Title:	Miriam Vale Solar Farm Noise Assessment
Project:	Miriam Vale Solar Farm
Client:	Attexo

Wood Doc No	AU02169-FN2	**Wood Job No.**	AU02169

Revision	Description	Prepared	Reviewed	Date
2	Detailed Assessment	D.Steinfeld	D.Steinfeld	31-05-2024

1 INTRODUCTION

1.1 Background

Attexo has been engaged by Private Energy Partners (PEP) to prepare a development application for the Miriam Vale Solar Farm in the Gladstone Regional Council Local Government Area (LGA).

PEP is proposing to develop a 1GW photovoltaic solar farm. Noise emissions associated with plant for the proposed solar farm has potential to cause adverse noise impacts at nearby noise sensitive receivers (NSRs). This report summarises potential noise impacts associated with the proposed plant's operations.

1.2 Objectives

The objectives of this assessment are to:

- Predict noise levels of operations associated with the Solar Farm,
- Assess predicted noise levels at the selected noise sensitive receivers against the relevant criteria,
- Where relevant, give general recommendations to assist with noise management.

1.3 Site Description

The proposed development evaluated here is a Solar Farm which noise generating equipment consists of 144x solar inverter and 2x transformers as outlined in Figure 1-1.

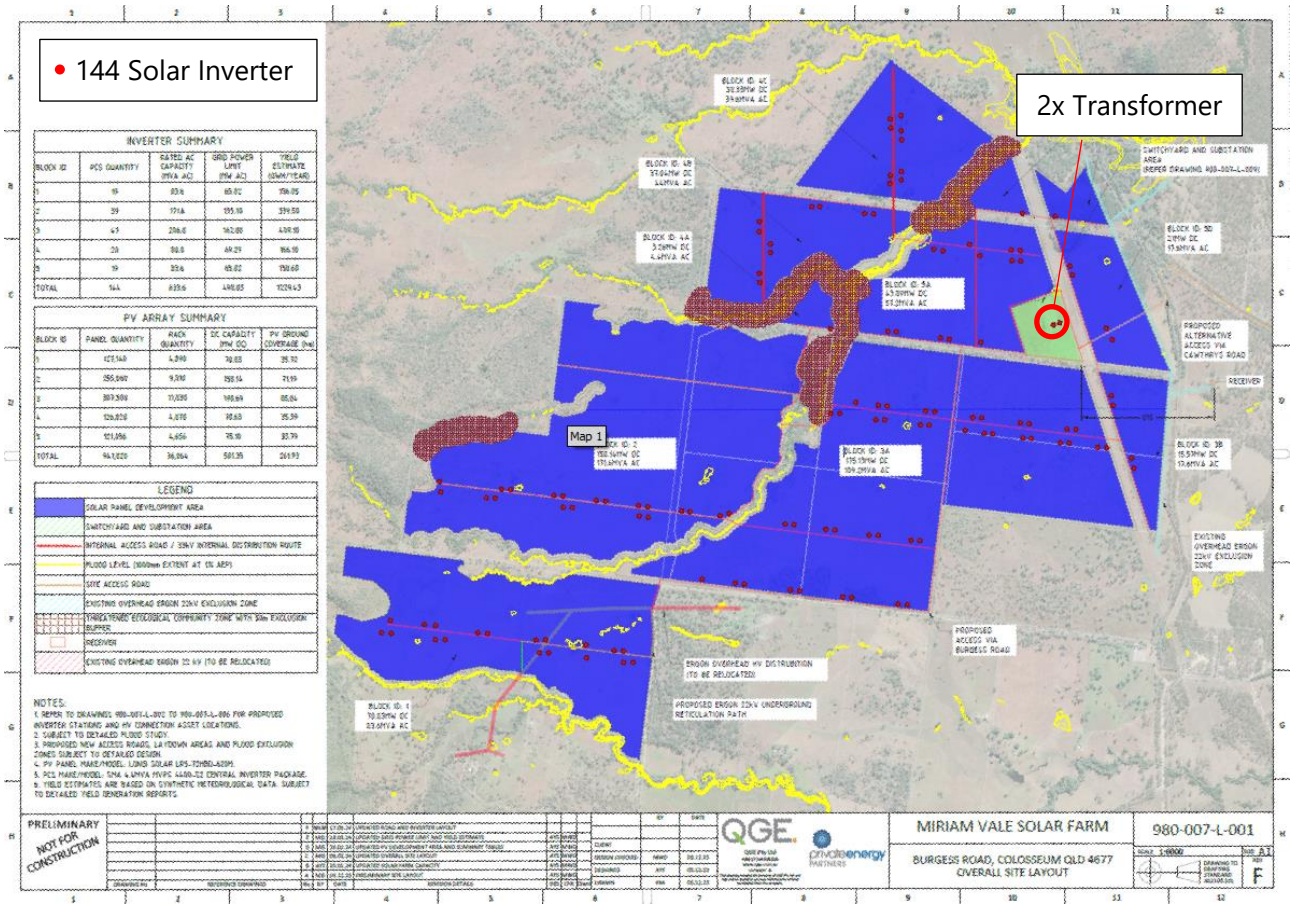


Figure 1-1 Equipment Layout

1.4 Noise Sensitive Receivers (NSRs)

Predicted noise levels have been assessed at 28 noise sensitive receivers surrounding the proposed site. The 28 receivers are dwellings located in a sparse rural area. Locations of the assessed noise sensitive receivers are presented in Figure 1-2.

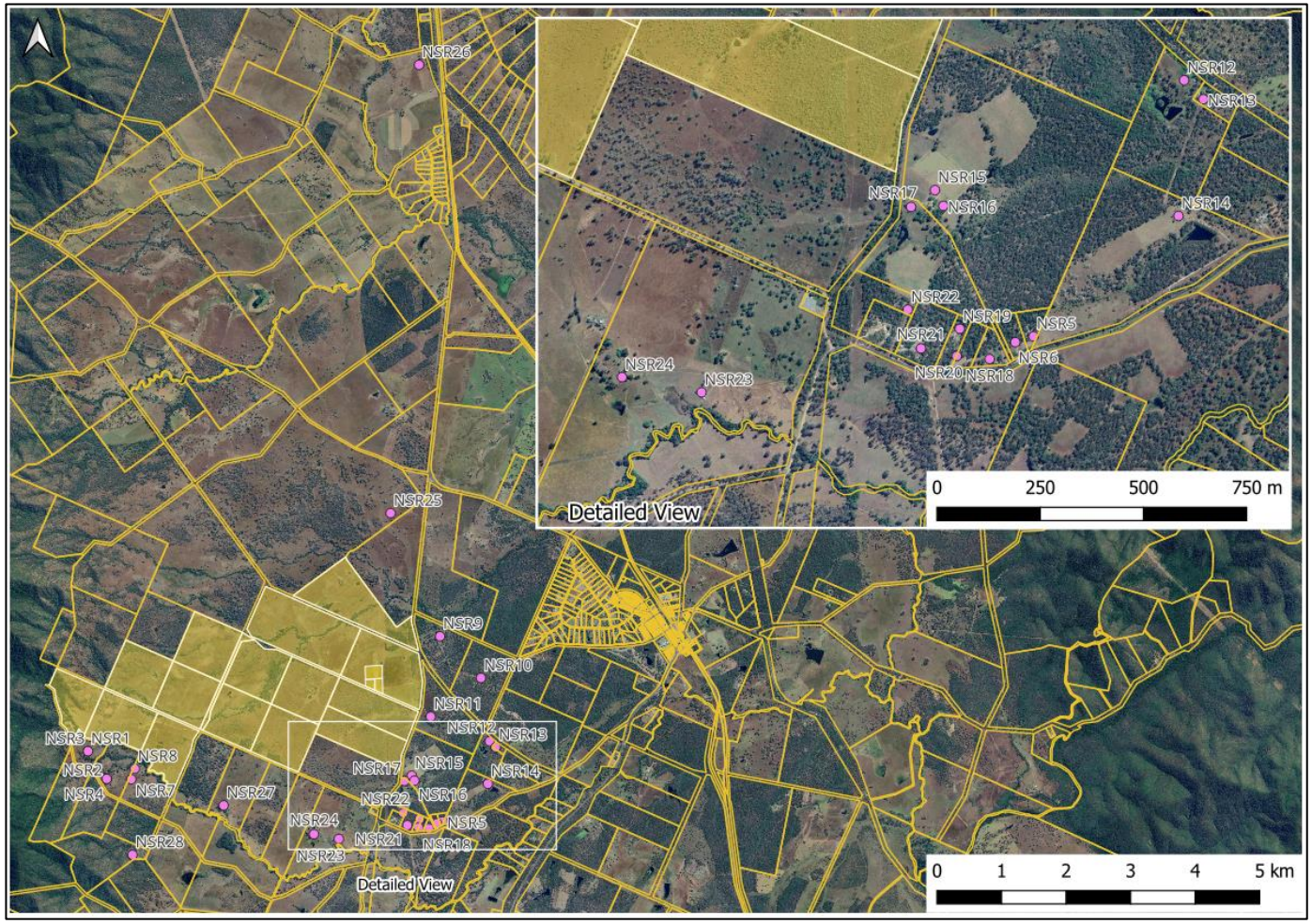


Figure 1-2 Site Location and Noise Sensitive Receptors (NSR)

2 NOISE CRITERIA

2.1 Acoustic Objectives

The noise criteria set by the project are governed by Queensland's Environmental Protection (Noise) Policy (2019).

As the proposed facility is close to residential houses, acoustic objectives have been considered using the resident sensitive receptor acoustic quality objective value. In addition, an outdoor to indoor attenuation value of 7 dB[1] was added to derive outdoor criteria. This results in an acoustic quality objective as outlined in Table 2-1.

Table 2-1 Environmental Noise Criteria

Sensitive Receptor	Period	Objective ($L_{Aeq,adj,1h}$)		Environmental Value
		Indoor	Outdoor adj	
Dwelling (for outdoors)	Day / Evening	-	50	Health and wellbeing
Dwelling (for indoors)	Day / Evening	35	50	Health and wellbeing
	Night	30	37 (30+7)[1]	Health and wellbeing, in relation to the ability to sleep

The Policy allows for corrections depending on the quality of the noise i.e. tonality. Third octave band data to evaluate noise quality has been provided and will be evaluated in this assessment.

The facility is anticipated to operate in a cycle of activity and inactivity depending on sun exposure. Sunrise and sunset near Miriam Vale is considered from 0500 to 1830 which includes portion of evening and night time operation. The development is therefore assessed against all time categories.

[1] *Department of Environment and Science 2022, Noise and vibration—EIS information guideline, ESR/2020/5305, Queensland Government, Brisbane*

2.2 Background Creep

The *Environmental Protection (Noise) Policy (2019)* proceeds further to address background creep in Section 9(4); however, the 2019 version of the policy does not set out guidance on controlling background creep. Therefore, *Explanatory Notes for SL 2008 No. 442 to the Environmental Protection (Noise) Policy (2008)* was used as guidance. Background creep occurs "when noise levels creep higher and higher over time with the establishment of new development in or near an area." Section 10 of *Environmental Protection (Noise) Policy (2008)* (also aligning to the *Noise and vibration—EIS information guideline*) states that noise from the activity must not be:

(a) for noise that is continuous noise measured by $L_{A90,\ T}$—more than nil dB(A) greater than the existing acoustic environment measured by $L_{A90,\ T}$; or
(b) for noise that varies over time measured by $L_{Aeq,\ adj,T}$—more than 5dB(A) greater than the existing acoustic environment measured by $L_{A90,T}$.

Noise monitoring was carried out between 26th of April and 3rd of May 2024 to establish Background (L_{A90}) at two locations surrounding with the outcome determining the Relevant Criteria for nearby residence. Key outcome of the monitoring is outlined in Section 4 with additional details provided in APPENDIX C.

2.3 Project Noise Limits

The applicable project noise limit considers acoustic quality objectives and limiting background creep. For this purpose the limit needs to consider the character of the noise (tonal, impulse) as well as cumulative effect of other sources.

No significant additional industrial noise sources have been identified nearby the sensitive receivers. As such, assessment of cumulative noise impacts have not been included in this assessment.

A summary of the applicable criteria is outlined in the Table below. The more stringent of the two criteria will be considered for the purpose of the assessment as highlighted below.

Table 2-2 Project Noise Limit

Period	Acoustic Quality Objective	Background Criteria		
	$L_{Aeq,adj,1h}$	$L_{Aeq,adj,1h}$	Lcn1	Lcn2
Day	50	Background noise level + 0dB	45.1	37.7
Evening	50	Background noise level + 0dB	47.3	44.6
Night	37	Background noise level + 0dB	41.5	40.6

3 METHODOLOGY

3.1 Overview

The methodology of the assessment is outlined in summary below.

