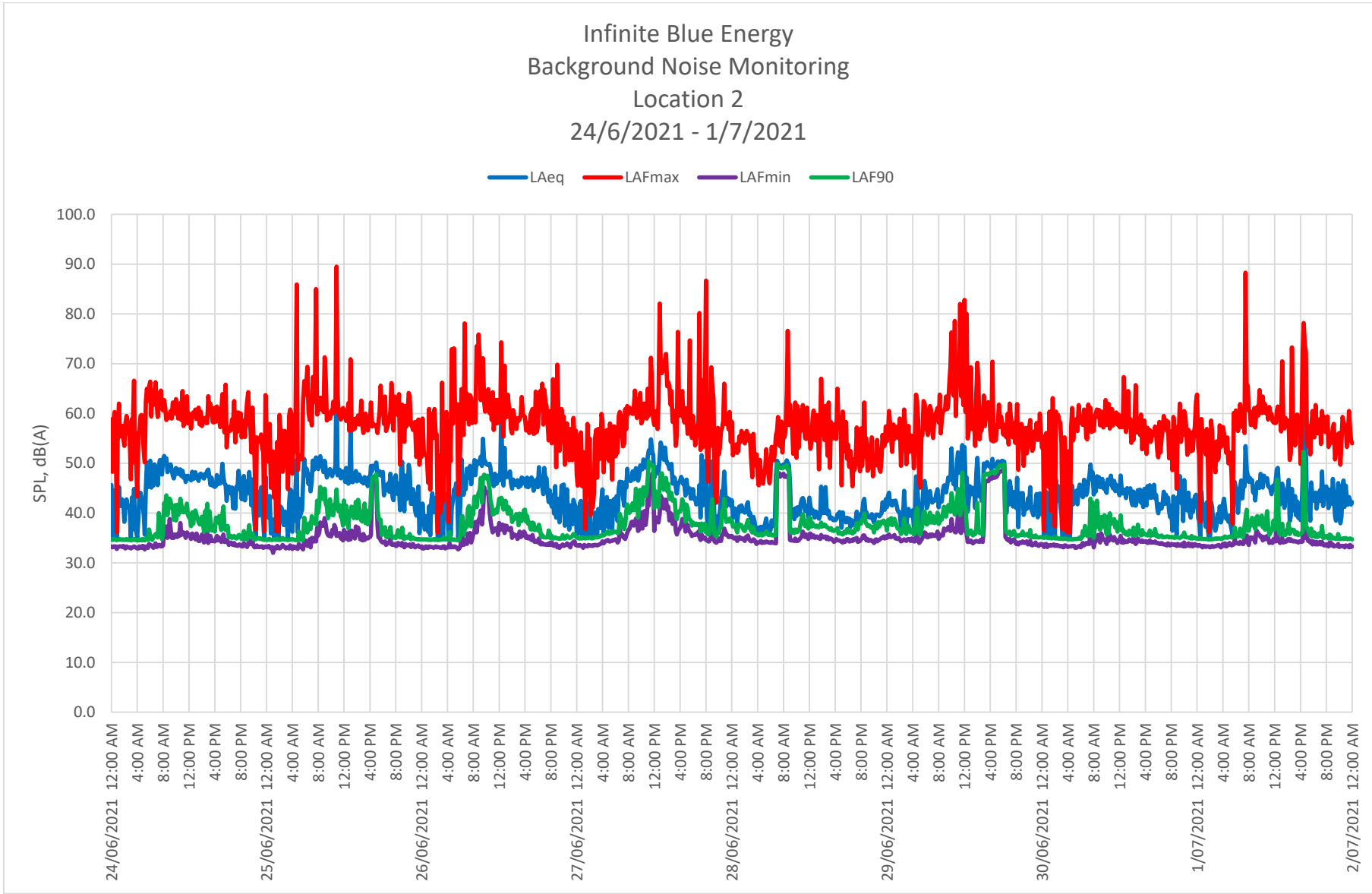
BACKGROUND NOISE LEVELS TIME HISTORY PLOTS

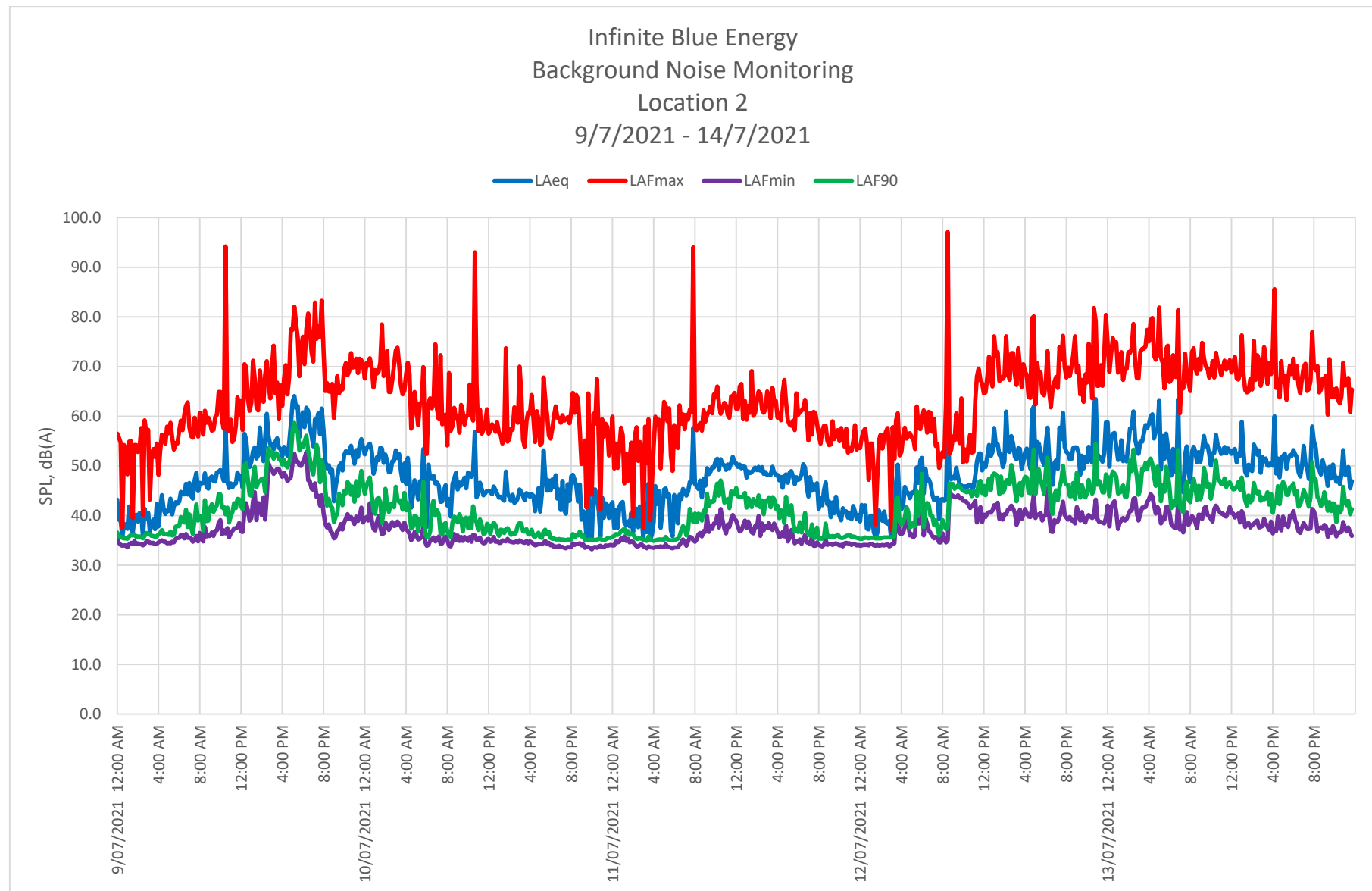












APPENDIX E

CALIBRATION CERTIFICATES



Certificate of Calibration – Sound Level Meter

Report Reference: SLM/20/09/006

Date of calibration: 10/09/2020

Client: Herring Storer Acoustics

Address: PO Box 219, Como WA 6952

Sound Level Meter: ARL NGARA

Meter Serial No: 87816C

Meter Class: 1

Hardware Version: 2.3

Software Version: 12.2.21

Channel/s tested: N/A

Microphone: RION UC-53A

Microphone Serial No: 321927

Preamplifier: RION NH-17

Preamplifier Serial No: 28295

Filters: N/A

Procedures from IEC 61672-3:2006 were used to perform periodic tests.

