MARSHALL DAY Acoustics

GELLIONDALE WIND FARM
BACKGROUND NOISE MONITORING

Rp 001 20211133 | 9 June 2023

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1.0 INTRODUCTION

This report presents the results of background noise monitoring undertaken for the proposed Gelliondale Wind Farm (subsequently referred to as GWF herein).

The background noise monitoring was commissioned by Synergy Wind P/L (Synergy) as part of the noise studies associated with the planning application. The background noise monitoring was undertaken to obtain a representation of typical baseline conditions at noise sensitive locations in the vicinity of the wind farm.

This report documents the survey method and the results of the background noise monitoring, which can be used to derive noise limits for assessing the wind farm's compliance with operational noise conditions.

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

Throughout this report, the term *receiver* is used to identify existing noise sensitive locations in the vicinity of the proposed wind energy facility.

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*, dated 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

At the time of the survey planning, five (5) preferred noise monitoring locations were identified on the basis of:

- A total of twelve (12) turbines[1] located at the coordinates detailed in Appendix C;
- The noise monitoring procedures outlined in NZS 6808; and
- Upper predicted operational wind farm noise levels as detailed in Appendix C[2].

It is noted that consent to undertake background noise monitoring was not granted at all preferred receivers presented in Appendix C. Accounting for the above factors, noise monitoring was undertaken at the five (5) receivers illustrated in Figure 1, where access was available for the deployment of unattended noise monitoring equipment.

Synergy provided a summary of their engagement with landowners for the preferred monitoring locations, as detailed in Appendix C. Prior to construction of the wind farm, background noise monitoring may be undertaken at additional receivers, should consent be provided.

Table 1: Background noise monitoring locations

Receiver	Direction from wind farm	Distance from nearest turbine
H02	West	Approximately 830 metres
H05	North	Approximately 500 metres
H06	North and west	Approximately 870 metres
H11	East	Approximately 720 metres
N048	Northwest	Approximately 1,140 metres

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.

[1] As presented in Figure 1, the current layout is proposed to comprise thirteen (13) turbines.

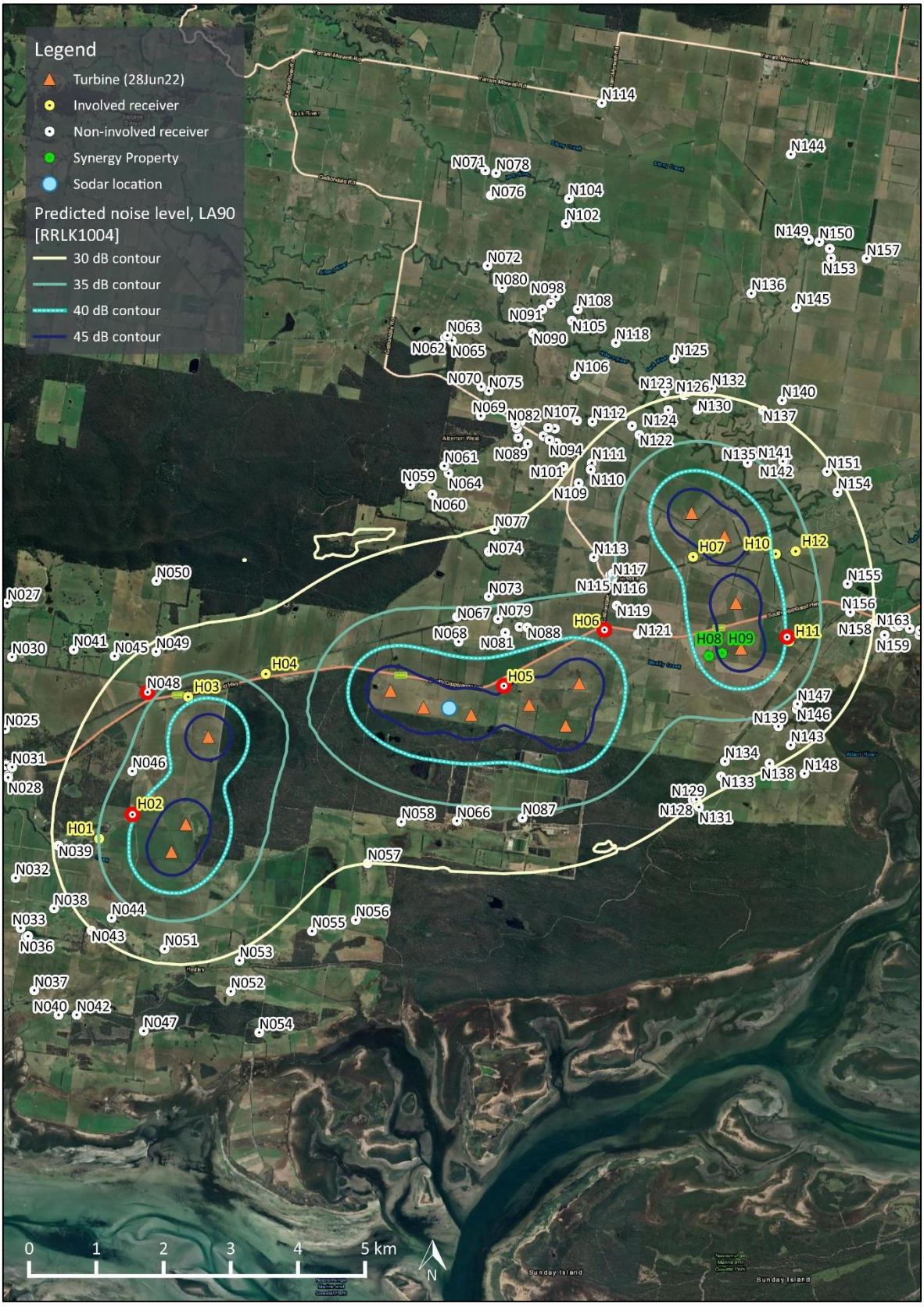
[2] Predicted noise levels using the method detailed in MDA report Rp 002 R01 *Gelliondale Wind Farm – Environmental Noise Assessment*, dated 9 June 2023 (the Noise Assessment Report)

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 G to Appendix K.

Figure 1: Monitoring locations relative to the proposed Gelliondale Wind Farm



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	Five (5) residential receivers as described in Section 2.1.
Monitoring Period	14 July to 2 September 2022 equating to approximately seven (7) weeks at each location. 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.
Sound level meters	Class 1 automated sound loggers (most accurate class rating for field usage). 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. See equipment specifications and calibration records in Appendix B.
Noise measurement data	A-weighted average and statistical sound pressure levels. One-third octave band frequency noise levels and a brief audio sample every ten (10) minutes to aid the identification of extraneous noise influences.
Local wind speed and rainfall data	A weather station was installed beside one of the noise monitoring locations to concurrently record rainfall and wind speeds at microphone height. This data was recorded to identify periods when local weather conditions may have resulted in excessive extraneous noise at the microphone (i.e. rainfall).
Site wind speed data	Hub height wind speeds for correlating background noise levels with site wind speeds. Site wind speed data was sourced from a SODAR located within the planned wind farm (see Figure 1 in Section 2.1). Wind speed data at 128 m was provided by Synergy Wind, based on analysis conducted by WSP Australia Pty Ltd using site-specific wind shear calculations. Details of the SODAR are provided in Appendix D. Documentation summarising the analysis process is reproduced in Appendix E.

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[3] are satisfied: • 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 • the identified one-third octave band A-weighted noise level is greater than a level of 20 dB L_{A90}.
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, diurnal trends were evident in the measurements. Therefore, consistent with common practice in Victoria, the data sets are considered for separate periods as follows: • All periods: no restriction on hours (i.e. data during day and night hours included) • Night period: 2200 to 0700 hours

[3] 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	Two datasets are plotted on a chart of noise levels versus wind speeds: • All data points that have been removed from the analysis using the above processes • The filtered dataset comprising all retained measurement data 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). 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.

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.

3.1 Noise environment

The noise environment in the vicinity of the project comprises a range of noise sources, including natural sources typical of a rural environment (e.g. wind disturbed vegetation, fauna, rain, etc.) and anthropogenic sources such as road traffic and agricultural activity. The survey results at most locations indicate higher background noise levels at low wind speeds than is typically observed in rural environments. Listening checks for selected audio recordings identified road traffic noise as a significant contributor to the measured noise levels at receivers along the South Gippsland Highway. Fauna noise associated with birds, insects and frogs was also regularly and clearly audible in the reviewed sample of audio recordings. Given the diurnal nature of some of these noise sources, a separate analysis was conducted for the night period (0700-2200 hrs) at all monitored receivers.

The types of sources referred to above are expected to be recurring features of the background noise environment at the site. However, in the case of Receiver H11, the review of selected audio recordings indicated the presence of continuous plant noise similar in character to a standby generator. This is unlikely to be a persistent feature of the noise environment. As such, the survey results for this receiver are not suitable to represent typical background noise levels at this receiver. Therefore, while the data is provided for reference purposes, it cannot be used to derive background dependent noise limits.

3.2 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 location in Appendix G to Appendix K.

Table 4: All-time period – background noise levels, dB L_{A90}

Location	Hub height wind speed, m/s [1]												
	3	4	5	6	7	8	9	10	11	12	13	14	15
H02 (I)	29.1	29.3	29.8	30.5	31.3	32.3	33.4	34.5	35.7	36.8	37.9	38.8	39.7
H05 (I)	32.4	32.7	33.0	33.4	33.9	34.5	35.1	35.8	36.5	37.3	38.2	39.2	40.3
H06 (I)	32.0	32.3	32.8	33.5	34.4	35.5	36.7	38.0	39.4	40.8	42.2	43.5	44.7
H11 (I) [2]	*37.4*	*37.8*	*38.2*	*38.6*	*39.0*	*39.5*	*39.9*	*40.4*	*40.9*	*41.5*	*42.2*	*43.0*	*43.8*
N048	32.4	33.0	33.9	35.1	36.6	38.2	39.9	41.6	43.3	45.0	46.5	47.9	49.0

Note 1: 128 m above ground level at 463232 E, 5723351 N (MGA 94 Zone 55)
Note 2: Values presented for reference only, see discussion in Section 3.1
(I) Involved receiver

Table 5: Night time period – background noise levels, dB L_{A90}

Location	Hub height wind speed, m/s [1]												
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**
H02 (I)	-	25.4	25.5	26.2	27.1	28.4	29.9	31.5	33.1	34.8	36.3	37.7	38.8
H05 (I)	-	27.8	27.8	28.2	28.8	29.7	30.7	31.9	33.2	34.6	36.1	37.6	39.0
H06 (I)	-	26.2	26.5	27.2	28.3	29.7	31.3	33.1	35.0	36.9	38.9	40.7	42.4
H11 (I) [2]	-	*32.9*	*33.0*	*33.3*	*33.8*	*34.4*	*35.2*	*36.1*	*37.1*	*38.2*	*39.3*	*40.5*	*41.8*
N048	28.8	29.0	29.8	31.1	32.9	35.1	37.4	39.8	42.2	44.4	46.3	47.7	48.7

Note 1: 128 m above ground level at 463232 E, 5723351 N (MGA 94 Zone 55)
Note 2: Values presented for reference only, see discussion in Section 3.1
(I) Involved receiver

4.0 SUMMARY

Background noise monitoring has been conducted at five (5) receiver locations around the proposed Gelliondale Wind Farm.

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 in 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 of the background survey provide a representation of typical noise levels in the vicinity of the project. The exception is Receiver H11, where the measured levels were affected by plant noise. Accordingly, for all receivers, other than Receiver H11:

- The results can be used to derive noise limits in accordance with NZS 6808 for surrounding receivers;
- The results of the measurements are to be referenced during the compliance monitoring phase of the project as an indication of potential background noise levels contributing to the compliance measurements.