- The site area and physical layouts were determined through drawings provided by the client.
- Data related to elevation contour were sourced from ELVIS[2] or provided by the client in a dxf / shapefile format.
- Background noise monitoring was carried out between 26th of April and 3rd of May 2024 with monitoring carried out at Lot 143 Burgess Road, Colosseum and Lot 132 Cawthray Road, Miriam Vale.
- Sound power levels of the solar inverter were provided by the client via vendor provided manufacturing data in overall dBA or 1/3 octave band spectrum.
- The equipment is expected to operate in daylight which can occur in day, evening and night time periods.
- Noise propagation was carried out in SoundPLAN to determine the sound pressure at the nominated receivers and compared to the criteria.
- The predicted noise level was adjusted where applicable for noise characteristics as described by Queensland Noise Measurement Manual including Tonal, Impulse and Low Frequency noise.
    - Tonal adjustments are carried out by applying 5dB to the 1/3 octave (dBA) that exceeds adjacent bands by 5dB. The sum difference between adjusted band with unadjusted is the applicable tonal factor
    - Impulse adjustment is a correction for noise sources with high peak (i.e. bangs, clicks & clatters). The equipment is expected to ramp up or down in steady fashion and not generate impulse noise
    - Low frequency noise is defined as noise with dominant content below 200Hz and is not applicable for the receiver sound pressure considered.
- If the predicted sound pressure levels exceed the criteria, noise controls will be recommended to bring the development into compliance.

[2] Elvis – Elevation and Depth – Foundational Spatial Data, Elvis (fsdf.org.au), is a cloud-based system allowing users to easily discover and obtain Australia elevation and bathymetry data in collaboration between state and federal government, accessed April 2024

3.2 Modelling

The major modelling parameters are summarised in Table 3-1 below. The weather conditions considered here represent worst case and may not occur at all times. It is therefore expected that the levels can be lower than the values predicted here.

Table 3-1 Noise Modelling Parameters

Parameter	Value	Description
Software	SoundPLAN	Soundplan is a modelling software that considers various factors to determine sound pressure (L_p) at a distance considering sound power (L_w), directivity (D_i), spherical model (K_0), spreading (D_s) and different contributing factors (D), $L_p=[L_w+D_i+K_0]-[D_s+D]$
Standard	ISO	Noise propagation calculations were undertaken in alignment with ISO 9613-2 (1996) "Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation". The calculation considers the geometrical divergence, atmospheric attenuation, and ground attenuation. Meteorological conditions of that favour noise propagation
Wind conditions	1-3m/s	The ISO standard considers the worst case conditions to be 1-3 m/s from source to receiver under slight temperature inversion conditions.
Ground Factor	0.3 within site and 0.6 everywhere else being 'moderately absorptive ground'	The ground factor G is a material property of the ground which varies depending type of soil considered. The value ranges between 0 and 1 with small values being hard reflective surfaces (concrete, water) and large considering more absorptive surfaces (cultivated land with loose ground)
Order of reflection	3	Order of reflection is the number of reflections that the noise model considers when calculating noise propagation
Foliage	Not included	Foliage can affect noise propagation but depends on nature & density of the growth. Conservative assessments typically do not include these factors as their performance can vary throughout the year and be affected by environmental influence (Bushfire & Backburning)
Relative Humidity	50%	Humidity considered here reflects typical conditions for noise propagation
Topography	Included	Topography at a resolution of 5m was sourced from the publicly available QLD spatial database (ELVIS). Topography at a resolution of 1m was provided by Attexo but not used in this assessment. The data was found to be in an unknown co-ordinate system and was not able to be projected. The use of lower resolution topography is not expected to impact results of this assessment.

3.3 Equipment specifications

Table 3-2 outlines the equipment included in this assessment, detailed spectral data where applicable has been presented in Appendix A[3].

Comprehensive 1/3 octave data is available the dominant solar inverter, the equipment types are typically tonal and tonal penalties will be applied as required to the predicted sound pressure level.

Table 3-2 Quantity of Operational Equipment for Assessment

Equipment	Make / Model	No. of units	Sound Power Level, dBA	
			Single	Cumulative
Solar Inverter	SMA Solar Inverter / MVPS 4400-S2	144	91.8	113.4
350 MVA Transformer	MVA	2	96.7	99.7

The noise model does not include noise emissions from any source other than the proposed equipment for this project. Therefore, noise emissions from other neighbouring industrial sources, road traffic, aircraft noise, animals, domestic sources, etc are excluded from the modelling.

[3] Raw noise levels for the operational equipment assessed have been taken from the Attexo provided datasheet- "Information required to undertake the Noise Study for the Miriam Vale Solar Farm Project.

4 NOISE MONITORING

4.1 Noise Monitoring Summary

The following outlines the measured background level for two (2) locations around the proposed development.

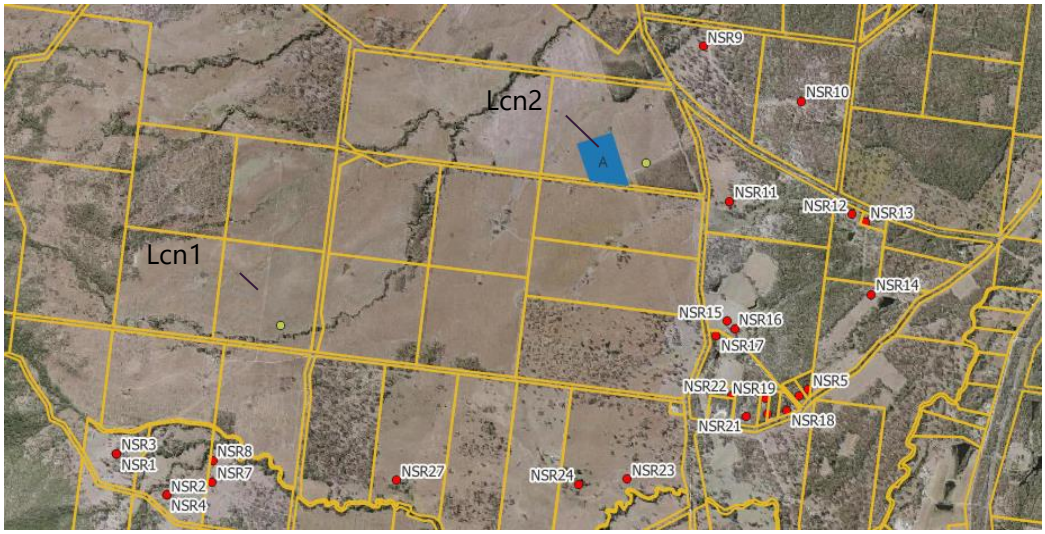


Figure 4-1 – Noise Monitoring Location

Table 4-1 provides a summary of the noise monitoring outcome carried out between 26th April and 3rd of May. Appendix C contains detailed results for the background noise monitoring as required in the *EIS information guideline*[4]:

Table 4-1 Measured Background Noise Levels (L_{A90}) dBA

Location		Observation	Background Noise		
			Day	Evening	Night
Lcn1	Lot 143 Burgess Road, Colosseum	No cattle or livestock in vicinity. No extraneous noise of power lines or traffic.	45.1	47.3	41.5
Lcn2	Lot 132 Cawthrays Road, Miram Vale	There were cattle in the vicinity which were later moved by landowner. No extraneous noise of power lines or traffic was noted.	37.7	44.6	40.6

[4] *Department of Environment and Science 2022, Noise and vibration—EIS information guideline, ESR/2020/5305, Queensland Government, Brisbane*

5 NOISE MODELLING RESULTS

The predicted noise levels at NSR locations are presented in Table 5-1 below. The levels show predicted noise levels and tonal adjustments where applicable. There are no noise levels predicted to be above quality objectives or background creep criteria.

The highest noise levels are expected to occur at NSR 8 located approx. 438m south of the nearest noise source.

Table 5-1 Predicted Noise Levels and criteria at NSRs

Sensitive Receiver	Applicable Criteria dBA			Predicted Noise levels dBA			Compliant with Criteria
	Day	Evening	Night	SPL	$Tone_{adj}$	$SPL_{Tone,adj}$	
NSR1	45.1	47.3	37	28.2	1.4	29.8	Yes
NSR2	45.1	47.3	37	26	-	26.0	Yes
NSR3	45.1	47.3	37	28.2	1.4	29.8	Yes
NSR4	37.7	44.6	37	26	-	26.0	Yes
NSR5	37.7	44.6	37	19.2	-	19.2	Yes
NSR6	37.7	44.6	37	19.2	-	19.2	Yes
NSR7	45.1	47.3	37	28	-	28.0	Yes
NSR8	45.1	47.3	37	30.8	1.5	32.3	Yes
NSR9	37.7	44.6	37	25.4	-	25.4	Yes
NSR10	37.7	44.6	37	21.3	-	21.3	Yes
NSR11	37.7	44.6	37	27.9	-	27.9	Yes
NSR12	37.7	44.6	37	19.9	-	19.9	Yes
NSR13	37.7	44.6	37	19.2	-	19.2	Yes
NSR14	37.7	44.6	37	18	-	18.0	Yes
NSR15	37.7	44.6	37	24.5	-	24.5	Yes
NSR16	37.7	44.6	37	23.5	-	23.5	Yes
NSR17	37.7	44.6	37	24.2	-	24.2	Yes
NSR18	37.7	44.6	37	18.6	-	18.6	Yes
NSR19	37.7	44.6	37	20.3	-	20.3	Yes
NSR20	37.7	44.6	37	19.3	-	19.3	Yes
NSR21	37.7	44.6	37	20.7	-	20.7	Yes
NSR22	37.7	44.6	37	21.2	-	21.2	Yes

Sensitive Receiver	Applicable Criteria dBA			Predicted Noise levels dBA			Compliant with Criteria
	Day	Evening	Night	SPL	$Tone_{adj}$	$SPL_{Tone,adj}$	
NSR23	45.1	47.3	37	20.3	-	20.3	Yes
NSR24	45.1	47.3	37	21.2	-	21.2	Yes
NSR25	37.7	44.6	37	21.5	-	21.5	Yes
NSR26	37.7	44.6	37	0.4	-	0.4	Yes
NSR27	45.1	47.3	37	25.5	-	25.5	Yes
NSR28	45.1	47.3	37	20.1	-	20.1	Yes

A map of noise level contribution of the proposed development are provided in the APPENDIX D. The noise levels portrayed do not include any other sources nor ambient sound level.

Unadjusted 1/3 octave band noise levels of all receivers are detailed in APPENDIX B. Low frequency noise is considered where the dominant content is located in below 200Hz which is not applicable for the considered receivers.

5.1 Discussion

The results outlined in Table 5-1 indicate that the development contribution is not expected to exceed the nominated criteria under the evaluated operations. The highest tonal adjusted noise level predicted is at NSR 8 is 32.3 dBA, below the strictest criteria 37dBA (night time). Impulse or Low frequency adjustments are not required.

It is recommended to carry out factory acceptance testing and or site verification to ensure the equipment meets the specifications set out in this document.

Noise monitoring should be carried out following operation of the development to ensure that the noise levels received at nearby receivers is below the criteria.

Based on the analysis carried in this assessment further noise controls are not required.

Should additional equipment be installed or the nominated manufacturer / laboratory sound power be inconsistent an update of this assessment should be carried out.

6 CONCLUSION

A noise study has been carried out for a proposed Solar Farm near Miriam Vale. The assessment was evaluated against QLD Environmental Protection (Noise) Policy (EPP2019) found that:

- The noise level of the proposed development were predicted at the nominated nearest receivers. The developments proposed equipment are 144x Solar Inverters, and 2x Transformer
- The criteria for the assessment were derived from the EPP quality objectives and through long term noise monitoring of the existing prevalent sound field (Background Creep criteria)
- Under the current configuration and including tonal penalty, the proposed development is compliant with QLD noise criteria being acoustic quality objective and background creep at nearby noise sensitive receivers.
- Recommendations for Noise Management
    - It is recommended to carry out Factory Acceptance Testing and Field verification to ensure the installed equipment utilized is consistent with the here nominated sound power levels
    - Once operational, noise monitoring should be carried out to ensure the noise levels recorded at nearby receivers is consistent with the outcome of this assessment
- No further noise control or conditions are imposed to operate the development at any time of the day

APPENDIX A EQUIPMENT SOUND POWER

The singular unit octave band noise levels for the equipment considered have been included in the table below.

