MOONIES HILL NEW ENERGY PTY LTD

KOJONUP WIND FARM
KOJONUP

NOISE IMPACT ASSESSMENT

SEPTEMBER 2025

OUR REFERENCE: 35195-2-23199

Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
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NOISE IMPACT ASSESSMENT

KOJONUP WIND FARM, KOJONUP

Job No: 23199

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FOR

MOONIES HILL NEW ENERGY PTY LTD

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1	2	Moonies Hill New Energy Pty Ltd Attn: Sarah Rankin Email: sarah@mhenergy.com.au		✓

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APPENDICES

1. INTRODUCTION

Herring Storer Acoustics were commissioned to carry out a noise impact assessment for the proposed Kojonup Wind Farm development, to be located approximately 15km south of the Kojonup townsite.

The proposed wind farm consists of 33 wind turbines, in cleared farming land.

See Appendix A for locations of turbines and noise sensitive premises.

The noise impact assessment has been carried out in accordance with the EPA of South Australia *"Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021"* (Guidelines) which is the guidelines recognised by the Department of Environment and Conservation for the assessment of wind farms.

This assessment has been undertaken to accompany the development application for the project.

2. SUMMARY

Noise levels were assessed at 44 identified receiver points, with these locations shown in Appendix A.

Noise emissions have been calculated to comply with the noise criteria, based upon background noise monitoring, for all non-stake holder locations.

Noise emissions at "stake holder" locations have been calculated to comply with the Guidelines recommended level of no more than 45 dB(A).

3. CRITERIA

According to the Western Australian Planning Position Statement : Renewable energy facilities - March 2020, the noise impact of proposed wind farms in Western Australia should be assessed in accordance with the criteria and approach of assessing wind farms described in the EPA of South Australia *"Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021"* (Guidelines)

Whilst the Western Australian Planning Position Statement additionally refers to the requirement of wind farms to meet the standards prescribed under the *Environmental Protection (Noise) Regulations 1997*, which relates to "unreasonable noise". The Environmental Protection Act 1986 under Part 1, Section 3, Clause 3 defines "unreasonable noise" as follows :

For the purposes of the Act, noise is to be unreasonable if –

a) It is emitted, or the equipment emitting it is used, in contravention of –
   i) this Act;
   ii) any subsidiary legislation made under this Act; or
   iii) any requirement or permission (by whatever name called) made or given by or under this Act;

b) having regard to the nature and duration of the noise emissions, the frequency of similar noise emissions from the same sources (or a source under the control of the same person or persons) and the time of day at which the noise is emitted, the noise unreasonably interferes with the health, welfare, convenience, comfort or amenity of any person; or

c) it is prescribed to be unreasonable for the purposes of the Act.

Given that the Regulations, and associated guidelines, were established prior to wind farms being a realistic consideration in Western Australia, and the meteorological conditions dictated within the DWER guidance on environmental noise for the modelling and assessment of proposed noise sources does not align with the maximum noise generated by wind turbines, the SA Guidelines is considered to provide an appropriate criteria to utilise for assessment purposes, and determination of if wind turbine noise is "unreasonable", based upon part b) of Clause 3 of the Act above. Hence, the Guidelines has been utilised in this assessment.

The Guidelines recommend the following criteria for the assessment of noise levels associated with proposed wind farms.

The predicted equivalent noise level ($L_{Aeq\ ,10\ minutes}$), adjusted for tonality in accordance with the Guidelines, should not exceed :

- 35 dB(A), or
- 40 dB(A) in a primary production / rural industry zone, or
- the "Alternative Minimum Criteria" (Varying with Wind Speed); or
- the background noise ($L_{A90,10\ minutes}$) by more than 5 dB(A).

The criteria for background noise levels will vary with wind speed, as will wind turbine generated noise.

The alternative minimum criterion, varying with wind speed, is listed below in Table 3.1. This conservative minimum criterion has been determined based on a comparison of background noise levels at a number of existing and proposed wind farm sites around Australia.

TABLE 3.1 – ALTERNATIVE MINIMUM CRITERIA (VARYING WITH WIND SPEED)

	Wind Speed at 10m above ground level					
	≤ 5	**6**	**7**	**8**	**9**	**≥ 10**
Minimum Criteria L_{Aeq} [dB(A)]	35	37	38	40	41	43

Based on the results of background noise monitoring undertaken between November 2023 and April 2024 (presented in the Herring Storer Acoustics report, attached in Appendix C), the criteria for wind turbine noise are as presented in Table 3.2. The background noise criteria establish for a hub height of 125m has been utilised in our assessment, as it is understood this is the intended hub height for the proposed wind turbine generators.

TABLE 3.2 – NOISE CRITERIA BASED ON BACKGROUND NOISE LEVELS, dB(A)

Background Monitoring Location	WIND SPEED AT 125m ABOVE GROUND LEVEL (m/s)										
	3	4	5	6	7	8	9	10	11	12	13
1	35	35	35	38	38	39	41	45	47	49	50
2	35	35	35	35	35	35	36	40	43	44	45
3	35	35	35	35	36	37	39	41	42	44	46
4	35	35	35	38	39	40	42	44	46	48	50
5	35	35	35	36	37	37	38	41	43	44	45
6	36	35	35	36	38	38	39	38	37	38	38
7	36	36	36	38	39	40	42	42	41	42	40
8	38	36	36	37	38	38	39	38	38	39	39
9	35	35	35	35	35	35	35	35	35	35	35
10	36	36	36	37	35	36	36	35	35	35	35
11	35	35	35	38	37	40	41	41	41	39	35
12	35	35	35	35	35	37	37	37	37	35	35

Utilising the nearest background noise monitoring location to each receiver point considered, results in the following background noise monitoring locations being utilised as shown in Table 3.3 below.

TABLE 3.3 – BACKGROUND NOISE MONITORING LOCATION UTILISED TO DETERMINE NOISE CRITERIA FOR EACH RECEIVER LOCATION

ID#	Background Noise Monitoring Location Utilised
1 – Stake Holder	3
2 – Stake Holder	3
3 – Stake Holder	4
4 – Stake Holder	4
5	12
6 – Stake Holder	1
7	10
8 – Stake Holder	6
9 – Stake Holder	3
10 – Stake Holder	2
11	3
12	7
14 – Stake Holder	5
15	7
16 – Stake Holder	12
17 – Stake Holder	12
18 – Stake Holder	5
19 – Stake Holder	5
20	8
21	6
22	6
23	7
24	1
25	7
26	6
27	8
28	12

ID#	Background Noise Monitoring Location Utilised
29 – Stake Holder	5
30	4
31 – Stake Holder	5
32	1
35	12
37 – Stake Holder	12
50	6
55	12
57	7
60	10
61	10
62	11
63	9
71	11
72	6
73	11

This assessment has been based on the noise criteria based on monitored background noise levels. It is noted that the Guidelines have been developed to minimise the impact on the amenity of premises that do not have an agreement with wind farm developers. Our assessment includes all identified residential premises in the surrounding area, some of which may have such an agreement. The status of agreements is not known.

The Guidelines recommend that a noise level criteria of not greater than 30 dB(A) indoors and 45 dB(A) outdoor is considered acceptable for “Stake-Holder” premises. Receiver locations that are understood to be a “Stake-Holder” are noted in Table 3.3 above. Additionally, they are notated in green text in Appendix A.

4. MODELLING

Noise immissions at residential premises, due to the proposed wind farm, were determined by noise modelling, using the computer program “SoundPlan” version 9.1.

SoundPlan uses the theoretical sound power levels determined from measured sound pressure levels to calculate the noise level at any location.

The following input data was used in the SoundPlan model:

a) Topographical Information – Ground contours of the development area;

b) Residential and Wind Turbine Locations – See Appendix A; and

c) Sound Power Levels, varying with wind speed, of the wind turbines intended to be utilised. The turbine proposed to be utilised is as follows:

Vestas V162-6.2 MW, 125m hub height
Blades with serrated trailing edges in normal operating mode (Noise Mode 0).

See Appendix A for locations and Appendix D for turbine specifications.

The Guidelines indicate that noise immissions should be modelled to reflect typical, (but not extreme) “worst case” meteorological conditions for sound propagation towards the receiver.

After a review of the literature available on the subject, noise level emissions were modelled using the ISO 9613-2:2024 algorithm, with the conditions listed in Table 4.1. These conditions and calculating noise levels utilising a “G=0” ground absorption have been found to provide a generally realistic, but conservative assessment of noise levels associated with wind turbines. This is also listed in Annex D of ISO 9613-2:2024 “Calculation of sound pressure levels caused by wind turbines” – hence is considered appropriate.

TABLE 4.1 – METEOROLOGICAL CONDITIONS

Condition	Value
Temperature	15 °C
Relative humidity	70%
Atmospheric Pressure	101.325 kPa

Noise levels attributable to the proposed wind farm were calculated for integer wind speeds 3 – 13m/s at a height of 125m above ground level (proposed hub height).

The sound power level of the turbines were varied for each integer wind speed, however the other weather conditions within the model remained constant at the conditions stipulated in Table 4.1 above.

5. RESULTS

Noise contour plots are attached in Appendix B.

The predicted noise level at each identified residential premises are listed in Table 5.1 below for each of the hub height wind speeds considered.

TABLE 5.1 – PREDICTED NOISE LEVELS AT IDENTIFIED RECEIVER LOCATIONS VARYING WITH WINDSPEED AT HUB HEIGHT

Receiver ID#	Predicted Noise Level, L_{Aeq} [dB(A)]										
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s	13m/s
1	33	34	35	36	40	38	41	42	42	42	42
2	33	34	35	35	39	38	41	42	42	41	41
3	23	24	26	26	29	27	30	31	31	30	30
4	23	24	26	26	29	28	31	32	32	31	31
5	25	26	28	28	31	30	33	34	34	33	33
6	28	28	30	30	34	32	35	36	36	35	35
7	24	25	27	27	30	29	32	33	32	32	32
8	28	29	30	31	35	33	36	37	37	37	37
9	34	35	36	36	40	39	42	43	43	42	42
10	34	35	36	37	41	39	42	43	43	43	42
11	25	25	27	27	31	29	32	33	33	32	32
12	23	24	26	26	29	28	31	32	32	31	31
14	31	32	33	34	37	36	39	40	40	39	39
15	23	23	25	25	28	27	30	31	30	30	30
16	30	31	32	33	37	35	38	39	39	38	38
17	29	30	31	32	35	34	37	38	38	37	37
18	30	31	32	33	36	35	38	39	39	38	38
19	31	32	33	34	37	36	39	40	40	39	39
20	24	25	27	27	30	28	32	32	32	32	31
21	14	15	17	17	19	18	21	22	22	21	21
22	19	20	22	22	25	23	27	27	27	26	26
23	16	17	19	19	22	20	23	24	24	23	23
24	26	27	28	29	32	30	34	34	34	34	34
25	19	19	22	22	24	23	26	27	27	26	26
26	19	19	22	22	24	23	26	27	27	26	26
27	27	28	29	30	33	31	34	35	35	35	34
28	25	25	27	27	30	29	32	33	33	32	32
29	29	30	31	32	35	34	37	38	38	37	37
30	23	24	26	26	29	27	30	31	31	30	30
31	30	31	32	33	37	35	38	39	39	38	38
32	24	24	26	26	29	28	31	32	32	31	31
35	24	25	27	27	30	28	31	32	32	31	31
37	31	32	33	34	36	37	39	40	40	39	39
50	16	16	19	19	21	19	23	23	23	22	22
55	21	22	24	24	27	25	29	29	29	28	28
57	18	18	21	21	23	22	25	26	26	25	25
60	21	22	24	24	27	25	28	29	29	28	28
61	21	22	24	24	26	25	28	29	29	28	28
62	18	19	21	21	23	22	25	26	26	25	25
63	24	25	26	27	30	28	31	32	32	31	31
71	18	19	21	21	23	22	25	26	26	25	25
72	12	13	16	15	17	16	19	20	20	19	19
73	24	25	27	27	30	28	32	32	32	32	32
73	20	21	23	23	26	24	28	28	28	27	27

6. ASSESSMENT

Table 6.1 below summarises the level of exceedance to the noise criteria based on background noise monitoring, with the predicted levels exceeding the criteria highlighted in red and the level of exceedance listed in brackets adjacent. The noise criteria at each location is based upon the background noise levels listed in Table 3.2, cross referenced with Table 3.3

TABLE 6.1 – ASSESSMENT OF NOISE LEVELS AT IDENTIFIED RECEIVER LOCATIONS

ID#	Predicted Noise Level, L_{Aeq} [dB(A)] Compared to Background Noise Criteria										
	3m/s	4m/s	5m/s	6m/s	7m/s	8m/s	9m/s	10m/s	11m/s	12m/s	13m/s
1	33	34	35	36 (+1)	40 (+4)	38 (+1)	41 (+2)	42 (+1)	42	42	42
2	33	34	35	35	39 (+3)	37	41 (+2)	42 (+1)	42	41	41
3	23	24	26	26	29	27	30	31	31	30	30
4	23	24	26	26	29	28	31	32	32	31	31
5	25	26	28	28	31	30	33	34	34	33	33
6	28	28	30	30	34	32	35	36	36	35	35
7	24	25	27	27	30	29	32	33	32	32	32
8	28	29	30	31	35	33	36	37	37	37	37
9	34	35	36 (+1)	36 (+1)	40 (+4)	39 (+2)	42 (+3)	43 (+2)	43 (+1)	42	42
10	34	35	36 (+1)	37 (+2)	41 (+6)	39 (+4)	42 (+6)	43 (+3)	43	43	42
11	25	25	27	27	31	29	32	33	33	32	32
12	23	24	26	26	29	28	31	32	32	31	31
14	31	32	33	34	37	36	39 (+1)	40	40	39	39
15	23	23	25	25	28	27	30	31	30	30	30
16	30	31	32	33	37 (+2)	35	38 (+1)	39 (+2)	39 (+2)	38 (+3)	38 (+3)
17	29	30	31	32	35	34	37	38 (+1)	38 (+1)	37 (+2)	37 (+2)
18	30	31	32	33	36	35	38	39	39	38	38
19	31	32	33	34	37	36	39 (+1)	40	40	39	39
20	24	25	27	27	30	28	32	32	32	32	31
21	14	15	17	17	19	18	21	22	22	21	21
22	19	20	22	22	25	23	27	27	27	26	26
23	16	17	19	19	22	20	23	24	24	23	23
24	26	27	28	29	32	30	34	34	34	34	34
25	19	19	22	22	24	23	26	27	27	26	26
26	19	19	22	22	24	23	26	27	27	26	26
27	27	28	29	30	33	31	34	35	35	35	34
28	25	25	27	27	30	29	32	33	33	32	32
29	29	30	31	32	35	34	37	38	38	37	37
30	23	24	26	26	29	27	30	31	31	30	30
31	30	31	32	33	37	35	38	39	39	38	38
32	24	24	26	26	29	28	31	32	32	31	31
35	24	25	27	27	30	28	31	32	32	31	31
37	31	32	33	34	36 (+1)	37	39 (+2)	40 (+3)	40 (+3)	39 (+4)	39 (+4)
50	16	16	19	19	21	19	23	23	23	22	22
55	21	22	24	24	27	25	29	29	29	28	28
57	18	18	21	21	23	22	25	26	26	25	25
60	21	22	24	24	27	25	28	29	29	28	28
61	21	22	24	24	26	25	28	29	29	28	28
62	18	19	21	21	23	22	25	26	26	25	25
63	24	25	26	27	30	28	31	32	32	31	31
71	18	19	21	21	23	22	25	26	26	25	25
72	12	13	16	15	17	16	19	20	20	19	19
73	24	25	27	27	30	28	32	32	32	32	32
73	20	21	23	23	26	24	28	28	28	27	27

As can be seen from the above tables, calculated noise levels comply with the noise criteria based upon background noise monitoring, with the exception of the receiver points shown above in red for various wind speeds – namely #9, #1, #17, #16, #2, #19, #10, #14 and #37.

