



WATTA WELLA RENEWABLE ENERGY PROJECT  
BACKGROUND NOISE MONITORING

Rp 002 20200098 | 8 July 2022

**Project:** **Watta Wella Renewable Energy Project  
Background Noise Monitoring**

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## 1.0 INTRODUCTION

This report presents the results of background noise monitoring undertaken for the proposed Watta Wella Renewable Energy Project (subsequently referred to as the project herein).

The background noise monitoring was commissioned by RES Australia Pty Ltd as part of the noise studies associated with the project's planning application. It was undertaken to obtain a representation of typical baseline conditions and derive applicable noise limits at receivers in the vicinity of the project.

This report documents the survey method and the results of the background noise monitoring, along with the derived noise limits which would be used to assess the project's compliance.

Acoustic terminology used throughout this report is presented in Appendix A.

Site layout and relevant coordinates are detailed in Appendix B.

Throughout this report, the term receiver is used to identify any dwelling existing in the vicinity of the proposed project.

## 2.0 BACKGROUND NOISE SURVEY & ANALYSIS METHOD

The background noise survey and analysis has been conducted in accordance with the following:

- New Zealand Standard 6808:2010 *Acoustics – Wind farm noise* (NZS 6808), as required by Victorian Government's *Development of Wind Energy Facilities in Victoria – Policy and Planning Guidelines*, November 2021 (the *Victorian Guidelines*).
- Supplementary guidance contained in UK Institute of Acoustics publication *A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise* dated May 2013 (UK IOA good practice guide).

This section of the report presents:

- An overview of the survey method;
- Details of the selected noise monitoring locations; and
- A summary of the data analysis procedures.

### 2.1 Monitoring locations

Background noise monitoring was carried out at four (4) receivers listed in Table 1.

**Table 1: Background noise monitoring locations**

Receiver	Direction from wind farm	Distance from nearest turbine
376*	West of mid section	Approximately 1,000 m
422	East of mid section	Approximately 1,500 m
404	Centrally	Approximately 1,800 m
412	North west	Approximately 1,600 m

\* Involved receiver

The location of each of these receivers is illustrated in Figure 1.

The monitoring locations were selected on the basis of:

- A total of forty-four (44) turbines located at the coordinates as detailed in Appendix B;
- The noise monitoring procedures outlined in NZS 6808; and
- Upper predicted operational wind farm noise levels prepared at the time of the survey planning.

The above information was used to identify the locations where background noise levels were required.

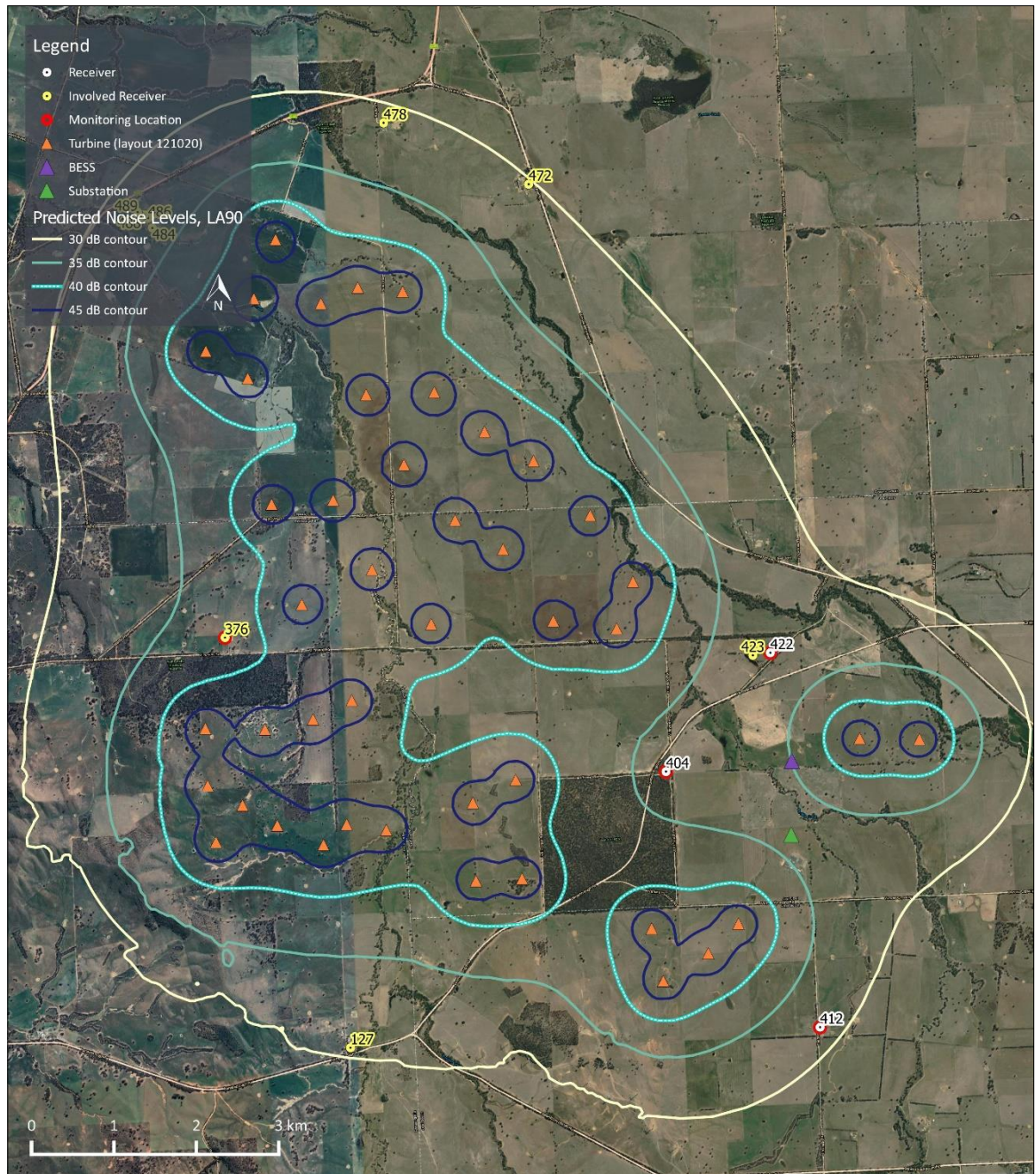
At each of the receivers where noise monitoring was carried out, the choice of location relative to the dwelling was made on account of the range of considerations specified in NZS 6808 and practical site constraints, where relevant. The following specific considerations were factored:

- The noise monitors were located on the proposed wind farm side of the dwelling;
- The noise monitors were located at least 3.5 m away from the dwelling and any significant vertical reflecting structures; and
- The noise monitors were located as far as practical from taller vegetation at each dwelling and any obvious sources of extraneous noise.

Coordinates and photographs for the noise monitoring locations are provided in Appendix F to Appendix I.



Figure 1: Preliminary noise contours and monitoring locations



## 2.2 Survey description

The background noise survey comprised unattended monitoring over a number of weeks to measure sound levels for a range of environmental conditions. Site wind speeds and local weather conditions were simultaneously recorded throughout the survey, along with periodic audio samples, to enable the relationship between background noise levels and site winds to be assessed.

The key elements of the background noise survey are summarised in Table 2 below.

**Table 2: Summary of key elements of background noise survey**

Item	Description
Monitoring locations	Four (4) residential receivers as described in Section 2.1.
Monitoring Period	<p>15 July to 20 September 2021 equating to approximately 9 weeks at each location.</p> <p>The duration was chosen to satisfy the guidance of NZS 6808 which indicates the measurements should be made for a representative range of wind speeds and directions for the site, and that a minimum of 1,440 individual 10-minute measurements, equivalent to 10 days of monitoring is normally required to obtain a satisfactory range.</p>
Sound level meters	<p>Class 1 automated sound loggers (most accurate class rating for field usage).</p> <p>Microphones mounted at approximately 1.5 m above ground level and fitted with enhanced wind shielding systems based on the design recommendations detailed in the UK IOA good practice guide.</p> <p>See equipment specifications and calibration records in Appendix C.</p>
Noise measurement data	<p>A-weighted average and statistical sound pressure levels.</p> <p>One-third octave band frequency noise levels and a brief audio sample every ten (10) minutes to aid the identification of extraneous noise influences.</p>
Local wind speed and rainfall data	<p>A weather station was installed beside one of the noise monitoring locations to concurrently record rainfall and wind speeds at microphone height.</p> <p>This data was recorded to identify periods when local weather conditions may have resulted in excessive extraneous noise at the microphone (i.e. rainfall).</p>
Site wind speed data	<p>Hub height wind speeds for correlating background noise levels with site wind speeds.</p> <p>Site wind speed data was sourced from a single met mast (AUSawdM810) located within the site, extending to a height of 130 m.</p> <p>Hub height wind speed data (166 m above ground level) was provided by the proponent, based on their analysis to extrapolate the 130 m height anemometer wind speed data to the proposed hub height of 166 m, using site-specific wind shear calculations.</p> <p>Documentation summarising the analysis process is reproduced in Appendix D.</p>

## 2.3 Data analysis

The analysis of the survey data has been conducted in accordance with the NZS 6808. This analysis broadly involves:

- Collating the measured noise levels, site wind speeds and local weather data into a single dataset;
- Filtering the data set to remove measurement results affected by extraneous or atypical noise;
- Filtering the data for the range of site wind speeds in which the turbines are expected to operate;
- Filtering the data where necessary to account for site wind directions; and
- Plotting a chart of noise levels versus wind speeds and determining the line of best fit to the data.

A summary of the key steps in the analysis of the data is presented in Table 3.

**Table 3: Background noise data analysis**

Process	Description
Data collation	Time stamps for each source of measurement data are reviewed to clarify start or end times and measurement time zone.  Measured noise levels, site wind speeds and local weather conditions are then collated for each ten-minute measurement interval.
Local weather data filtering	10-minute intervals are identified and filtered from the analysis if rainfall was identified for any ten-minute measurement interval
Extraneous noise filtering	The measured sound frequencies (one-third octave bands) in each 10-minute interval are used to identify periods that are significantly affected by bird or insect sounds.  10-minute intervals have been identified, and filtered from the analysis, when the following conditions <sup>1</sup> are satisfied: <ul style="list-style-type: none"> <li>• the highest A-weighted one-third octave band noise level is within 5 dB of the broadband A-weighted background noise level for that interval; and</li> <li>• the identified one-third octave band A-weighted noise level is greater than a level of 20 dB L<sub>A90</sub>.</li> </ul>
Time periods	Neither NZS 6808 nor the Victorian Guidelines define separate time periods for the analysis of background noise levels or assessment of wind farm noise. However, in accordance with the requirements commonly defined in Victorian wind farm planning permits, the data sets are considered for separate periods as follows: <ul style="list-style-type: none"> <li>• All periods: no restriction on hours (i.e. data during day and night hours included); and</li> <li>• Night period: 2200 to 0700 hours.</li> </ul>

<sup>1</sup> Griffin, D., Delaire, C., & Pischedda, P. (2013). Methods of identifying extraneous noise during unattended noise measurements. *20th International Congress of Sound & Vibration*.