Prior to construction of the wind farm, background noise monitoring may be undertaken at additional receivers, should consent be provided.

APPENDIX A GLOSSARY

dB	Decibel. The unit of sound level.
A-weighting	The process by which noise levels are corrected to account for the non-linear frequency response of the human ear.
L_{Aeq}	The A-weighted equivalent continuous sound level and is measured in dB.
L_{A90}	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 1996-1:2016 *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_A 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 thirteen (13) turbine layout (data supplied by Synergy on 28 June 2022).

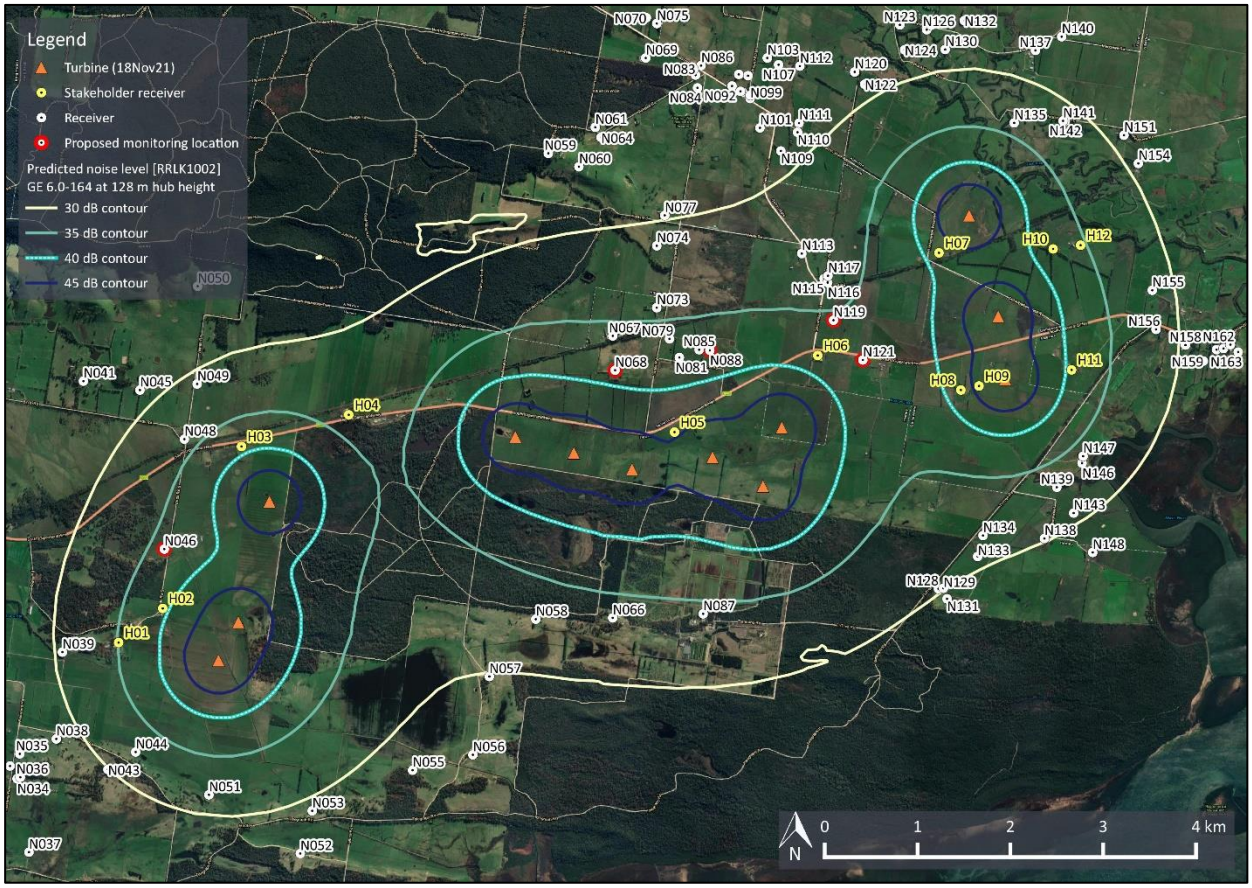
Table 6: Wind turbine coordinates – MGA 94 zone 55

Turbine	Easting	Northing
GWT01	459100	5721210
GWT02	459315	5721622
GWT03	459649	5722922
GWT04	462359	5723610
GWT05	463560	5723252
GWT06	464422	5723400
GWT07	465167	5723719
GWT08	466839	5726260
GWT09	467329	5725912
GWT10	467499	5724918
GWT11	467573	5724240
GWT12	462850	5723361
GWT13	464965	5723088

APPENDIX C PREFERRED NOISE MONITORING LOCATIONS

The figure presented in this Appendix indicates the preferred noise monitoring locations which were identified prior to undertaking the background noise monitoring, subject to consent being provided by the landowners.

As noted in Section 2.1, consent to undertake background noise monitoring was not granted at all preferred receivers. Prior to construction of the wind farm, background noise monitoring may be undertaken at additional receivers, should consent be provided.



Synergy's records of attempts to gain access to the preferred monitoring locations were provided in an email dated 6 June 2023 and are reproduced below.

Preferred monitoring location	***Reason for no consent***	***Additional comment***	***Proxy monitoring location/s***
N046	*No contact – reported health condition*	*Instructed by concerned neighbour to cease contact attempts*	*H02 & N048*
N068	*Absent / uncontactable*	*Informed by neighbour of absence and no response to calls made*	*H05*
N088	*Advised not to consent*	*Owner of N115 objects to NZS 6808:2010; intervened with unreasonable "conditions" for access*	*H05*
N119	*Advised not to consent*	*Owner of N115 objects to NZS 6808:2010; intervened with unreasonable "conditions" for access*	*H06*
N121	*Uncontactable / nil response*	*Multiple calls made and discussions; never received owner go-ahead*	*H06 & H11*

After attempts to gain access at preferred locations, time constraints (equipment availability) dictated that proxy locations with likely good access be utilised for the scheduled monitoring period.

Owners of N068, N088, N119 and N121 were contacted by the proponent in writing (registered post letter) in July 2022 to extend the offer for background noise monitoring (and precision distance survey) for their properties. The proponent received no responses.

APPENDIX D SURVEY INSTRUMENTATION

Table 7: Sound level measurement instrumentation summary

Item	Description
Equipment type	Automated/unattended integrating sound levels
Make & model	01dB CUBE, 01dB DUO and 01dB FUSION
Instrumentation class	Certified to Type1 / Class 1 (precision grade) standards in accordance with AS 1259.2-1990[4] and IEC 61672.1-2004[5]
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 8: Sound level meter installation records

Receiver	System	Unit serial number	Microphone serial number	Independent calibration date [1]	Calibration drift [2,3]
H02	01dB DUO	10655	217255	22/06/2022	0.08 dB
H05	01dB FUSION	14021	415858	21/07/2021	0.19 dB
H06	01dB-CUBE	10523	207224	23/06/2021	0.03 dB
H11	01 dB CUBE	11876	331776	10/02/2022	0.01 dB
N048	01 dB CUBE	10517	161870	01/07/2021	0.36 dB

Note 1: Independent (laboratory) calibration date to be within 2 years of measurement period as per AS 1055-1:1997[6]

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

Table 9: Wind speed measurement instrumentation

Wind speeds	Description
Local wind speeds	Vaisala WXT 520 weather station (serial number K3630005) positioned at receiver N048 from 15 August to 2 September 2022.
Site wind speeds	Third party owned and operated system comprising a single Fulcrum3D FS1 SODAR measurement system (serial number: FS1M_1214). Equipment located at 463232 E, 5723351 N (MGA 94 Zone 55). The data collected by the SODAR was extrapolated to a height of 128 m. Further information is provided in Appendix E.

[4] AS 1259.2-1990: *Acoustics - Sound level meters - Integrating - Averaging*

[5] IEC 61672.1-2004: *Electroacoustics - Sound level meters - Specification*

[6] AS 1055-1:1997 *Acoustics – Description and measurement of environmental noise - Part 1: General Procedures*

APPENDIX E SITE WIND SPEED DATA DERIVATION

This appendix reproduces correspondence provided by Synergy documenting the process used by WSP Australia Pty Ltd to derive the 128 m AGL wind speeds required to analyse the measured background noise data.

In order to provide a dataset of wind speed and direction measurements at the exact hub height of the modelled wind turbine in the Environmental Noise Assessment, WSP were engaged to extrapolate these values from measurements recorded by a Fulcrum3D SODAR wind profiler located in the central area of the project site. The SODAR measurements are at 10m intervals between 60 and 200m above ground level, providing a comprehensive dataset from which to interpolate values for a proposed hub height (as modelled in the assessment) that is just 2m below a measured elevation. WSP provided the following notes about the extrapolation and interpolation process they employed to produce the dataset utilised in the noise modelling:

"The wind shear is calculated using the Power Law wind shear model. The magnitude of the wind shear (rate of change of wind speed against height) is known to vary with four (4) main variables:

- Wind direction - the unique topography in each direction has its own influence on wind shear;
- Time of day - thermal effects during the day often results in a lower wind shear than that experienced at night;
- Season - varying surface roughnesses associated with changes in vegetation characteristics, together with changes in thermal effects and varying climate regimes that typically exist across seasons; and
- Wind speed - turbulence levels and the impact of topographical features depend on wind speed.

WSP has considered these variables by creating multi-dimensional data bins based on time, season, and wind direction to resolve the shear extrapolation for the sodar measurements.
Prior to generating the shear profile, WSP had conducted preliminary cleaning by applying the approprite data filters to the dataset, namely a binary filter flagging erroneous or poor quality data by a 1 or 0.

WSP has then generated the shear profile based on cleaned 80, 90, 100, 110, 120 and 130m measurements, and interpolated down from the 130m wind speed measurements to minimise the interpolation distance and hence the uncertainty. The measurement period spans from 30/06/2022 10:00 to 04/09/2022 09:40.

- Note that the data coverage of the dataset is dependent on the data coverage of the 130 m wind speed measurements.
- It is understood the Sodar has not been validated, therefore WSP are unable to quantify the uncertainty in the measurments. Typically the uncertainty for RSDs can range from 3 - 5 %."