All the locations where an exceedance to the background noise criteria have been calculated are "Stake-Holders", with all calculated levels below the Guidelines recommended level of 45 dB(A) for "Stake-Holders".

Hence, the proposed wind farm is considered to meet all relevant criteria established by the Guidelines.

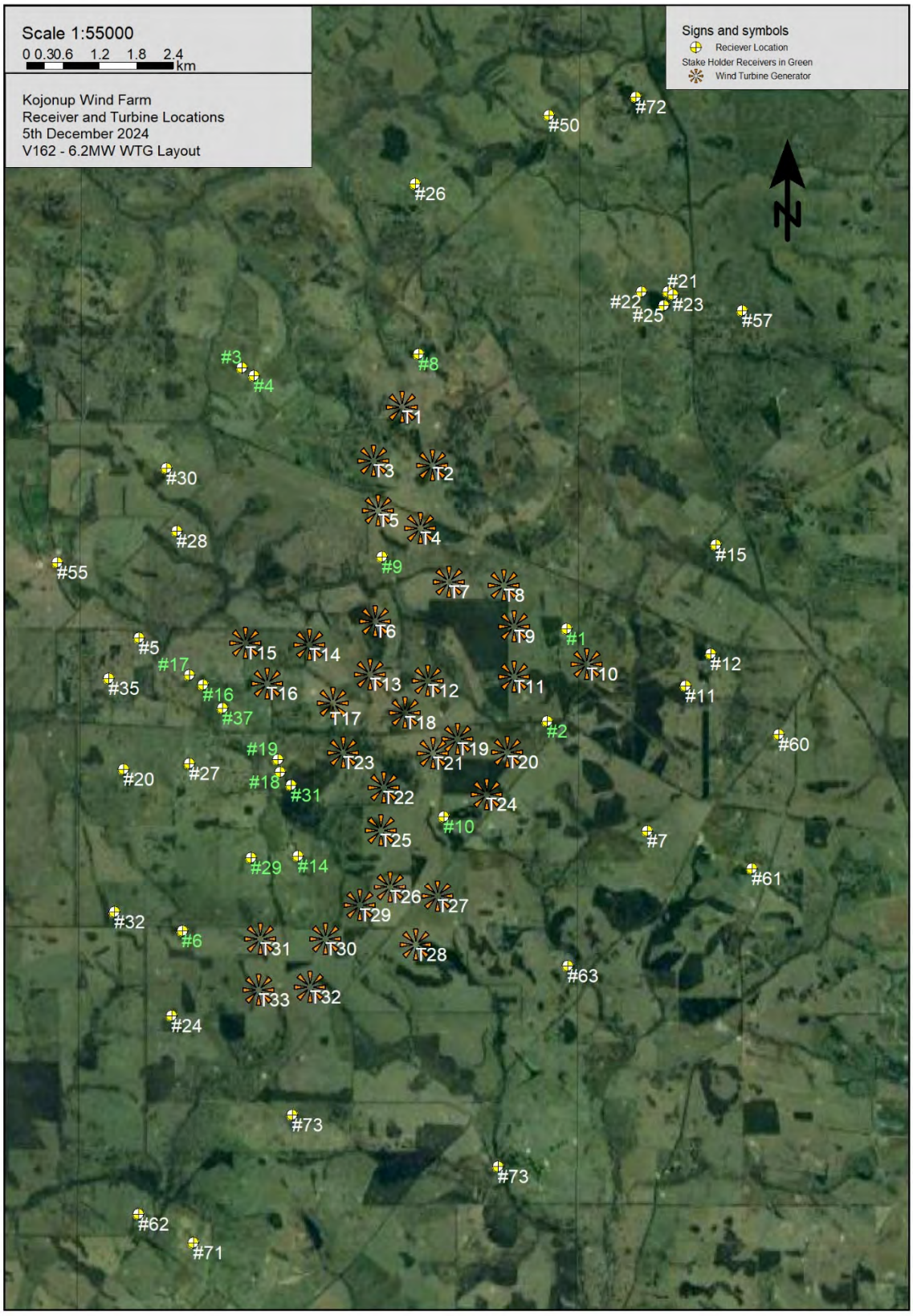
7. CONCLUSION

Noise emissions at all "non-Stake Holder" locations have been found to comply with the noise criteria based on background noise monitoring.

All "Stake Holder" locations have been found to comply with the recommended level of 45 dB(A) for "Stake Holders" established in the Guidelines.

APPENDIX A

RESIDENTIAL AND TURBINE LOCATIONS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km
Kojonup Wind Farm
Receiver and Turbine Locations
5th December 2024
V162 - 6.2MW WTG Layout
Signs and symbols
Reciever Location
Stake Holder Receivers in Green
Wind Turbine Generator
N
#72
#50
#26
#21
#22
#23
#25
#57
#3
#4
#8
T1
T3
T2
#30
T5
T4
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#32
#6
T31
T30
T28
#63
T33
T32
#24
#73
#73
#62
#71

RESIDENTIAL LOCATIONS

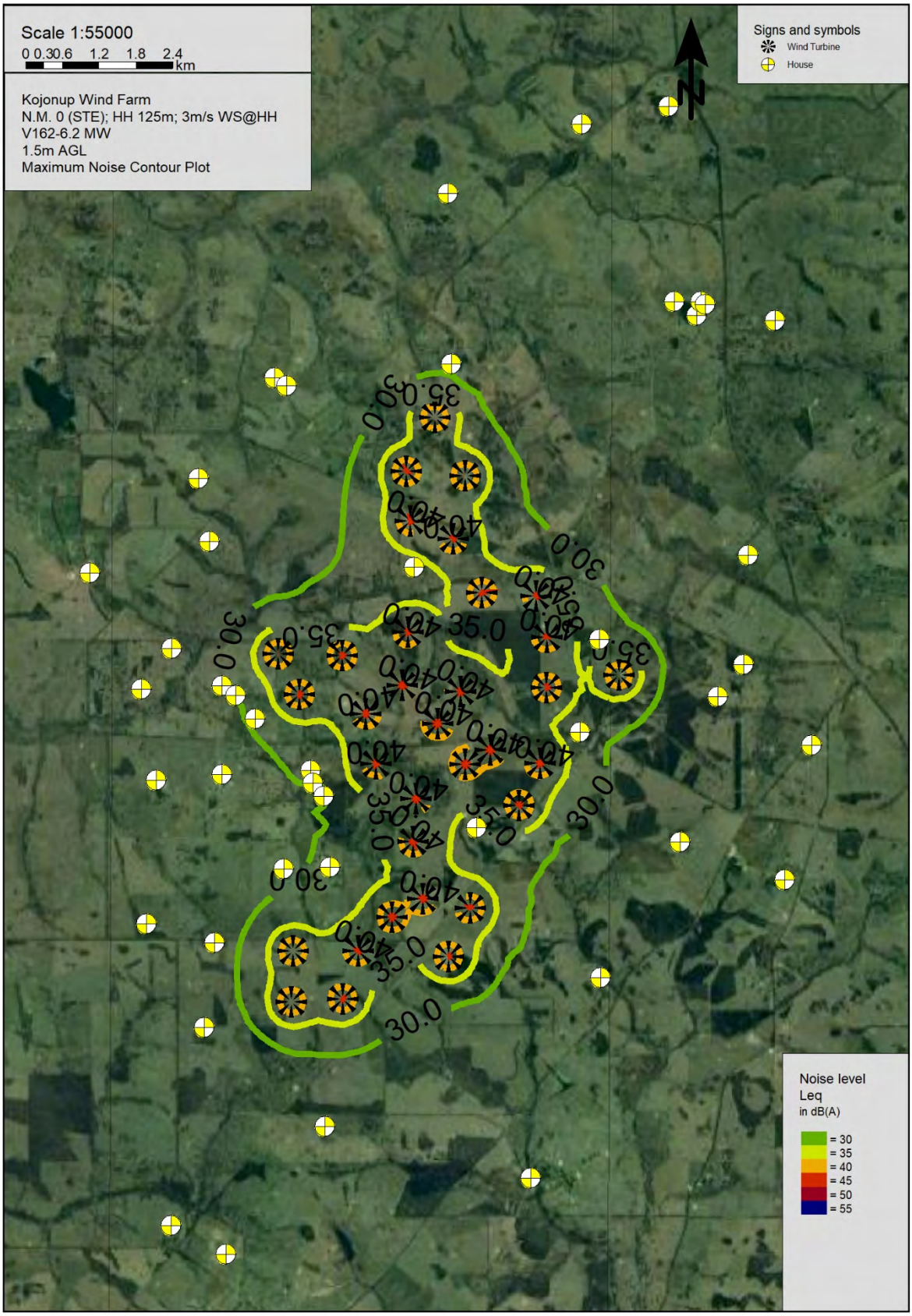
Name	Easting, m	Northing, m
1	514474	6243010
2	514159	6241499
3	509187	6247267
4	509385	6247137
5	507510	6242858
6	508214	6238071
7	515794	6239708
8	512063	6247493
9	511465	6244182
10	512476	6239944
11	516411	6242077
12	516826	6242597
14	510096	6239305
15	516903	6244382
16	508552	6242094
17	508333	6242258
18	509812	6240672
19	509776	6240880
20	507264	6240722
21	516125	6248508
22	515698	6248505
23	516205	6248460
24	508042	6236697
25	516062	6248278
26	512008	6250262
27	508333	6240815
28	508125	6244601
29	509340	6239277
30	507955	6245627
31	509990	6240459
32	507108	6238383
35	507016	6242197
37	508870	6241716
50	514190	6251387
55	506178	6244093
57	517336	6248196
60	517929	6241285
61	517493	6239099
62	507500	6233474
63	514494	6237502
71	508394	6233003
72	515602	6251681
73	510010	6235079
73	513358	6234241

WIND TURBINE LOCATIONS AND TYPE

Name	Turbine Type	Operating Mode	Easting, m	Northing, m
T1	V162-6.2 MW	Normal – serrated blade edge	511793	6246626
T2	V162-6.2 MW	Normal – serrated blade edge	512289	6245670
T3	V162-6.2 MW	Normal – serrated blade edge	511332	6245747
T4	V162-6.2 MW	Normal – serrated blade edge	512091	6244646
T5	V162-6.2 MW	Normal – serrated blade edge	511400	6244934
T6	V162-6.2 MW	Normal – serrated blade edge	511361	6243131
T7	V162-6.2 MW	Normal – serrated blade edge	512562	6243769
T8	V162-6.2 MW	Normal – serrated blade edge	513448	6243714
T9	V162-6.2 MW	Normal – serrated blade edge	513619	6243050
T10	V162-6.2 MW	Normal – serrated blade edge	514798	6242430
T11	V162-6.2 MW	Normal – serrated blade edge	513617	6242225
T12	V162-6.2 MW	Normal – serrated blade edge	512216	6242161
T13	V162-6.2 MW	Normal – serrated blade edge	511270	6242263
T14	V162-6.2 MW	Normal – serrated blade edge	510288	6242753
T15	V162-6.2 MW	Normal – serrated blade edge	509244	6242775
T16	V162-6.2 MW	Normal – serrated blade edge	509593	6242116
T17	V162-6.2 MW	Normal – serrated blade edge	510670	6241802
T18	V162-6.2 MW	Normal – serrated blade edge	511840	6241639
T19	V162-6.2 MW	Normal – serrated blade edge	512700	6241211
T20	V162-6.2 MW	Normal – serrated blade edge	513509	6240997
T21	V162-6.2 MW	Normal – serrated blade edge	512295	6240979
T22	V162-6.2 MW	Normal – serrated blade edge	511492	6240417
T23	V162-6.2 MW	Normal – serrated blade edge	510837	6240988
T24	V162-6.2 MW	Normal – serrated blade edge	513168	6240310
T25	V162-6.2 MW	Normal – serrated blade edge	511446	6239717
T26	V162-6.2 MW	Normal – serrated blade edge	511600	6238792
T27	V162-6.2 MW	Normal – serrated blade edge	512370	6238638
T28	V162-6.2 MW	Normal – serrated blade edge	512022	6237851
T29	V162-6.2 MW	Normal – serrated blade edge	511102	6238495
T30	V162-6.2 MW	Normal – serrated blade edge	510545	6237941
T31	V162-6.2 MW	Normal – serrated blade edge	509485	6237940
T32	V162-6.2 MW	Normal – serrated blade edge	510300	6237162
T33	V162-6.2 MW	Normal – serrated blade edge	509462	6237113