Process	Description
Regression analysis	<p>Two datasets are plotted on a chart of noise levels versus wind speeds:</p> <ul style="list-style-type: none"> <li>• All data points that have been removed from the analysis using the above processes</li> <li>• The filtered dataset comprising all retained measurement data</li> </ul> <p>The chart of filtered noise levels versus wind speed is reviewed to determine if there are any distinctive trends or gaps in the data which could warrant separation of the measurement results into subgroups (e.g. subgroups for time of day or wind direction).</p> <p>A line of best fit is determined for the filtered data and, where applicable, any subgroups of the filtered data. The line of best fit is determined using a regression analysis of the range of noise levels and wind speeds or, where necessary, analysis of noise levels at individual wind speeds.</p>
Noise limits	<p>Noise limits are defined at each wind speed in accordance with NZS 6808 by a base noise level or the background (<math>L_{A90}</math>) plus 5 dB, whichever is higher. The value of the background noise level at each integer wind speed is defined by the line of best to the measurement results.</p> <p>As presented in the noise assessment detailed in MDA report Rp 001 03Draft 20200098 <i>Watta Wella Wind Farm – Noise Assessment</i> dated 14 June 2022, the base noise level is specified as:</p> <ul style="list-style-type: none"> <li>• 40 dB <math>L_{A90}</math> for non-involved receivers</li> <li>• 45 dB <math>L_{A90}</math> for involved receivers</li> </ul>

### 3.0 SURVEY & ANALYSIS RESULTS

This section presents a summary of the background noise measurement results, analysed in accordance with the method described in Section 2.2.

The analysis results include the noise limits which would be used during compliance monitoring to assess the operational noise of the project.

#### 3.1 Background noise levels

The tabulated data presented in Table 4 and Table 5 summarises the derived background noise levels for the all-time and night-time periods respectively.

The data in these tables is provided for the key wind speeds relevant to the assessment of wind farm noise. The results for all surveyed wind speeds are illustrated in the graphical data provided for each receiver in Appendix F to Appendix I.

**Table 4: Background noise levels, dB L<sub>A90</sub> - All-time period**

Location	Hub height wind speed, m/s <sup>[1]</sup>												
	3	4	5	6	7	8	9	10	11	12	13	14	15
376*	28.0	28.6	29.4	30.2	31.1	32.0	33.0	34.1	35.1	36.2	37.2	38.3	39.3
422	30.6	31.5	32.4	33.2	34.0	34.7	35.3	36.0	36.6	37.1	37.6	38.1	38.5
404	29.2	29.4	29.8	30.3	30.8	31.5	32.2	33.0	33.8	34.6	35.5	36.4	37.3
412	26.3	27.3	28.2	29.2	30.2	31.2	32.2	33.1	33.9	34.7	35.4	35.9	36.3

Note 1: 166 m above ground level at 672316 E, 5904979 N (MGA 94 Zone 54)

\* Involved receiver

**Table 5: Background noise levels, dB L<sub>A90</sub> - Night period**

Location	Hub height wind speed, m/s <sup>[1]</sup>												
	3	4	5	6	7	8	9	10	11	12	13	14	15
376*	25.1	25.7	26.3	27.0	27.8	28.6	29.5	30.5	31.5	32.7	33.9	35.1	36.5
422	29.2	29.6	29.9	30.2	30.5	30.9	31.3	31.7	32.2	32.7	33.4	34.1	34.9
404	28.5	28.1	27.8	27.7	27.7	27.9	28.2	28.7	29.4	30.2	31.2	32.3	33.7
412	23.6	24.9	26.0	27.0	27.8	28.6	29.3	30.0	30.6	31.1	31.6	32.1	32.6

Note 1: 166 m above ground level at 672316 E, 5904979 N (MGA 94 Zone 54)

\* Involved receiver

### 3.2 Noise limits

The limits presented herein are based on background noise levels presented in Section 3.1 and the status of each receiver at the time of preparation of this report.

In particular, the receivers 422, 404 and 412 are considered non-involved locations and the minimum limit is therefore set at 40 dB  $L_{A90}$  in accordance with NZS 6808.

Receiver 376 is considered involved and consistent with the Victorian Wind Energy Guidelines the minimum limit is therefore set at 45 dB  $L_{A90}$ .

As per the background noise data, the tabulated data is provided for the key wind speeds relevant to the assessment of wind farm noise. The derived noise limits for all surveyed wind speeds are illustrated in the graphical data provided for each receiver in Appendix F to Appendix I.

**Table 6: All-hours period operational wind farm noise limits, dB  $L_{A90}$  – All-time period**

Location	Hub height wind speed, m/s <sup>[1]</sup>												
	3	4	5	6	7	8	9	10	11	12	13	14	15
376*	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
422	40.0	40.0	40.0	40.0	40.0	40.0	40.3	41.0	41.6	42.1	42.6	43.1	43.5
404	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.5	41.4	42.3
412	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.4	40.9	41.3

Note 1: 166 m above ground level at 672316 E, 5904979 N (MGA 94 Zone 54)

\* Involved receiver

**Table 7: All-hours period operational wind farm noise limits, dB  $L_{A90}$  – Night period**

Location	Hub height wind speed, m/s <sup>[1]</sup>												
	3	4	5	6	7	8	9	10	11	12	13	14	15
376*	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0	45.0
422	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
404	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0
412	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0	40.0

Note 1: 166 m above ground level at 672316 E, 5904979 N (MGA 94 Zone 54)

\* Involved receiver

#### 4.0 SUMMARY

Background noise monitoring has been conducted at four (4) receivers around the proposed Watta Wella Renewable Energy Project.

The survey and analysis have been carried out on the basis of:

- New Zealand Standard 6808:2010 *Acoustics – The assessment and measurement of sound from wind turbine generators* (NZS 6808), as required by *Policy and Planning Guidelines for Development of Wind Energy Facilities in Victoria* published by the Victorian Department of Environment, Land, Water and Planning issued November 2021 (the Victorian Guidelines).
- Supplementary guidance contained in UK Institute of Acoustics publication *A good practice guide to the application of ETSU-R-97 for the assessment and rating of wind turbine noise* dated May 2013 (UK IOA good practice guide).

The results have been analysed to derive noise limits in accordance with NZS 6808 for surrounding receivers. Specifically, noise limits have been derived at integer hub-height wind speeds as the greater of a minimum limit (40 dB  $L_{A90}$  for non-involved receivers and 45 dB  $L_{A90}$  for involved receivers) and the background level plus 5 dB.

The results of the measurements are to be referenced during any future compliance assessment of the project as an indication of potential background noise levels contributing to the total measured noise levels.

## APPENDIX A GLOSSARY

<b>dB</b>	Decibel. The unit of sound level.
<b>A-weighting</b>	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
<b>L<sub>Aeq</sub></b>	The A-weighted equivalent continuous sound level and is measured in dB.
<b>L<sub>A90</sub></b>	The A-weighted noise level exceeded for 90 % of the measurement period, measured in dB. This is commonly referred to as the background noise level.

The basic quantities used within this document to describe noise adopt the conventions outlined in ISO 1996-1:201– *Acoustics - Description measurement and assessment of environmental noise – Part 1: Basic quantities and assessment procedures*. Accordingly, all frequency weighted sound pressure levels are expressed as decibels (dB) in this report. For example, sound pressure levels measured using an “A” frequency weighting are expressed as L<sub>A</sub> dB. Alternative ways of expressing A-weighted decibels such as dBA or dB(A) are therefore not used within this report.



## APPENDIX B TURBINE COORDINATES

The following table sets out the coordinates of the forty-four (44) turbine layout.

Data supplied by the proponent on 16 October 2020.

**Table 8: Turbine coordinates – MGA 94 zone 94**

Turbine	Easting, m	Northing, m	Terrain elevation, m
1	669,444	5,901,185	257
2	669,738	5,905,755	210
3	670,241	5,899,957	259
4	669,429	5,900,492	269
5	670,668	5,907,054	208
6	671,168	5,906,245	210
7	672,627	5,900,081	233
8	670,786	5,899,686	240
9	671,239	5,901,414	230
10	671,558	5,899,817	230
11	673,186	5,903,128	230
12	670,226	5,905,394	210
13	674,797	5,897,777	242
14	669,836	5,900,227	253
15	672,628	5,903,518	229
16	672,051	5,904,230	220
17	670,418	5,903,851	213
18	671,627	5,906,410	208
19	672,168	5,906,326	210
20	675,363	5,898,078	236
21	671,082	5,899,916	240
22	673,163	5,900,326	234
23	672,473	5,905,084	212
24	673,164	5,899,126	240
25	672,605	5,899,133	235
26	674,502	5,902,083	220
27	674,268	5,903,473	210
28	670,360	5,906,355	210
29	671,647	5,905,106	213
30	673,740	5,902,224	220

Turbine	Easting, m	Northing, m	Terrain elevation, m
31	673,052	5,904,566	215
32	670,755	5,901,213	230
33	672,259	5,902,278	216
34	674,696	5,898,420	240
35	674,735	5,902,637	210
36	675,751	5,898,414	228
37	677,361	5,900,566	220
38	678,084	5,900,510	220
39	671,166	5,903,854	210
40	671,584	5,902,982	210
41	669,487	5,899,801	260
42	670,707	5,902,615	220
43	670,165	5,901,129	243
44	673,623	5,904,175	210

## APPENDIX C SURVEY INSTRUMENTATION

**Table 9: Sound level measurement instrumentation summary**

Item	Description
Equipment type	Automated/unattended integrating sound levels
Make & model	01dB CUBE & DUO
Instrumentation class	Certified to Type 1 / Class 1 (precision grade) standards in accordance with AS 1259.2-1990 <sup>2</sup> and IEC 61672.1-2004 <sup>3</sup>
Instrumentation noise floor	Less than 20 dB
Time synchronisation	Internal GPS clocks
Wind shielding	Enhanced wind shielding system based on the design recommendations detailed in the UK IOA good practice guide. The system comprises an inner solid primary wind shield and an outer secondary large diameter hollow wind shield

**Table 10: Sound level meter installation records**

Receiver	System	Unit serial number	Microphone serial number	Independent calibration date <sup>1</sup>	Calibration drift <sup>2,3</sup>
376*	01dB CUBE	10510	161869	12/06/2021	+0.17 dB
422	01dB DUO	10196	331724	23/06/2021	+0.00 dB
404	01dB CUBE	10657	161822	25/05/2021	+0.14 dB
412	01dB CUBE	10514	161824	13/07/2020	+0.18 dB

Note 1: Independent (laboratory) calibration date to be within 2 years of measurement period as per AS 1055-1:1997<sup>4</sup>

Note 2: Difference between reference level checks during deployment and collection of instruments

Note 3: Calibration drift should not be greater than 1 dB as specified in AS 1055-1:1997

\* Involved receiver

**Table 11: Wind speed measurement instrumentation**

Wind speeds	Description
Local wind speeds	Vaisala VTX 250 weather station (serial number 215524) positioned at receiver 422
Site wind speeds	Third party owned and operated system comprising of 1 monitoring location with the use of Fulcrum3D SODAR Data Logger. Further information provided in Appendix D.