APPENDIX F SUMMARY OF BACKGROUND NOISE LEVELS

Table 10: 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	**Regression order**	**a**	**b**	**c**	**d**	**R^2**	**Valid wind speed range, m/s**
H02	3rd	-0.00626	0.19590	-0.89650	30.16000	0.21870	3-15
H05	3rd	0.00048	0.02208	0.13180	31.74000	0.12250	3-15
H06	3rd	-0.00606	0.20880	-1.01400	33.37000	0.18980	3-15
H11 [1]	3rd	*0.00185*	*-0.03102*	*0.57690*	*35.88000*	*0.08670*	*3-15*
N048	3rd	-0.00951	0.27980	-1.00100	33.13000	0.46020	3-15

Note 1: Values presented for reference only, see discussion in Section 3.1

Table 11: 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	**Regression order**	**a**	**b**	**c**	**d**	**R^2**	**Valid wind speed range, m/s**
H02	3rd	-0.01270	0.40800	-2.71000	30.48000	0.32880	4-15
H05	3rd	-0.00591	0.23890	-1.73700	31.30000	0.25420	4-15
H06	3rd	-0.01106	0.38430	-2.50200	30.74000	0.37890	4-15
H11 [1]	3rd	*-0.00301*	*0.14290*	*-1.00100*	*34.82000*	*0.15280*	*4-15*
N048	3rd	-0.02062	0.59400	-3.28900	33.92000	0.58040	3-15

Note 1: Values presented for reference only, see discussion in Section 3.1

APPENDIX G Receiver H02 DATA

G1 Receiver H02 location data

Table 12: Receiver H02 noise monitor coordinates – MGA 94 Zone 55

Location	Easting	Northing
Dwelling location (H02)	458500	5721772
Background noise monitoring location (H02)	458521	5721766

Figure 2: Receiver H02 aerial view – dwelling and noise monitor locations

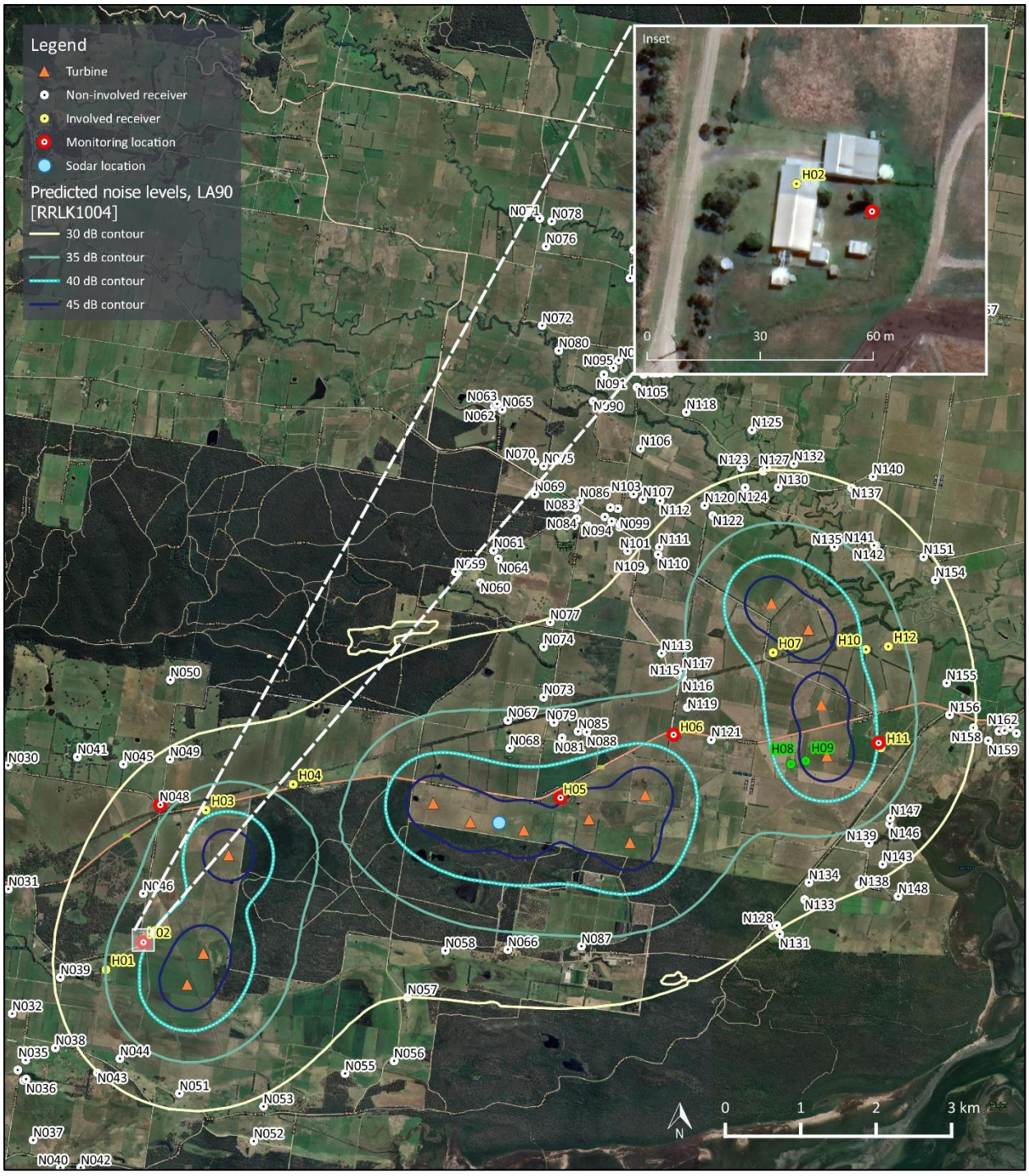


Table 13: Receiver H02 monitor installation photos

Looking North	Looking East
	
Looking South	**Looking West**
	

G2 Receiver H02 measurement data summary

Table 14: Receiver H02 background noise level analysis summary

Item	All-time period	Night period
Number of data points collected	6201	2345
Number of data points removed	1190	661
Number of data points for analysis	5011	1684