APPENDIX B

PREDICTED NOISE LEVEL CONTOURS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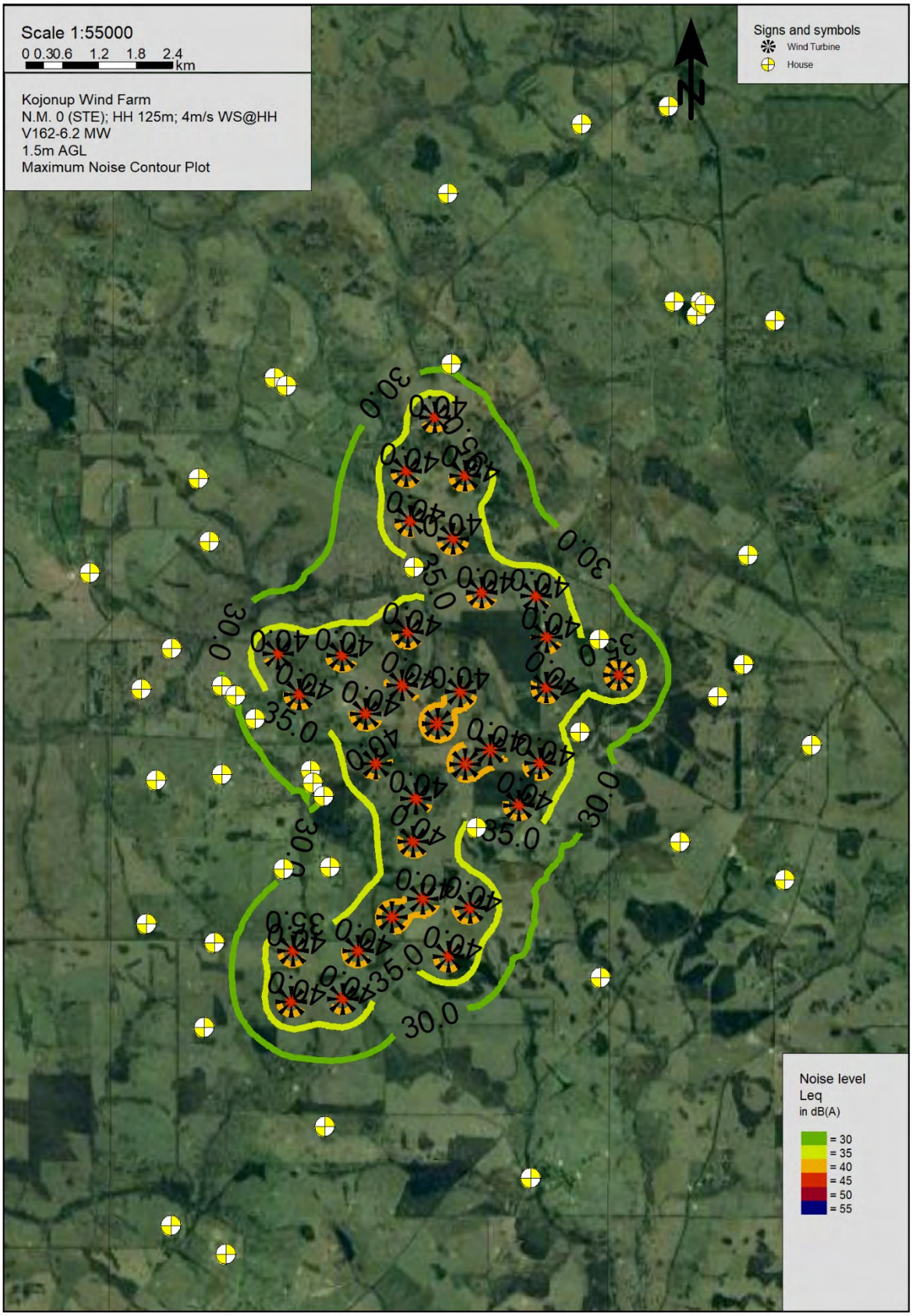
km
Kojonup Wind Farm
N.M. 0 (STE); HH 125m; 3m/s WS@HH
V162-6.2 MW
1.5m AGL
Maximum Noise Contour Plot
Signs and symbols
Wind Turbine
House
35.0
30.0
40.0
Noise level
Leq
in dB(A)
= 30
= 35
= 40
= 45
= 50
= 55