<sup>2</sup> AS 1259.2-1990: *Acoustics - Sound level meters - Integrating - Averaging*

<sup>3</sup> IEC 61672.1-2004: *Electroacoustics - Sound level meters - Specification*

<sup>4</sup> AS 1055-1:1997 *Acoustics – Description and measurement of environmental noise - Part 1: General Procedures*

## APPENDIX D SITE WIND SPEED DATA DERIVATION

This appendix reproduces correspondence provided by the proponent documenting the process used to derive the 166 m AGL wind speeds required to analyse the measured background noise data.

Below is information provided by the proponent in an email dated 3 February 2022.

*The shear was calculated between 150 m to 110 m and then applied to the data at 130 m to extrapolate up to 166 m.*

*When extrapolating such a short distance it is preferable to use closer measurement heights as this is more representative of the shear at this height. Given this I favoured using 150 m – 130 m and then applied the calculated shear to the data at 150 m (gap filling with the 130 m data and using a time of day value where no real time shear could be calculated)*

## APPENDIX E SUMMARY OF BACKGROUND NOISE LEVELS

Table 12: Regression equation coefficients - All-time period

Regression equation coefficients for background noise equation of best fit $L_{A90} = ax^3+bx^2+cx+d$ , where x = windspeed in m/s						
Location	a	b	c	d	R <sup>2</sup>	Valid wind speed range, m/s
376*	-0.0021	0.0736	0.2004	26.79	0.3133	3-20
422	0.0003	-0.02887	1.095	27.6	0.1382	3-20
404	-0.000192	0.08161	-0.2553	29.28	0.1717	3-20
412	-0.00308	0.05947	0.6172	24.05	0.2054	3-17

\* Involved receiver

Table 13: Regression equation coefficients - Night period

Regression equation coefficients for background noise equation of best fit $L_{A90} = ax^3+bx^2+cx+d$ , where x = windspeed in m/s						
Location	a	b	c	d	R <sup>2</sup>	Valid wind speed range, m/s
376*	-	0.03613	0.296	23.92	0.4286	3-20
422	0.002240	-0.0385	0.5458	27.85	0.1171	3-20
404	0.00033	0.07115	-0.9446	30.72	0.1933	3-20
412	0.00193	-0.08629	1.758	19.1	0.1991	3-20



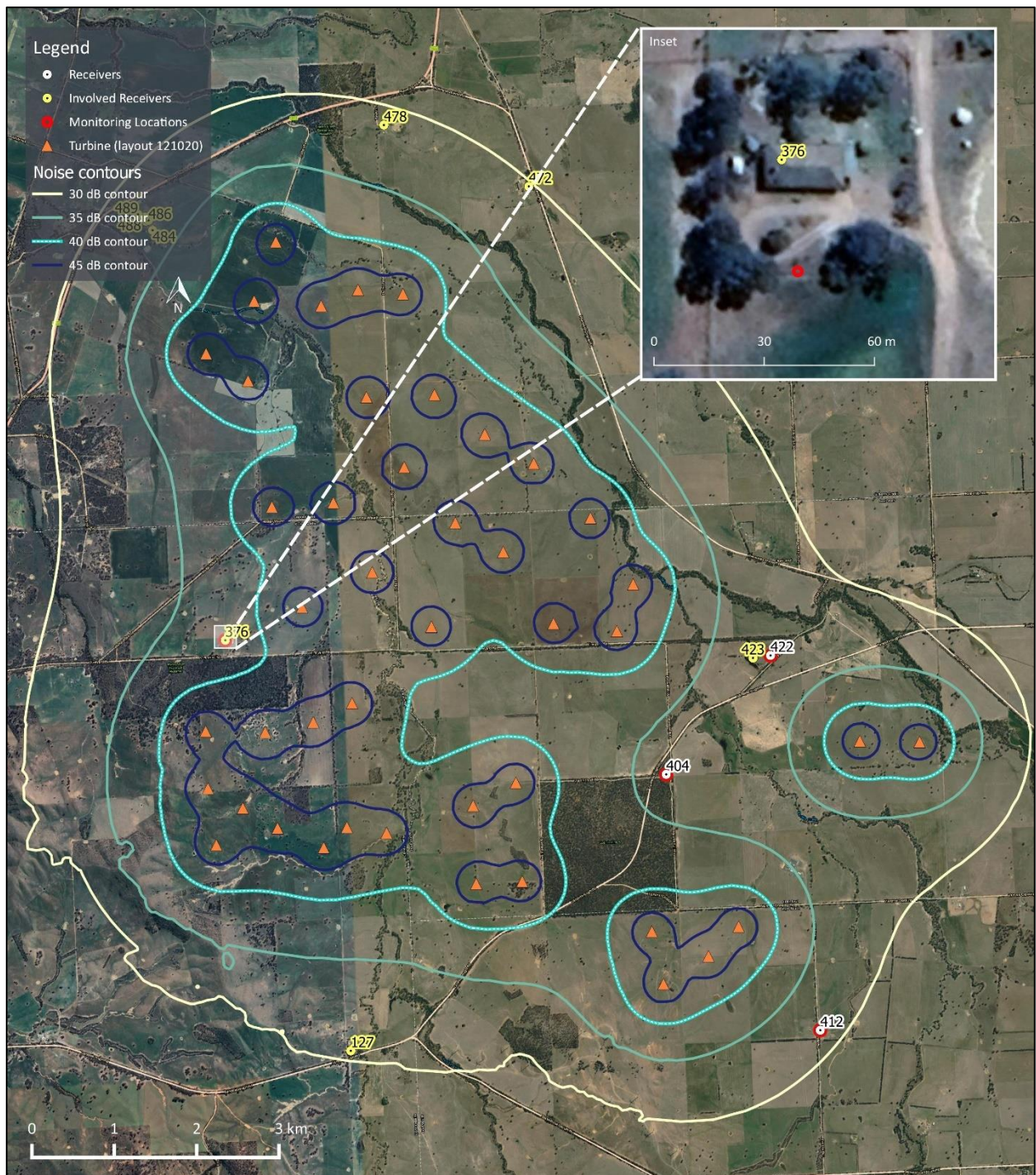
## APPENDIX F RECEIVER 376 DATA

### F1 Receiver 376 location data

Table 14: Receiver 376 dwelling and noise monitor coordinates – MGA 94 Zone 54

Location	Easting	Northing
Dwelling location	669,752	5,902,272
Background noise monitoring location	669,755	5,902,243

Figure 2: Receiver 376 aerial view – dwelling and noise monitor locations





**Table 15: Receiver 376 monitor installation photos**

Looking North	Looking East
	
Looking South	Looking West
	

## F2 Receiver 376 measurement data summary

Table 16: Receiver 376 background noise level analysis summary

Item	All-time period	Night period
Number of data points collected	7,484	2,800
Number of data points removed	2,059	1,044
Number of data points for analysis	5,425	1,756

Figure 3: Receiver 376 background noise level and wind speed time history

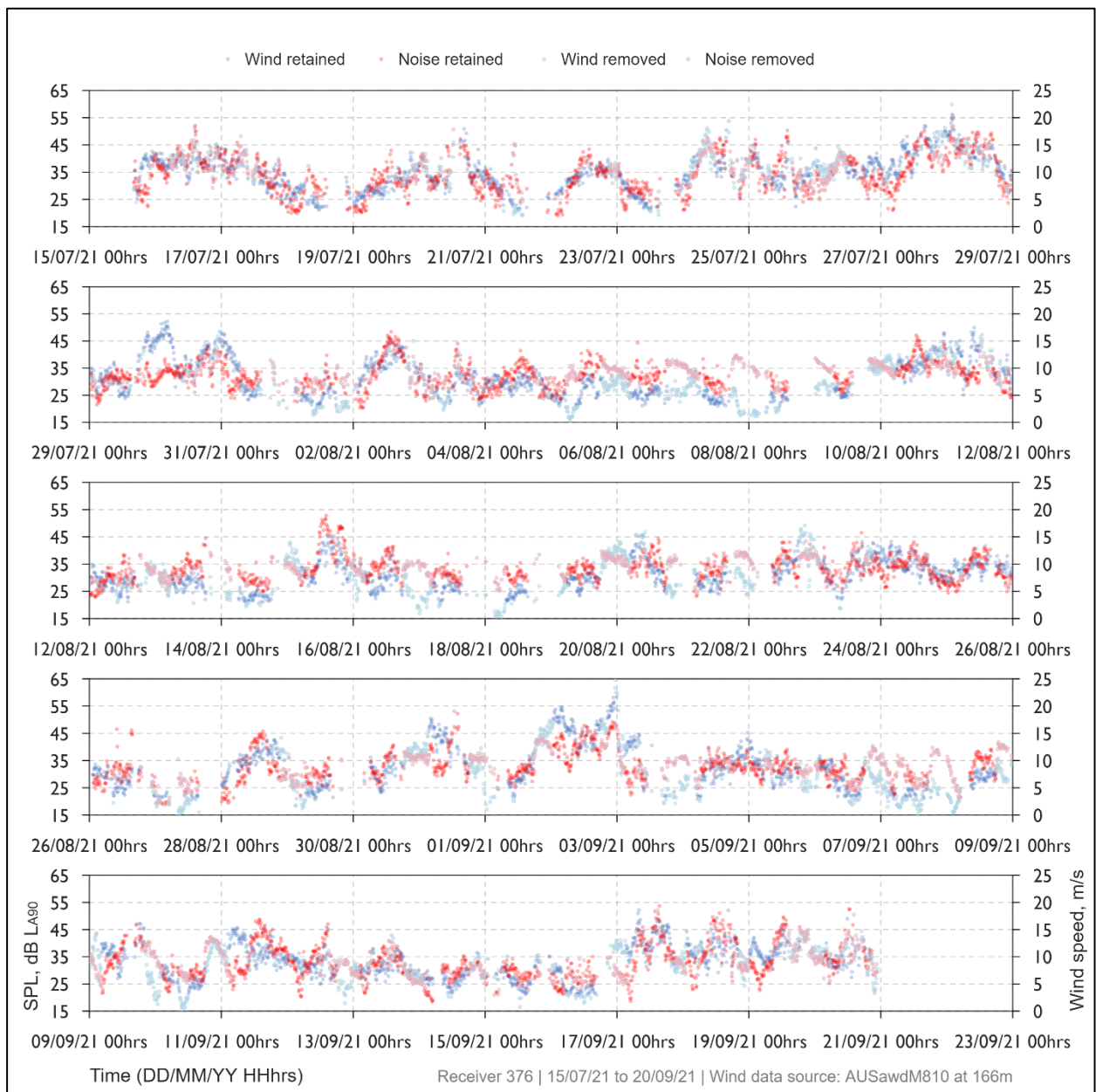




Figure 4: Receiver 376 all-time periods – derived background noise levels and noise limits