Figure 3: Receiver H02 noise level and wind speed time history

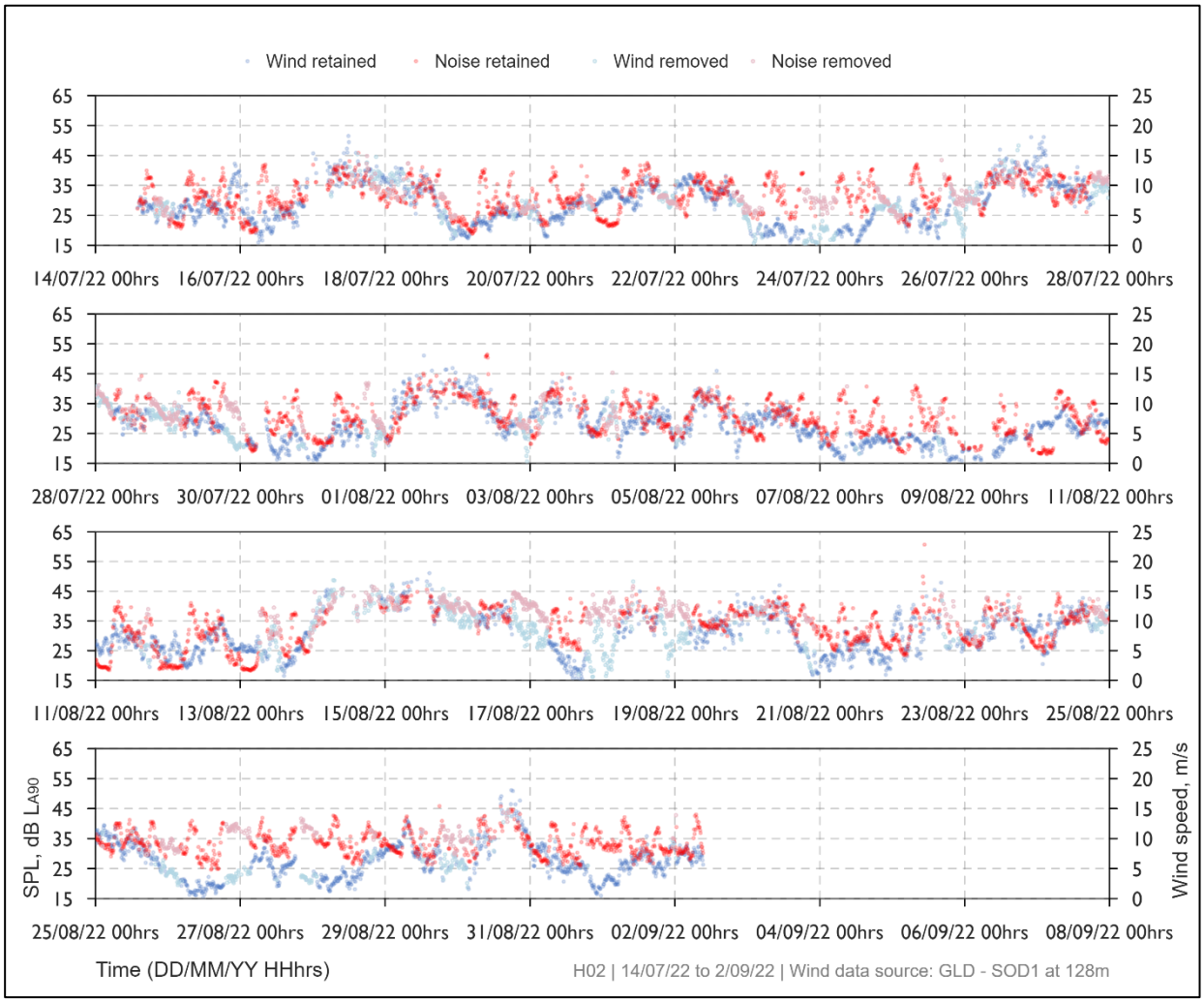


Figure 4: Receiver H02 background noise levels – All-time period

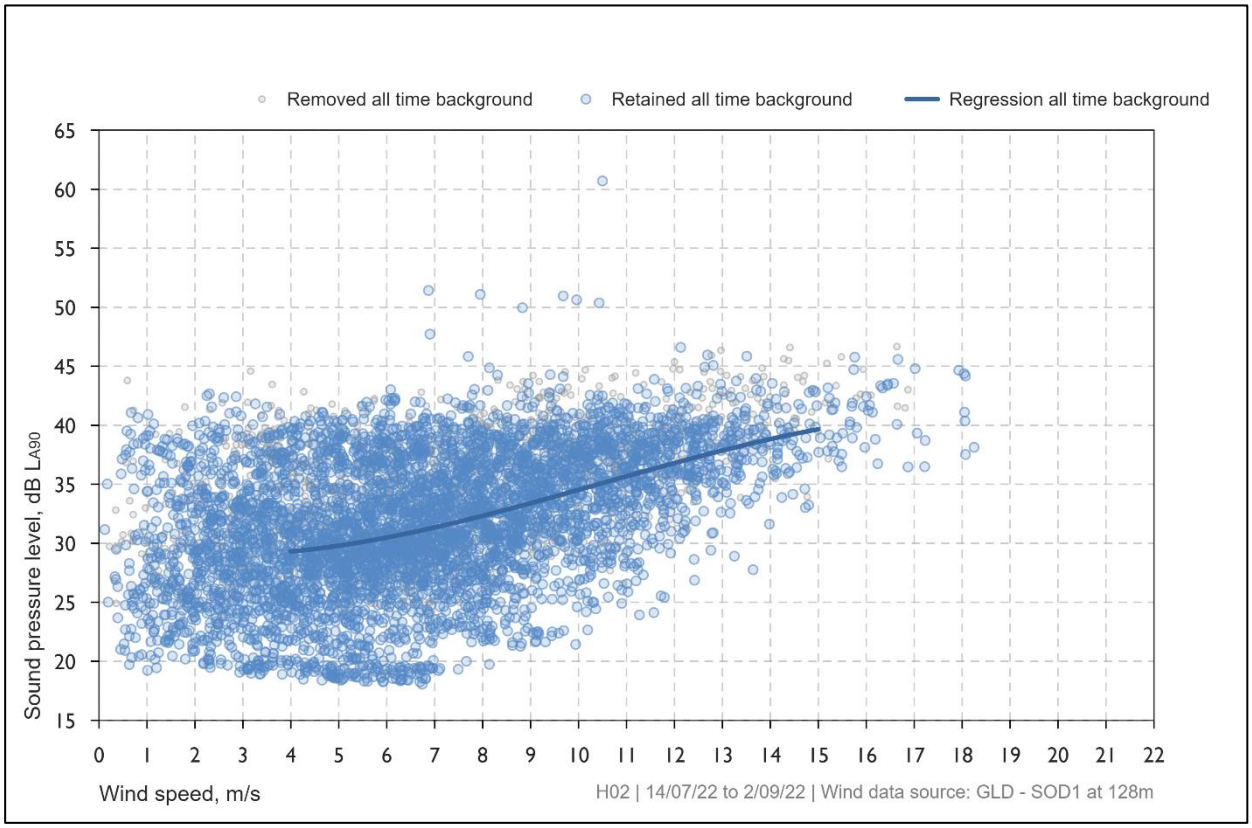
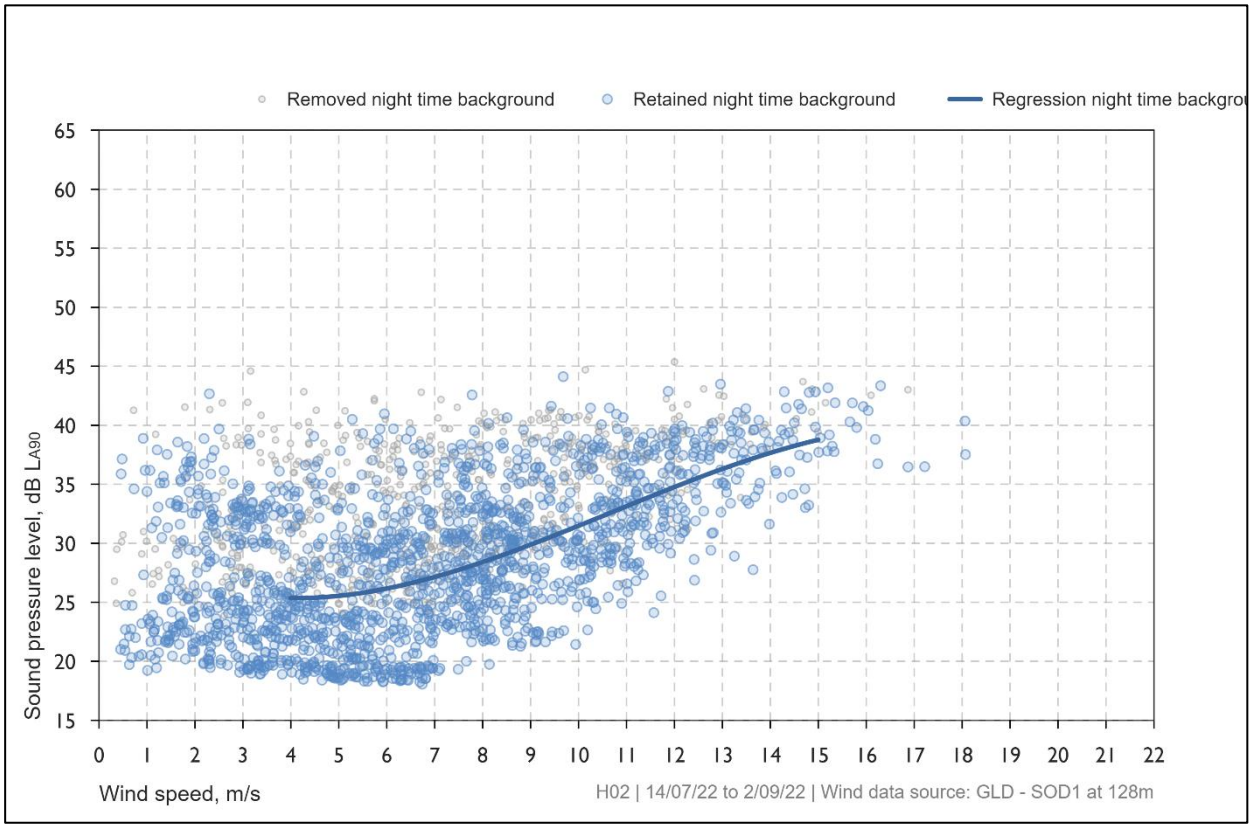


Figure 5: Receiver H02 background noise levels – Night period



APPENDIX H Receiver H05 DATA

H1 Receiver H05 location data

Table 15: Receiver H05 noise monitor coordinates – MGA 94 Zone 55

Location	Easting	Northing
Dwelling location (H05)	464013	5723672
Background noise monitoring location (H05)	464046	5723682

Figure 6: Receiver H05 aerial view – dwelling and noise monitor locations

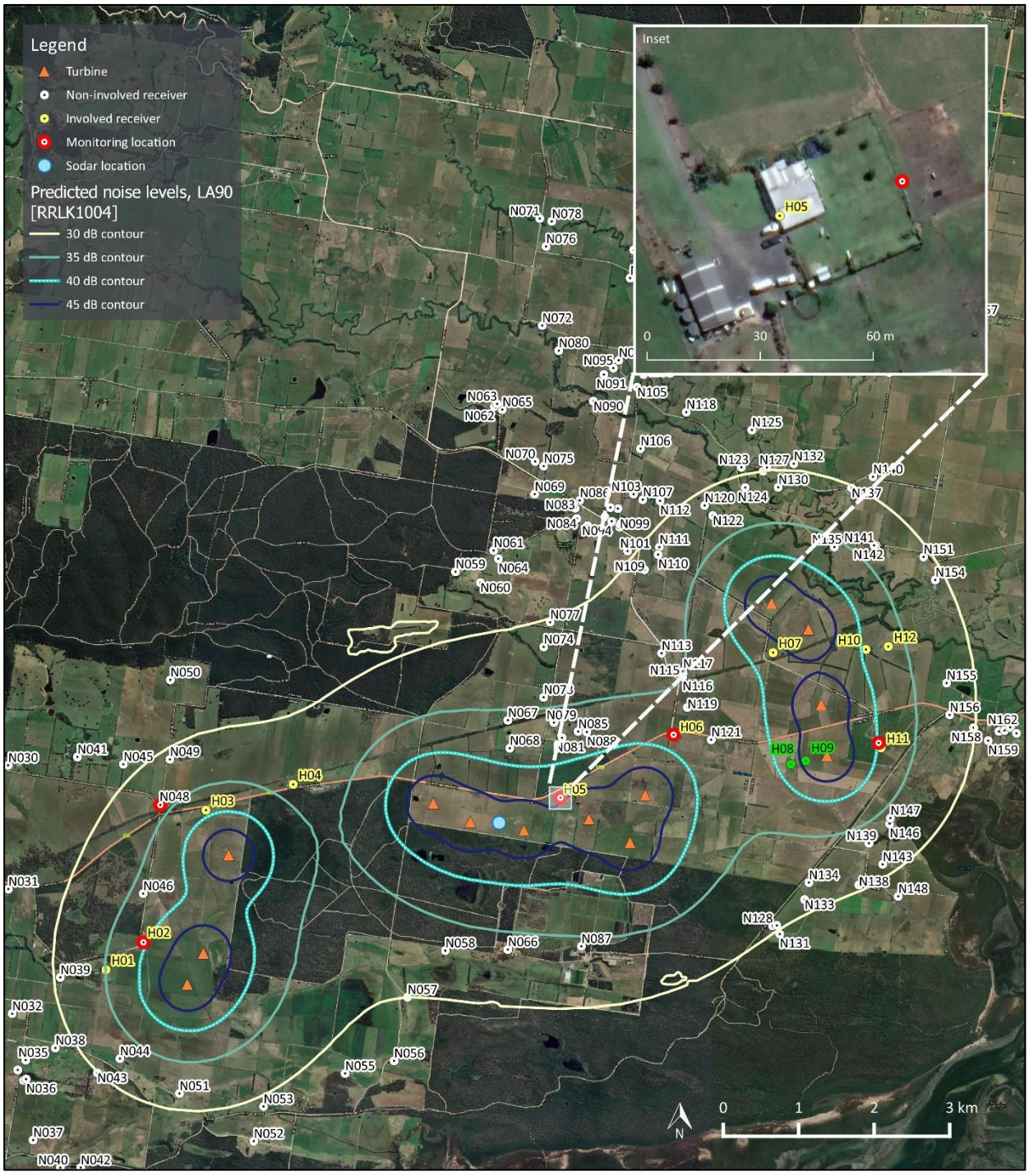


Table 16: Receiver H05 monitor installation photos

Looking North	Looking East
	
Looking South	**Looking West**
	

H2 Receiver H05 measurement data summary

Table 17: Receiver H05 background noise level analysis summary

Item	All-time period	Night period
Number of data points collected	6079	2299
Number of data points removed	1619	888
Number of data points for analysis	4460	1411