Table A -1 Nominated Equipment Sound Power

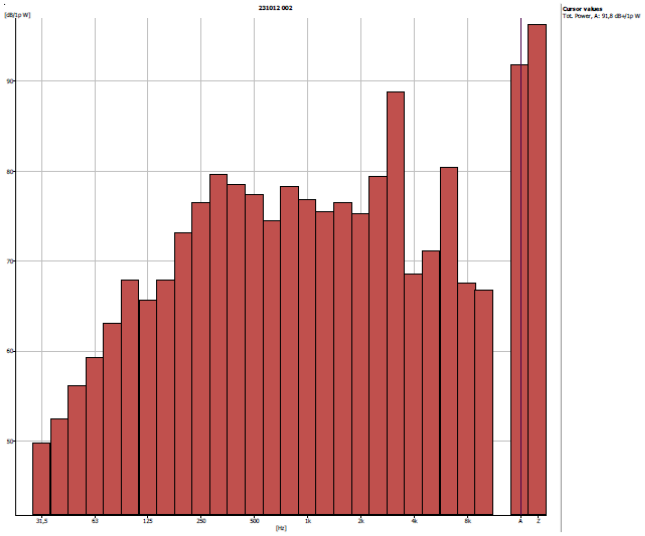
Description	Overall dBA	Linear Octave Band (Hz)												
		25	31.5	40	50	63	80	100	125	160	200	250	315	400
Solar Inverter	91.8	86.4	89.2	87.1	86.4	85.5	85.6	87.0	81.7	81.2	84.0	85.1	86.2	83.4
350 MVA Transformer	96.7		96			96			63			90		

Table A -2 Nominated Equipment Sound Power continued

Description	Linear Octave Band (Hz)													
	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
Solar Inverter	80.6	76.4	79.1	76.8	74.9	75.5	74.1	78.2	87.6	67.6	70.6	80.5	68.7	69.3
350 MVA Transformer	96			91			88			86			76	

4.2.2 Measurement No. 2 at 4600 kVA without Silencer Kit (Reference)

Sound Power Levels of the Third Octave Band Frequencies according to EN ISO 9614-2



Overview of the Sound Power [dB]

231012 002	Meas. 2
Frequency	Tot.Pwr,A
25 Hz	41,74
31,5 Hz	49,75
40 Hz	52,48
50 Hz	56,18
63 Hz	59,29
80 Hz	63,07

100 Hz	67,9
125 Hz	65,64
160 Hz	67,85
200 Hz	73,12
250 Hz	76,51
315 Hz	79,63
400 Hz	78,56
500 Hz	77,41
630 Hz	74,51
800 Hz	78,24
1 kHz	76,79
1,25 kHz	75,54
1,6 kHz	76,53
2 kHz	75,31
2,5 kHz	79,44
3,15 kHz	88,76
4 kHz	68,53
5 kHz	71,18
6,3 kHz	80,41
8 kHz	67,57
10 kHz	66,8
A	91,85
Z	96,32

Sound Power on finite surfaces [dB]

		AC Side		Stacks		

APPENDIX B 1/3 OCTAVE BAND RECEIVER

Table B -3 Receiver Sound Pressure Level unadjusted – A-weighted

Description	Overall dBA	A-weighted Octave Band (Hz)												
		25	31.5	40	50	63	80	100	125	160	200	250	315	400
NSR1	28.4	-11.1	-3.1	-0.4	3.3	6.4	10	9.1	6.7	8.8	12.3	15.4	18.2	18.6
NSR2	26	-9.9	-1.9	0.8	4.4	7.5	11.1	7.9	5.4	7.4	10.5	13.5	16.3	16.7
NSR3	28.4	-11.1	-3.1	-0.4	3.3	6.4	10	9.1	6.7	8.8	12.3	15.4	18.2	18.6
NSR4	26	-9.9	-1.9	0.8	4.4	7.5	11.1	7.9	5.4	7.4	10.5	13.5	16.3	16.7
NSR5	19.2	-15.1	-6.8	-4.4	-0.8	2.9	5.8	3.1	0.5	2.2	5.4	8.6	10.5	10.3
NSR6	19.2	-15.3	-7	-4.7	-1	2.7	5.5	3.2	0.6	2.3	5.6	8.7	10.7	10.4
NSR7	28	-9.6	-1.6	1.1	4.7	7.9	11.5	9.3	6.9	8.9	11.9	15	17.7	18.1
NSR8	30.8	-8.2	-0.1	2.6	6.2	9.4	13	11.4	9.1	11.1	13.5	16.7	19.5	20
NSR9	25.4	-12.3	-3.6	-1.6	2	6.6	8.7	7	4.5	6.4	9.9	13.8	15.6	15.6
NSR10	21.3	-15	-6.3	-4.4	-0.7	3.8	5.9	4.4	1.8	3.6	7.1	10.7	12.4	12.1
NSR11	27.9	-10.4	-1.9	0.3	3.9	8.2	10.7	8.8	6.4	8.4	11.6	15.4	17.5	17.7
NSR12	19.9	-15	-6.6	-4.4	-0.8	3.3	5.9	3.4	0.8	2.6	5.8	9.2	11	10.8
NSR13	19.2	-15.6	-7.2	-5	-1.4	2.7	5.2	3	0.4	2.1	5.3	8.7	10.5	10.2
NSR14	18	-16.9	-8.4	-6.2	-2.6	1.5	3.9	2.5	-0.2	1.5	4.8	8	9.8	9.3
NSR15	24.5	-12.8	-4.4	-2.1	1.5	5.5	8.2	6.9	4.5	6.4	9.9	13.3	15.6	15.5
NSR16	23.5	-13.4	-5	-2.8	0.9	4.8	7.6	6.4	3.9	5.8	9.3	12.7	14.9	14.7

Description	Overall dBA	A-weighted Octave Band (Hz)												
		25	31.5	40	50	63	80	100	125	160	200	250	315	400
NSR17	24.2	-13	-4.6	-2.3	1.3	5.3	8	6.9	4.4	6.3	9.9	13.2	15.5	15.3
NSR18	18.6	-16.4	-8	-5.7	-2.1	1.8	4.5	3.1	0.5	2.2	5.6	8.7	10.7	10.2
NSR19	20.3	-14.7	-6.4	-4	-0.4	3.4	6.2	4	1.4	3.1	6.5	9.7	11.7	11.4
NSR20	19.3	-16	-7.7	-5.4	-1.8	2.1	4.8	3.5	0.9	2.7	6	9.2	11.2	10.8
NSR21	20.7	-13.7	-5.5	-3.1	0.5	4.1	7.1	4.2	1.5	3.3	6.5	9.8	11.8	11.6
NSR22	21.2	-14.4	-6.1	-3.7	-0.1	3.7	6.6	4.8	2.2	4	7.4	10.6	12.8	12.5
NSR23	20.3	-14.9	-6.7	-4.3	-0.6	3	6	4.7	2.1	3.9	7.3	10.4	12.6	12.2
NSR24	21.2	-14.1	-5.9	-3.5	0.2	3.7	6.8	5.3	2.8	4.6	8.1	11.1	13.4	13.1
NSR25	21.5	-12.9	-4.4	-2.2	1.4	5.5	8	4.3	1.7	3.5	6.6	9.9	11.9	12.1
NSR26	0.4	-27	-18.8	-16.6	-13.1	-9.7	-7.3	-9.3	-12.9	-12.3	-10.3	-9	-8.7	-11.2
NSR27	25.5	-10.8	-2.7	-0.1	3.6	6.8	10.3	7.7	5.3	7.2	10.5	13.5	16.1	16.5
NSR28	20.1	-15.1	-6.9	-4.3	-0.6	2.6	6.1	3.9	1.3	3	5.8	8.6	10.9	11.5

Table B -4 Receiver Sound Pressure Level unadjusted – A-weighted continued

Description	A-weighted Octave Band (Hz)													
	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
NSR1	17.3	14	18.9	17.1	15.3	16.3	13.7	15.4	20.8	-5.4	-11.9	-16.4	-49.7	-79.7
NSR2	15.2	11.7	18.5	16.2	13.6	13.5	9.5	9.3	12.2	-18	-30.5	-44	-90.3	0
NSR3	17.3	14	18.9	17.1	15.3	16.3	13.7	15.4	20.8	-5.4	-11.9	-16.4	-49.7	-79.7
NSR4	15.2	11.7	18.5	16.2	13.6	13.5	9.5	9.3	12.2	-18	-30.5	-44	-90.3	0
NSR5	11.6	4.4	9.6	9.6	2.7	0.6	-4	-10.2	-12.9	-50.8	-74.8	-105.7	0	0
NSR6	11.6	4.5	9.2	9.4	1.9	-0.2	-4.5	-11.4	-14.3	-52.1	-75.9	-105.8	0	0
NSR7	16.7	13.3	19.9	17.8	15.6	15.9	12.6	13.5	18	-9.7	-18.6	-26.5	-64.5	-101.3
NSR8	18.7	15.4	22.3	20.3	18.3	19	16.2	17.9	23.7	-2	-7.7	-10.9	-41.9	-68.7
NSR9	18.8	10.4	15.3	17.4	9.9	9.4	10	4.2	6.7	-16.1	-35.3	-47.5	-91.8	0
NSR10	14.8	6.5	10.8	12.2	4.3	2.7	1.2	-6.7	-8.2	-38.2	-65.5	-91.5	0	0
NSR11	20.1	12.8	18.7	19.3	14.2	14.4	12.9	11.8	16.3	-10.2	-19.9	-27.6	-65.4	-102.4
NSR12	12.7	5	10.5	10.3	3.8	2	-2.1	-8.3	-10.9	-47.9	-74.4	-107	0	0
NSR13	12	4.3	9.4	9.3	2.4	0.5	-3.9	-10.8	-14.3	-52.3	-80.8	-116	0	0
NSR14	10.8	3.3	7.4	7.3	0	-2.3	-7.1	-14.5	-18.5	-57.9	-85.7	0	0	0
NSR15	16.6	10.4	15	15	9.8	9.6	7.3	5.5	9.1	-19.2	-28.6	-37.1	-75.9	-114.3
NSR16	15.6	9.5	14	13.4	8.6	8.1	4.6	3.3	6.2	-23.2	-34	-44.8	-87.1	0
NSR17	16.1	10.2	14.7	14.1	9.4	9.1	5.7	4.8	8.1	-20.7	-30.6	-39.9	-80.1	0
NSR18	10.8	4.3	8.2	7.1	0.9	-1.3	-7.1	-12.7	-15.7	-54.1	-78.6	-109.9	0	0

Description	A-weighted Octave Band (Hz)													
	500	630	800	1k	1.25k	1.6k	2k	2.5k	3.15k	4k	5k	6.3k	8k	10k
NSR19	12.7	5.7	10.5	10.8	3.6	1.7	-2.4	-8.4	-10.2	-46.5	-67.9	-94.3	0	0
NSR20	11.8	5	9.1	8.9	2.1	0.2	-4.1	-10.5	-13.2	-51.1	-74.6	-104.1	0	0
NSR21	13.6	5.9	11.2	11.4	4.1	2	-2.6	-8.7	-11.1	-48.1	-70.3	-97.8	0	0
NSR22	13.4	6.9	11.8	11.3	5.2	3.7	-0.5	-5.2	-6	-40.6	-59.3	-81.7	0	0
NSR23	11.9	6.5	10.6	8.6	3.6	1.7	-4.6	-9	-11.4	-48.7	-70.9	-98.7	0	0
NSR24	12.5	7.5	11.8	9.6	5.2	3.6	-2.2	-5.2	-5.5	-39.6	-57.3	-78.6	0	0
NSR25	13.7	6.5	13.3	12.3	7.1	5.7	0.5	-2.6	-3.4	-38.8	-59.2	-84.8	0	0
NSR26	-13.5	-22.1	-21.7	-28.9	-42.6	-57.4	-83.4	-118.7	0	0	0	0	0	0
NSR27	15.3	11.4	17.7	15.6	13	12.7	8	6.8	8.2	-24.1	-39.5	-57.5	-110.4	0
NSR28	9.8	5.6	13.1	9.9	5.9	3.8	-3.2	-7.8	-11.5	-51.6	-79.2	-115.8	0	0

APPENDIX C NOISE MONITORING

C.1 Background Noise Monitoring

The method of the assessment considers the sound power levels of the nominated sources

The background monitoring and analysis was conducted in accordance with the method detailed in the *EIS information guideline*[5] and the *Noise Measurement Manual*[6].

C.1.1 Measurement Equipment

A list of noise monitoring equipment used for is provided in Table C -5.

Table C -5 Noise Monitoring Equipment

Equipment Type	Model
Sound Level Meter	Svantek Type 977A
Reference Sound Source	Svantek SV 33B

C.1.2 Noise Level Descriptors

The noise parameters outlined in Table C-6 were measured throughout the logging period. The noise parameters were logged over 1-second intervals over the monitoring period.

Table C-6 Noise Level Descriptors

Parameter	Definition
$L_{A\ max}$	A maximum sound level achieved during the measurement period.
$L_{A\ 1}$	A sound level exceeded for 1% of the time period over which the level is determined.
$L_{A\ 10}$	A sound level exceeded for 10% of the time period over which the level is determined.
$L_{A\ 90}$	A sound level exceeded for 90% of the time period over which the level is determined (commonly referred to as the background noise level if a measurement of ambient noise is made before the proposal is in operation).

[5] *Noise and vibration—EIS information guideline (2022), Department of Environment and Science (Queensland Government)*

[6] *Noise Measurement Manual (2020), Department of Environment and Science (Queensland Government)*

Parameter	Definition
$L_{A\ eq}$	The equivalent continuous sound level that has the same energy as the fluctuating sound under consideration over the time period which the level is determined.

C.1.3 Monitoring Locations

Background measurements were undertaken at a location that best represents the most affected location as outlined in the *Noise Measurement Manual*. Coordinates for the measurement locations are outlined Table C-7. An image of a typical noise monitoring setup has been provided in Figure C-1.