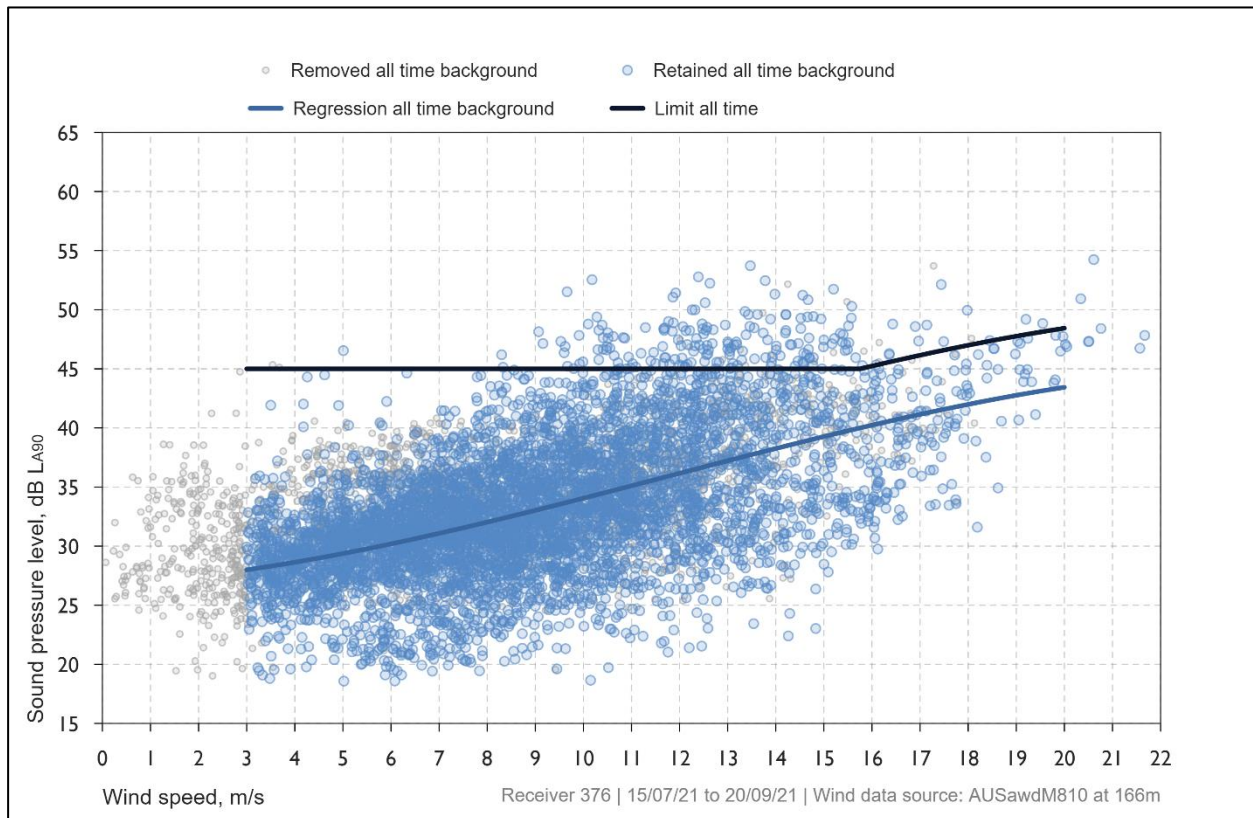
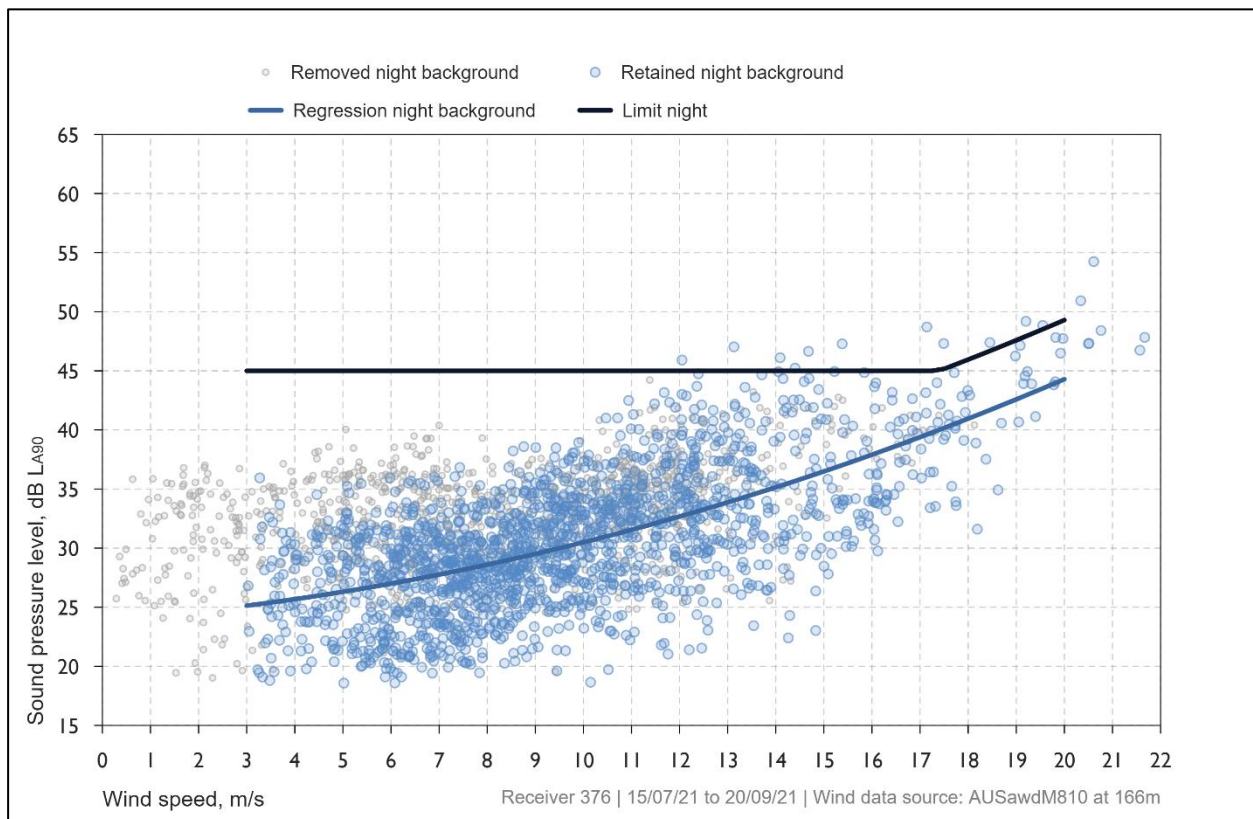


Figure 5: Receiver 376 night-time periods – derived background noise levels and noise limits





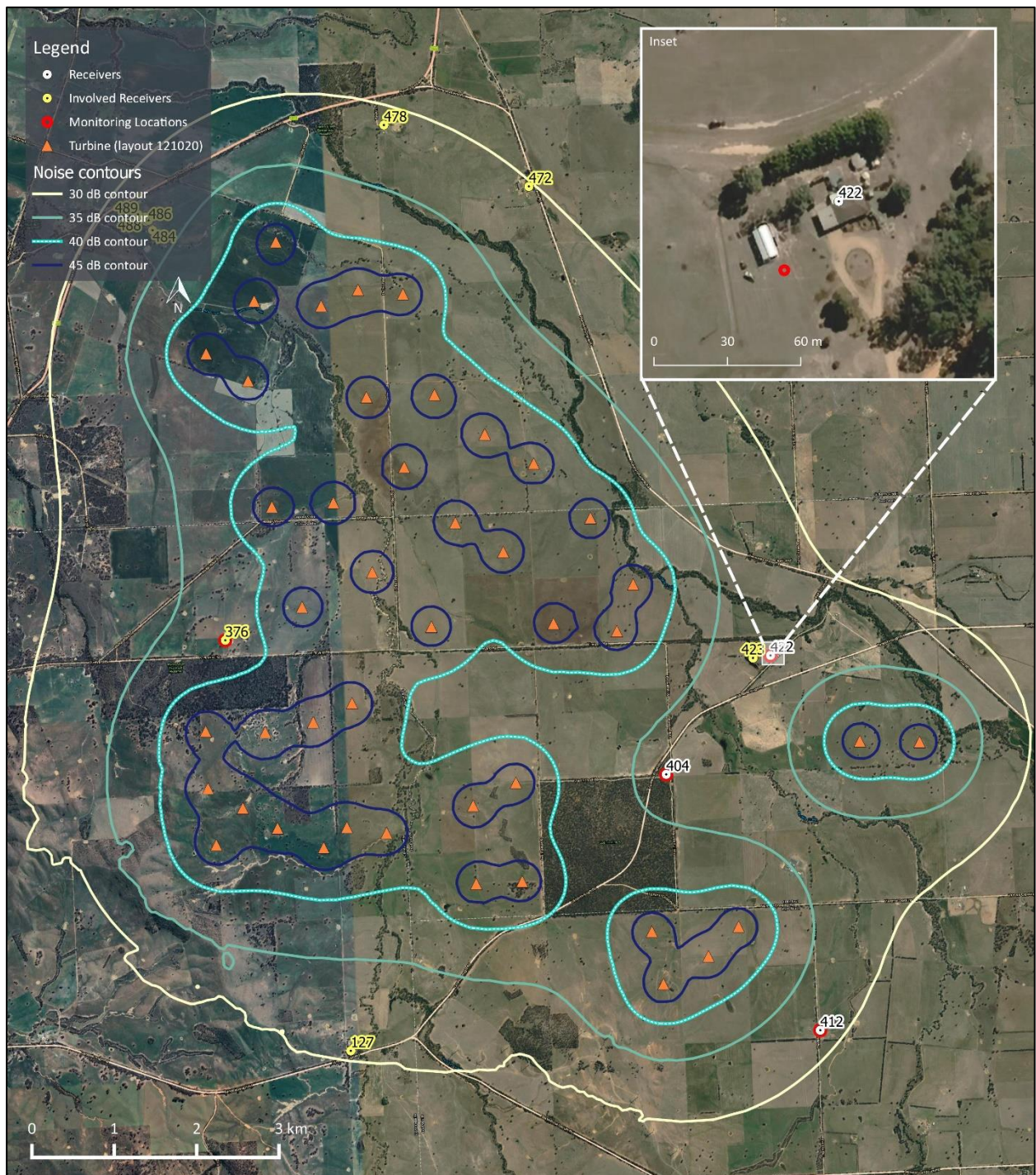
## APPENDIX G RECEIVER 422 DATA

### G1 Receiver 422 location data

Table 17: Receiver 422 dwelling and noise monitor coordinates – MGA 94 Zone 54

Location	Easting	Northing
Dwelling location	676,344	5,901,671
Background noise monitoring location	676,321	5,901,646