Figure 7: Receiver H05 noise level and wind speed time history

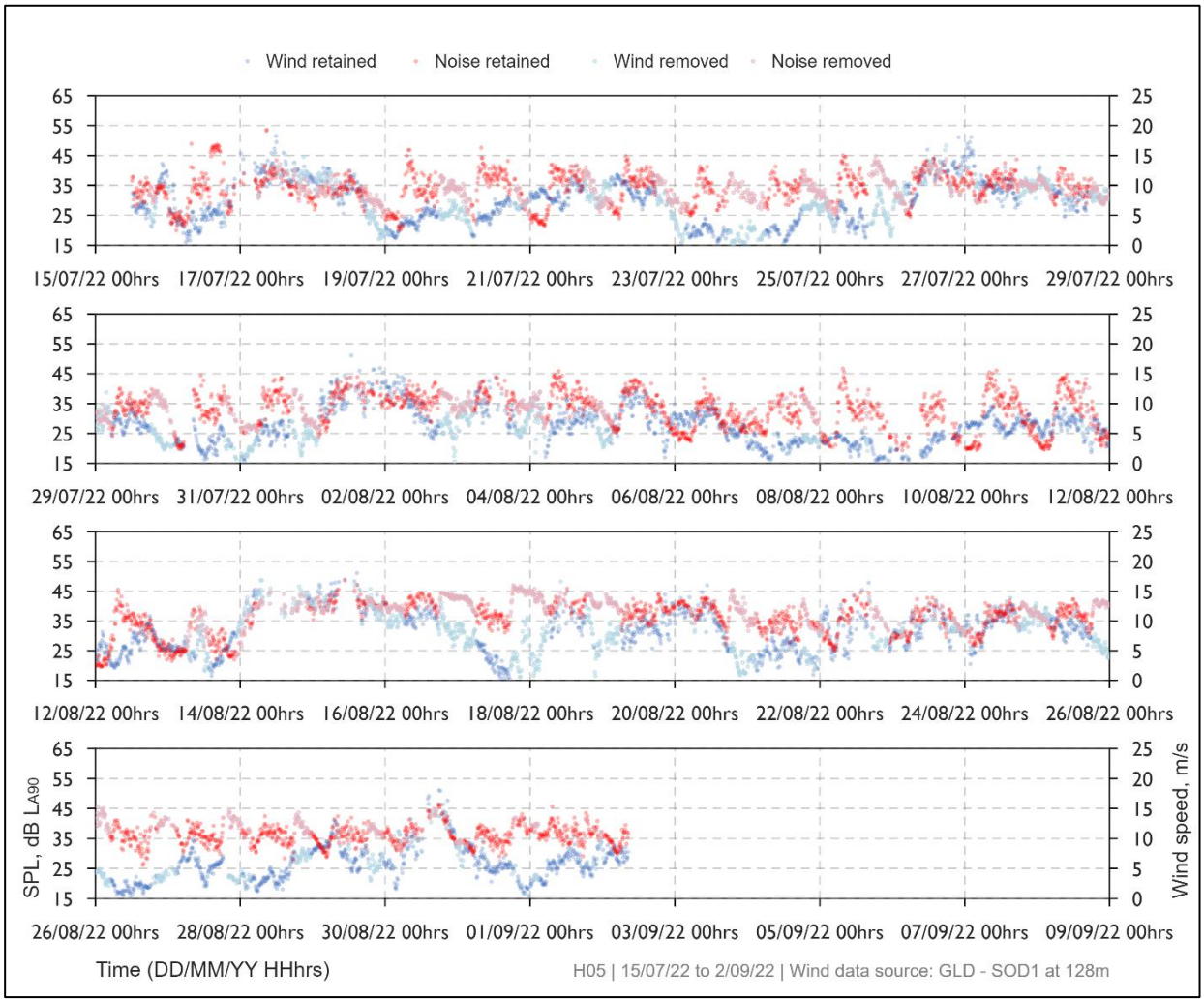


Figure 8: Receiver H05 background noise levels – All-time period

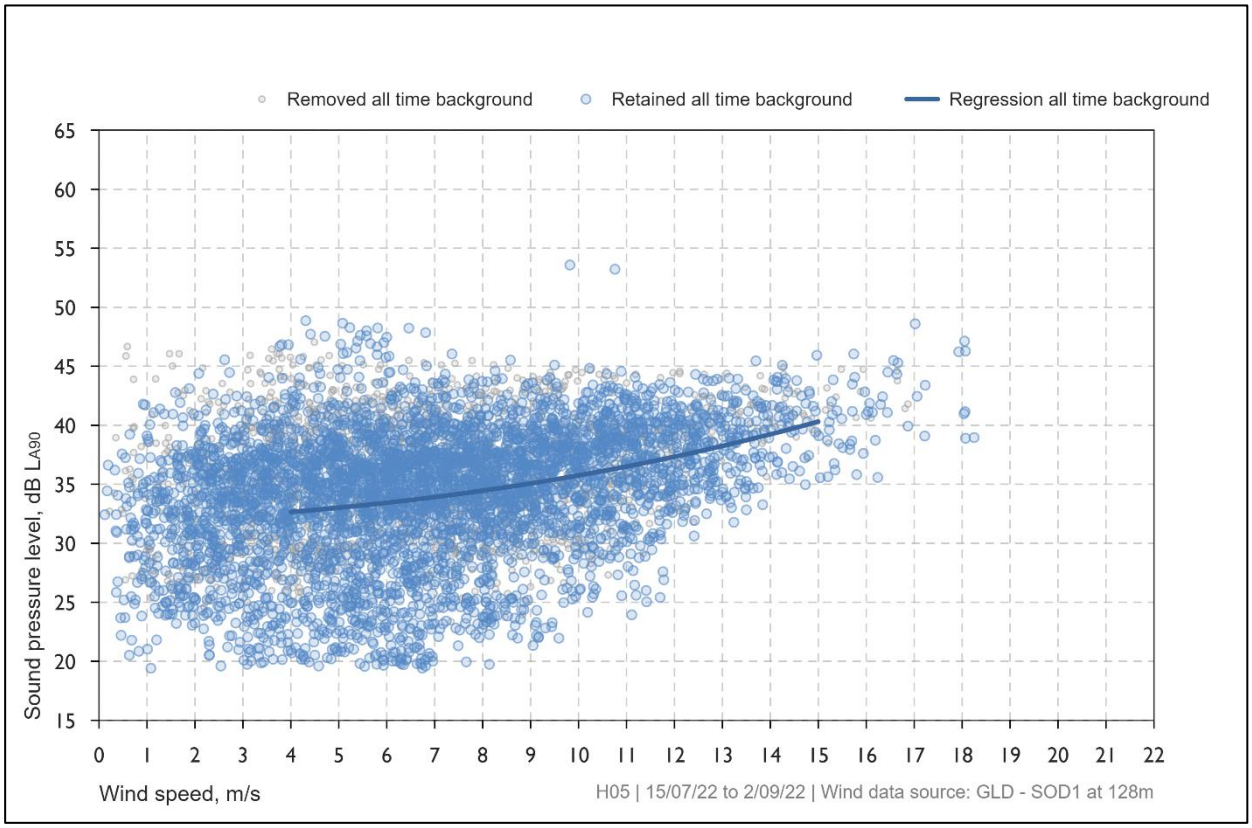


Figure 9: Receiver H05 background noise levels – Night period

APPENDIX I Receiver H06 DATA

I1 Receiver H06 location data

Table 18: Receiver H06 noise monitor coordinates – MGA 94 Zone 55

Location	Easting	Northing
Dwelling location (H06)	465556	5724498
Background noise monitoring location (H06)	465542	5724517

Figure 10: Receiver H06 aerial view – dwelling and noise monitor locations

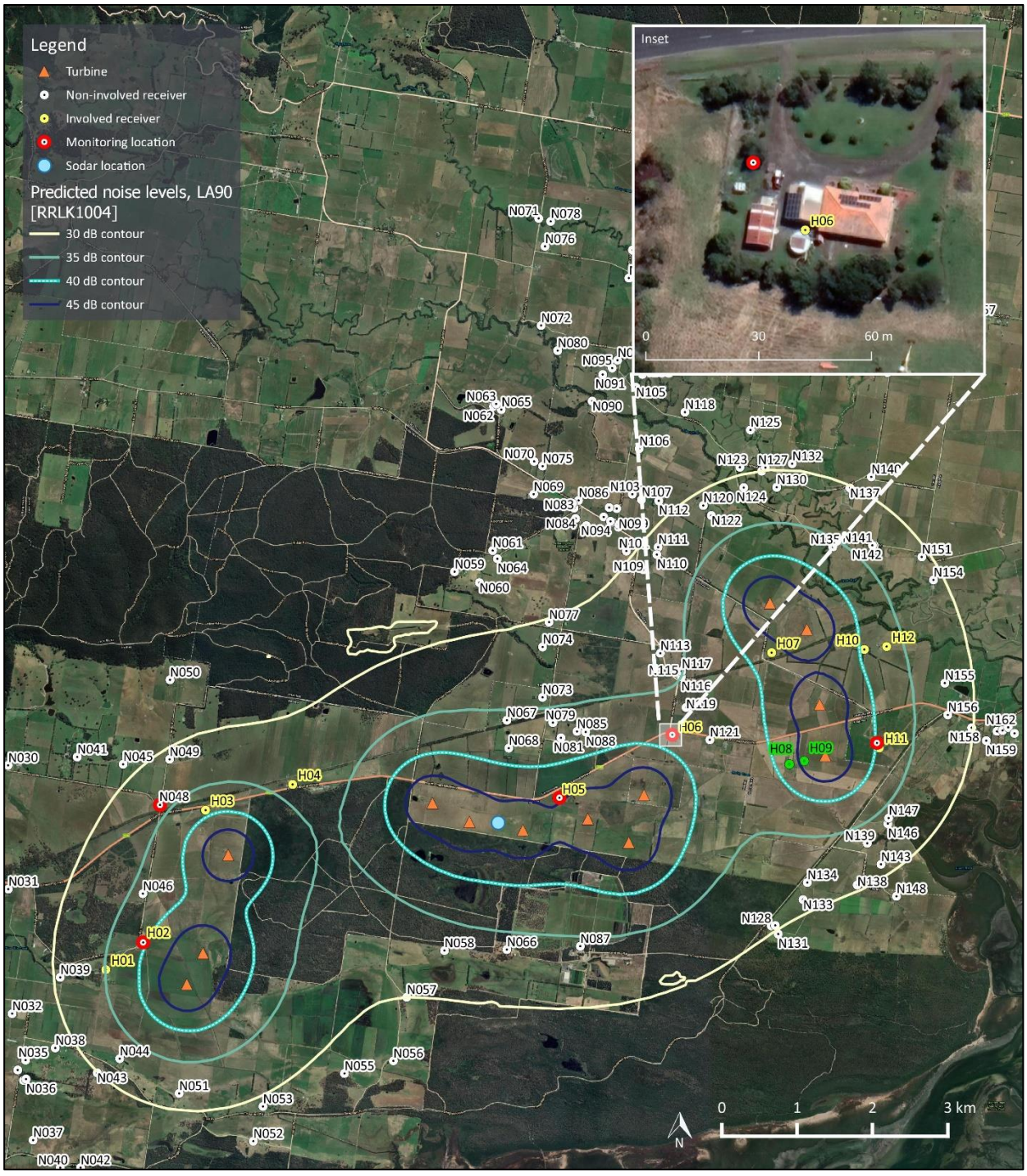


Table 19: Receiver H06 monitor installation photos

Looking North	Looking East
	
Looking South	**Looking West**
	

I2 Receiver H06 measurement data summary

Table 20: Receiver H06 background noise level analysis summary

Item	All-time period	Night period
Number of data points collected	6190	2350
Number of data points removed	1163	620
Number of data points for analysis	5027	1730