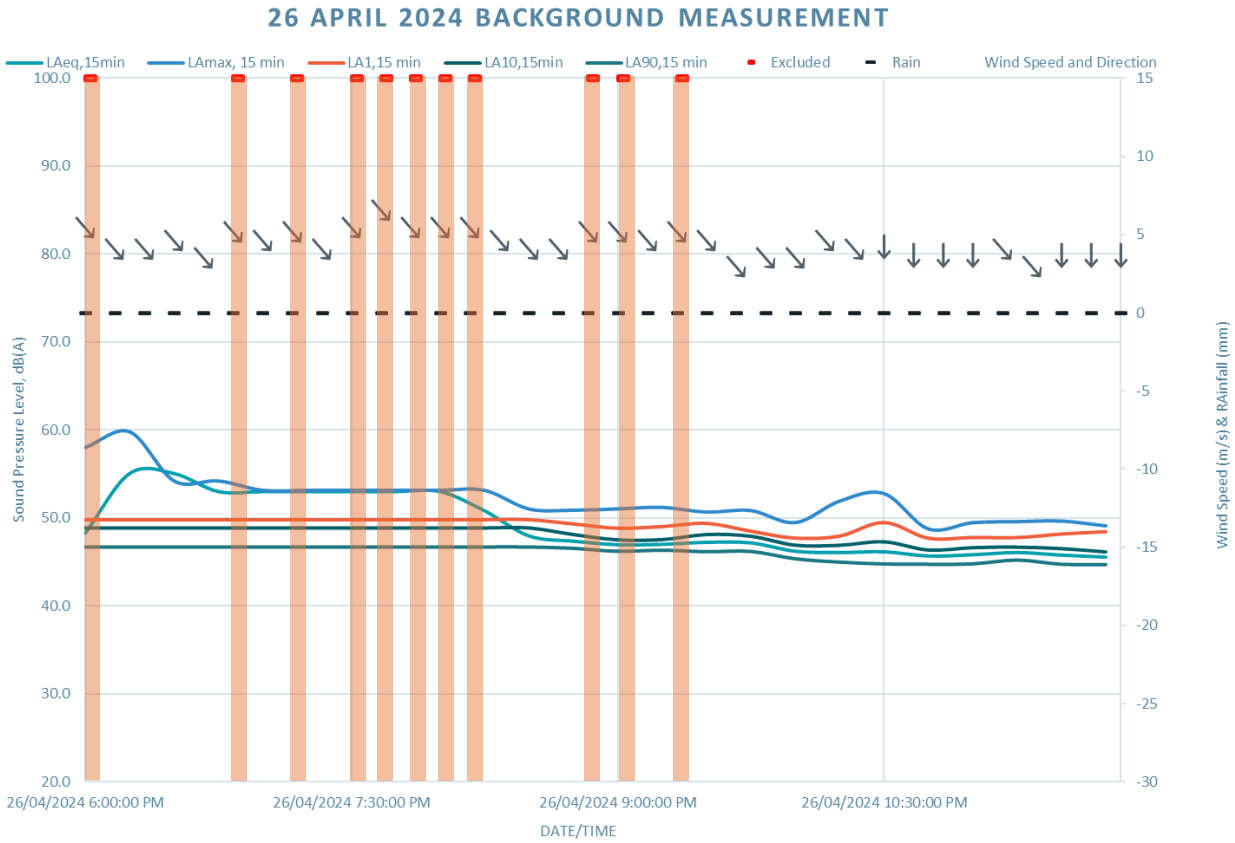
Table C-7 Background Monitoring Location

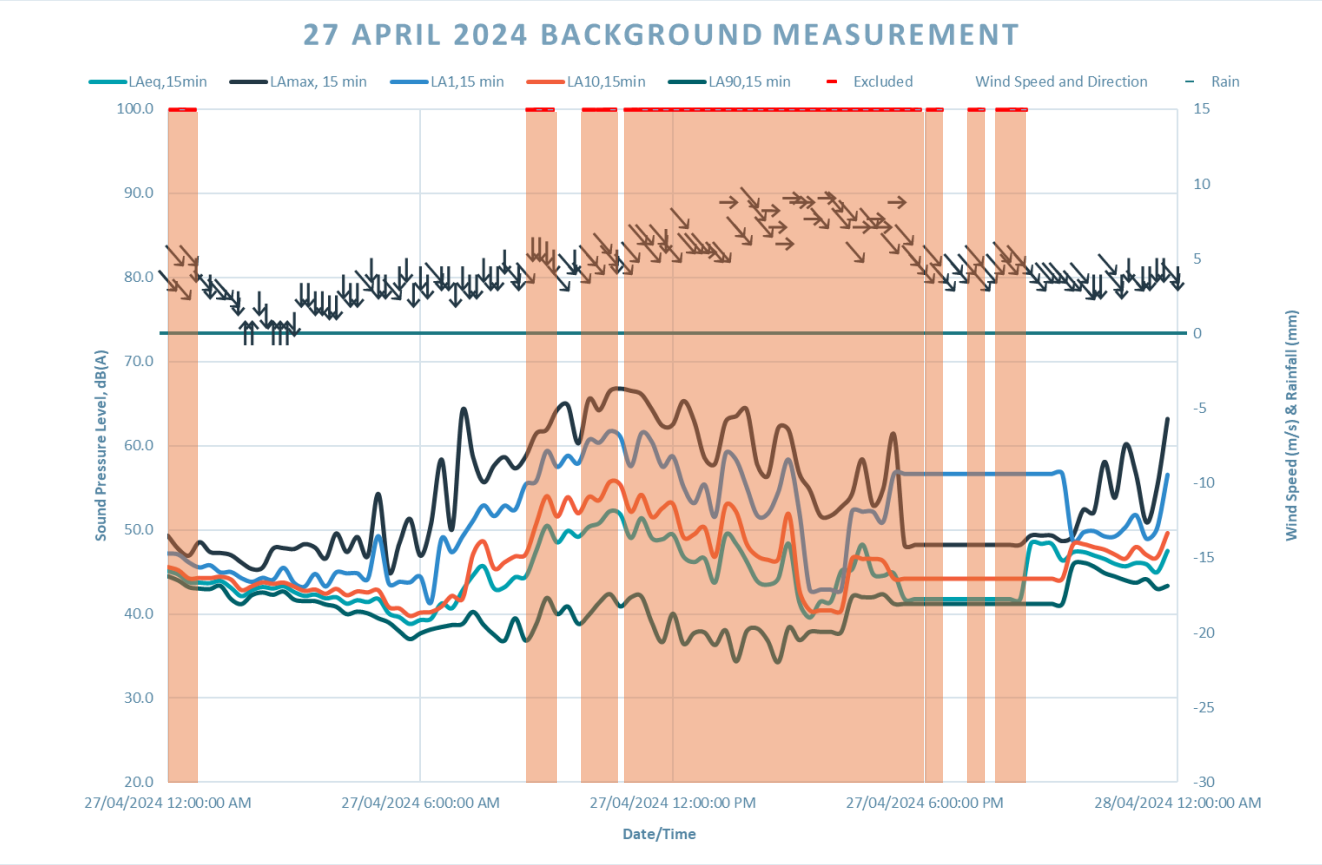
Address	Easting	Northing
Lcn1 - Lot 143 Burgess Road, Colosseum	347277.20	7305400.29
Lcn 2 - Lot 132 Cawthrays Road, Miram Vale	350158.30	7306620.16