Figure 6: Receiver 422 aerial view - dwelling and noise monitor locations





**Table 18: Receiver 422 monitor installation photos**

Looking North	Looking East
	
Looking South	Looking West
	

## G2 Receiver 422 measurement data summary

Table 19: Receiver 422 background noise level analysis summary

Item	All-time period	Night period
Number of data points collected	7,513	2,811
Number of data points removed	2,421	1,277
Number of data points for analysis	5,092	1,534

Figure 7: Receiver 422 background noise level and wind speed time history

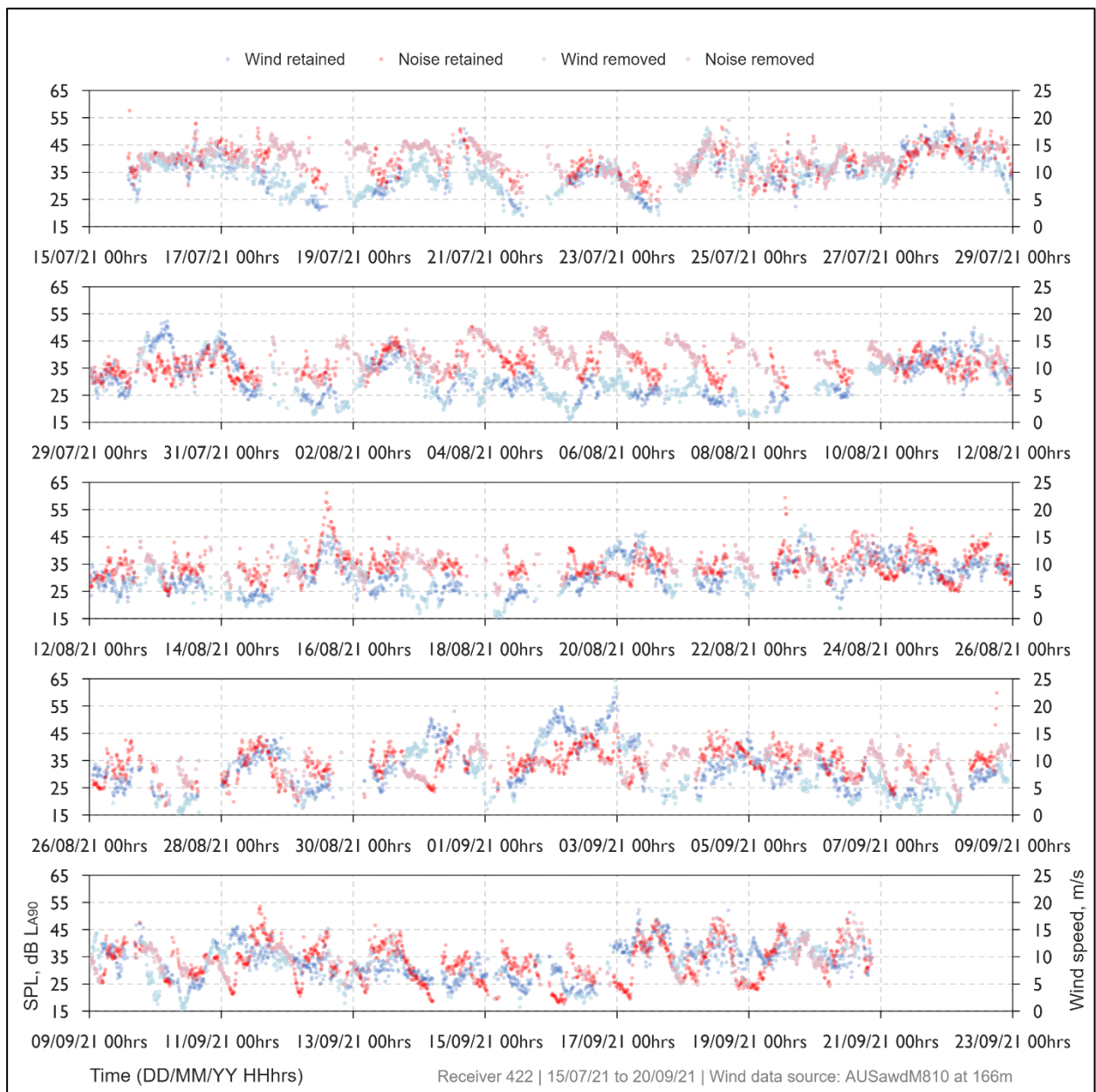


Figure 8: Receiver 422 all-time periods – derived background noise levels and noise limits

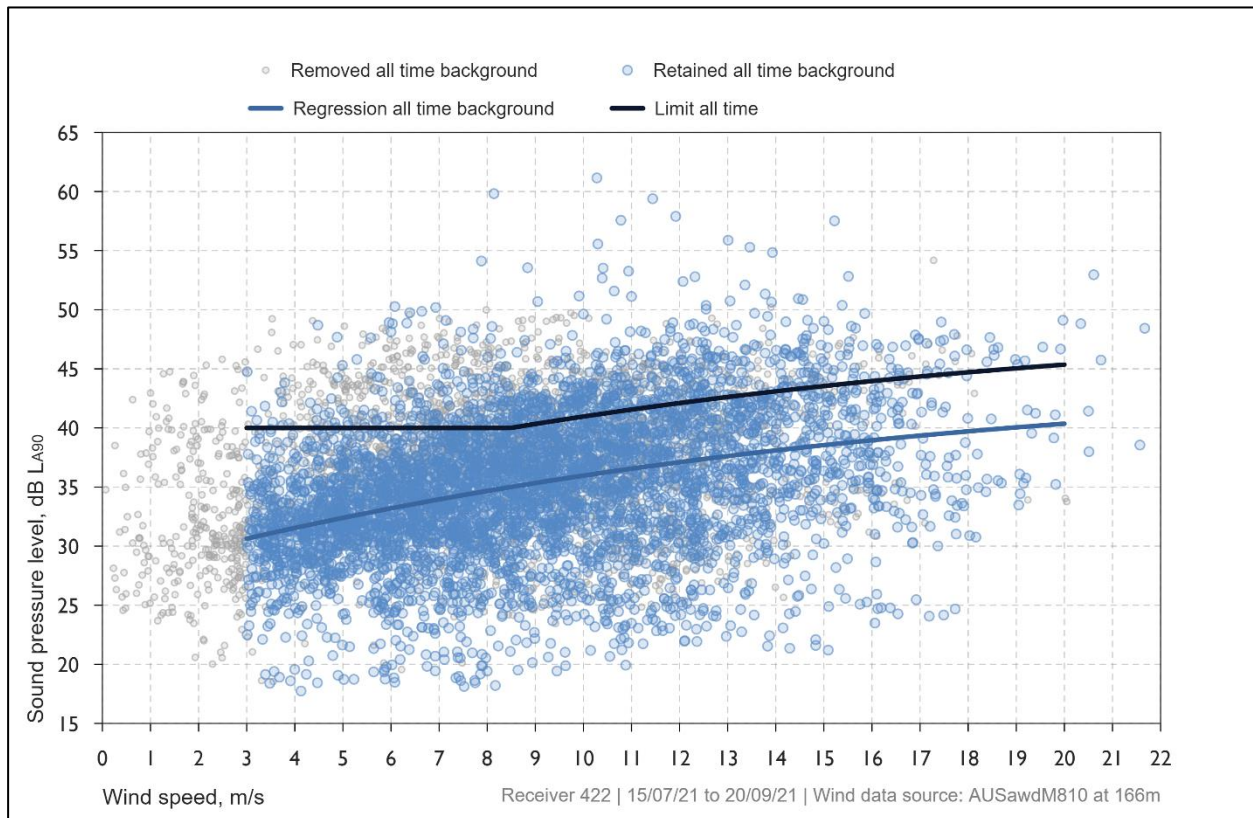
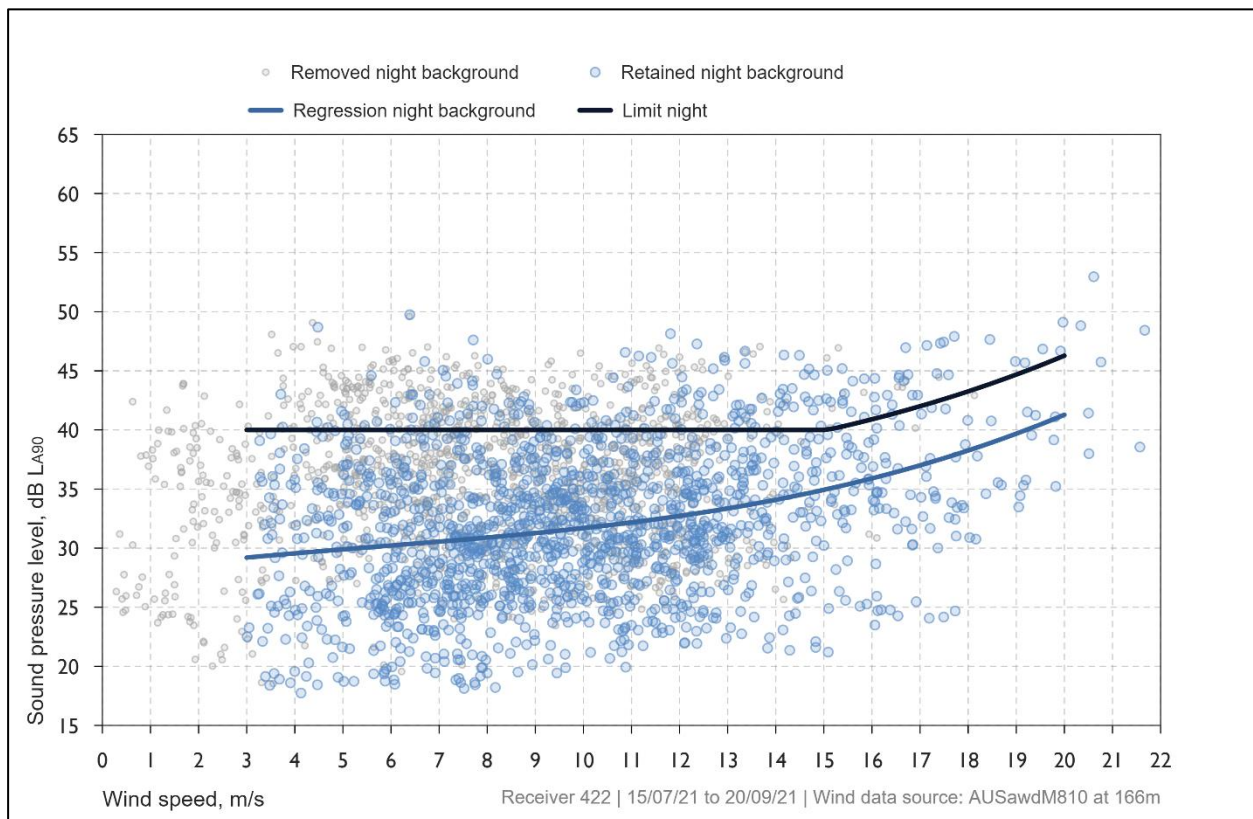