Scale 1:55000
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km
Kojonup Wind Farm
N.M. 0 (STE); HH 125m; 4m/s WS@HH
V162-6.2 MW
1.5m AGL
Maximum Noise Contour Plot
Signs and symbols
Wind Turbine
House
N
30.0
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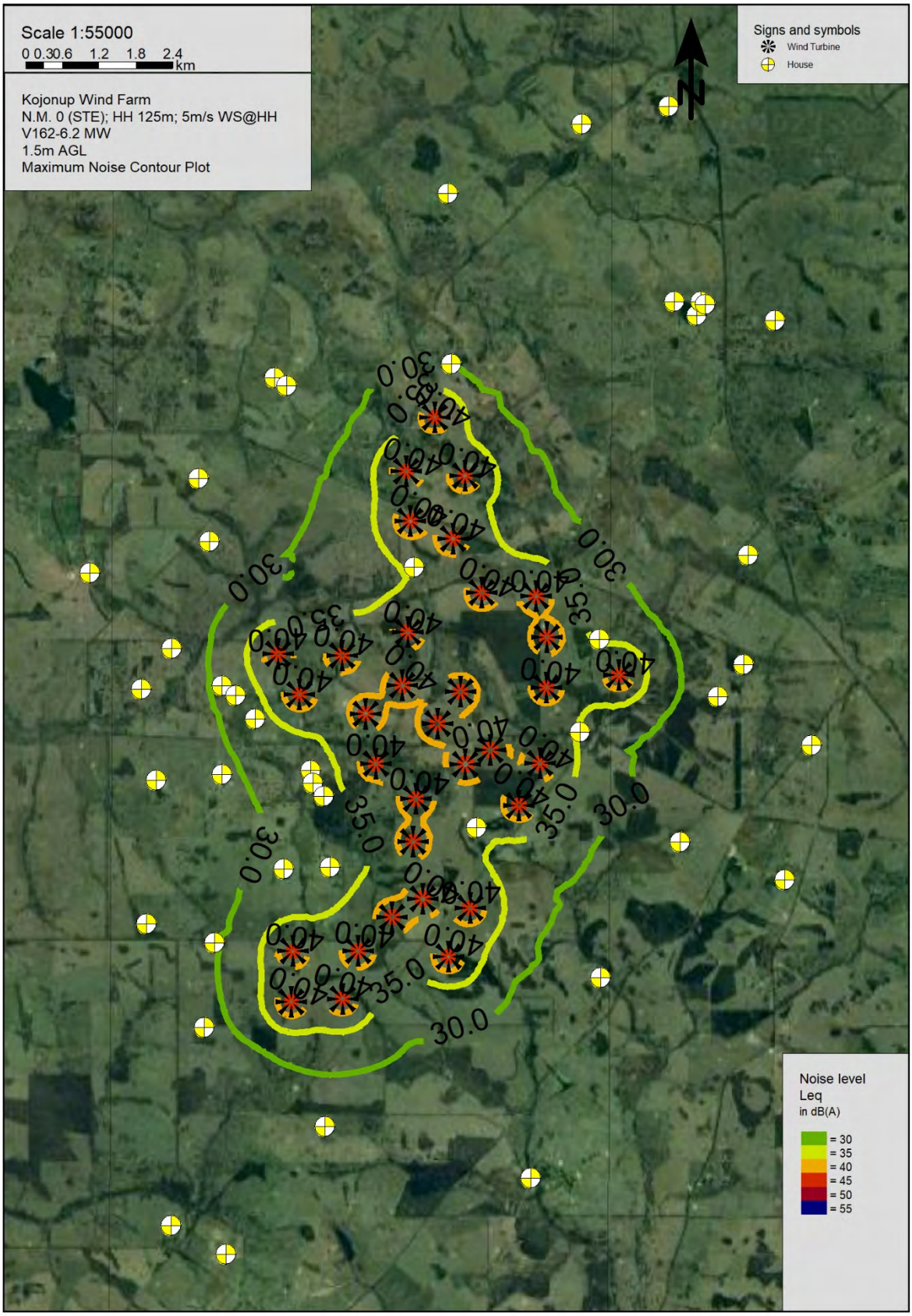
40.0
Noise level
Leq
in dB(A)
= 30
= 35
= 40
= 45
= 50
= 55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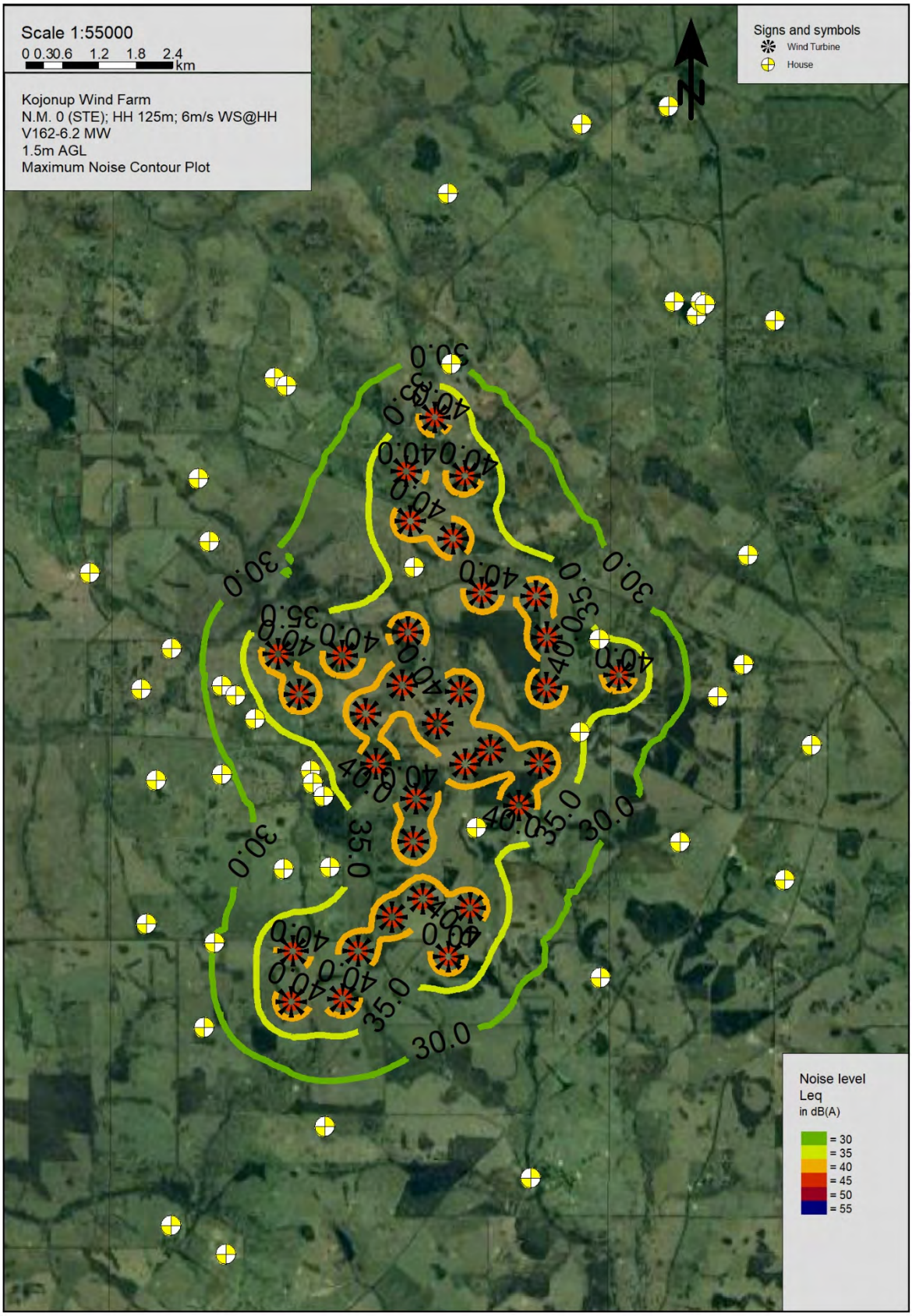
km
Kojonup Wind Farm
N.M. 0 (STE); HH 125m; 5m/s WS@HH
V162-6.2 MW
1.5m AGL
Maximum Noise Contour Plot
Signs and symbols
Wind Turbine
House
N
30.0
35.0
40.0
Noise level
Leq
in dB(A)
= 30
= 35
= 40
= 45
= 50
= 55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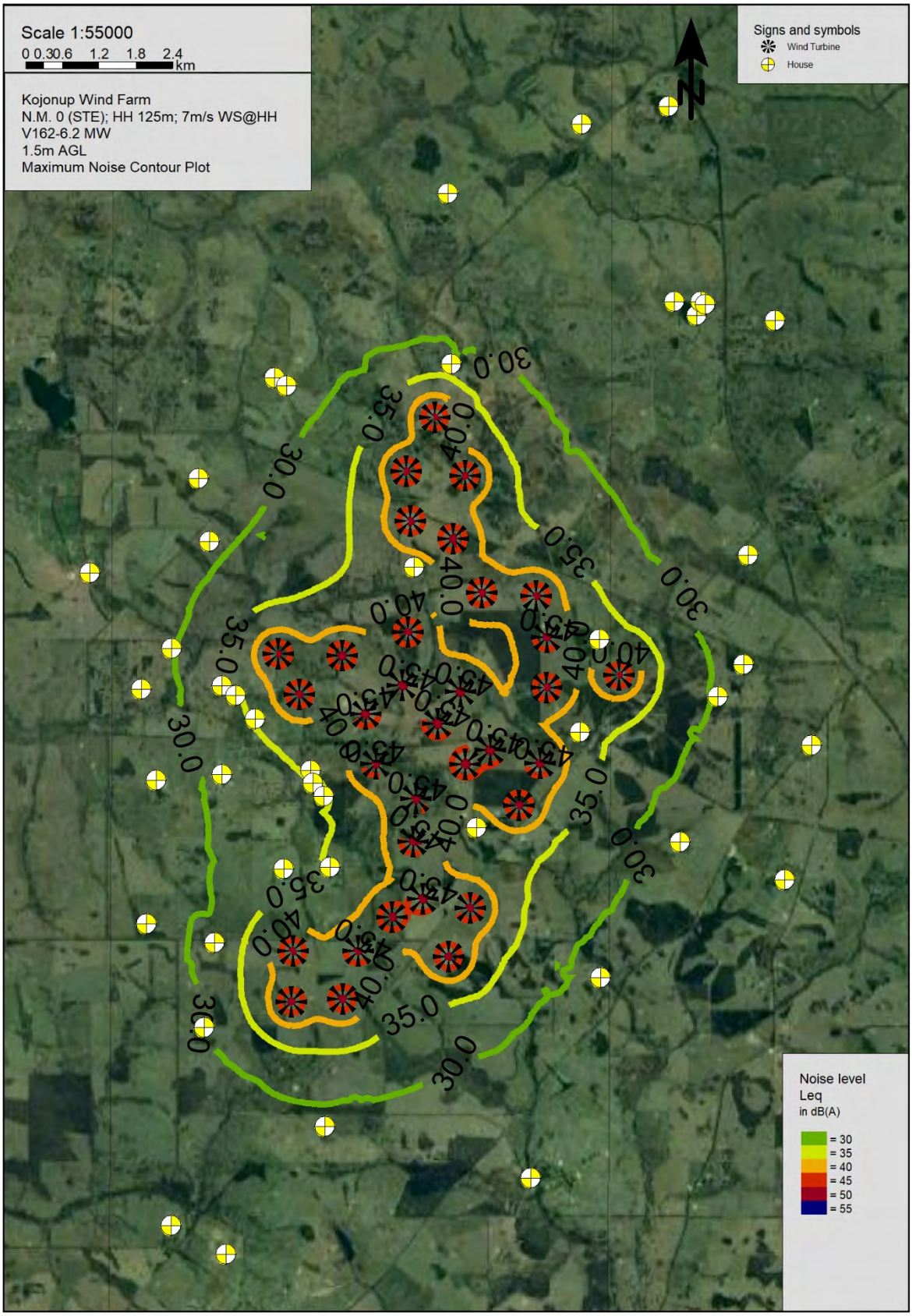
V162-6.2 MW
1.5m AGL
Maximum Noise Contour Plot
Signs and symbols
Wind Turbine
House
N
Noise level
Leq
in dB(A)
= 30
= 35
= 40
= 45
= 50
= 55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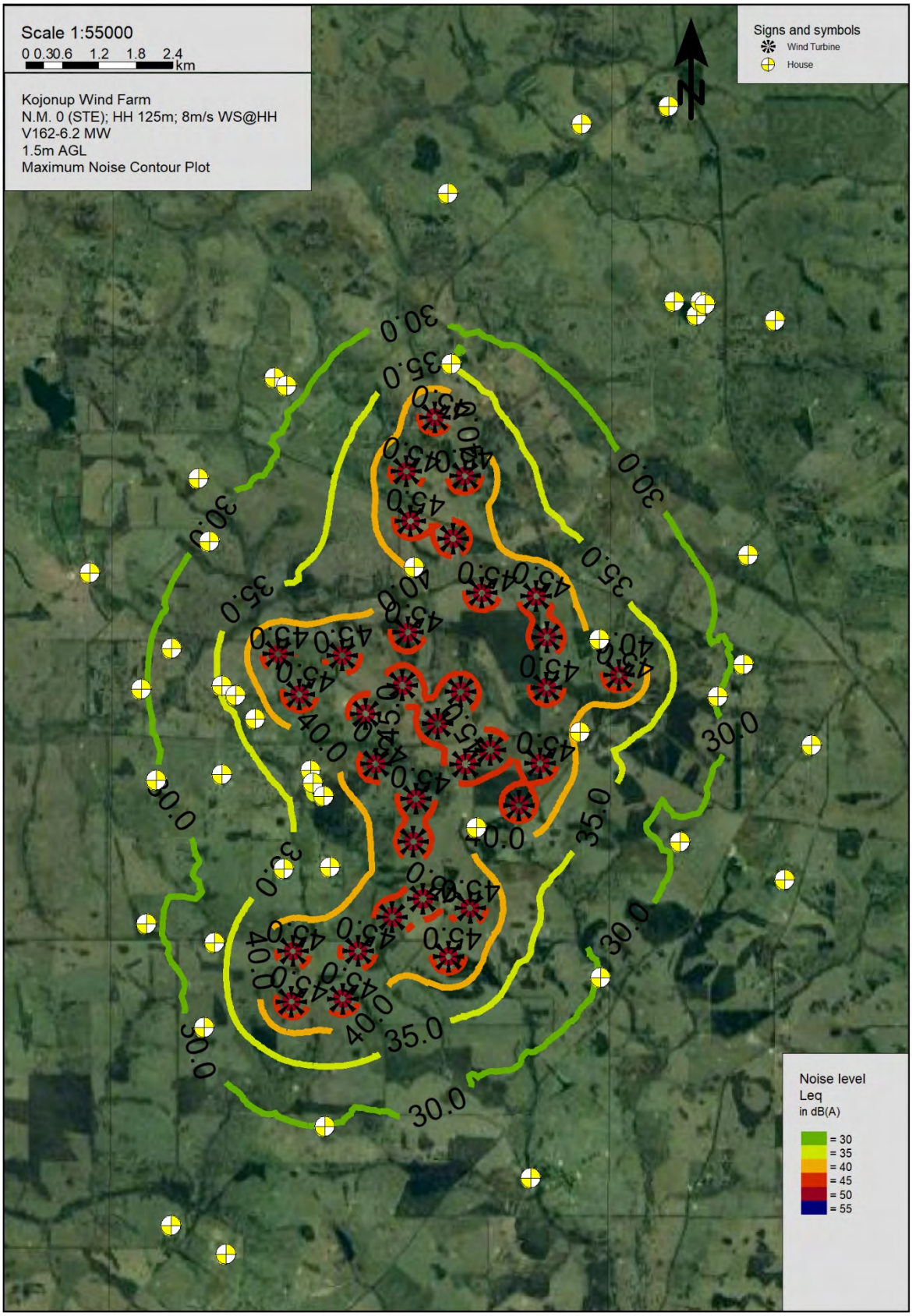
km
Kojonup Wind Farm
N.M. 0 (STE); HH 125m; 7m/s WS@HH
V162-6.2 MW
1.5m AGL
Maximum Noise Contour Plot
Signs and symbols
Wind Turbine
House
N
Noise level
Leq
in dB(A)
= 30
= 35
= 40
= 45
= 50
= 55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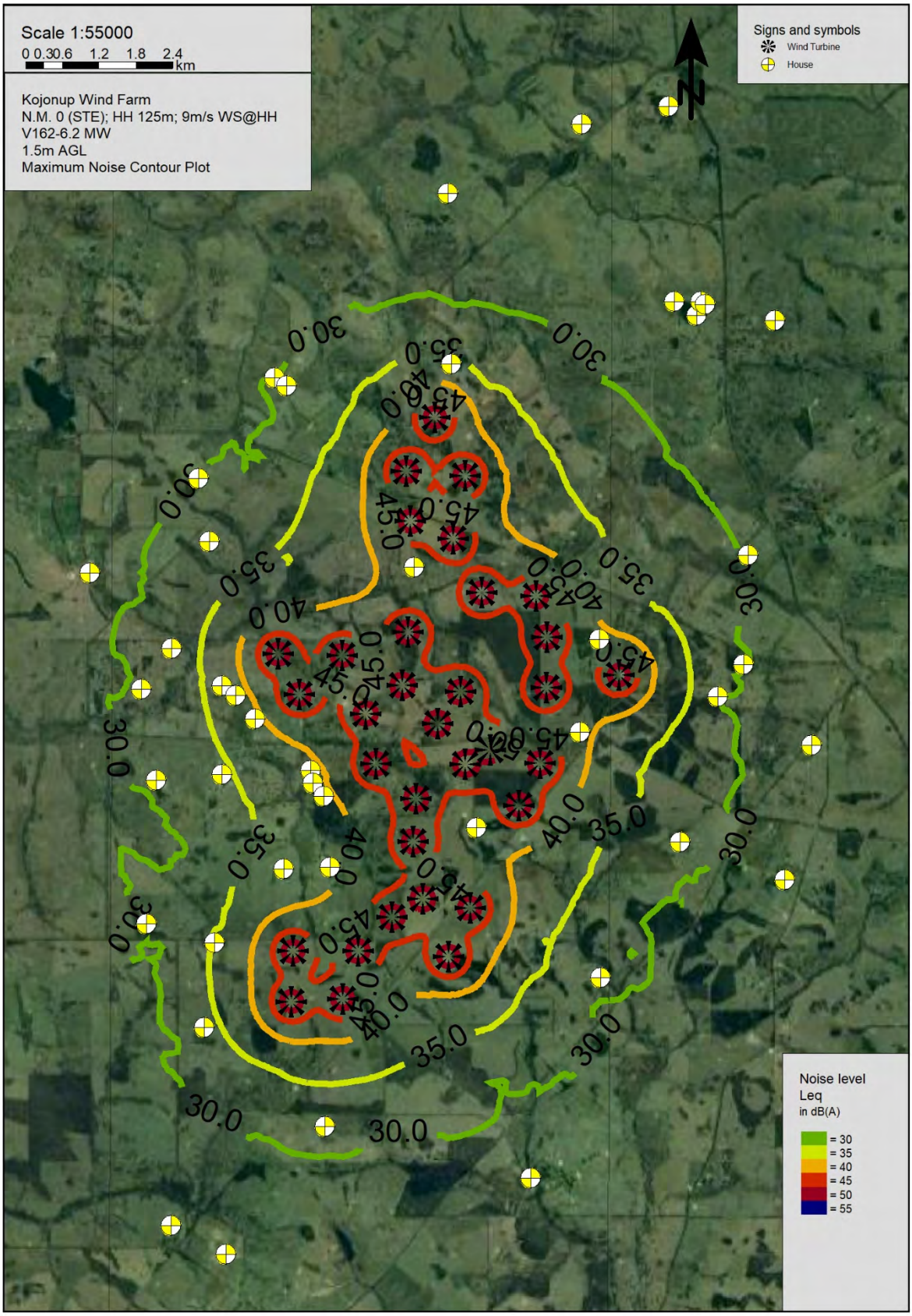
km
Kojonup Wind Farm
N.M. 0 (STE); HH 125m; 8m/s WS@HH
V162-6.2 MW
1.5m AGL
Maximum Noise Contour Plot
Signs and symbols
Wind Turbine
House
N
Noise level
Leq
in dB(A)
= 30
= 35
= 40
= 45
= 50
= 55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km
Kojonup Wind Farm
N.M. 0 (STE); HH 125m; 9m/s WS@HH
V162-6.2 MW
1.5m AGL
Maximum Noise Contour Plot
Signs and symbols
Wind Turbine
House
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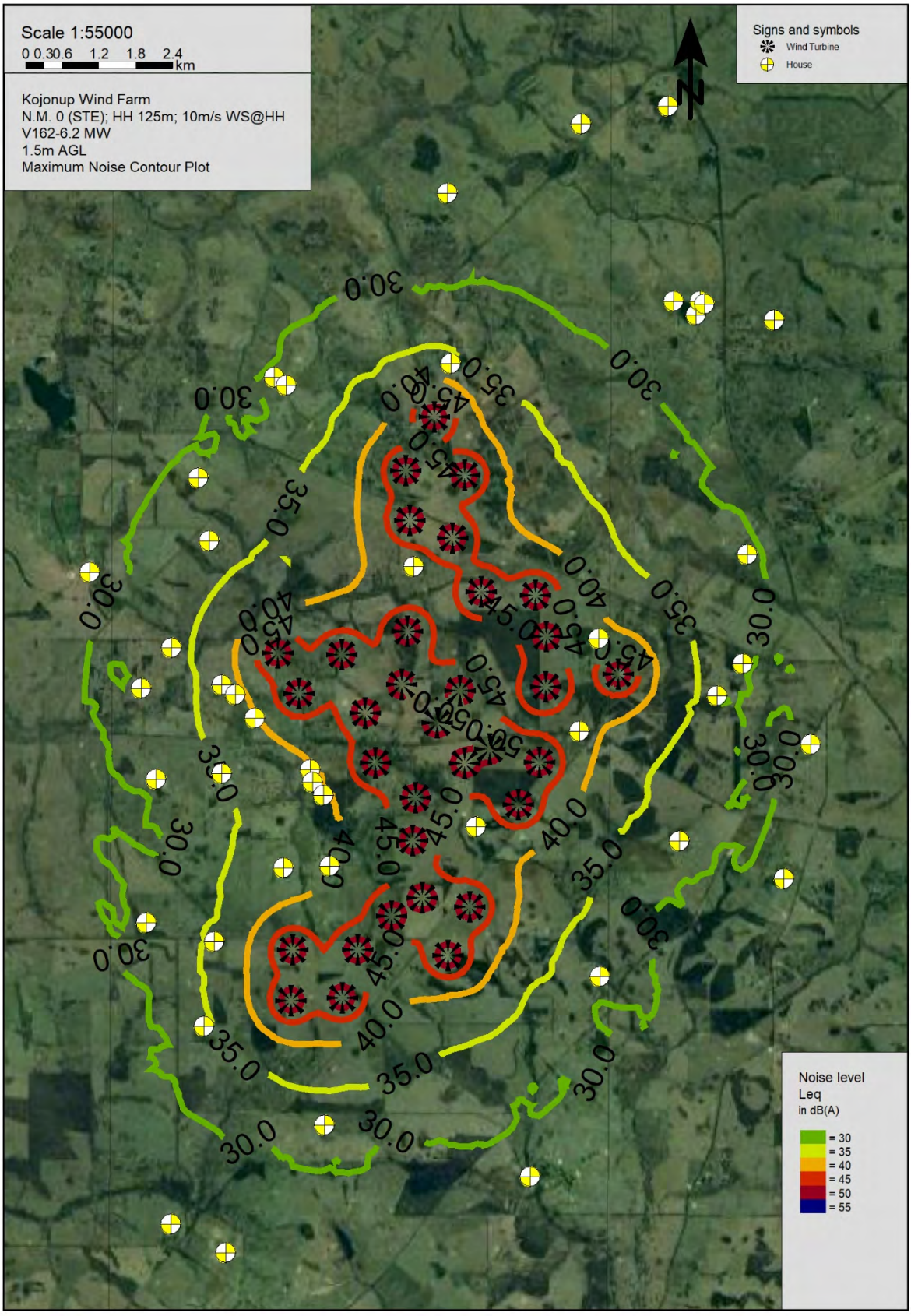
35.0
40.0
45.0
Noise level
Leq
in dB(A)
= 30
= 35
= 40
= 45
= 50
= 55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N.M. 0 (STE); HH 125m; 10m/s WS@HH
V162-6.2 MW
1.5m AGL
Maximum Noise Contour Plot
Signs and symbols
Wind Turbine
House
Noise level
Leq
in dB(A)
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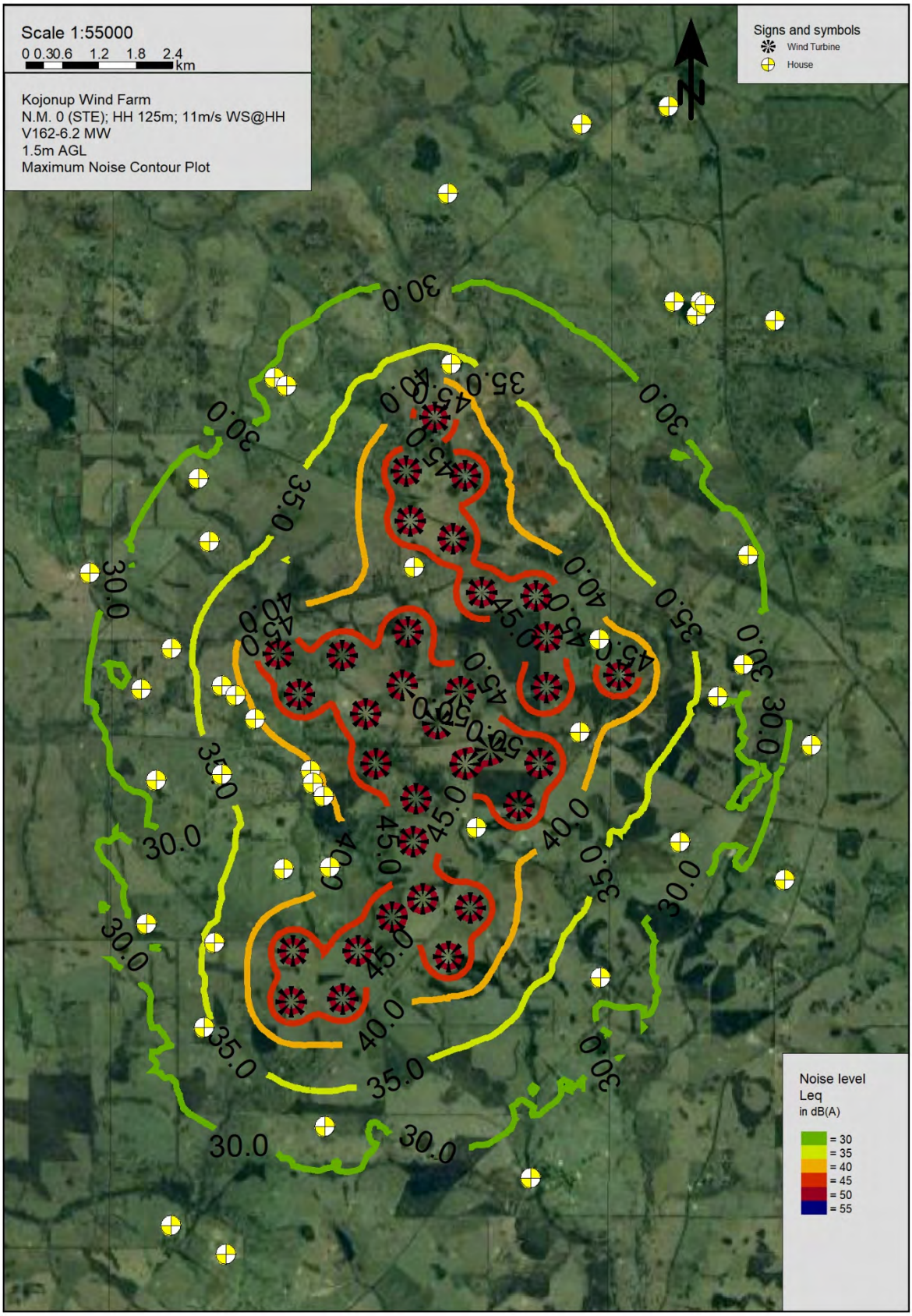
= 35
= 40
= 45
= 50
= 55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Kojonup Wind Farm
N.M. 0 (STE); HH 125m; 11m/s WS@HH
V162-6.2 MW
1.5m AGL
Maximum Noise Contour Plot
Signs and symbols
Wind Turbine
House
N
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45.0
50.0
Noise level
Leq
in dB(A)
= 30
= 35
= 40
= 45
= 50
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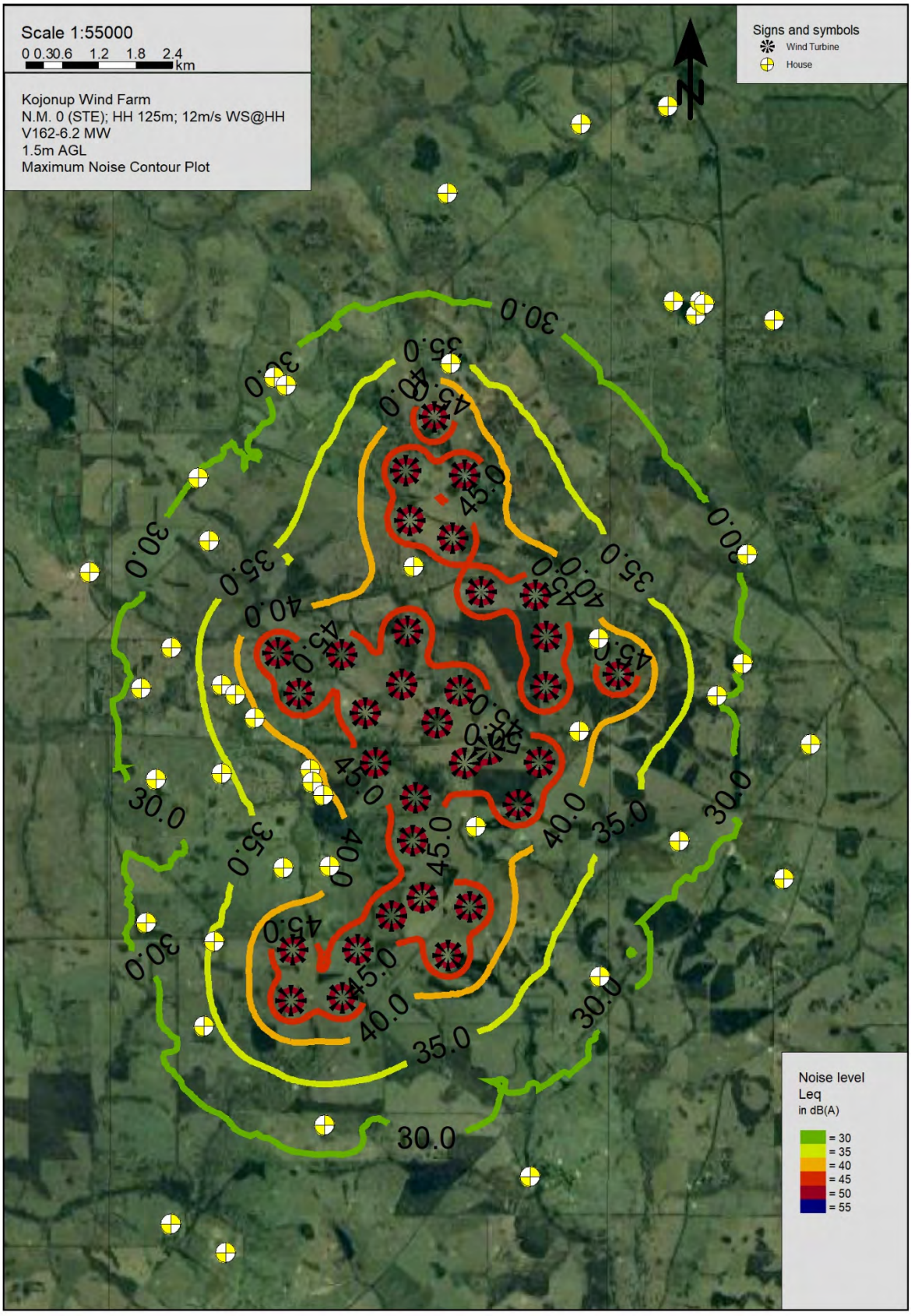
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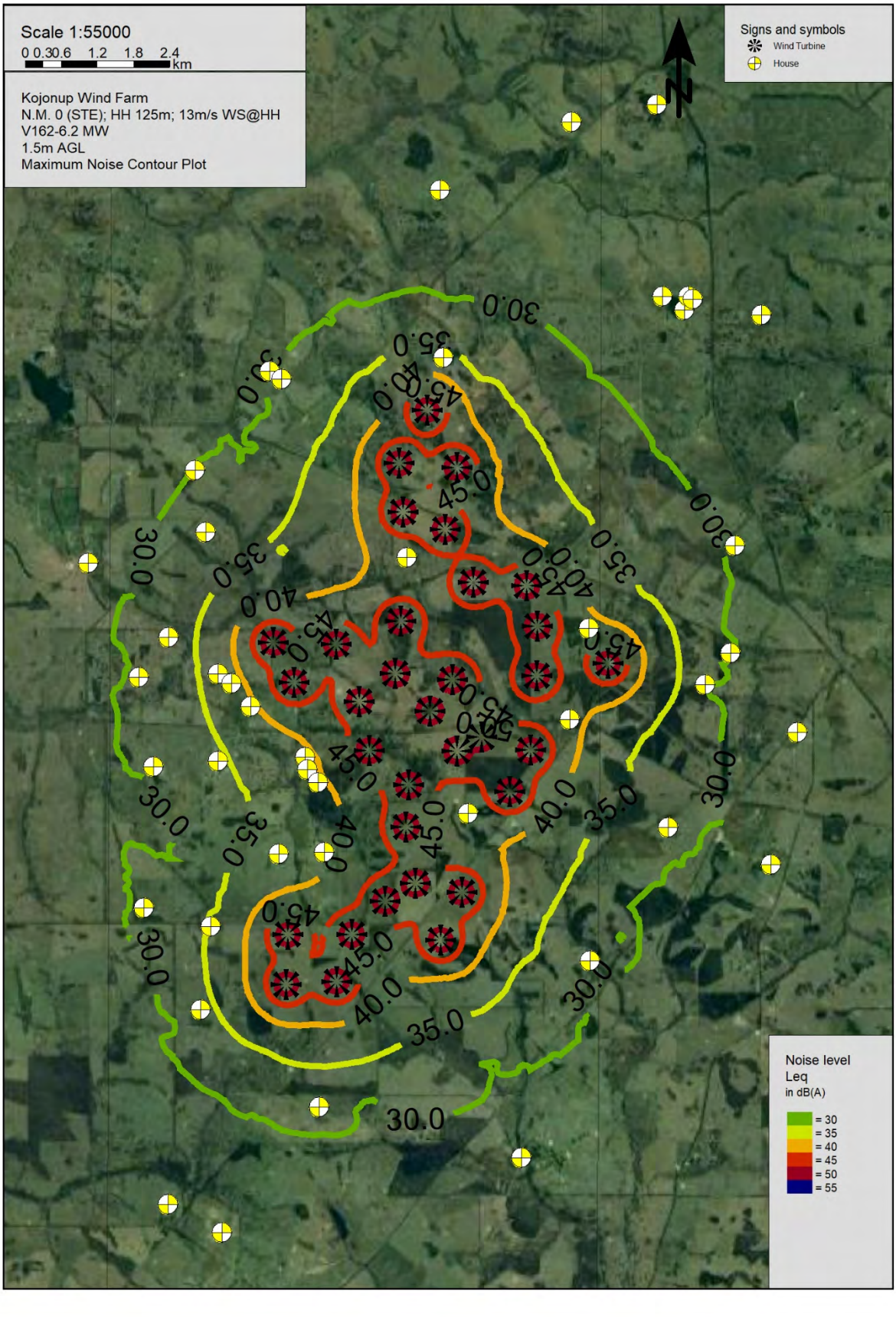
km
Kojonup Wind Farm
N.M. 0 (STE); HH 125m; 12m/s WS@HH
V162-6.2 MW
1.5m AGL
Maximum Noise Contour Plot
Signs and symbols
Wind Turbine
House
N
30.0
35.0
40.0
45.0
Noise level
Leq
in dB(A)
= 30
= 35
= 40
= 45
= 50
= 55