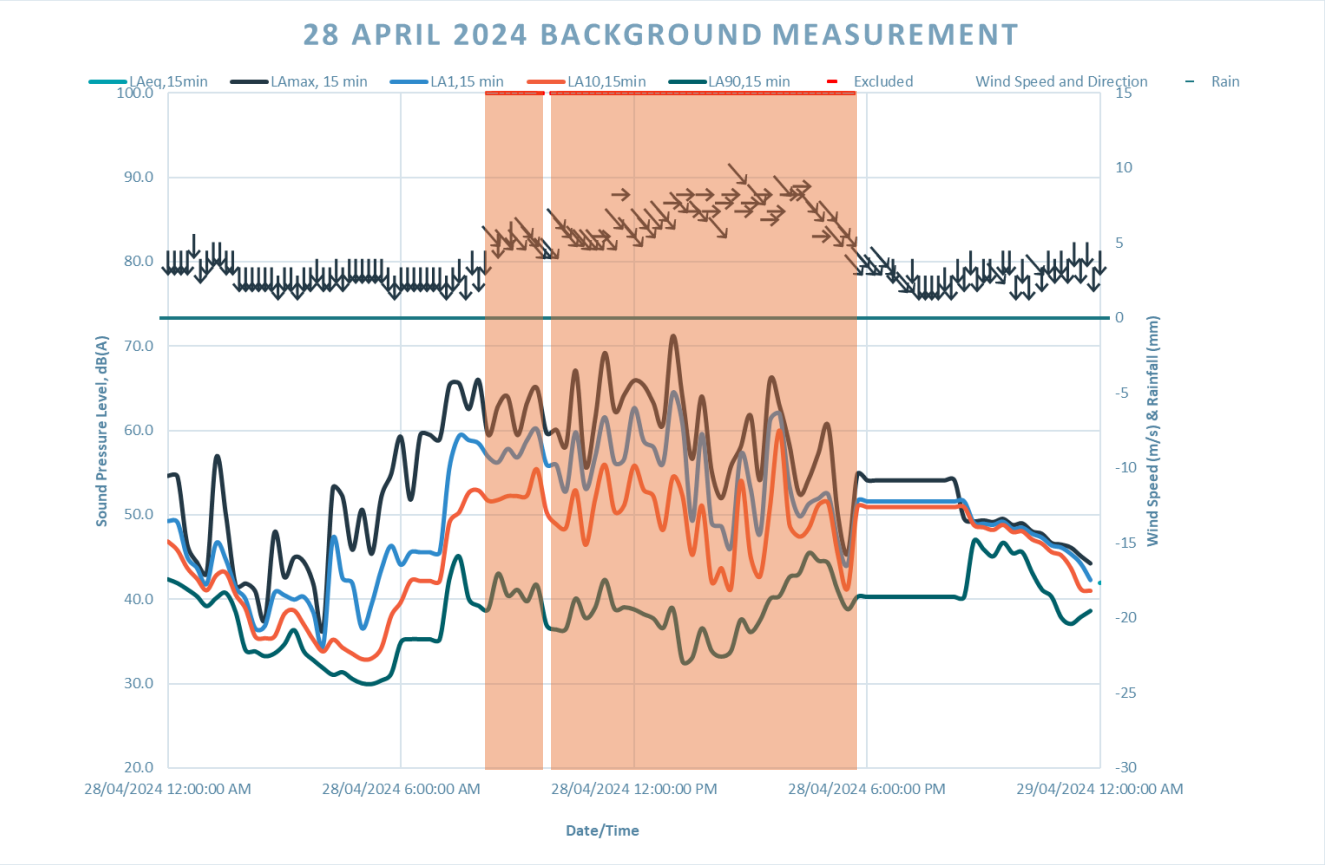
Figure C-1Typical Noise Logge

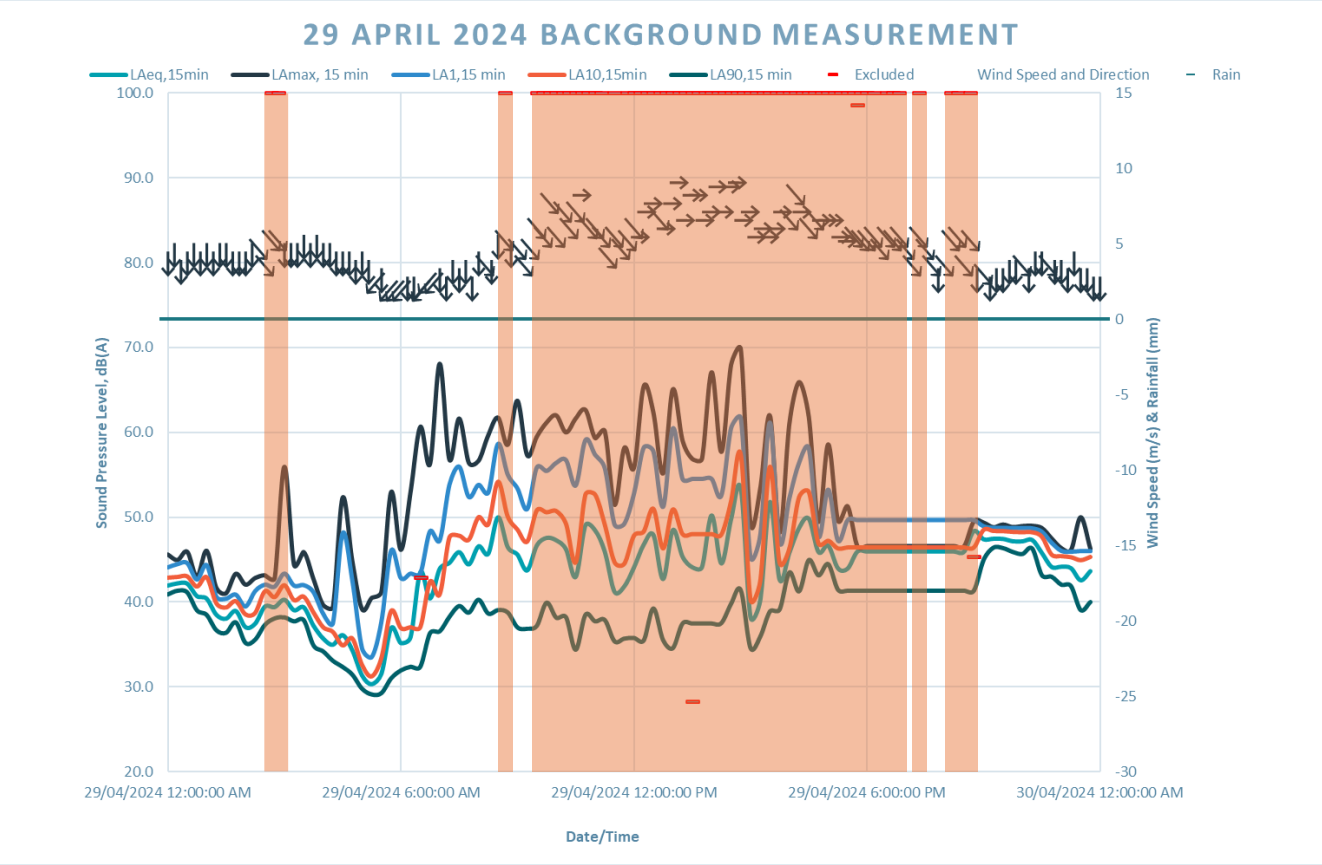
C.1.4 Noise Monitoring Results

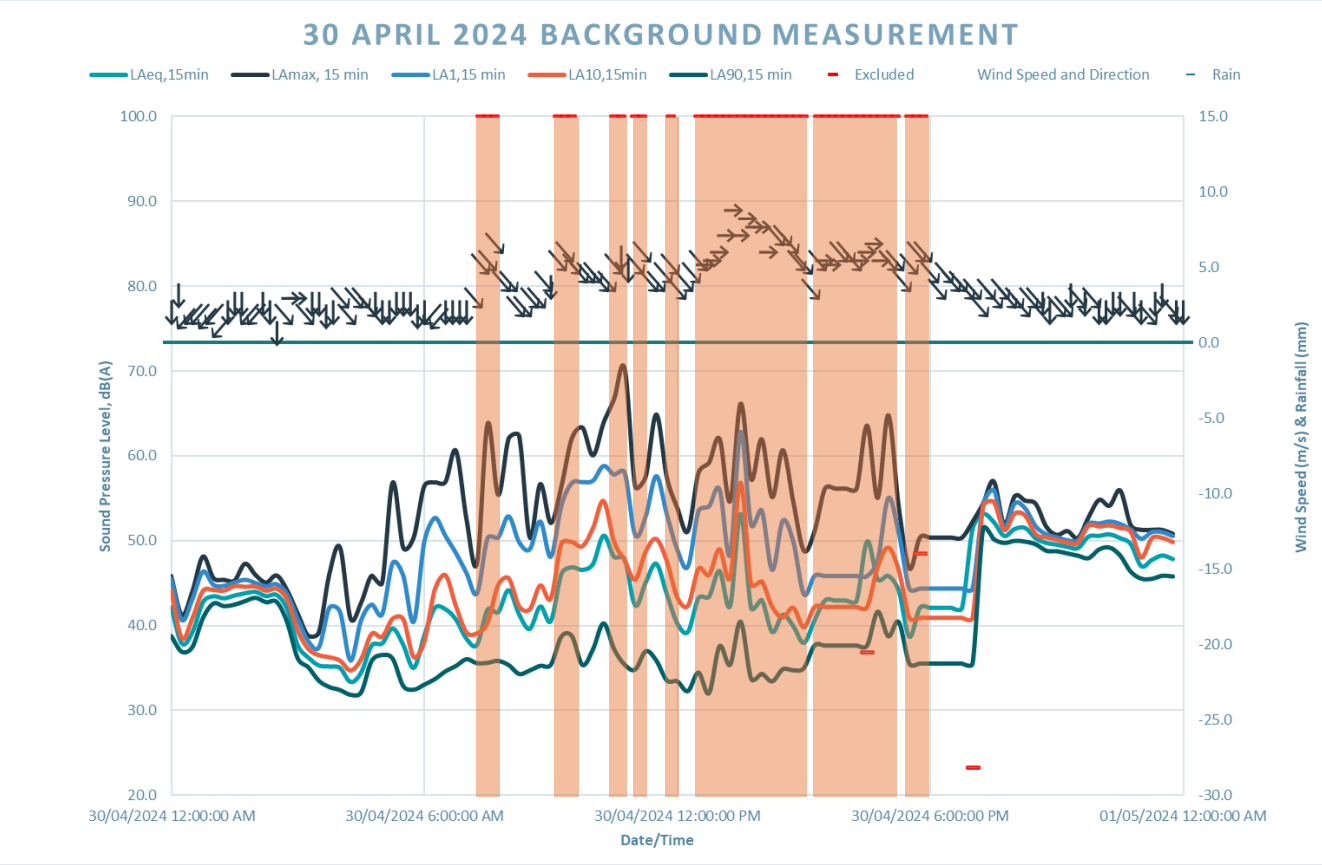
Burgess Road

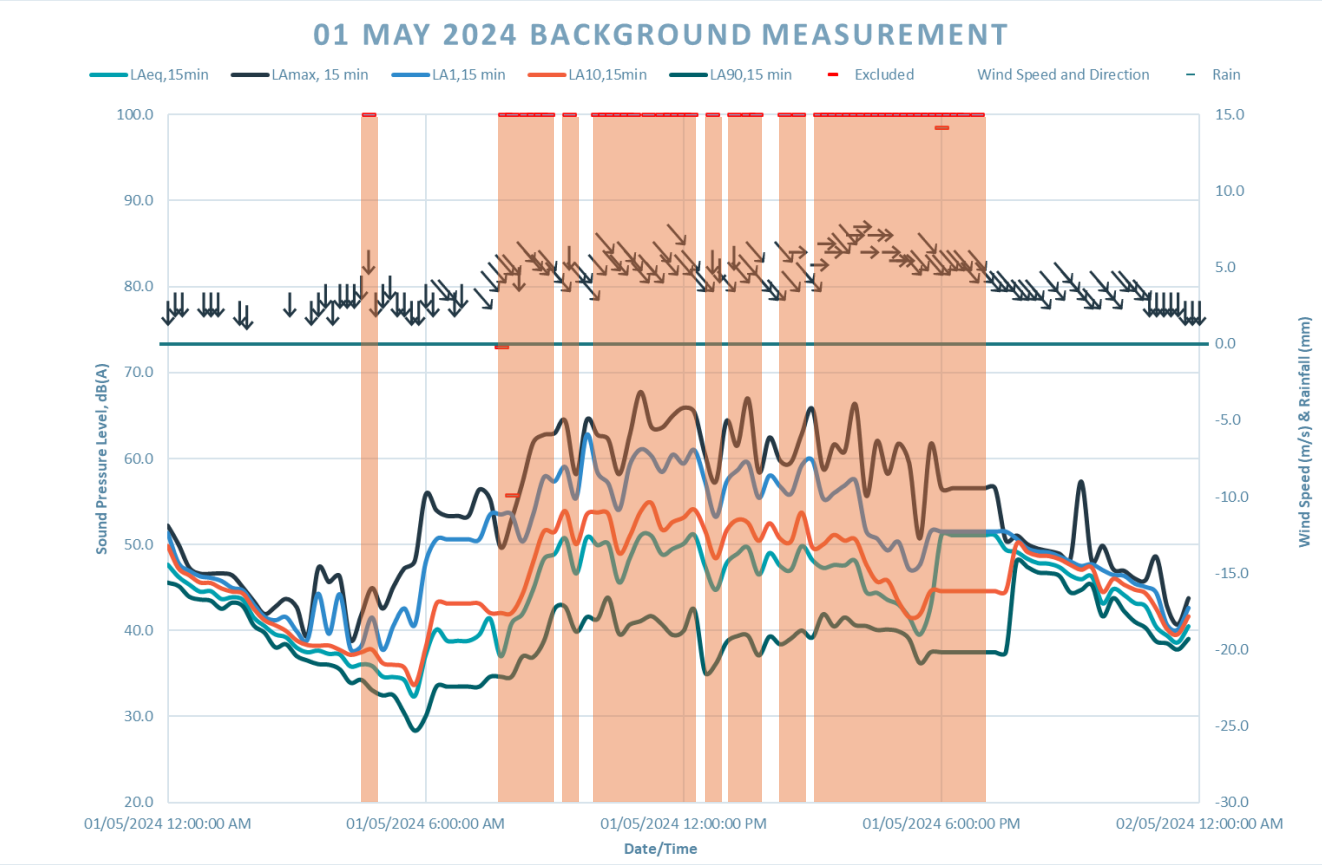

26 APRIL 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Rain
Wind Speed and Direction
Sound Pressure Level, dB(A)
Wind Speed (m/s) & RAinfall (mm)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15
10
5
0
-5
-10
-15
-20
-25
-30
26/04/2024 6:00:00 PM
26/04/2024 7:30:00 PM
26/04/2024 9:00:00 PM
26/04/2024 10:30:00 PM
DATE/TIME

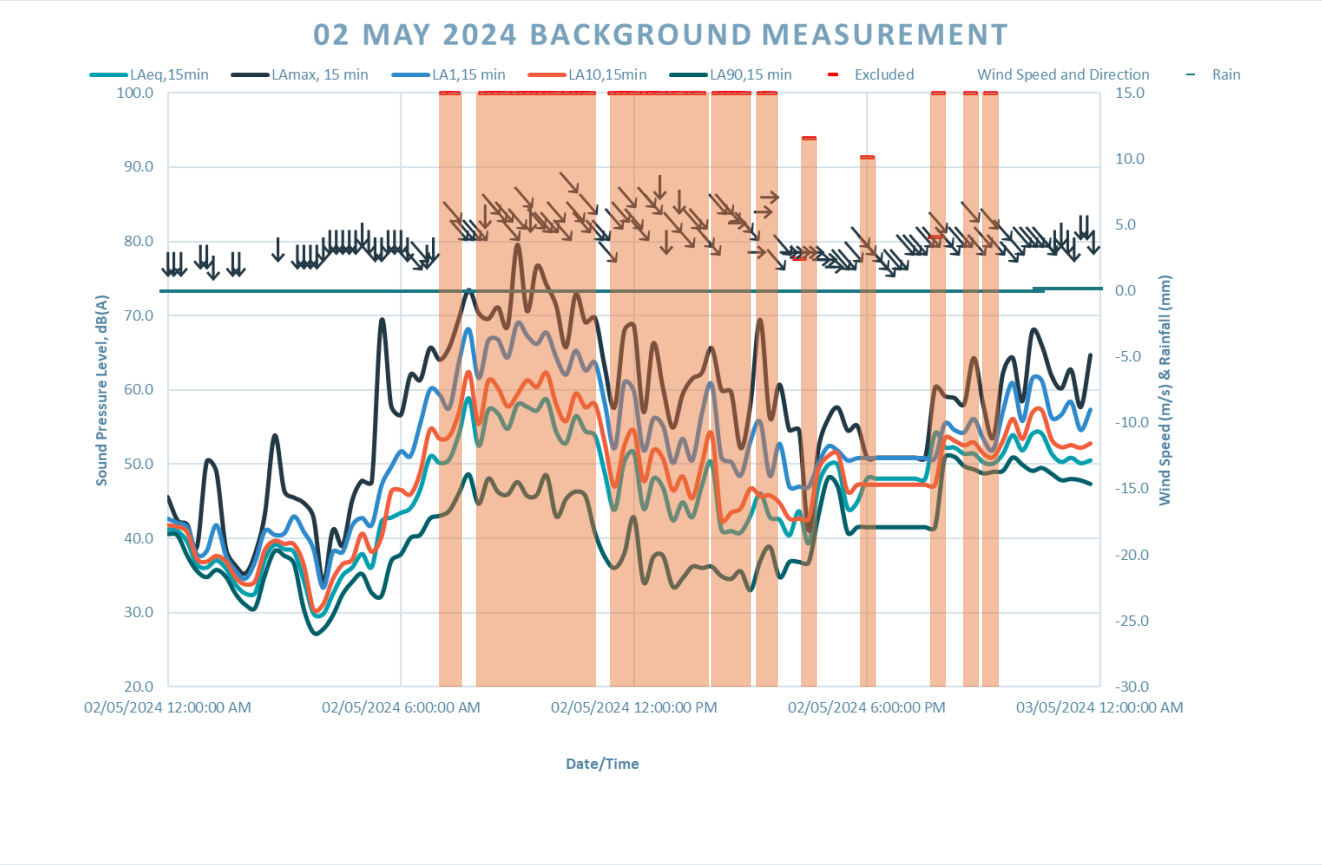

27 APRIL 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Wind Speed and Direction
Rain
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15
10
5
0
-5
-10
-15
-20
-25
-30
Sound Pressure Level, dB(A)
Wind Speed (m/s) & Rainfall (mm)
27/04/2024 12:00:00 AM
27/04/2024 6:00:00 AM
27/04/2024 12:00:00 PM
27/04/2024 6:00:00 PM
28/04/2024 12:00:00 AM
Date/Time