Figure 11: Receiver H06 noise level and wind speed time history

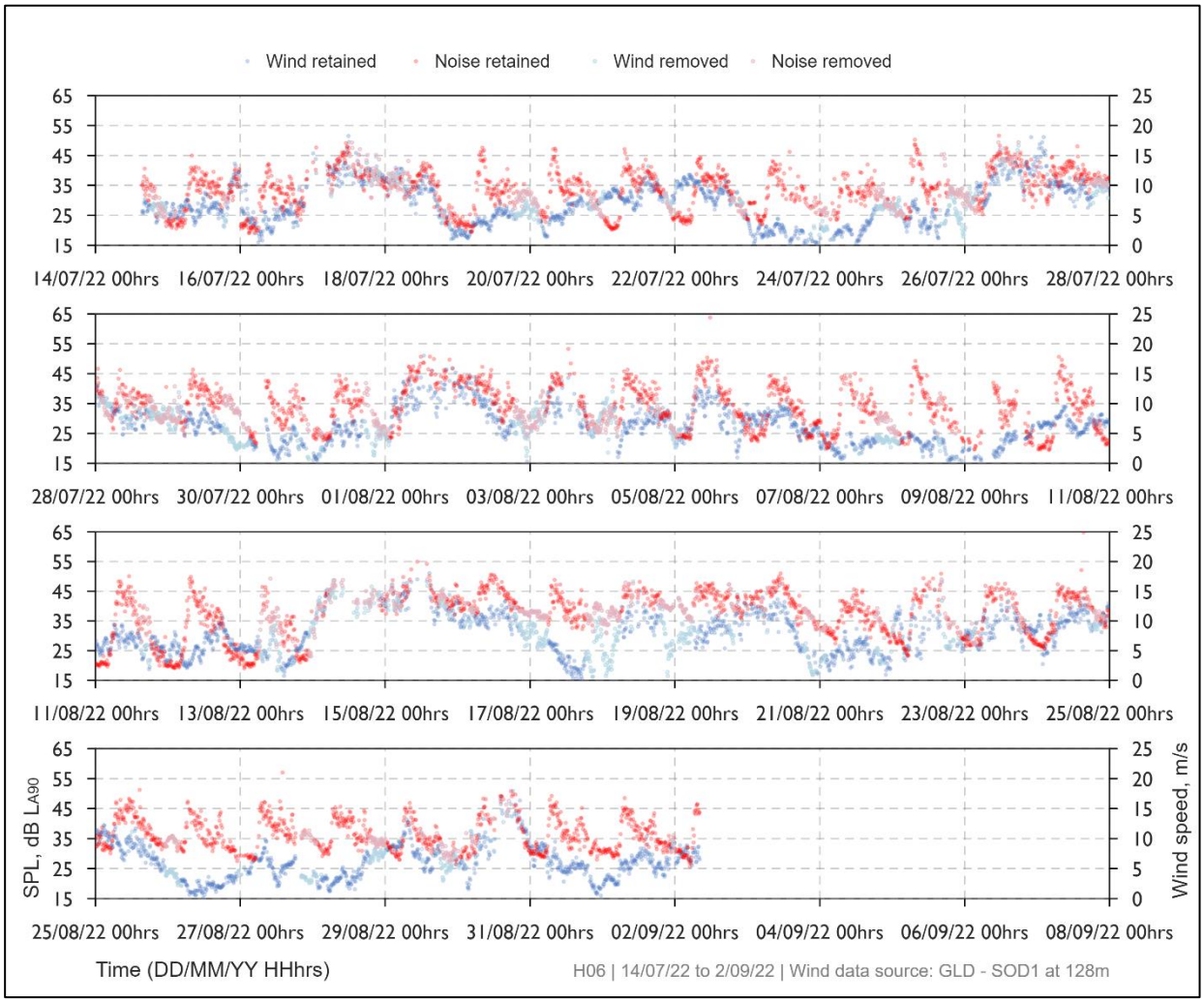


Figure 12: Receiver H06 background noise levels – All-time period

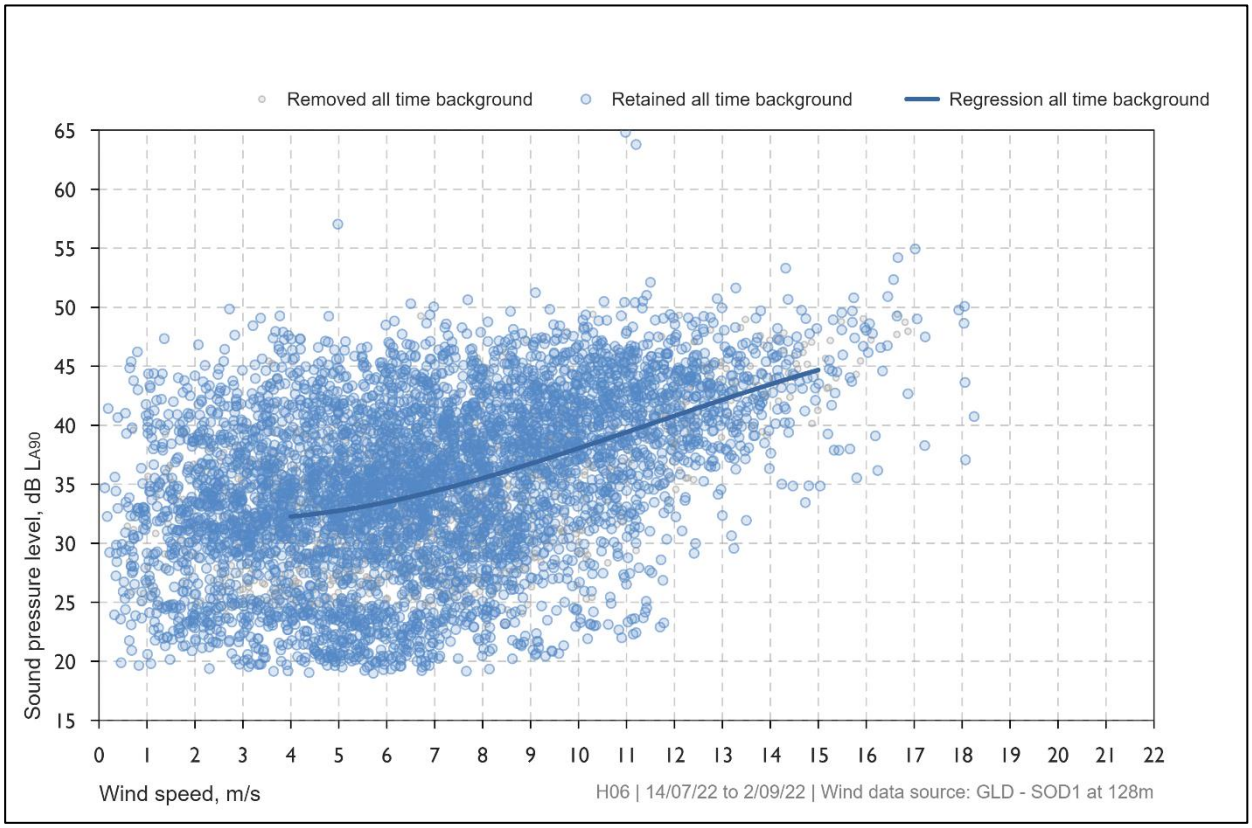
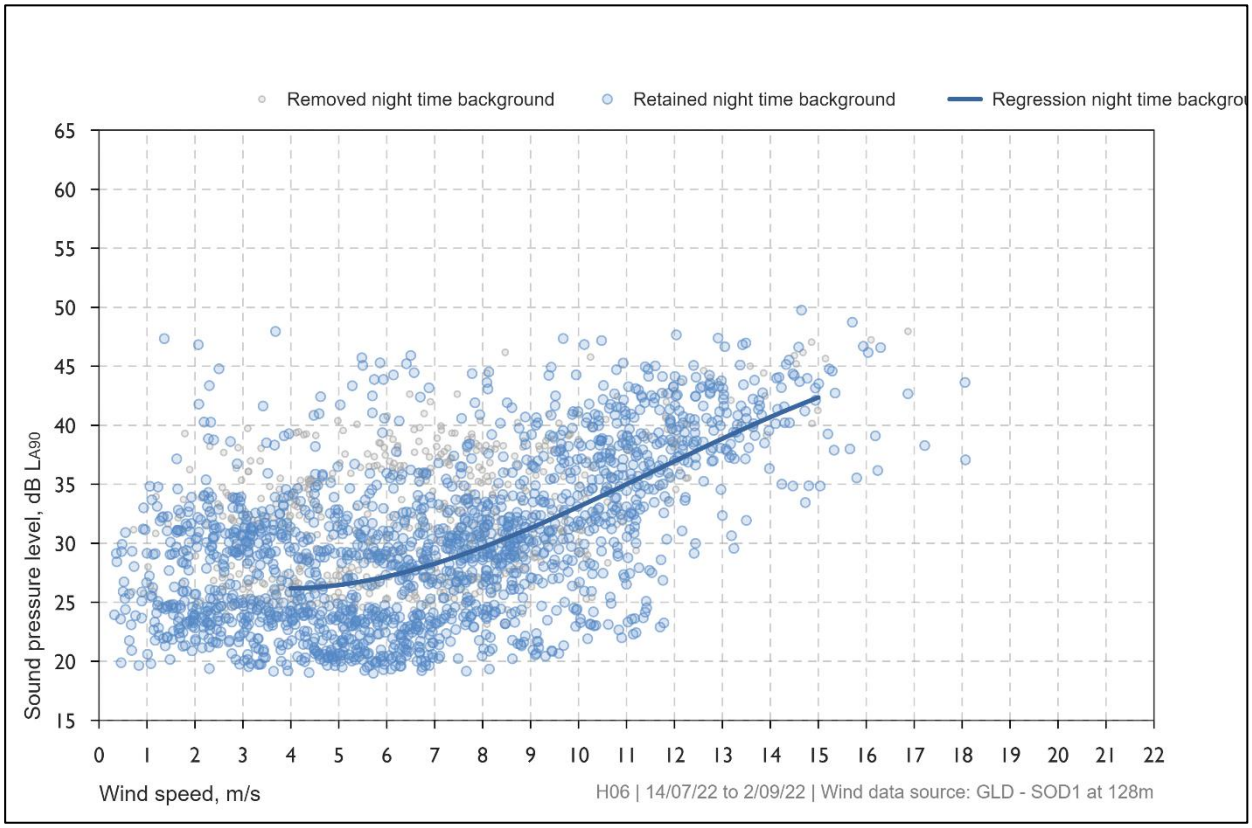


Figure 13: Receiver H06 background noise levels – Night period



APPENDIX J Receiver H11 DATA

J1 Receiver H11 location data

Table 21: Receiver H11 noise monitor coordinates – MGA 94 Zone 55

Location	Easting	Northing
Dwelling location (H11)	468261	5724393
Background noise monitoring location (H11)	468259	5724409

Figure 14: Receiver H11 aerial view – dwelling and noise monitor locations

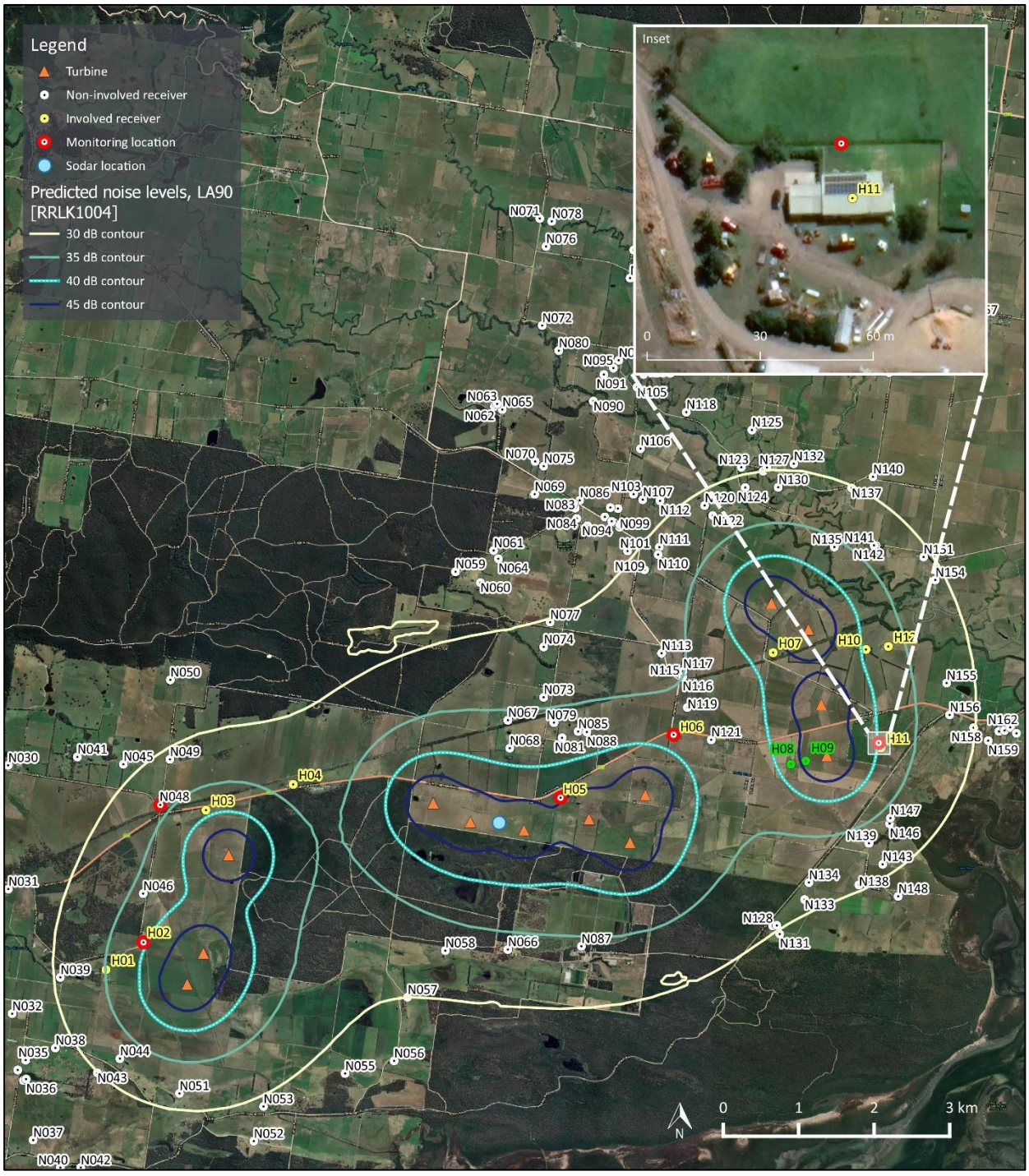


Table 22: Receiver H11 monitor installation photos

Looking North	Looking East
	
Looking South	**Looking West**
	

J2 Receiver H11 measurement data summary

Table 23: Receiver H11 background noise level analysis summary

Item	All-time period	Night period
Number of data points collected	6066	2300
Number of data points removed	1289	804
Number of data points for analysis	4777	1496