Scale 1:55000
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km
Kojonup Wind Farm
N.M. 0 (STE); HH 125m; 13m/s WS@HH
V162-6.2 MW
1.5m AGL
Maximum Noise Contour Plot
Signs and symbols
Wind Turbine
House
N
30.0
35.0
40.0
45.0
Noise level
Leq
in dB(A)
= 30
= 35
= 40
= 45
= 50
= 55

APPENDIX C

BACKGROUND NOISE MONITORING REPORT

MOONIES HILL NEW ENERGY

WIND FARM
KOJONUP

BACKGROUND NOISE MONITORING

MAY 2024

OUR REFERENCE: 32731-3-23199

Rochdale Holdings Pty Ltd A.B.N. 85 009 049 067 trading as:
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DOCUMENT CONTROL PAGE

BACKGROUND NOISE MONITORING

KOJONUP WIND FARM

Job No: 23199

Document Reference : 32731-3-23199

FOR

MOONIES HILL NEW ENERGY

DOCUMENT INFORMATION			
Author:	George Watts	**Checked By:**	Paul Daly
Date of Issue:	16 May 2024		

REVISION HISTORY				
Revision	**Description**	**Date**	**Author**	**Checked**
1	Addition of 125m HH B/G Noise Criteria	28/5/2024	GW	
2	Revision following client feedback	14/6/2024	GW	

DOCUMENT DISTRIBUTION				
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CONTENTS

APPENDICIES

1. INTRODUCTION

Herring Storer Acoustics were commissioned by Moonies Hill New Energy to carry out background noise monitoring for the proposed wind farm located approximately 15km south of Kojonup townsite.

Background noise monitoring was commissioned to enable the results to be used in the noise impact assessment, carried out in accordance with the EPA of South Australia *"Wind Farms – Environmental noise guidelines– July 2009, Updated November 2021"* (Guidelines) which is the guidelines recognised by the Western Australian Department Water Environment and Regulation for the assessment of wind farms.

Noise monitoring was carried out between 14th November 2023 and 22nd April 2024 at 12 locations, with monitoring occurring for approximately 1 month at each location.

This report presents the results of the monitoring and analysis.

2. SUMMARY

Based on the results of background noise monitoring within the proposed wind farm development area, the applicable criteria for each location is as listed in Table 2.1 and 2.2.