Figure 9: Receiver 422 night-time periods – derived background noise levels and noise limits





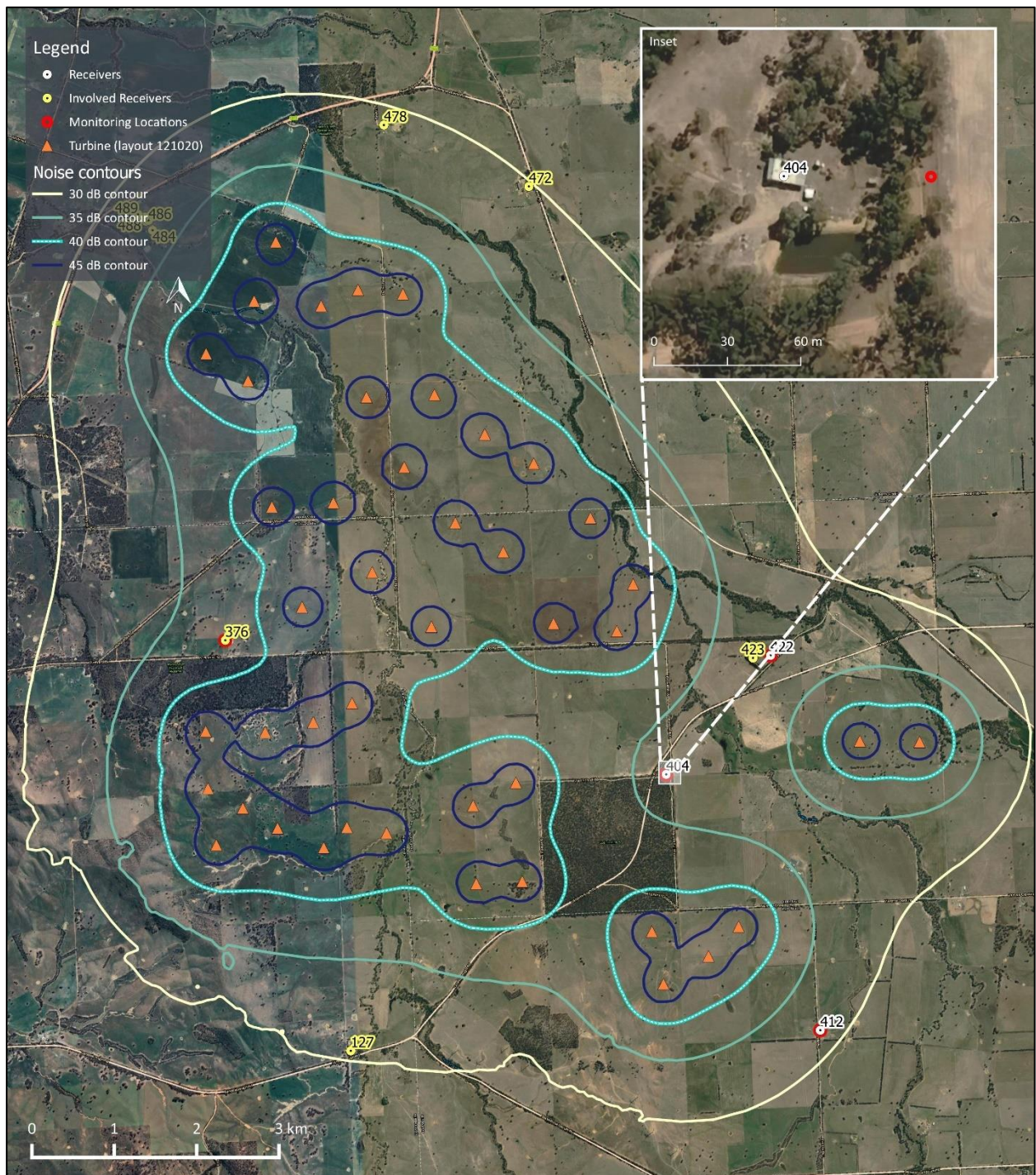
## APPENDIX H RECEIVER 404 DATA

### H1 Receiver 404 location data

Table 20: Receiver 404 dwelling and noise monitor coordinates – MGA 94 Zone 54

Location	Easting	Northing
Dwelling location	674,990	5,900,312
Background noise monitoring location	675,071	5,900,343

Figure 10: Receiver 404 aerial view - dwelling and noise monitor locations





**Table 21: Receiver 404 monitor installation photos**

Looking North	Looking East
	
Looking South	Looking West
	



## H2 Receiver 404 measurement data summary

Table 22: Receiver 404 background noise level analysis summary

Item	All-time period	Night period
Number of data points collected	7,467	2,783
Number of data points removed	1,222	496
Number of data points for analysis	6,245	2,287

Figure 11: Receiver 404 background noise level and wind speed time history

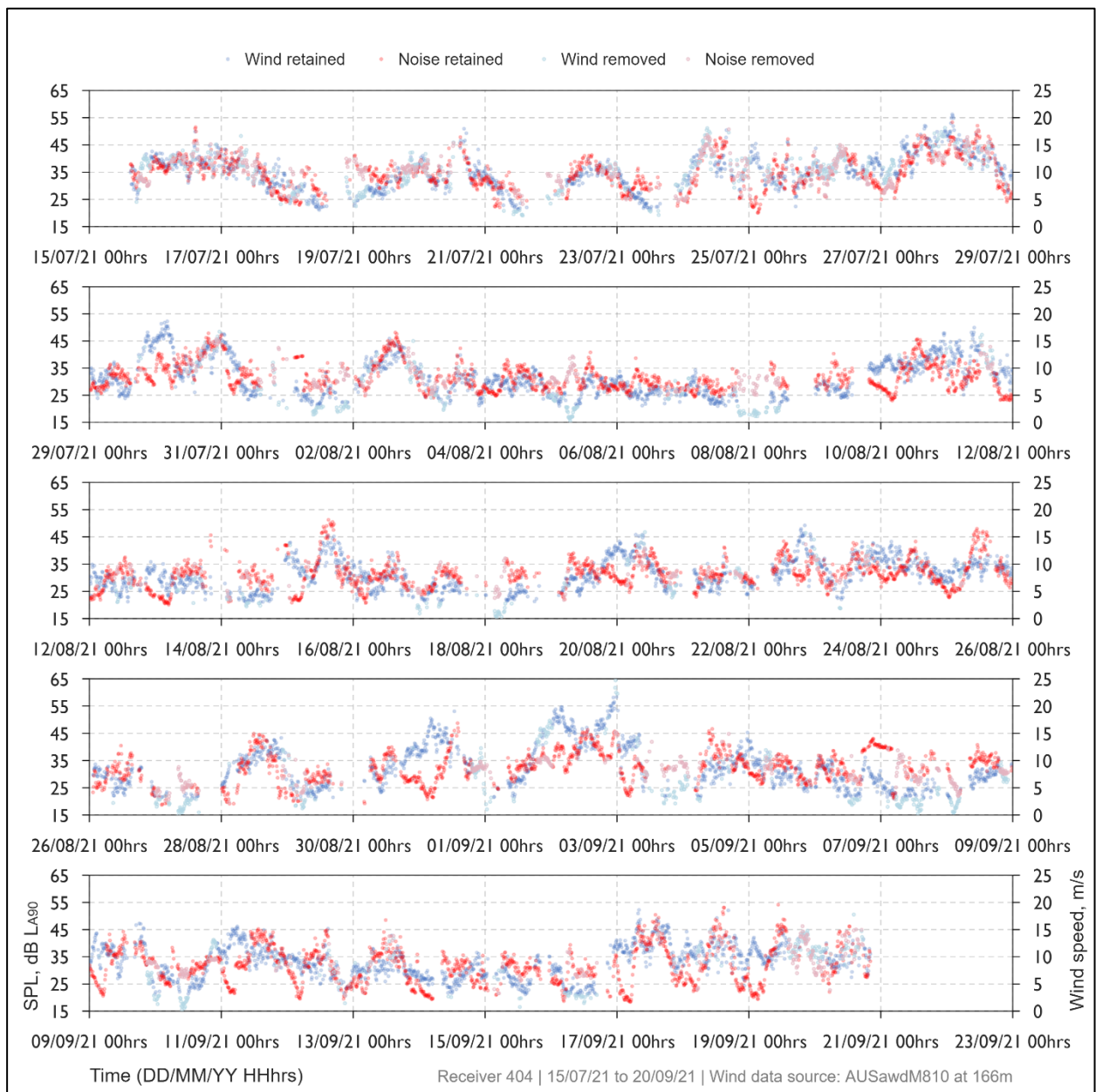


Figure 12: Receiver 404 all-time periods – derived background noise levels and noise limits