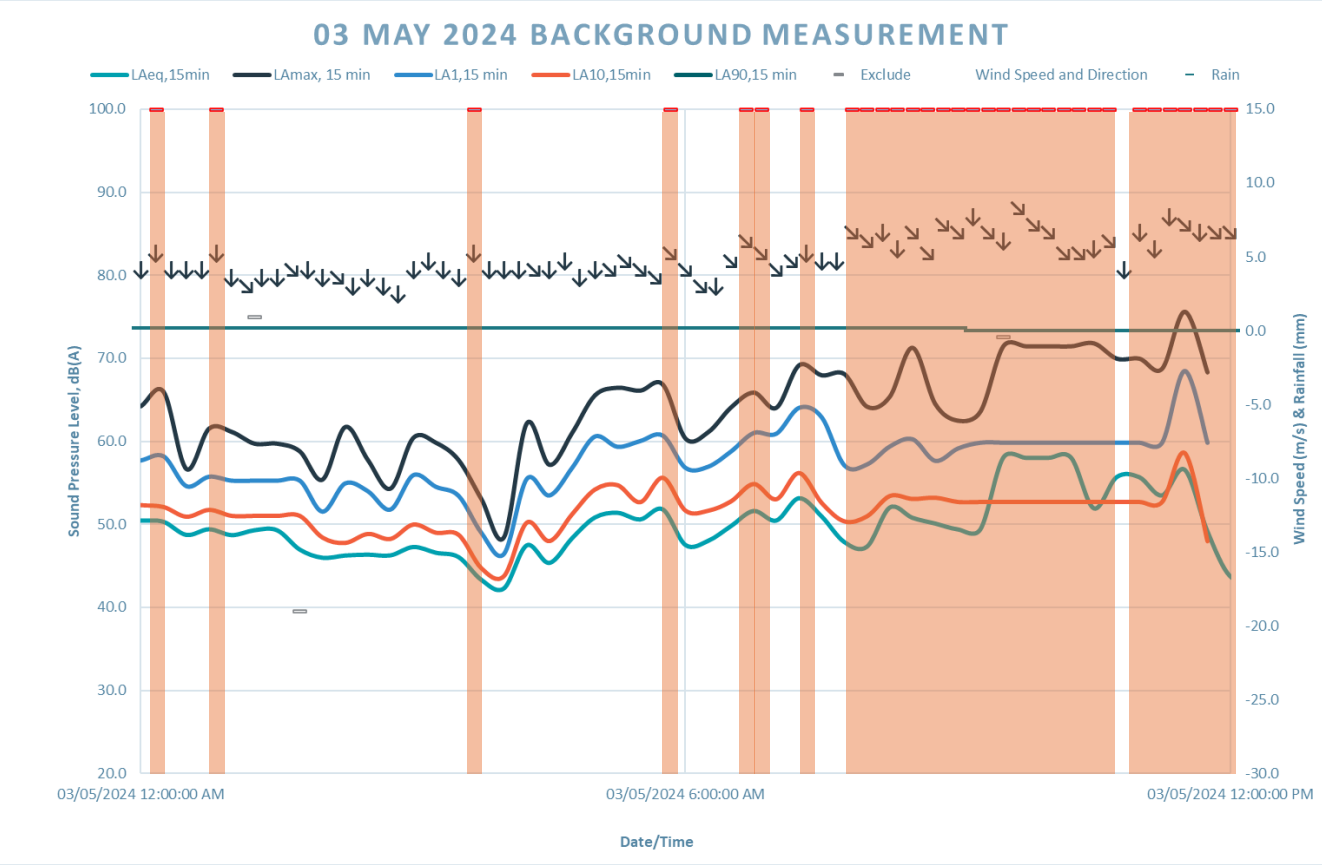

28 APRIL 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Wind Speed and Direction
Rain
Sound Pressure Level, dB(A)
Wind Speed (m/s) & Rainfall (mm)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15
10
5
0
-5
-10
-15
-20
-25
-30
28/04/2024 12:00:00 AM
28/04/2024 6:00:00 AM
28/04/2024 12:00:00 PM
28/04/2024 6:00:00 PM
29/04/2024 12:00:00 AM
Date/Time


29 APRIL 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Wind Speed and Direction
Rain
Sound Pressure Level, dB(A)
Wind Speed (m/s) & Rainfall (mm)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15
10
5
0
-5
-10
-15
-20
-25
-30
29/04/2024 12:00:00 AM
29/04/2024 6:00:00 AM
29/04/2024 12:00:00 PM
29/04/2024 6:00:00 PM
30/04/2024 12:00:00 AM
Date/Time

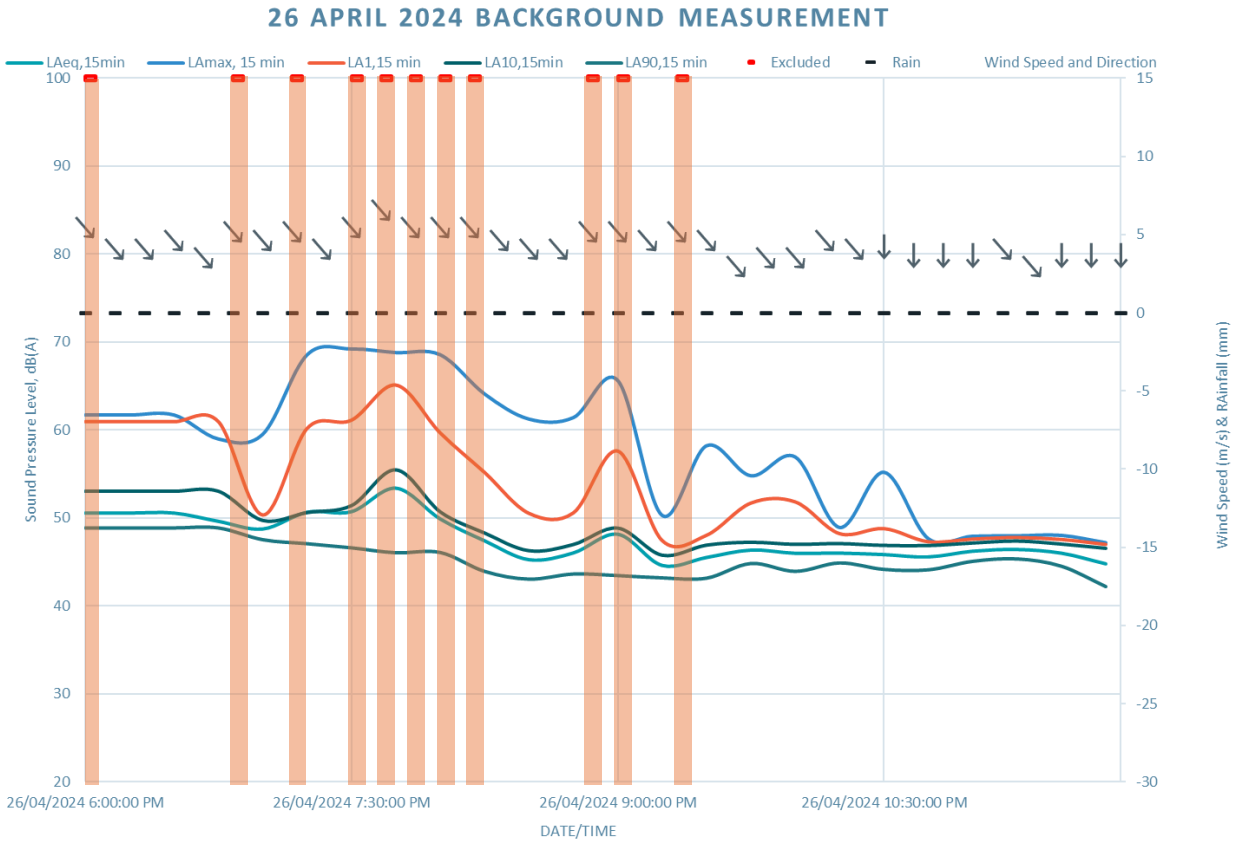

30 APRIL 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Wind Speed and Direction
Rain
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
Sound Pressure Level, dB(A)
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
Wind Speed (m/s) & Rainfall (mm)
30/04/2024 12:00:00 AM
30/04/2024 6:00:00 AM
30/04/2024 12:00:00 PM
30/04/2024 6:00:00 PM
01/05/2024 12:00:00 AM
Date/Time

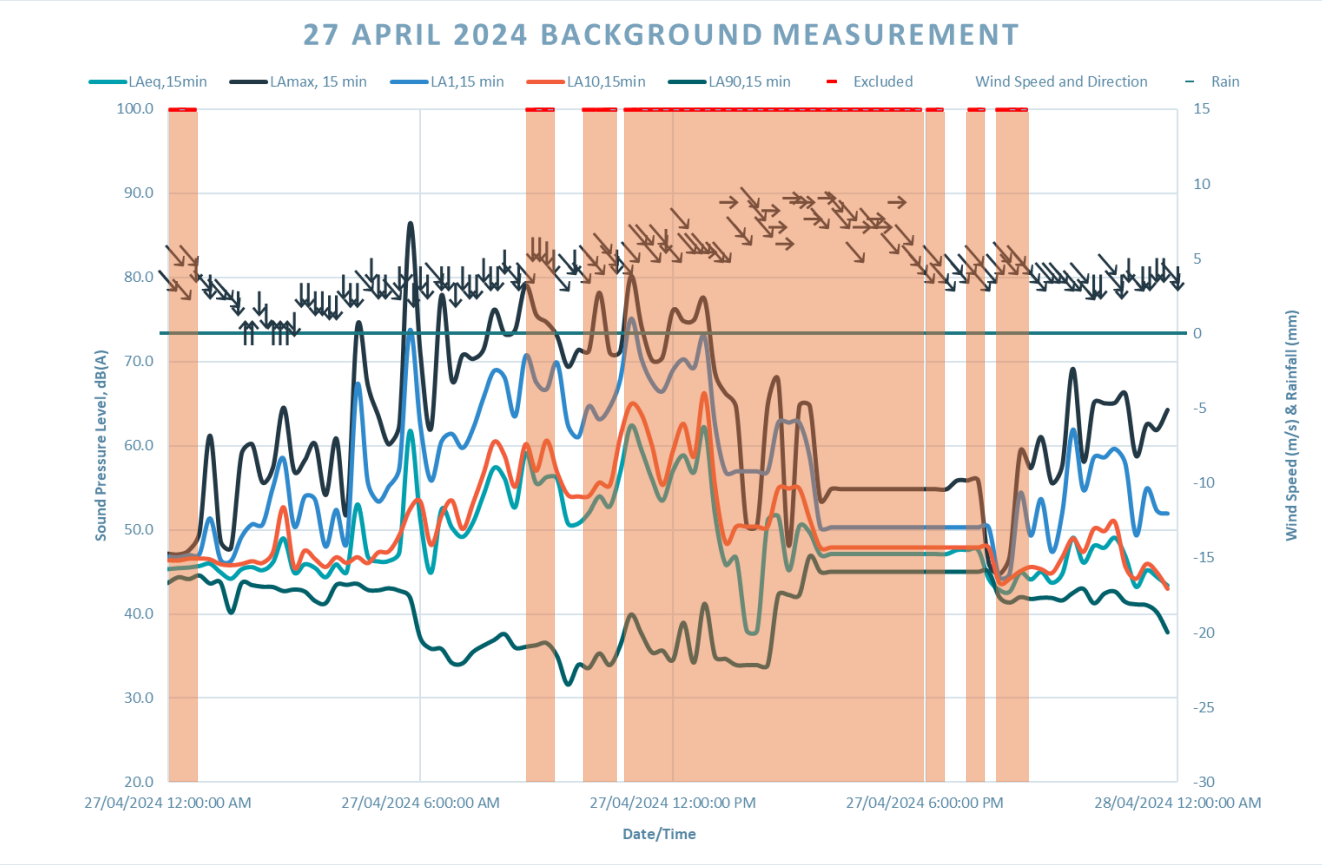

01 MAY 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Wind Speed and Direction
Rain
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
Sound Pressure Level, dB(A)
Wind Speed (m/s) & Rainfall (mm)
01/05/2024 12:00:00 AM
01/05/2024 6:00:00 AM
01/05/2024 12:00:00 PM
01/05/2024 6:00:00 PM
02/05/2024 12:00:00 AM
Date/Time