TABLE 2.1 – NOISE CRITERIA BASED ON BACKGROUND NOISE LEVELS @ 125m AGL HUB HEIGHT, dB(A)

Location	WIND SPEED AT 125m ABOVE GROUND LEVEL (m/s)										
	3	4	5	6	7	8	9	10	11	12	13
1	35	35	35	38	38	39	41	45	47	49	50
2	35	35	35	35	35	35	36	40	43	44	45
3	35	35	35	35	36	37	39	41	42	44	46
4	35	35	35	38	39	40	42	44	46	48	50
5	35	35	35	36	37	37	38	41	43	44	45
6	36	35	35	36	38	38	39	38	37	38	38
7	36	36	36	38	39	40	42	42	41	42	40
8	38	36	36	37	38	38	39	38	38	39	39
9	35	35	35	35	35	35	35	35	35	35	35
10	36	36	36	37	35	36	36	35	35	35	35
11	35	35	35	38	37	40	41	41	41	39	35
12	35	35	35	35	35	37	37	37	37	35	35

TABLE 2.2 – NOISE CRITERIA BASED ON BACKGROUND NOISE LEVELS @ 150m AGL HUB HEIGHT, dB(A)

Location	WIND SPEED AT 150m ABOVE GROUND LEVEL (m/s)										
	3	4	5	6	7	8	9	10	11	12	13
1	35	35	35	38	38	39	40	44	45	48	50
2	35	35	35	35	35	35	35	39	41	44	45
3	35	35	35	35	36	36	39	41	42	44	45
4	35	35	35	37	38	39	41	44	45	48	49
5	35	35	35	36	36	36	38	41	42	44	44
6	37	35	35	36	38	38	38	38	39	37	38
7	36	35	35	37	39	40	40	42	42	42	40
8	38	36	36	37	38	38	38	39	39	39	38
9	35	35	35	35	35	35	35	35	35	35	35
10	36	36	37	37	36	36	36	36	35	35	35
11	35	35	35	37	38	40	40	42	41	41	38
12	35	35	35	35	36	37	37	38	37	37	35

3. METHODOLOGY

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

TABLE 3.1 – MONITORING LOCATION DETAILS

Location	Easting (m)	Northing (m)
1	508214	6238112
2	512505	6239948
3	514468	6242985
4	509385	6247137
5	510116	6239346
6	512120	6247852
7	516856	6244420
8	507292	6240727
9	514473	6237553
10	515838	6239719
11	509994	6235091
12	507541	6242815
Wind Monitor	512131	6241641

Monitored noise levels were then paired with corresponding wind data, provided by the Triton wind monitoring station located within the proposed wind farm area.

Two potential hub heights were considered in our background noise monitoring, being 125m above ground level and 150m above ground level.

The wind speeds at 140m above ground level have been utilised for the proposed hub height of 150m above ground level. An analysis of the difference between 140m and 150m height indicated insignificant differences in the wind speeds, hence, the 140m height above ground level wind speed has been utilised as being representative of the wind speed at 150m. Similarly, the wind speed at 120m above ground level has been utilised as representative of the wind speed at 125m above ground level.

Rain affected data was removed from the collected data using weather information attained from the BOM.

The Guidelines requires 2000 valid data points to be collected for each site, and also recommends that not less than 500 data points collected for downwind conditions.

Wind direction for downwind conditions is defined as +- 45 degrees from the line connecting the receptor and the nearest turbine. It is noted that in this instance there are some background noise monitoring locations that have turbines in all directions – hence all wind directions are considered downwind.

The Guidelines recognises that the collection of 500 valid points for the downwind condition will not always be practical to achieve given prevailing wind conditions for some monitoring locations.

The number of data points – both downwind and overall at 125m and 150m above ground level– are listed below in Table 3.2 and 3.3.

TABLE 3.2 – NUMBER OF VALID BACKGROUND NOISE MONITORING POINTS @ 125m AGL

Location	Total Data Points	Downwind
1	3948	400
2	2722	2722
3	3045	3045
4	3948	182
5	2378	2378
6	2834	368
7	3714	212
8	3306	184
9	2906	2005
10	3157	2060
11	2440	212
12	2906	109

TABLE 3.3 – NUMBER OF VALID BACKGROUND NOISE MONITORING POINTS @ 150m AGL

Location	Total Data Points	Downwind
1	3653	395
2	2490	2490
3	2829	2829
4	3643	175
5	2196	2196
6	2547	312
7	3383	172
8	2987	149
9	2598	1826
10	2806	1870
11	2192	178
12	2598	92

The number of downwind condition data points collected at each background monitoring location has not exceed 500 in all cases. Given that the land uses in the surrounding area of each location is consistent in use and noise generating sources (i.e. vegetation state surrounding each location is the same) it is considered that the monitoring undertaken is representative of background noise levels at each location and wind direction.

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

The background noise levels monitored were correlated to wind speed, and processed in accordance with the Guidelines, with the resultant noise criteria at each hub height wind speed (from cut in rated power of the wind turbine generator) as listed below :

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

*whichever is greater.

Calibration certificates for meters used are attached in Appendix F.

4. RESULTS

Background noise monitoring for each of the twelve locations is presented in Appendix C and D, with time history charts presented in Appendix E.

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

Processing the collected data in accordance with the Guidelines, Table 4.1 summarises the background noise at each location for each integer hub height wind speed, from cut in speed to rated power.

TABLE 4.1 – NOISE CRITERIA ACCOUNTING FOR BACKGROUND NOISE LEVELS @ 125m AGL

Location	WIND SPEED AT 125m ABOVE GROUND LEVEL (m/s)										
	3	4	5	6	7	8	9	10	11	12	13
1	35	35	35	38	38	39	41	45	47	49	50
2	35	35	35	35	35	35	36	40	43	44	45
3	35	35	35	35	36	37	39	41	42	44	46
4	35	35	35	38	39	40	42	44	46	48	50
5	35	35	35	36	37	37	38	41	43	44	45
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7	36	36	36	38	39	40	42	42	41	42	40
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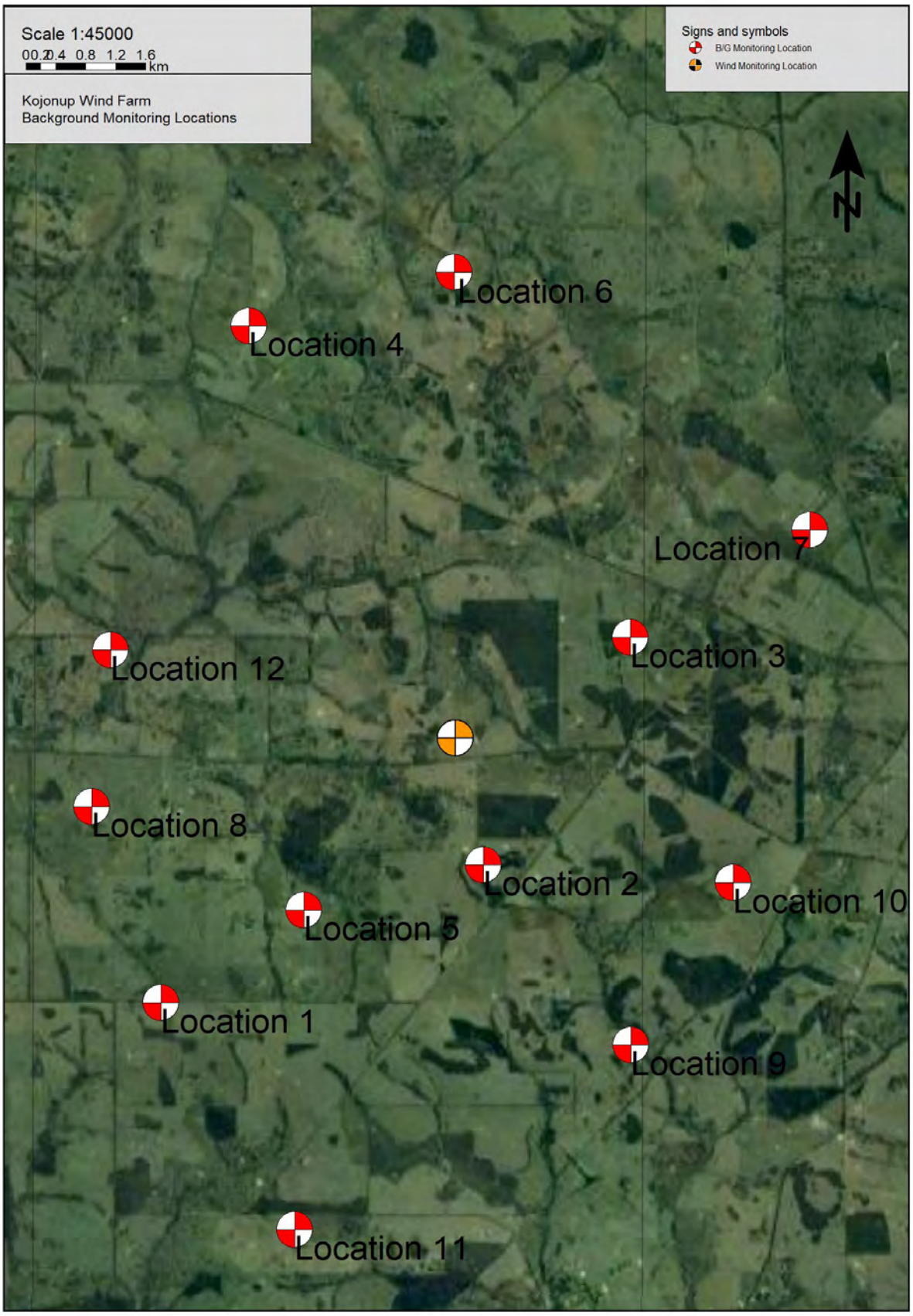
9	35	35	35	35	35	35	35	35	35	35	35
10	36	36	36	37	35	36	36	35	35	35	35
11	35	35	35	38	37	40	41	41	41	39	35
12	35	35	35	35	35	37	37	37	37	35	35

TABLE 4.2 – NOISE CRITERIA ACCOUNTING FOR BACKGROUND NOISE LEVELS

Location	WIND SPEED AT 150m ABOVE GROUND LEVEL (m/s)										
	3	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**
1	35	35	35	38	38	39	40	44	45	48	50
2	35	35	35	35	35	35	35	39	41	44	45
3	35	35	35	35	36	36	39	41	42	44	45
4	35	35	35	37	38	39	41	44	45	48	49
5	35	35	35	36	36	36	38	41	42	44	44
6	37	35	35	36	38	38	38	38	39	37	38
7	36	35	35	37	39	40	40	42	42	42	40
8	38	36	36	37	38	38	38	39	39	39	38
9	35	35	35	35	35	35	35	35	35	35	35
10	36	36	37	37	36	36	36	36	35	35	35
11	35	35	35	37	38	40	40	42	41	41	38
12	35	35	35	35	36	37	37	38	37	37	35

APPENDIX A

MONITORING LOCATIONS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km
Kojonup Wind Farm
Background Monitoring Locations
Signs and symbols
B/G Monitoring Location
Wind Monitoring Location
N
Location 6
Location 4
Location 7
Location 12
Location 3
Location 8
Location 2
Location 10
Location 5
Location 1
Location 9
Location 11