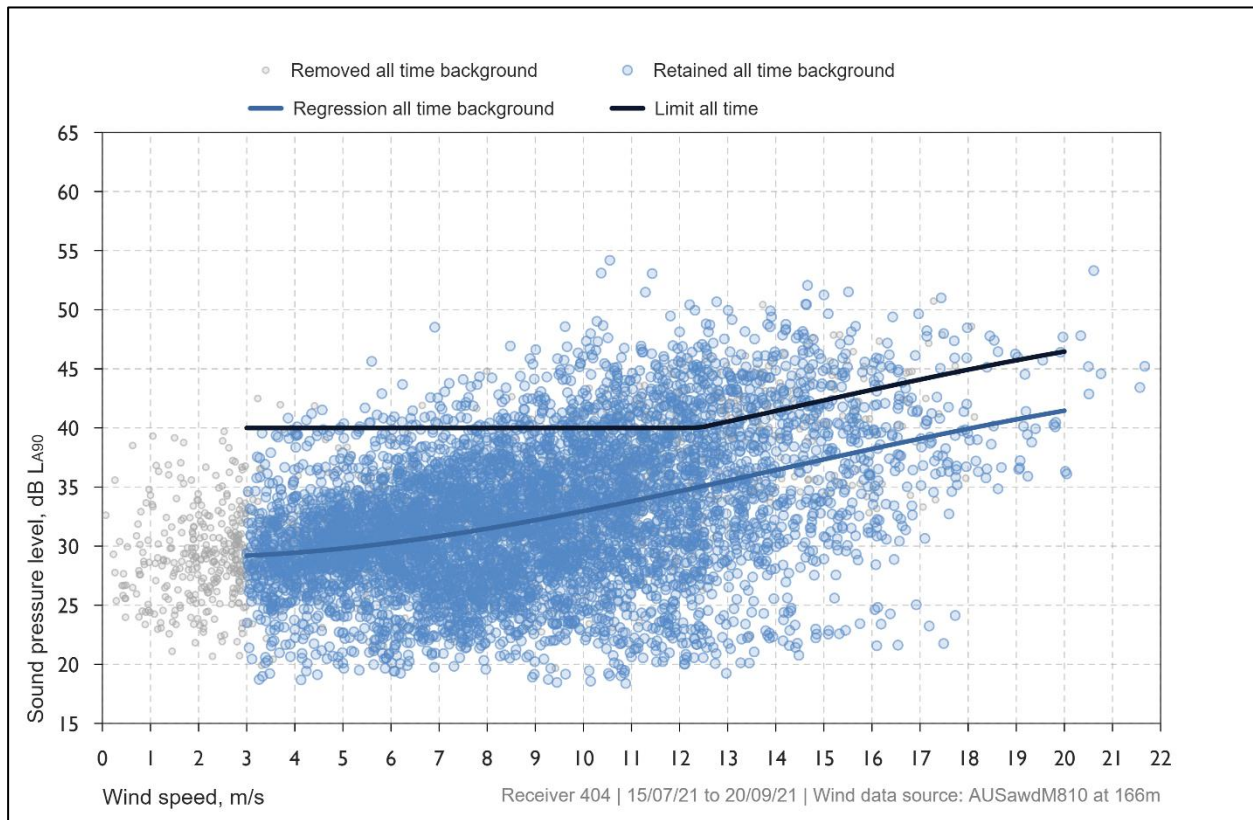
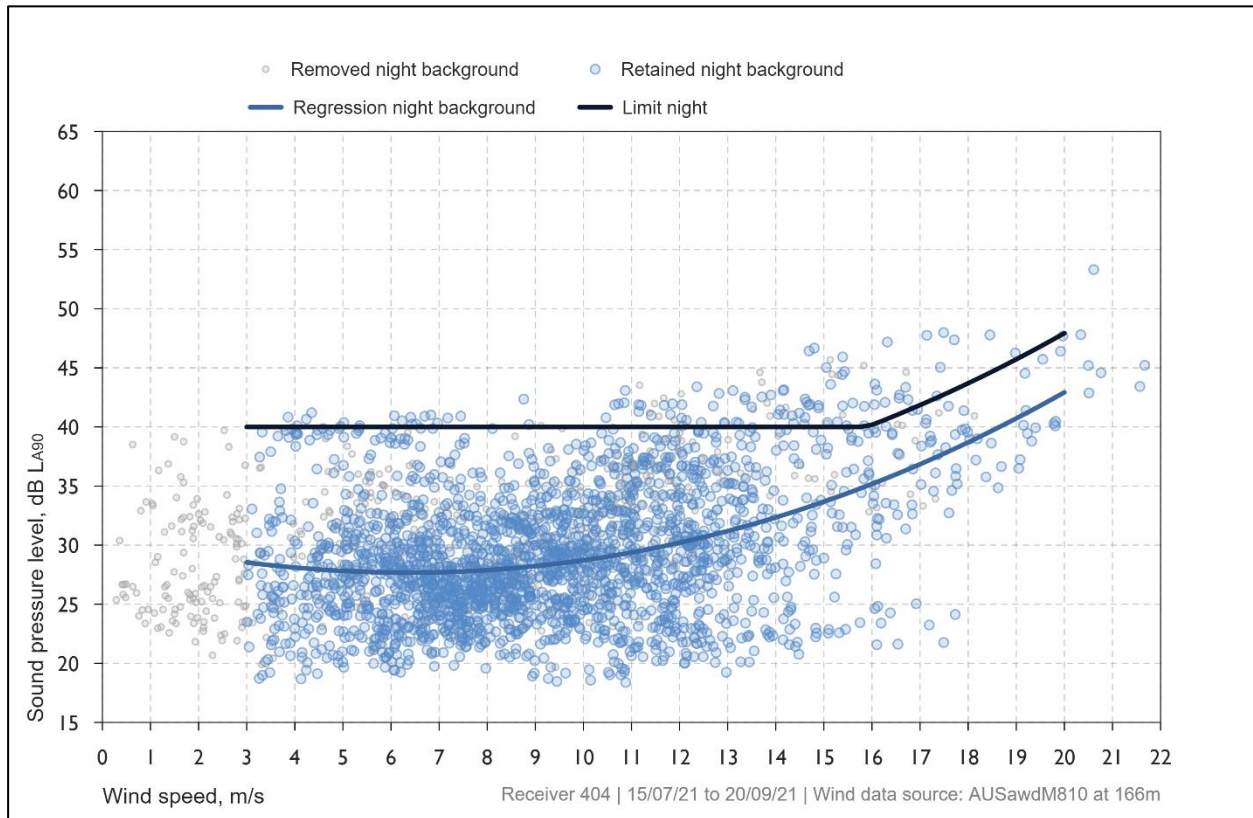


Figure 13: Receiver 404 night-time periods – derived background noise levels and noise limits





## APPENDIX I RECEIVER 412 DATA

### I1 Receiver 412 location data

Table 23: Receiver 412 dwelling and noise monitor coordinates – MGA 94 Zone 54

Location	Easting	Northing
Dwelling location	676,660	5,897,097
Background noise monitoring location	676,579	5,897,120