Figure 15: Receiver H11 noise level and wind speed time history

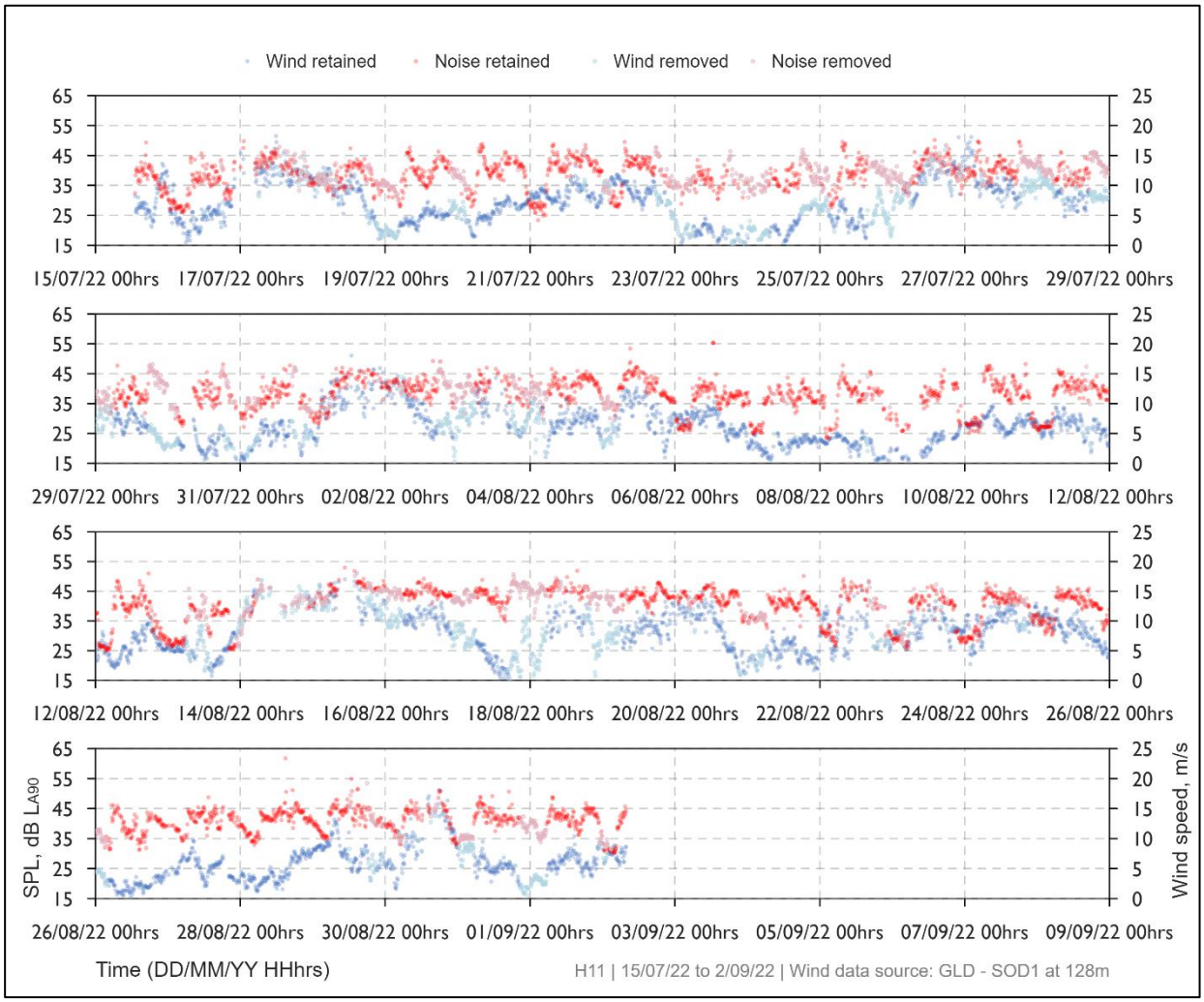


Figure 16: Receiver H11 background noise levels– All-time period

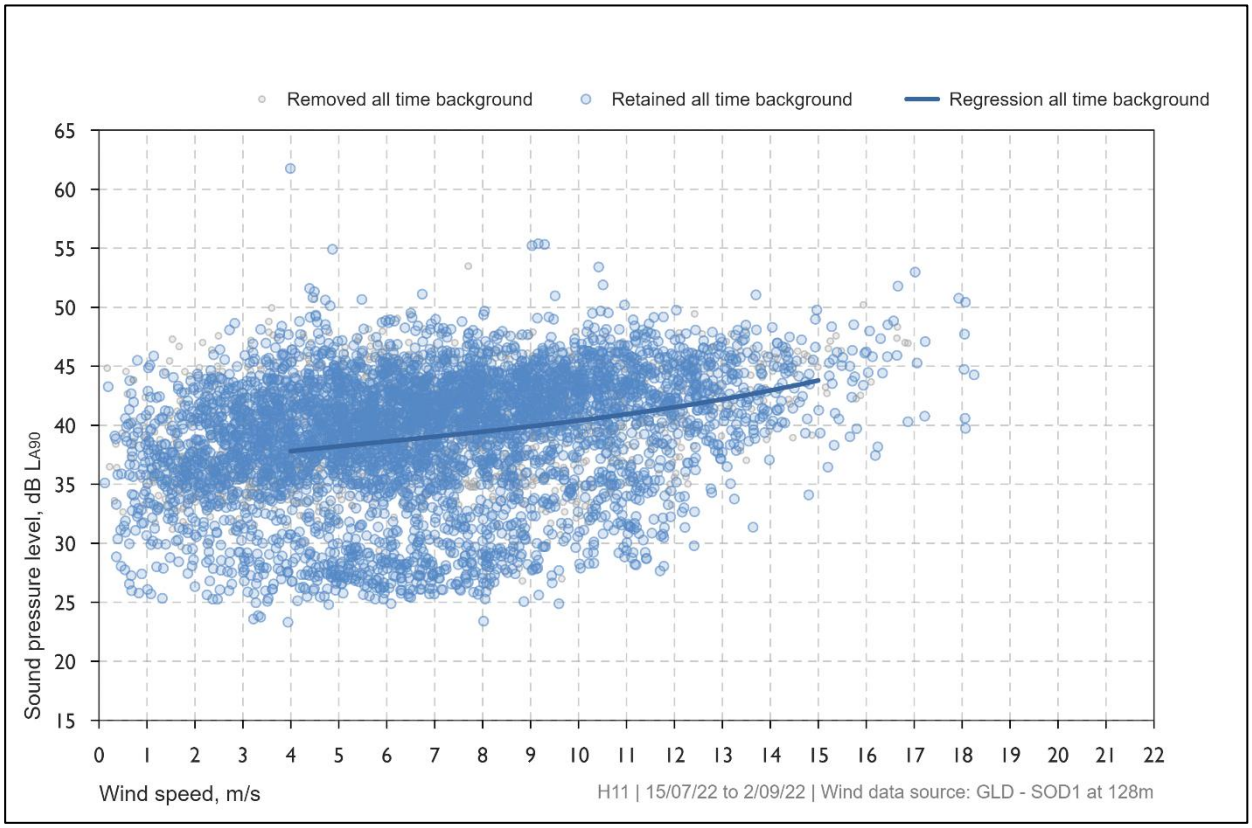


Figure 17: Receiver H11 background noise levels– Night period

APPENDIX K Receiver N048 DATA

K1 Receiver N048 location data

Table 24: Receiver N048 noise monitor coordinates – MGA 94 Zone 55

Location	Easting	Northing
Dwelling location (N048)	458733	5723594
Background noise monitoring location (N048)	458745	5723587

Figure 18: Receiver N048 aerial view – dwelling and noise monitor locations

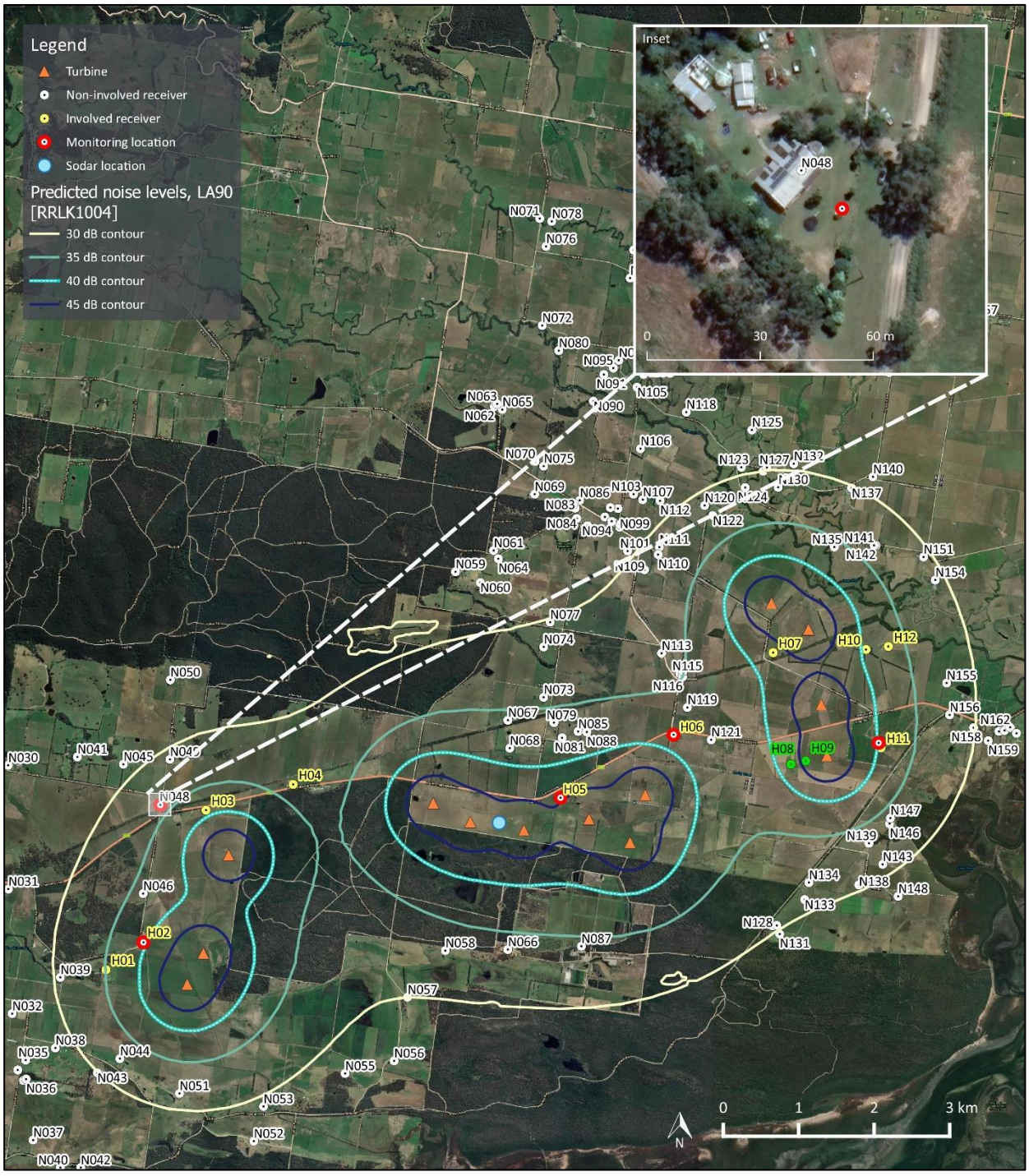


Table 25: Receiver N048 monitor installation photos

Looking North	Looking East
	
Looking South	**Looking West**
	

K2 Receiver N048 measurement data summary

Table 26: Receiver N048 background noise level analysis summary

Item	All-time period	Night period
Number of data points collected	6079	2290
Number of data points removed	1886	996
Number of data points for analysis	4193	1294