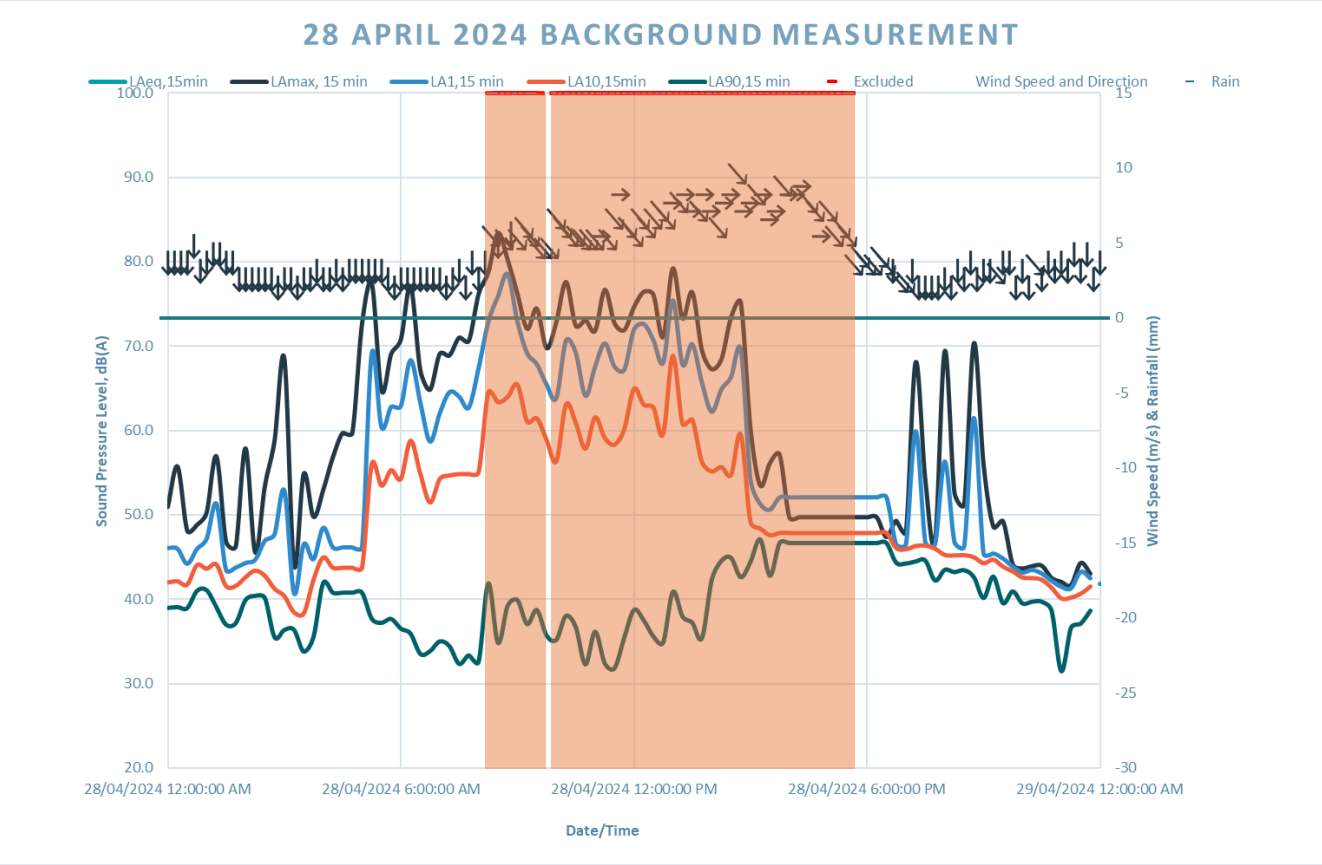

02 MAY 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Wind Speed and Direction
Rain
Sound Pressure Level, dB(A)
Wind Speed (m/s) & Rainfall (mm)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
02/05/2024 12:00:00 AM
02/05/2024 6:00:00 AM
02/05/2024 12:00:00 PM
02/05/2024 6:00:00 PM
03/05/2024 12:00:00 AM
Date/Time

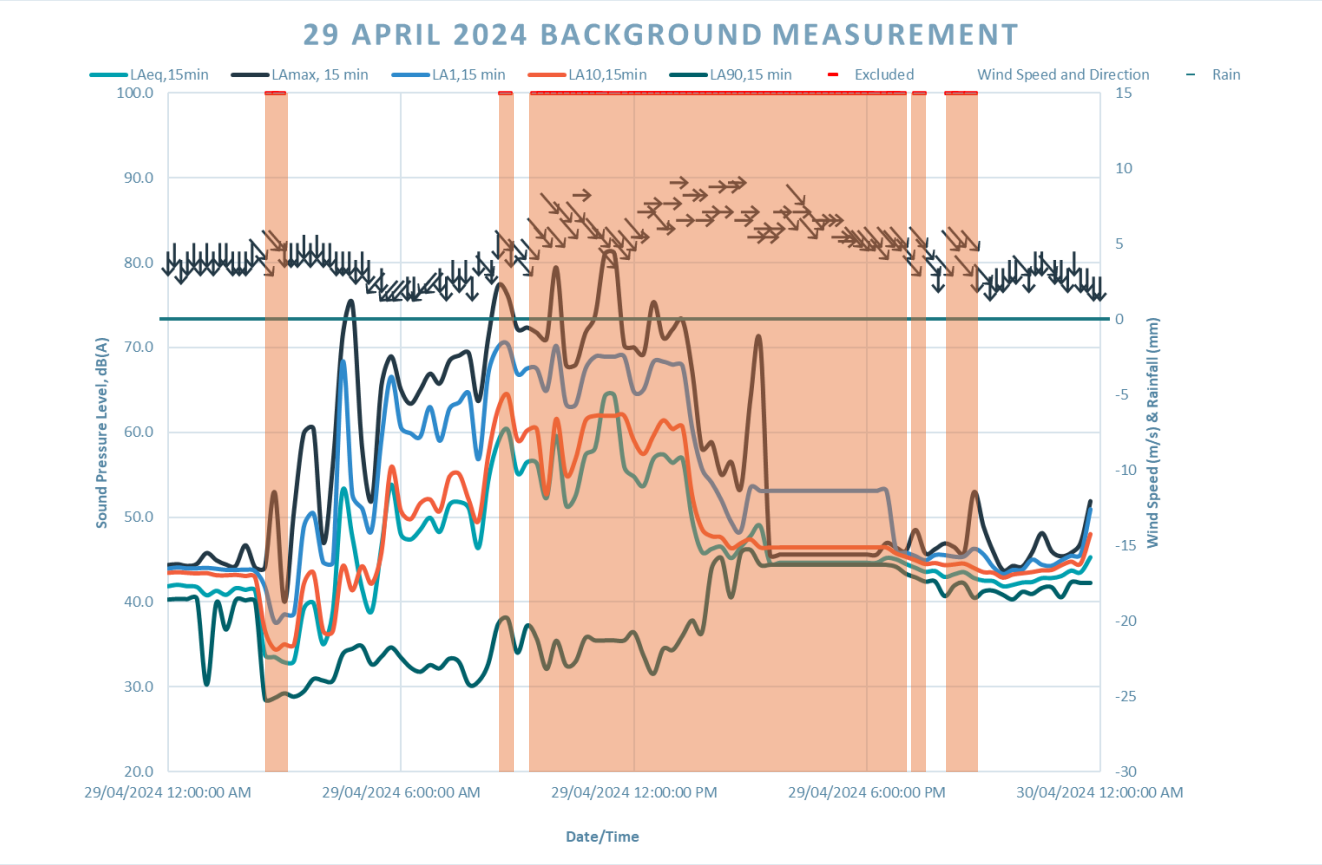

03 MAY 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Exclude
Wind Speed and Direction
Rain
Sound Pressure Level, dB(A)
Wind Speed (m/s) & Rainfall (mm)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
03/05/2024 12:00:00 AM
03/05/2024 6:00:00 AM
03/05/2024 12:00:00 PM
Date/Time

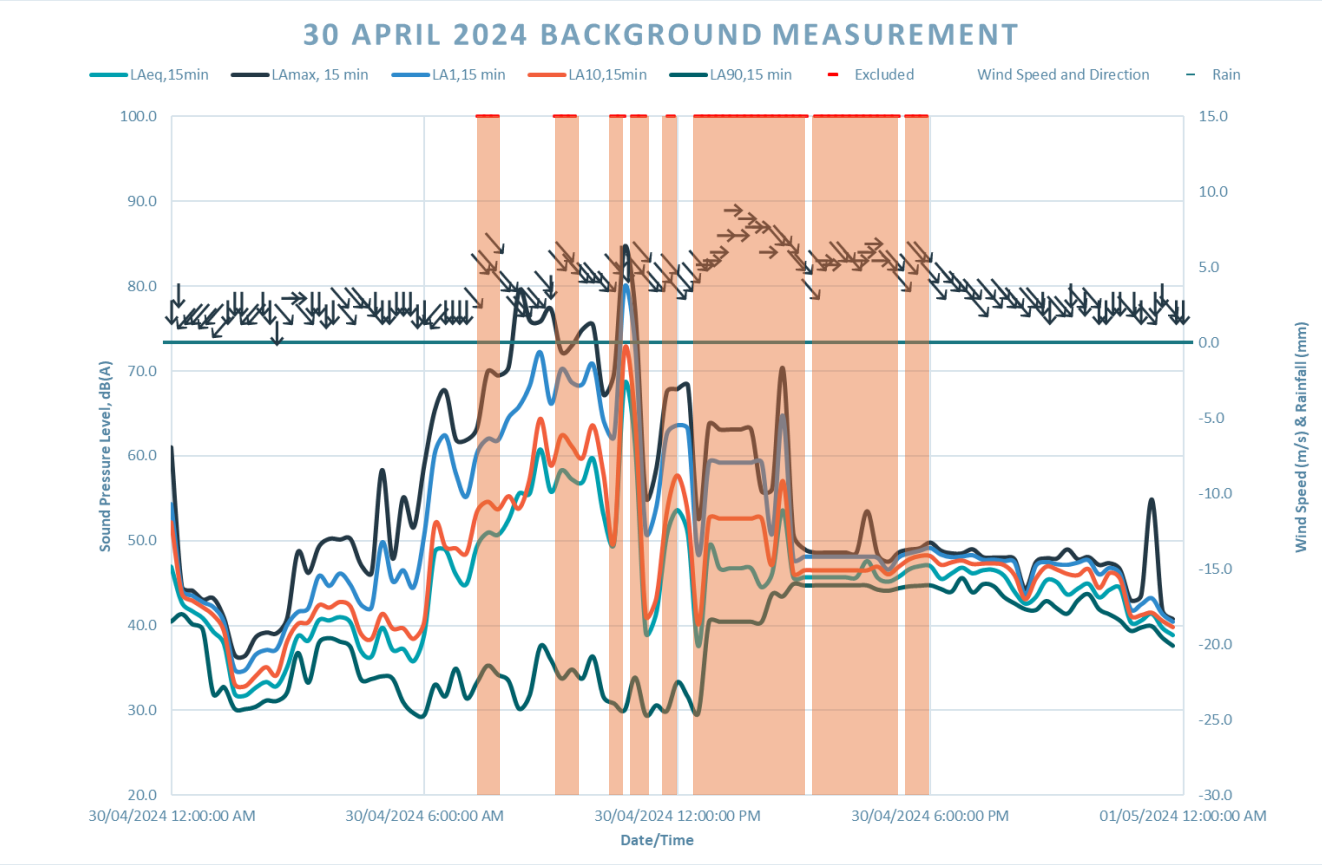
Cawthrays Road

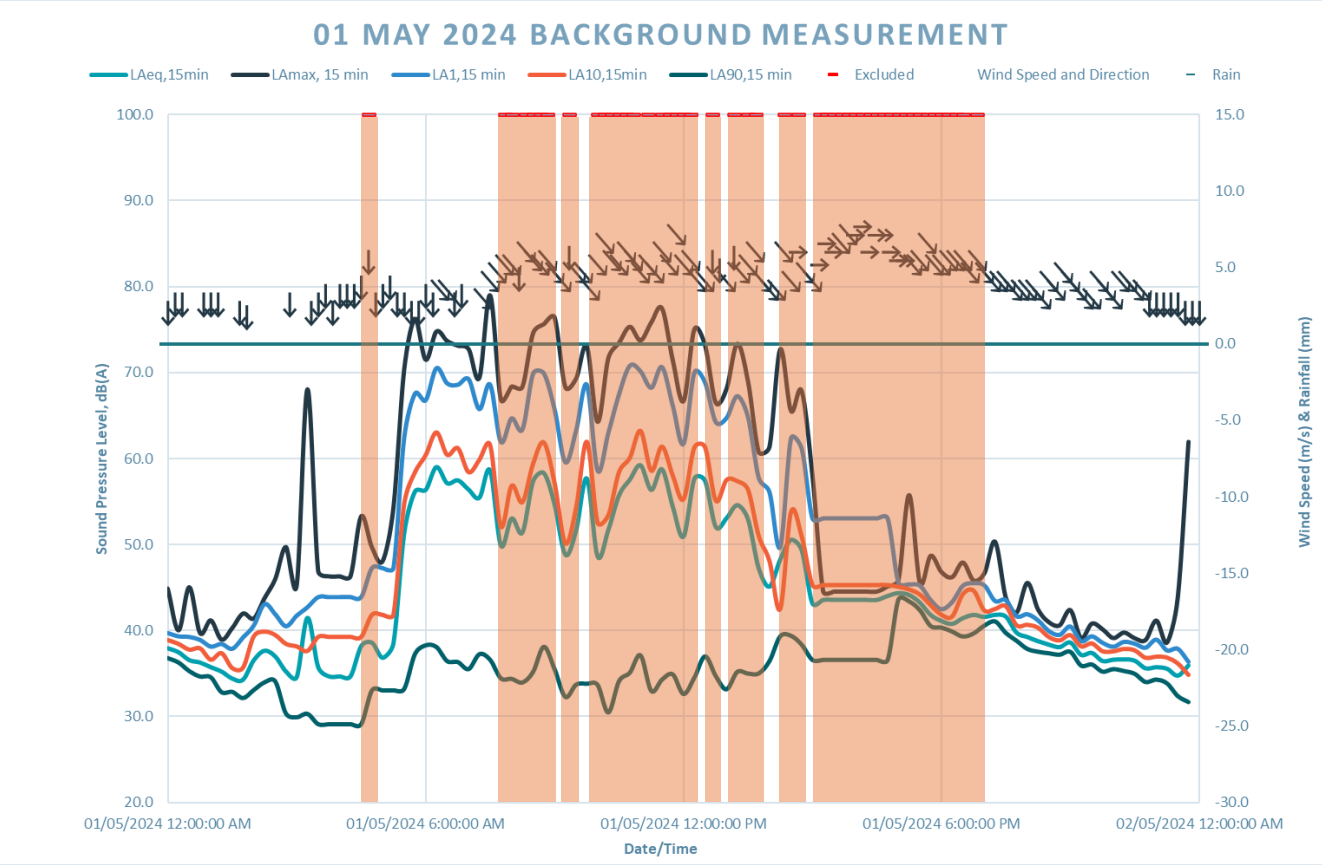

26 APRIL 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Rain
Wind Speed and Direction
Sound Pressure Level, dB(A)
Wind Speed (m/s) & RAinfall (mm)
100
90
80
70
60
50
40
30
20
15
10
5
0
-5
-10
-15
-20
-25
-30
26/04/2024 6:00:00 PM
26/04/2024 7:30:00 PM
26/04/2024 9:00:00 PM
26/04/2024 10:30:00 PM
DATE/TIME