Figure 14: Receiver 412 aerial view - dwelling and noise monitor locations

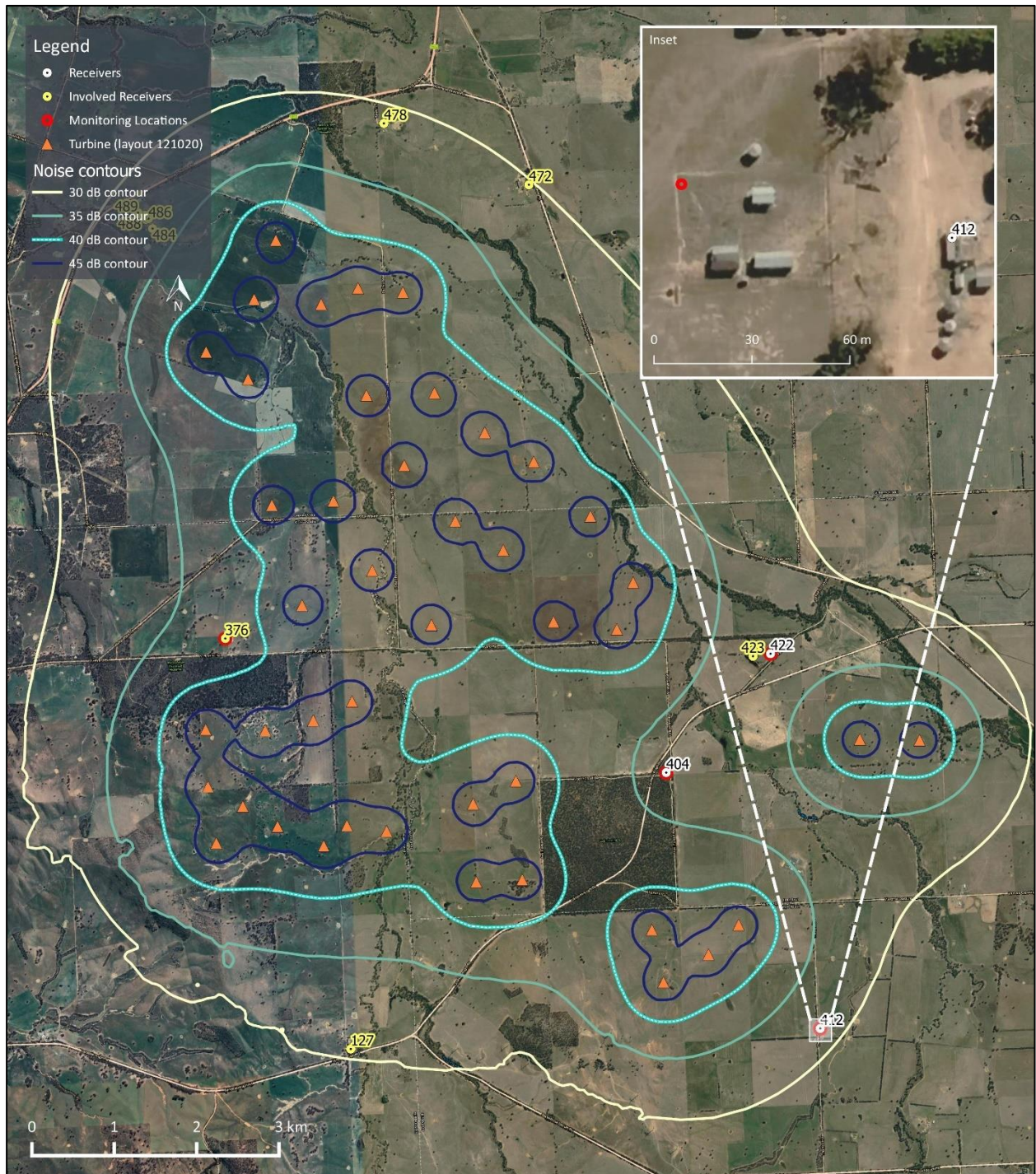








Table 24: Receiver 412 monitor installation photos

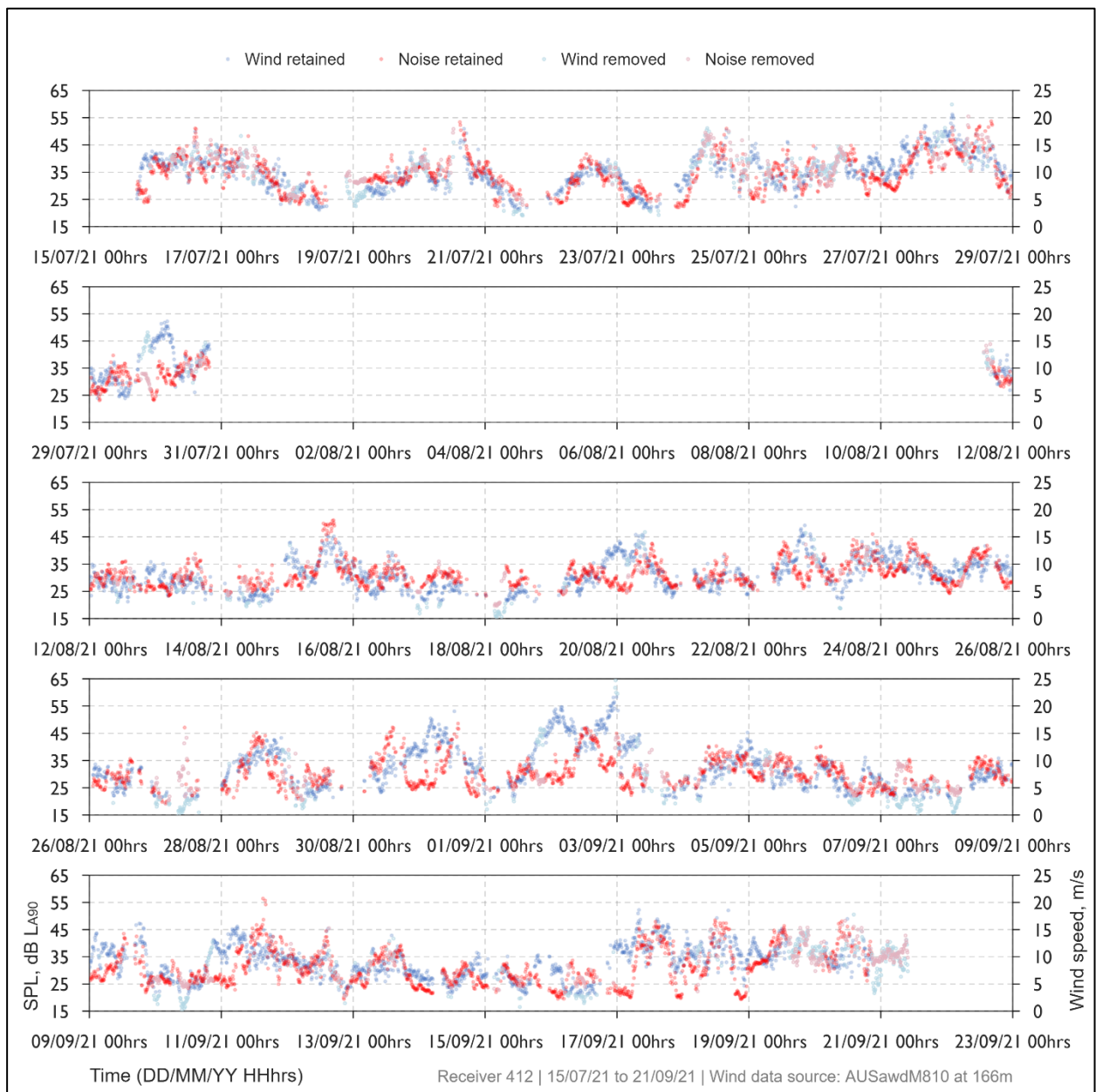
Looking North	Looking East
	
Looking South	Looking West
	

## I2 Receiver 412 measurement data summary

Table 25: Receiver 412 background noise level analysis summary

Item	All-time period	Night period
Number of data points collected	5,354	2,353
Number of data points removed	915	382
Number of data points for analysis	6,269	1,971

Figure 15: Receiver 412 background noise level and wind speed time history



As shown above, there was a period of approximately 11 days when no data was recorded. This has been attributed to an internal error and resulted in the duration of the monitoring period being extended once the issue was resolved.

Figure 16: Receiver 412 all-time periods – derived background noise levels and noise limits

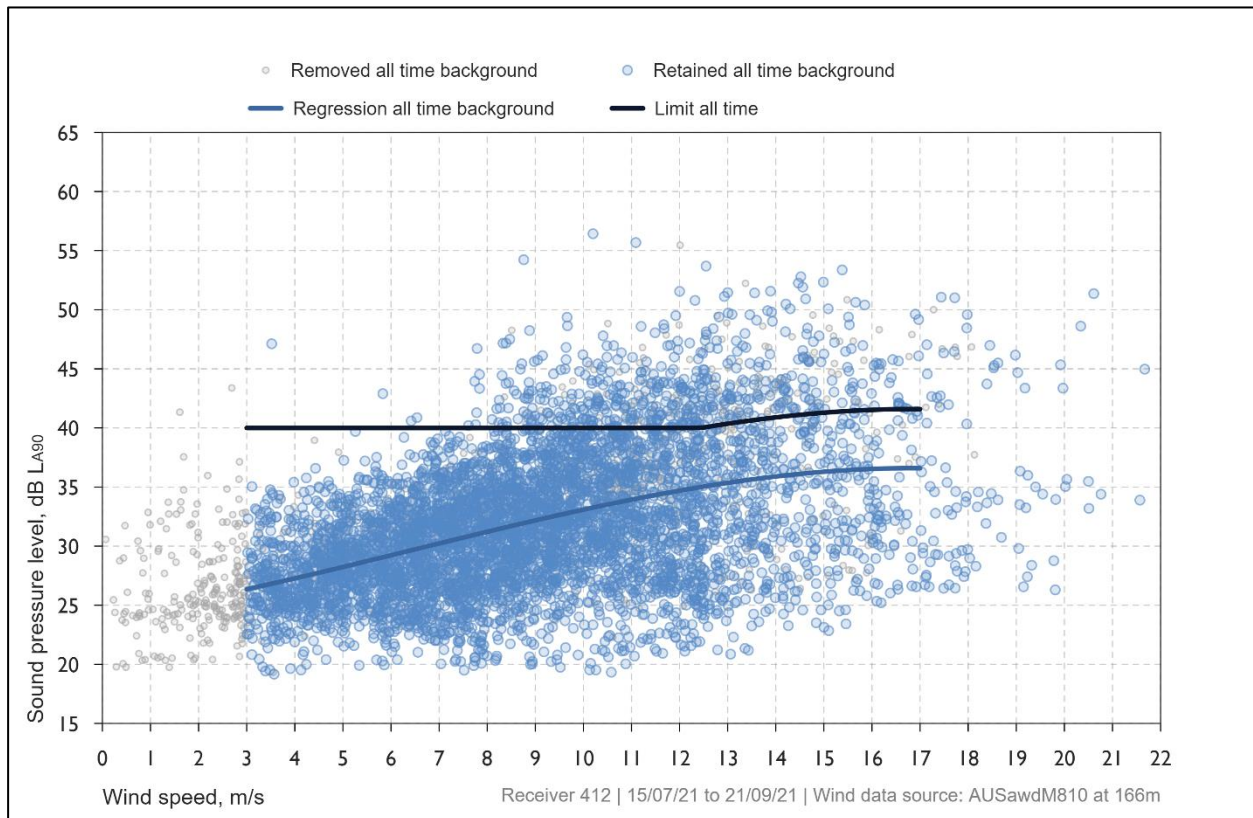
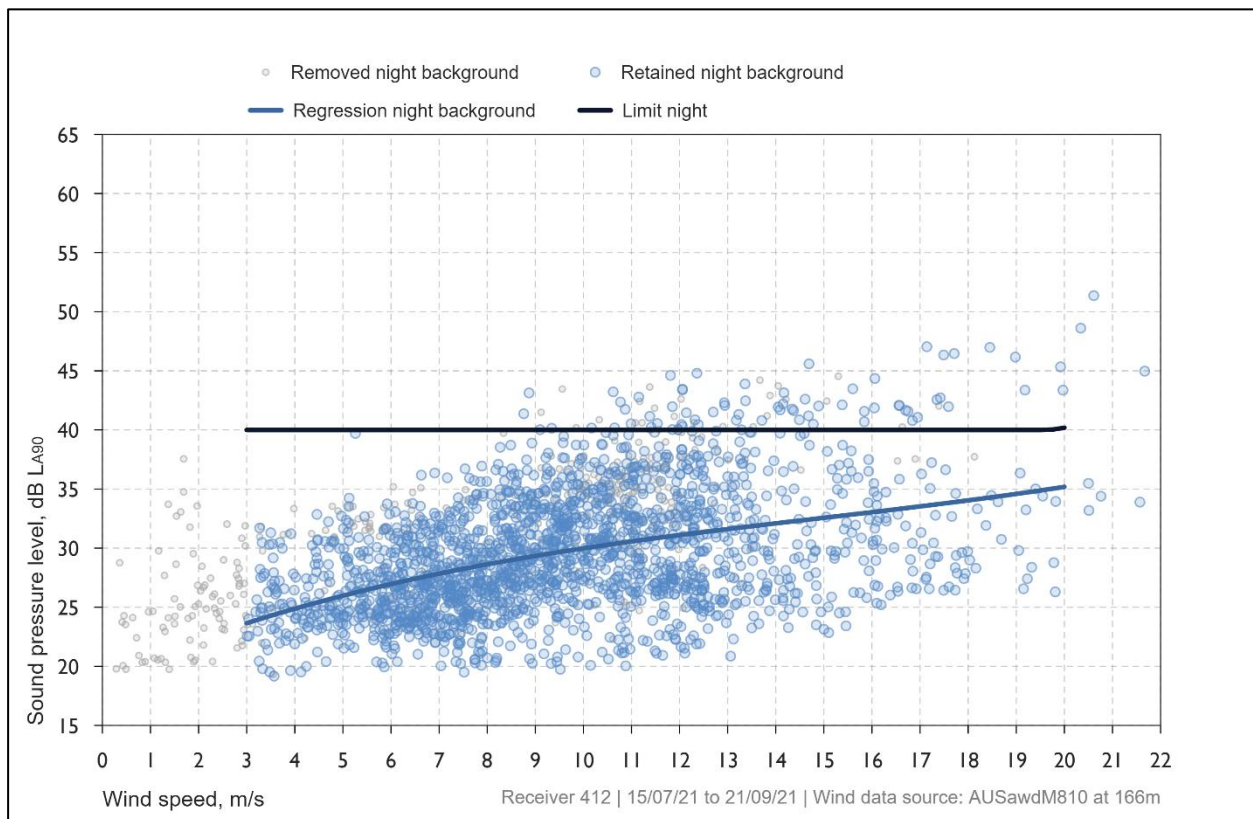


Figure 17: Receiver 412 night-time periods – derived background noise levels and noise limits





## APPENDIX J DOCUMENTATION

Section 8.2 of NZS 6808 specifies the information to be included in a background noise measurement and assessment report. The information requirements, and the report section(s) where the information has been provided, are detailed below.

**Table 26: NZS 6808 reporting requirements for compliance assessments**

Section 8.3 subclause	Reporting requirement	Report section
(a)	Description of the sound monitoring equipment including any ancillary equipment	Appendix C
(b)	The location of sound monitoring positions	Section 2.1
(c)	Description of the anemometry equipment including the height AGL of the anemometer	Appendix C
(d)	Position of wind speed measurements	Appendix C
(e)	Time and duration of monitoring period	Section 2.2
(f)	Averaging period for both sound and wind speed measurements	Section 2.2
(g)	Atmospheric conditions: the wind speed and direction at the wind farm position and rainfall shall be recorded	Data available upon request
(h)	Number of data pairs measured (wind speed in m/s, background sound in $L_{90}$ )	Appendix F to Appendix I
(i)	Description of the regression analysis	Appendix E
(j)	Graphical plots showing the data scatter and the regression lines	Appendix F to Appendix I