APPENDIX B

MONITORING LOCATION DETAILS

LOCATION 1

LOCATION 2

LOCATION 3

LOCATION 4

LOCATION 5

LOCATION 6

LOCATION 7

LOCATION 8

LOCATION 9

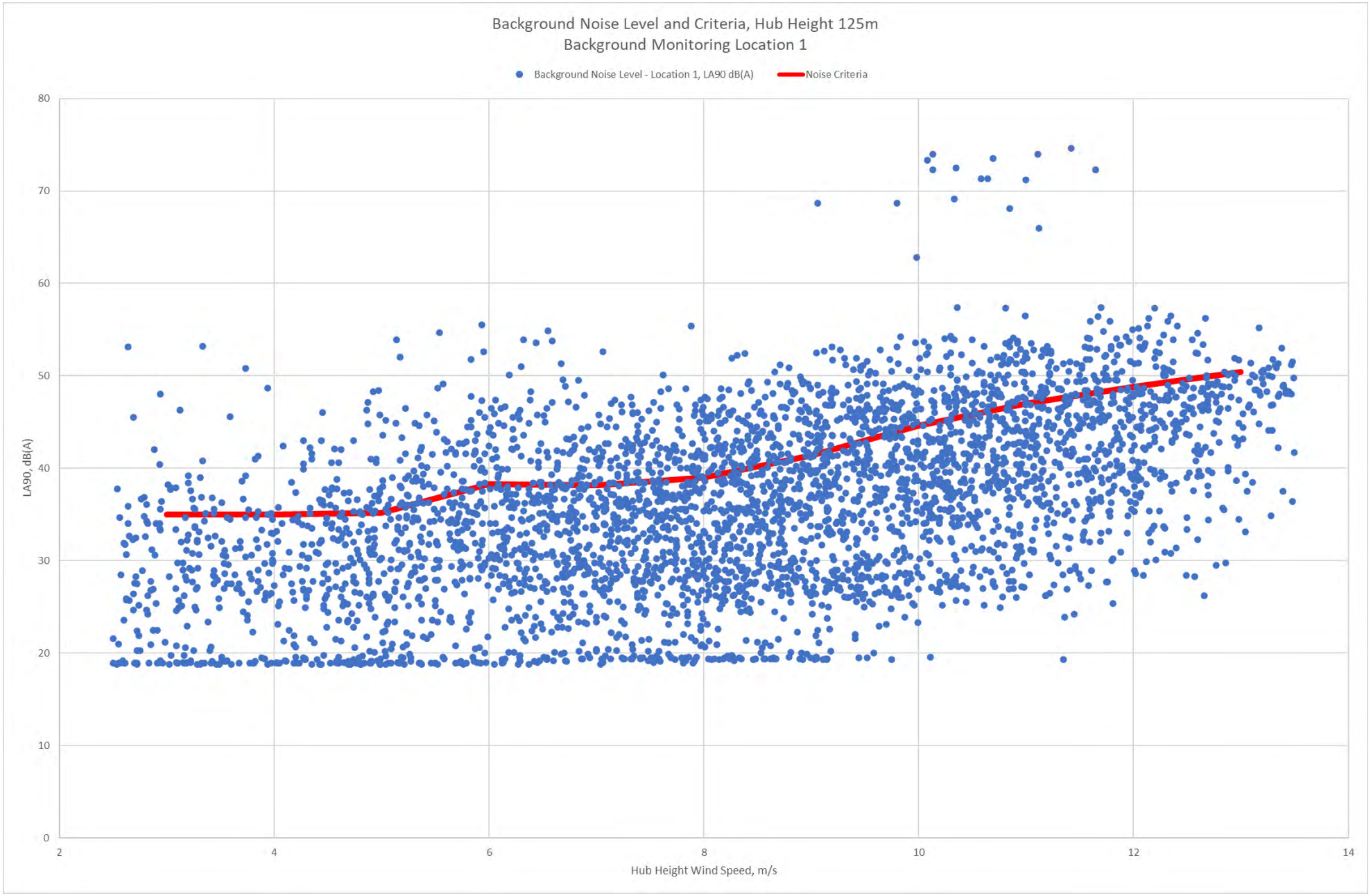
LOCATION 10

LOCATION 11

LOCATION 12

APPENDIX C

BACKGROUND NOISE LEVELS vs WIND SPEED PLOTS
125m AGL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Background Monitoring Location 1
Background Noise Level - Location 1, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
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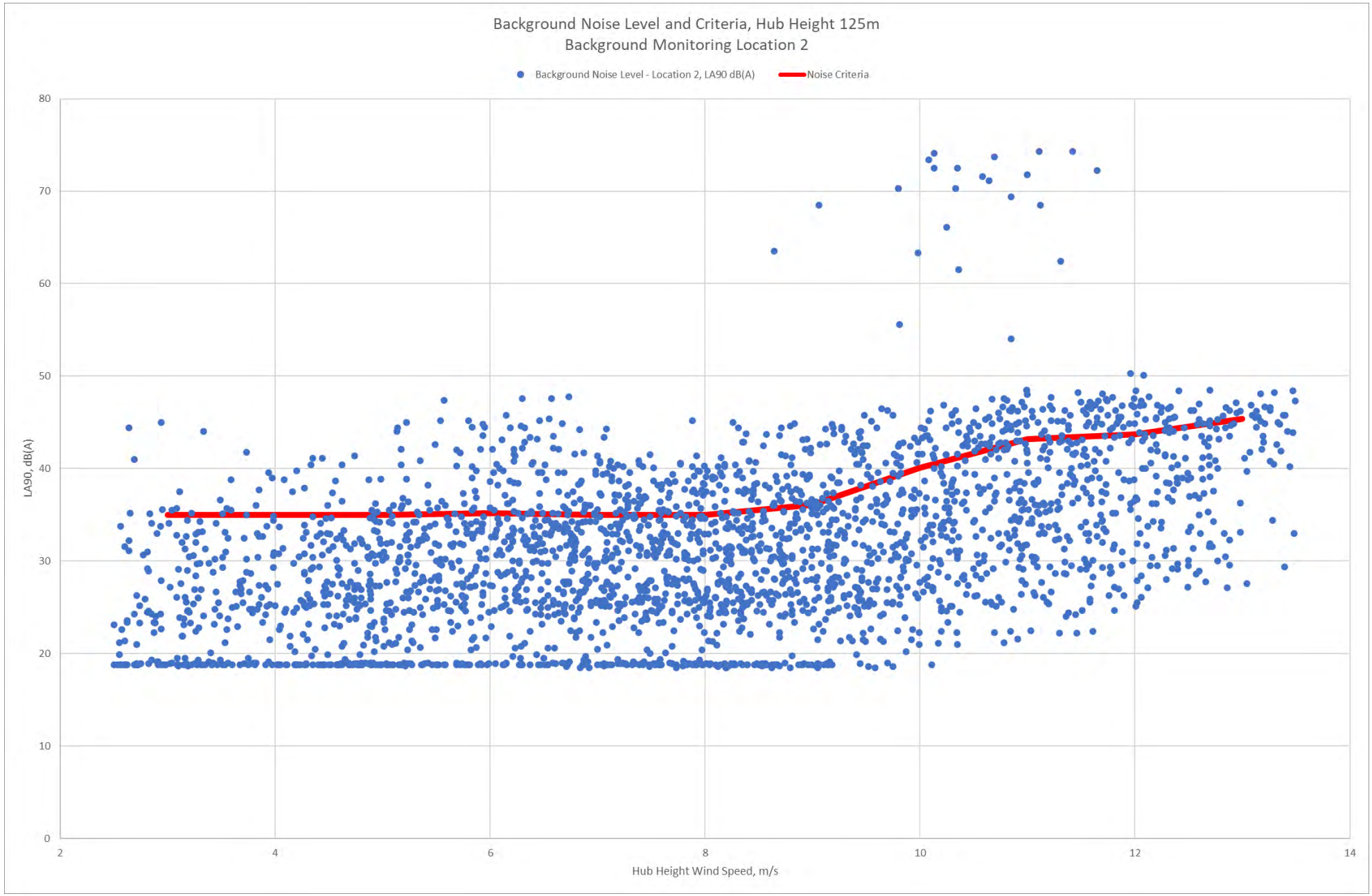
20
30
40
50
60
70
80
2
4
6
8
10
12
14


Background Noise Level and Criteria, Hub Height 125m
Background Monitoring Location 2
Background Noise Level - Location 2, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
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20
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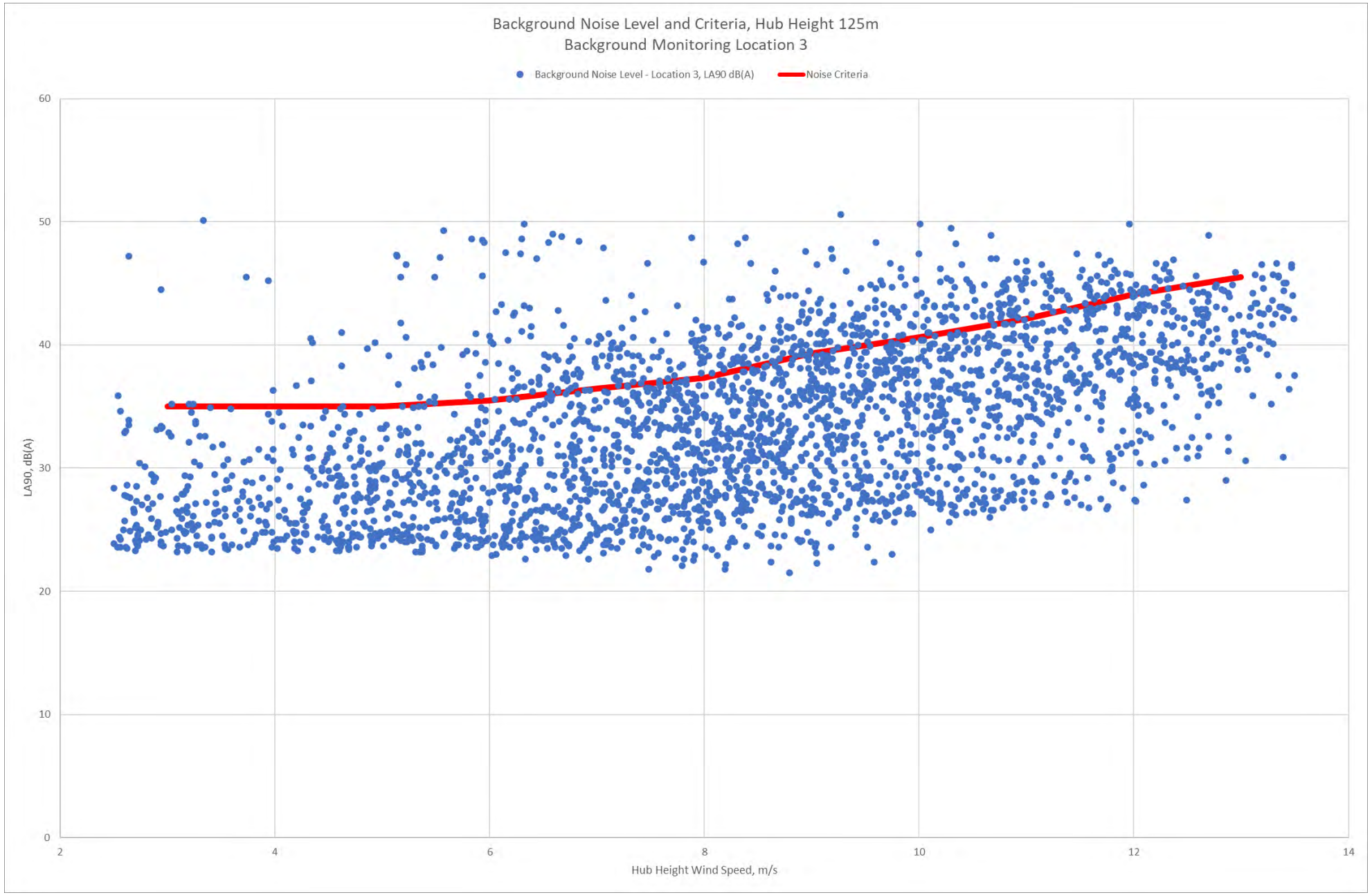
40
50
60
70
80
2
4
6
8
10
12
14


Background Noise Level and Criteria, Hub Height 125m
Background Monitoring Location 3
Background Noise Level - Location 3, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
0
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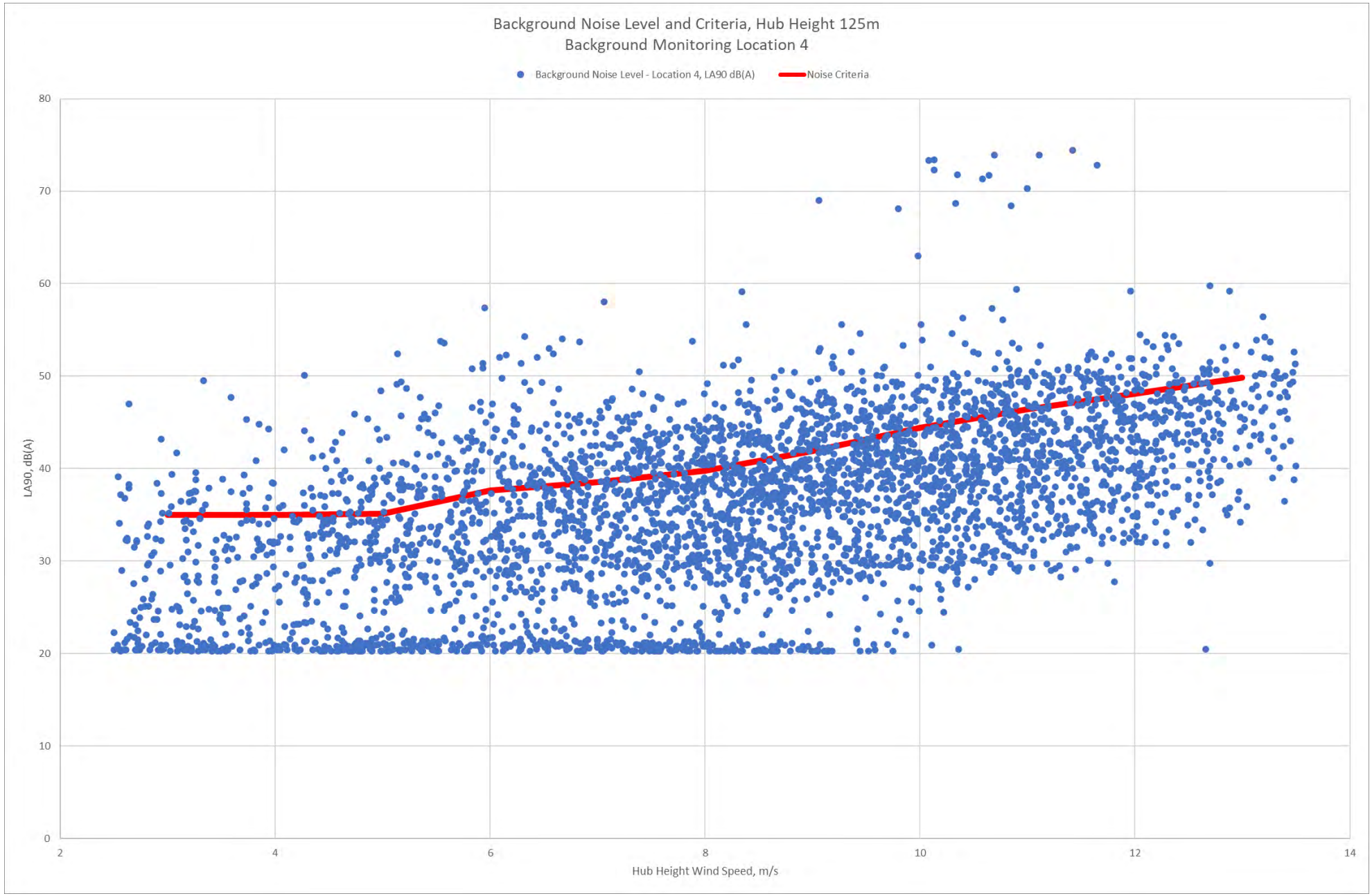
20
30
40
50
60
2
4
6
8
10
12
14