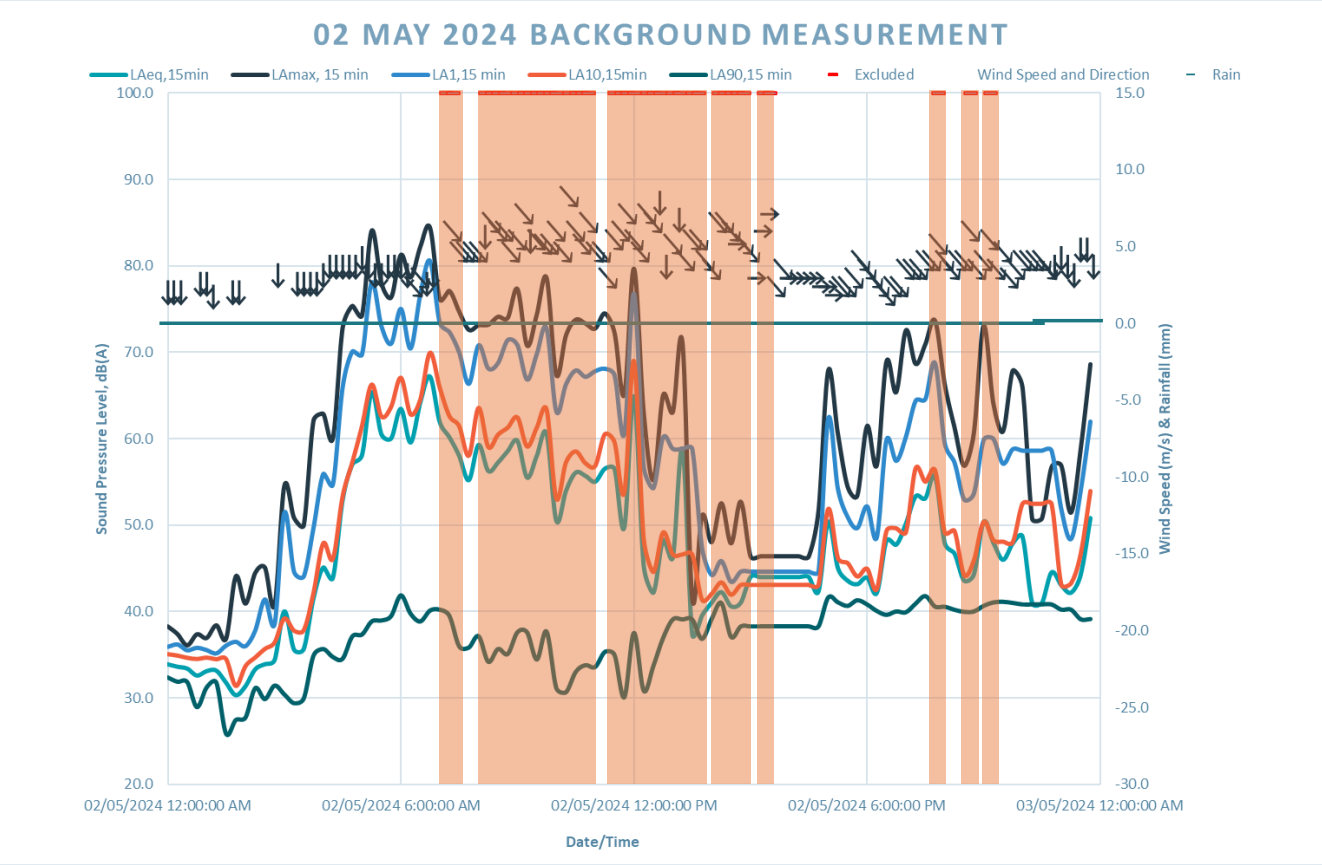

27 APRIL 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Wind Speed and Direction
Rain
Sound Pressure Level, dB(A)
Wind Speed (m/s) & Rainfall (mm)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15
10
5
0
-5
-10
-15
-20
-25
-30
27/04/2024 12:00:00 AM
27/04/2024 6:00:00 AM
27/04/2024 12:00:00 PM
27/04/2024 6:00:00 PM
28/04/2024 12:00:00 AM
Date/Time

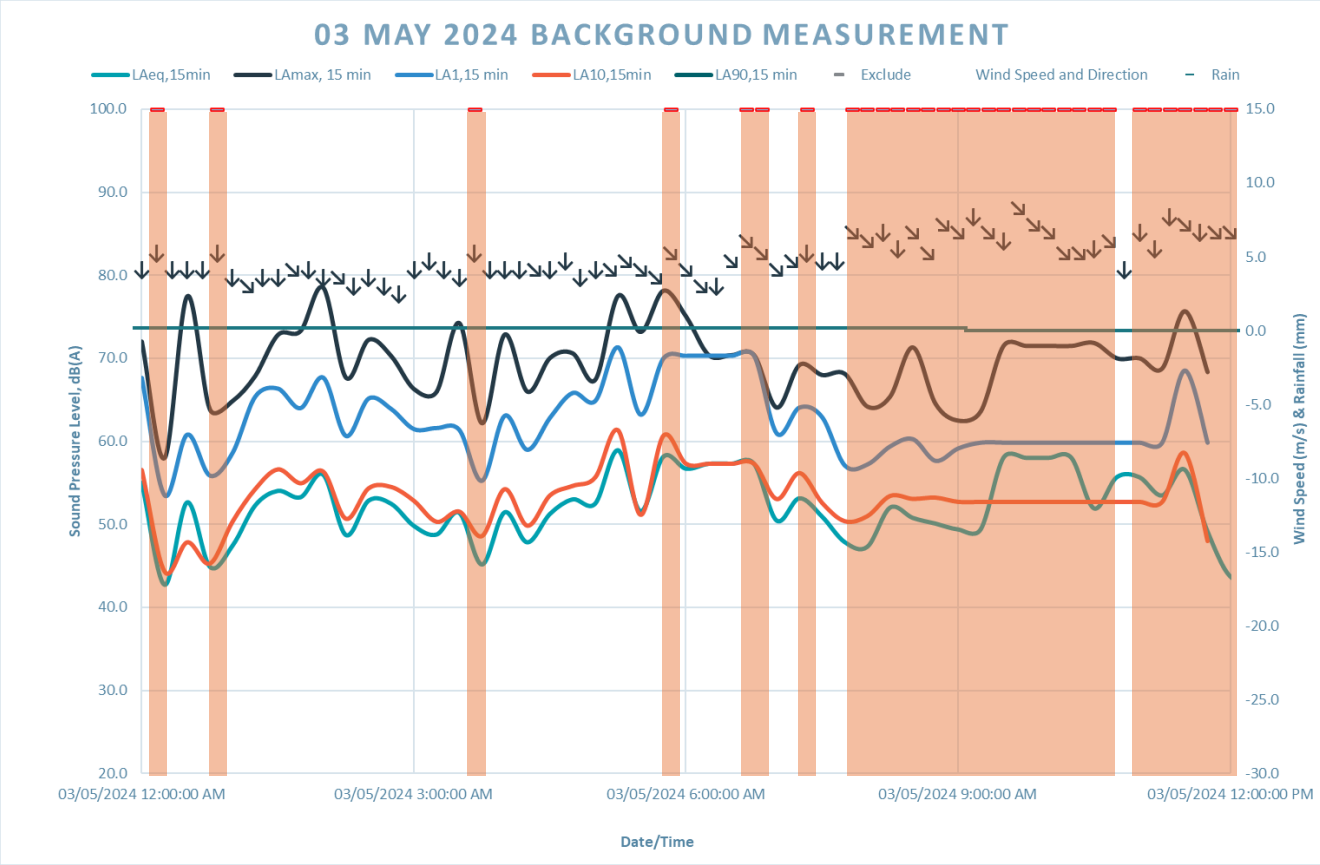

28 APRIL 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Wind Speed and Direction
Rain
Sound Pressure Level, dB(A)
Wind Speed (m/s) & Rainfall (mm)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15
10
5
0
-5
-10
-15
-20
-25
-30
28/04/2024 12:00:00 AM
28/04/2024 6:00:00 AM
28/04/2024 12:00:00 PM
28/04/2024 6:00:00 PM
29/04/2024 12:00:00 AM
Date/Time


29 APRIL 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Wind Speed and Direction
Rain
Sound Pressure Level, dB(A)
Wind Speed (m/s) & Rainfall (mm)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15
10
5
0
-5
-10
-15
-20
-25
-30
29/04/2024 12:00:00 AM
29/04/2024 6:00:00 AM
29/04/2024 12:00:00 PM
29/04/2024 6:00:00 PM
30/04/2024 12:00:00 AM
Date/Time


30 APRIL 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Wind Speed and Direction
Rain
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
Sound Pressure Level, dB(A)
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
Wind Speed (m/s) & Rainfall (mm)
30/04/2024 12:00:00 AM
30/04/2024 6:00:00 AM
30/04/2024 12:00:00 PM
30/04/2024 6:00:00 PM
01/05/2024 12:00:00 AM
Date/Time


01 MAY 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Wind Speed and Direction
Rain
Sound Pressure Level, dB(A)
Wind Speed (m/s) & Rainfall (mm)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
01/05/2024 12:00:00 AM
01/05/2024 6:00:00 AM
01/05/2024 12:00:00 PM
01/05/2024 6:00:00 PM
02/05/2024 12:00:00 AM
Date/Time


02 MAY 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Excluded
Wind Speed and Direction
Rain
Sound Pressure Level, dB(A)
Wind Speed (m/s) & Rainfall (mm)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
02/05/2024 12:00:00 AM
02/05/2024 6:00:00 AM
02/05/2024 12:00:00 PM
02/05/2024 6:00:00 PM
03/05/2024 12:00:00 AM
Date/Time


03 MAY 2024 BACKGROUND MEASUREMENT
LAeq,15min
LAmax, 15 min
LA1,15 min
LA10,15min
LA90,15 min
Exclude
Wind Speed and Direction
Rain
Sound Pressure Level, dB(A)
Wind Speed (m/s) & Rainfall (mm)
100.0
90.0
80.0
70.0
60.0
50.0
40.0
30.0
20.0
15.0
10.0
5.0
0.0
-5.0
-10.0
-15.0
-20.0
-25.0
-30.0
03/05/2024 12:00:00 AM
03/05/2024 3:00:00 AM
03/05/2024 6:00:00 AM
03/05/2024 9:00:00 AM
03/05/2024 12:00:00 PM
Date/Time

APPENDIX D NOISE CONTOURS

.

Miram Vale Solar Farm Noise Impact Assessment

Operational without Mitigation, no Tonal adjustment

Legend

Noise Levels

- 22 dBA and below
- 23 to 27 dBA
- 28 to 32 dBA
- 33 to 37 dBA
- 38 to 42 dBA
- 43 to 47 dBA
- 48 to 52 dBA
- 53 dBA and above
- Noise Source
- Noise Sensitive Receiver
- 37dBA Criteria

Project Number: AU02169
Created By: DS
Last Modified: 31/05/2024

wood.

N

0 0.4 0.8 1.2 1.6 km

Client:
Attexo Group PTY LTD
Report Title:
FN02-AU02169-Miriam Vale Solar Farm Noise Assessment-rev0

Figure 1

A3 size