Clause 9	Indication at the calibration check frequency	Complied
Clause 10	Self-generated noise	Checked
Clause 11	Acoustical tests of frequency weighting	Complied
Clause 12	Electrical tests of frequency weightings	Complied
Clause 13	Frequency and time weighting at 1kHz	Complied
Clause 14	Level linearity on the reference level range	Complied
Clause 15	Level linearity including level range control	N/A
Clause 16	Toneburst response	Complied
Clause 17	Peak C sound level	N/A
Clause 18	Overload indication	Complied

Where the instrument includes an Octave Band or 1/3 Octave Band Filter Set, performance characteristics were checked against the requirements of the following clauses of AS/NZS4476:1997:

Clause 4.4, 5.3 Relative Attenuation N/A

Primary test equipment:

Bruel & Kjaer type 4226 multifunction calibrator S/N 1899898

Agilent Technologies HP33120A Waveform generator S/N US36006913

Agilent Technologies HP8903E Distortion Analyser S/N 2818A00472

Environmental conditions – start of test: 23.7 deg C, 101.3 kPa, 44.6 %RH

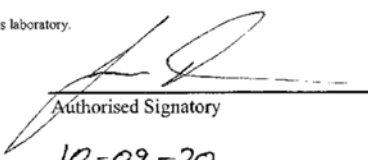
Environmental conditions – end of test: 23.6 deg C, 101.3 kPa, 43.1 %RH

The sound level meter submitted for testing has successfully completed the Class 1 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.

The calibration procedures followed are in accordance with the terms of the NATA accreditation of this laboratory.



Accredited for compliance with ISO/IEC 17025 - Calibration.
Measurement results are traceable to SI and IEC 61672.3. Reference
equipment has been calibrated by the National Measurement
Institute or NATA accredited laboratories.
Accreditation No. 12604


Authorised Signatory

10-09-20
Date of Issue

Noise & Vibration Measurement Systems Pty Ltd
433 Vincent Street West, West Leederville, WA 6007, Australia
PO Box 514, Wembley, WA 6913

Phone: (08) 9380 6933
Fax: (08) 9388 2631

e-mail: sales@nvms.com.au

CERTIFICATE OF CALIBRATION

CERTIFICATE No.: SLM 25348 & FILT 5434

Equipment Description: Sound Level Meter

Manufacturer: Svantek

Model No: Svan-958 **Serial No:** 81114

Microphone Type: 7052E **Serial No:** 75768

Preamplifier Type: SV12L **Serial No:** 86565

Filter Type: 1/3 Octave **Serial No:** 81114

Comments: All tests passed for class 1.
(See over for details)

Owner: Herring Storer Acoustics
Suite 34, 11 Preston Street
Como, WA 6152

Ambient Pressure: 988 hPa ± 1.5 hPa

Temperature: 24 °C $\pm 2^\circ$ C **Relative Humidity:** 29% $\pm 5\%$

Date of Calibration: 24/09/2019 **Issue Date:** 25/09/2019

Acu-Vib Test Procedure: AVP10 (SLM) & AVP06 (Filters)

CHECKED BY: *JKR*

AUTHORISED SIGNATURE:

Jack Klett

Accredited for compliance with ISO/IEC 17025 - Calibration
The results of the tests, calibration and/or measurements included in this document are traceable to
Australian/national standards.



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Accredited Lab. No. 9262
Acoustic and Vibration
Measurements

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AVCERT10 Rev. 1.3 15.05.18

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: 25606

EQUIPMENT TESTED: Ground Vibration Monitor

Manufacturer: Svantek
Type No: Svan-958 **Serial No:** 81114
Transducers: SV-84 **Serial No:** J9813
Tri-axial Geophone.

Owner: Herring Storer Acoustics
Suite 34, 11 Preston Street
Como, WA 6152

Tests Performed: Frequency Response
Correct level display
Display Linearity
Detailed overleaf.

CONDITION OF TEST:

Relative Humidity: 36% $\pm 5\%$

Temperature: 24 °C $\pm 2^\circ$ C

Date of Calibration: 24/09/2019

Date Issued: 25/09/2019

Acu-Vib Test Procedures: AVP15 (Ground Vibration) AS2187.2 DIN 45669-1

CHECKED BY: *JKB* **AUTHORISED SIGNATURE:** *Jack Kiele*

Accredited for compliance with ISO/IEC 17025 - Calibration

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

The uncertainties quoted are calculated in accordance with the methods of the ISO Guide to the Uncertainty of Measurement and quoted at a coverage factor of 2 with a confidence interval of approximately 95%.



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