Figure 19: Receiver N048 noise level and wind speed time history

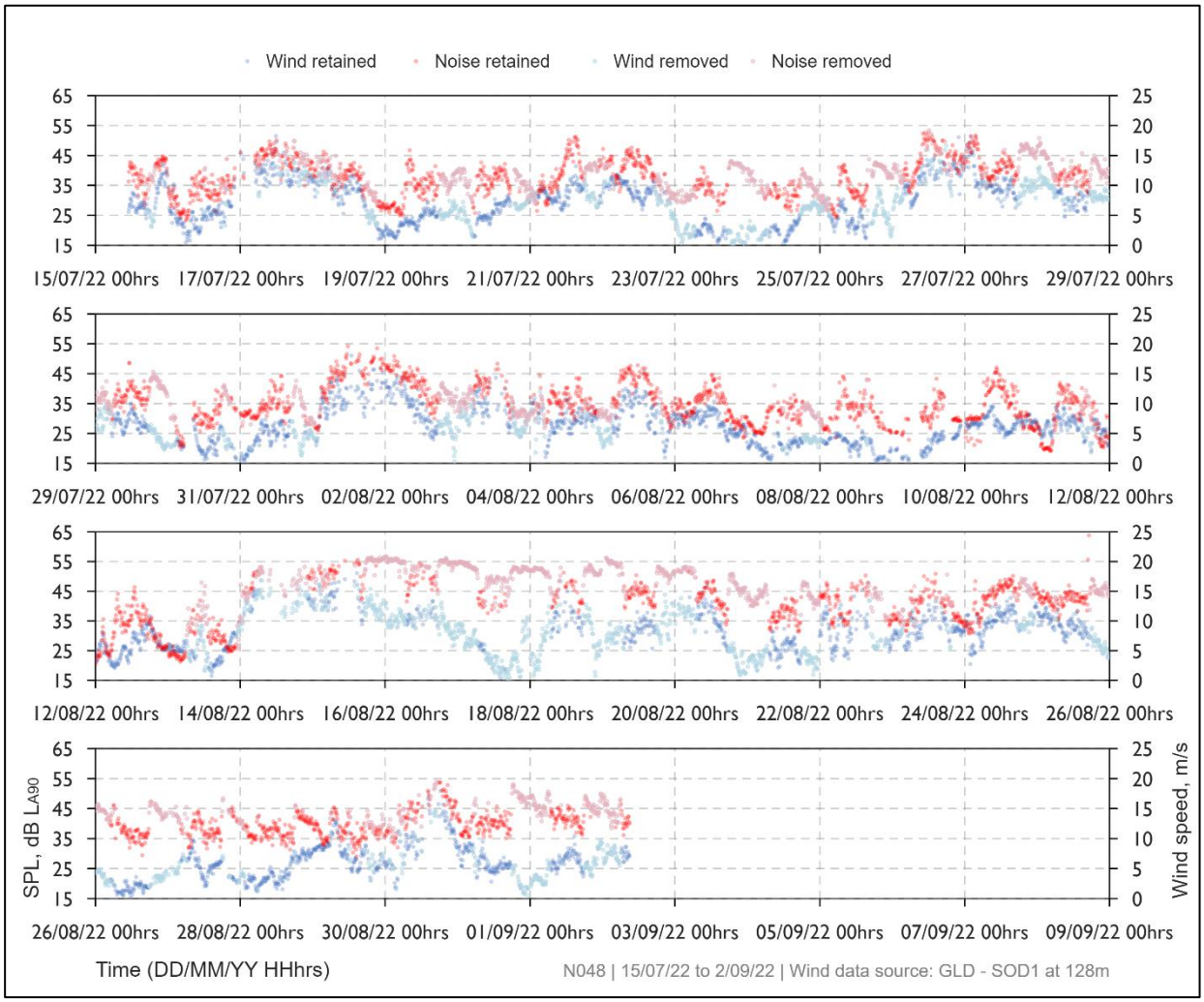


Figure 20: Receiver N048 background noise levels – All-time period

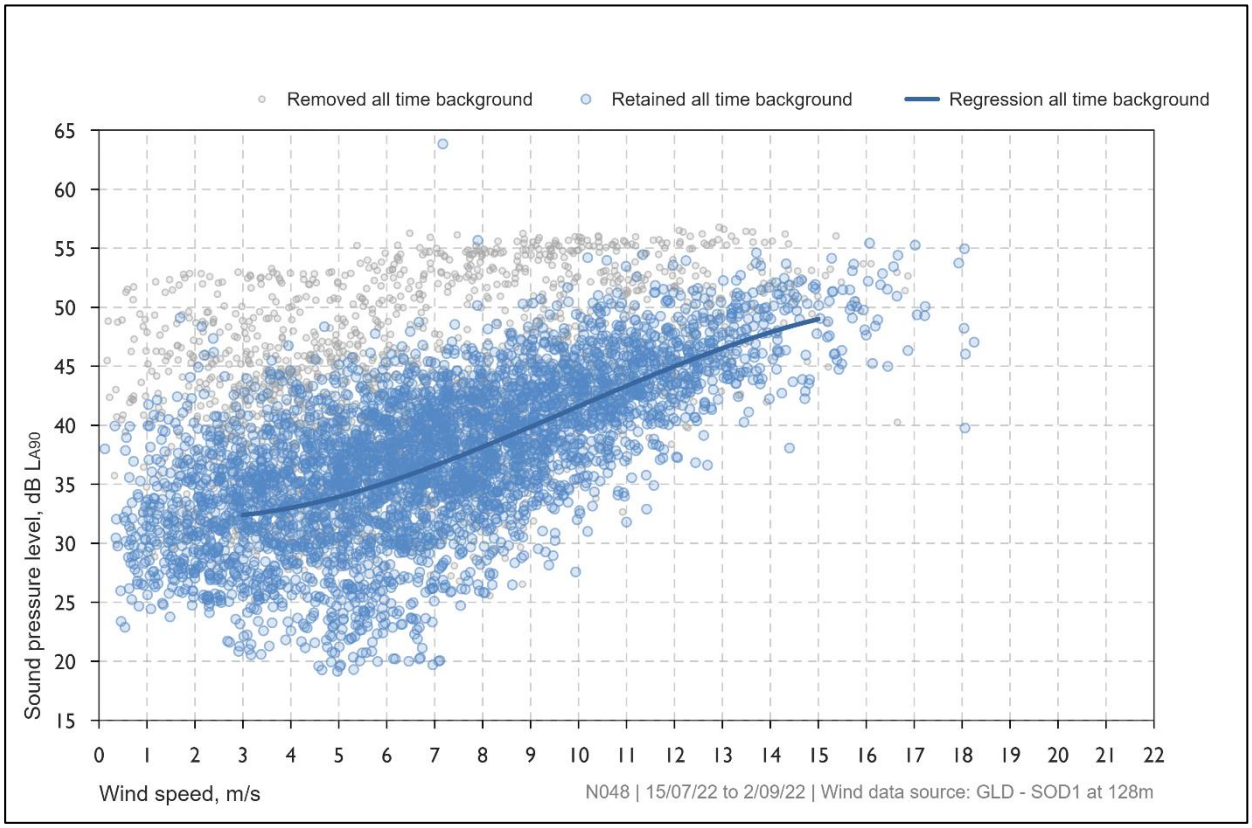
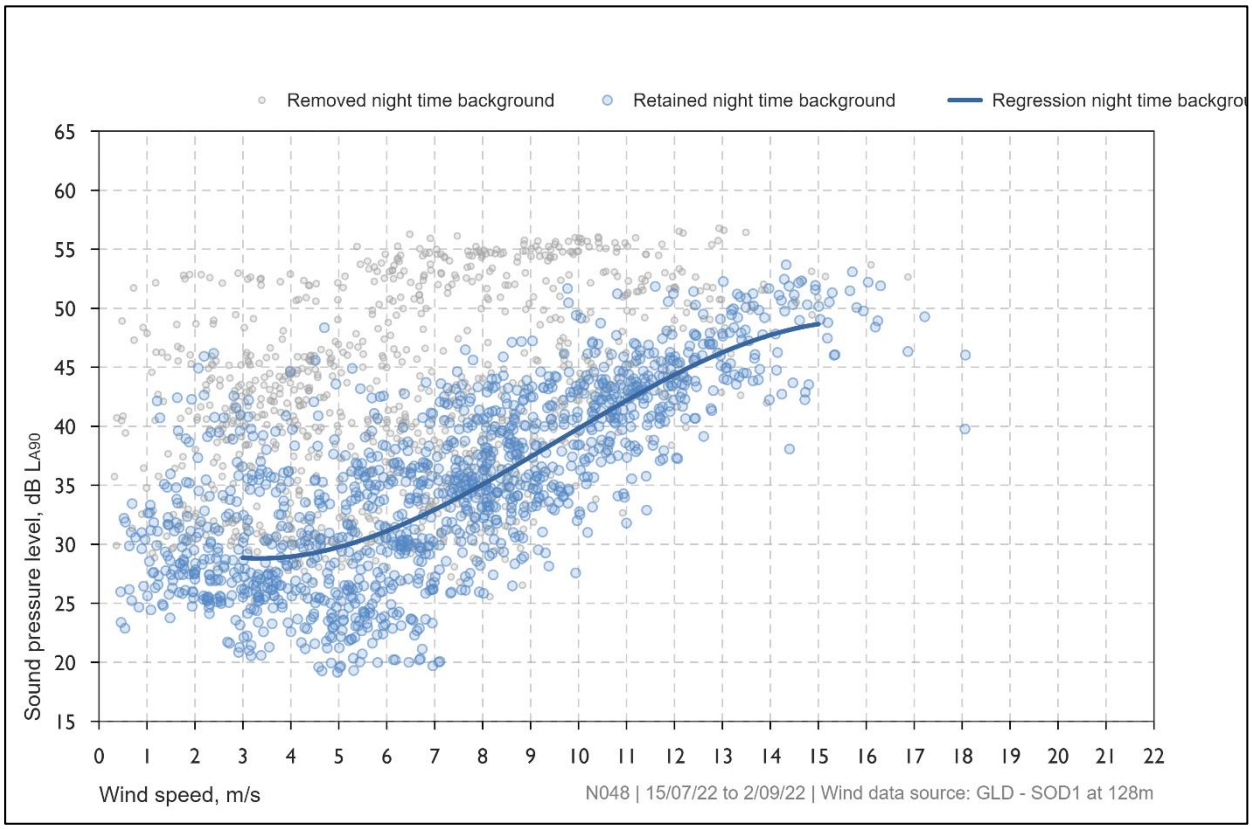


Figure 21: Receiver N048 background noise levels – Night period



APPENDIX L 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 27: 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	Section 2.2
(d)	Position of wind speed measurements	Section 2.2
(e)	Time and duration of monitoring period	Section 2.2
(f)	Averaging period for both sound and wind speed measurements	Section 2.1 and 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 G to Appendix K
(i)	Description of the regression analysis	Section 2.2 and Appendix F
(j)	Graphical plots showing the data scatter and the regression lines	Appendix G to Appendix K