Background Noise Level and Criteria, Hub Height 125m
Background Monitoring Location 4
Background Noise Level - Location 4, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
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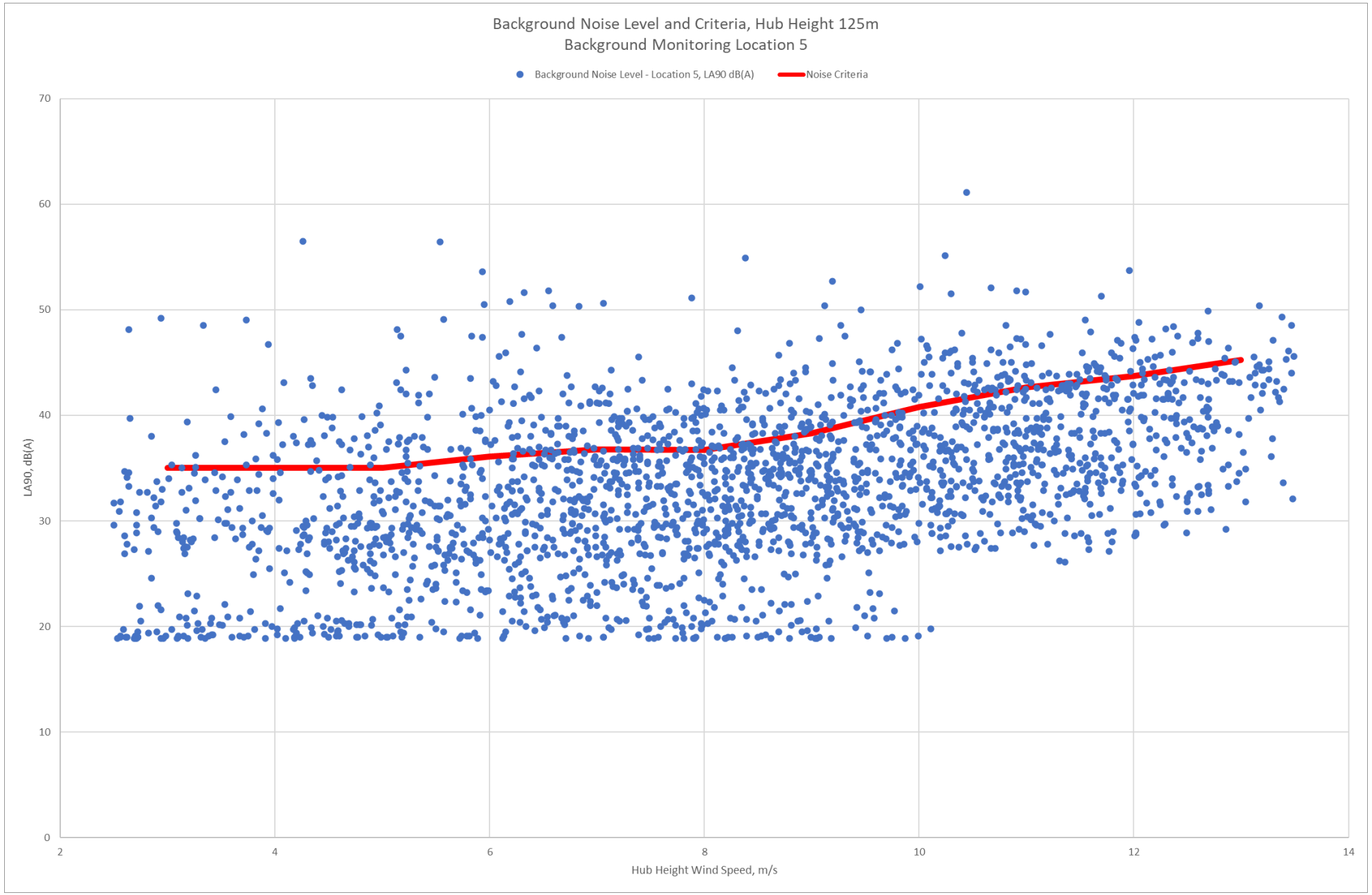
20
30
40
50
60
70
80
2
4
6
8
10
12
14


Background Noise Level and Criteria, Hub Height 125m
Background Monitoring Location 5
Background Noise Level - Location 5, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
0
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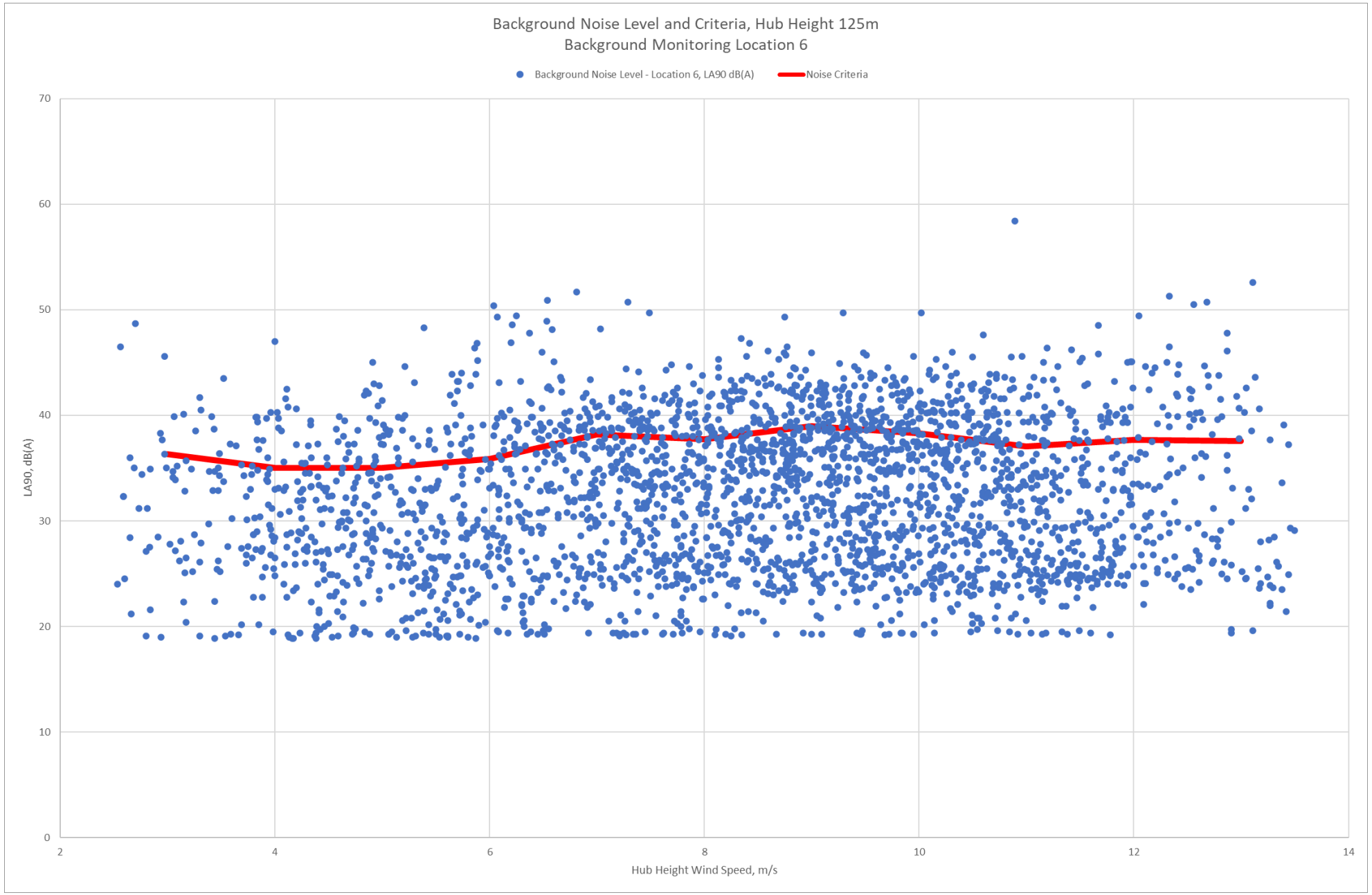
20
30
40
50
60
70
2
4
6
8
10
12
14


Background Noise Level and Criteria, Hub Height 125m
Background Monitoring Location 6
Background Noise Level - Location 6, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
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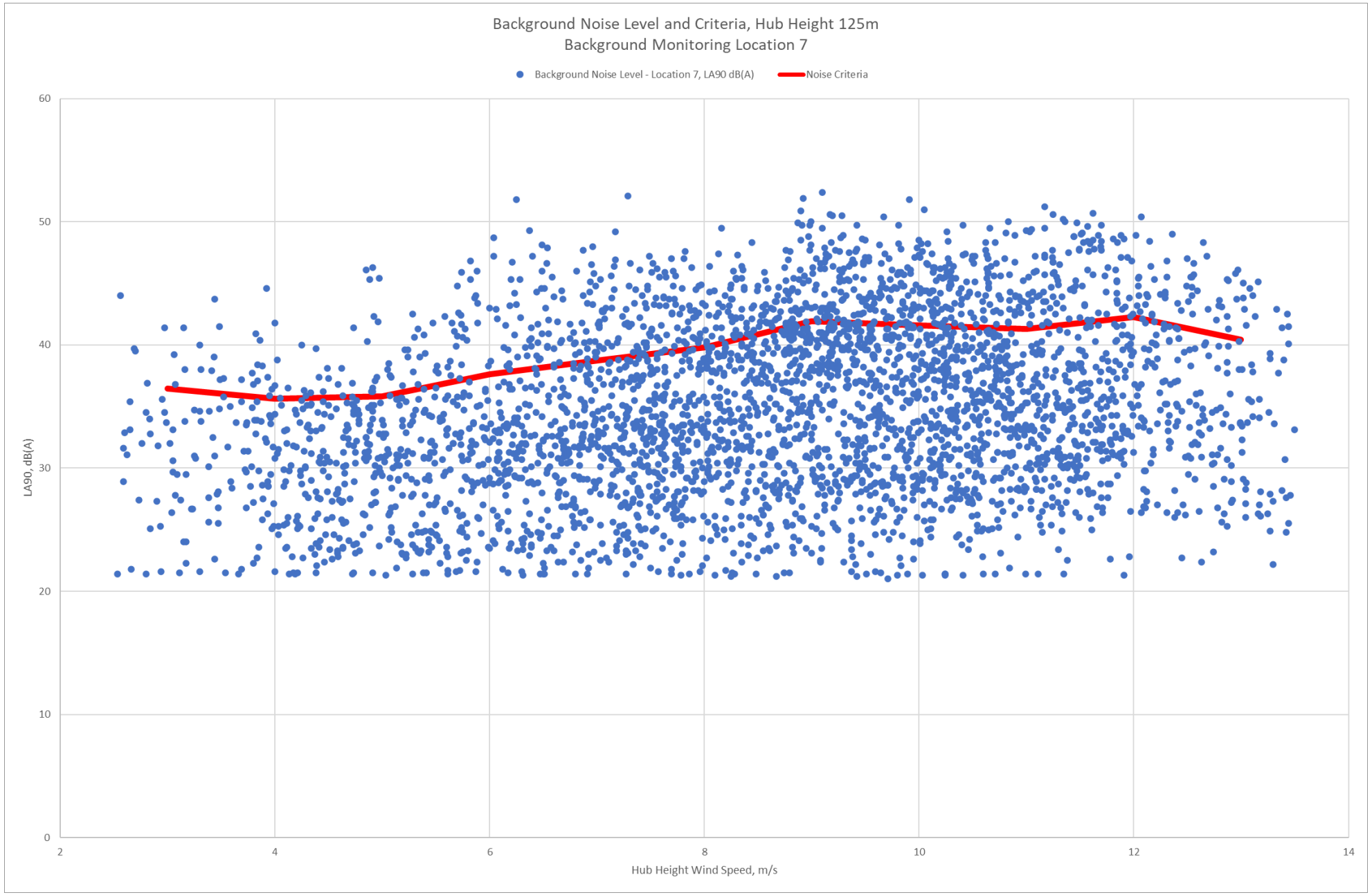
20
30
40
50
60
70
2
4
6
8
10
12
14


Background Noise Level and Criteria, Hub Height 125m
Background Monitoring Location 7
Background Noise Level - Location 7, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
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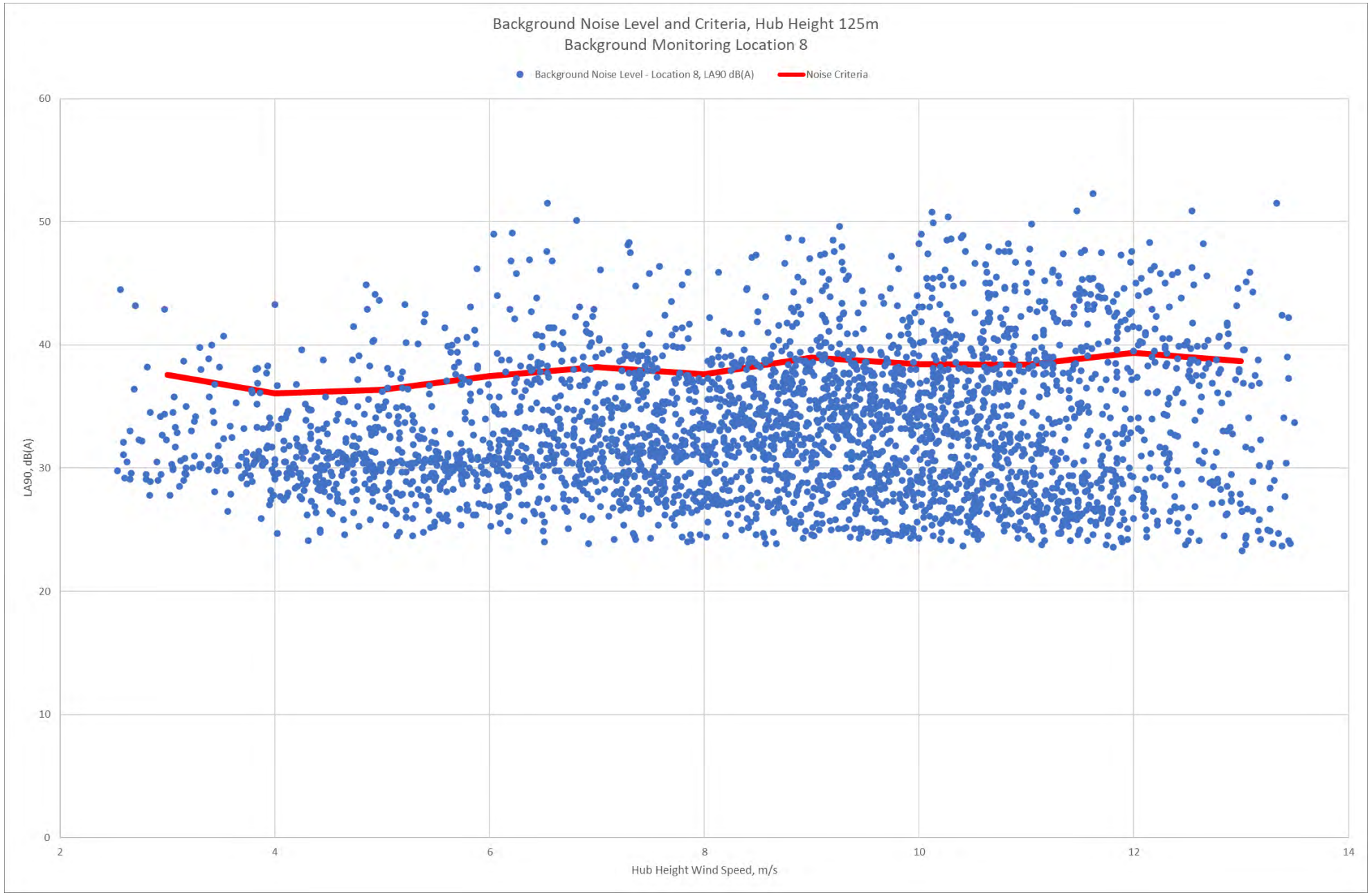
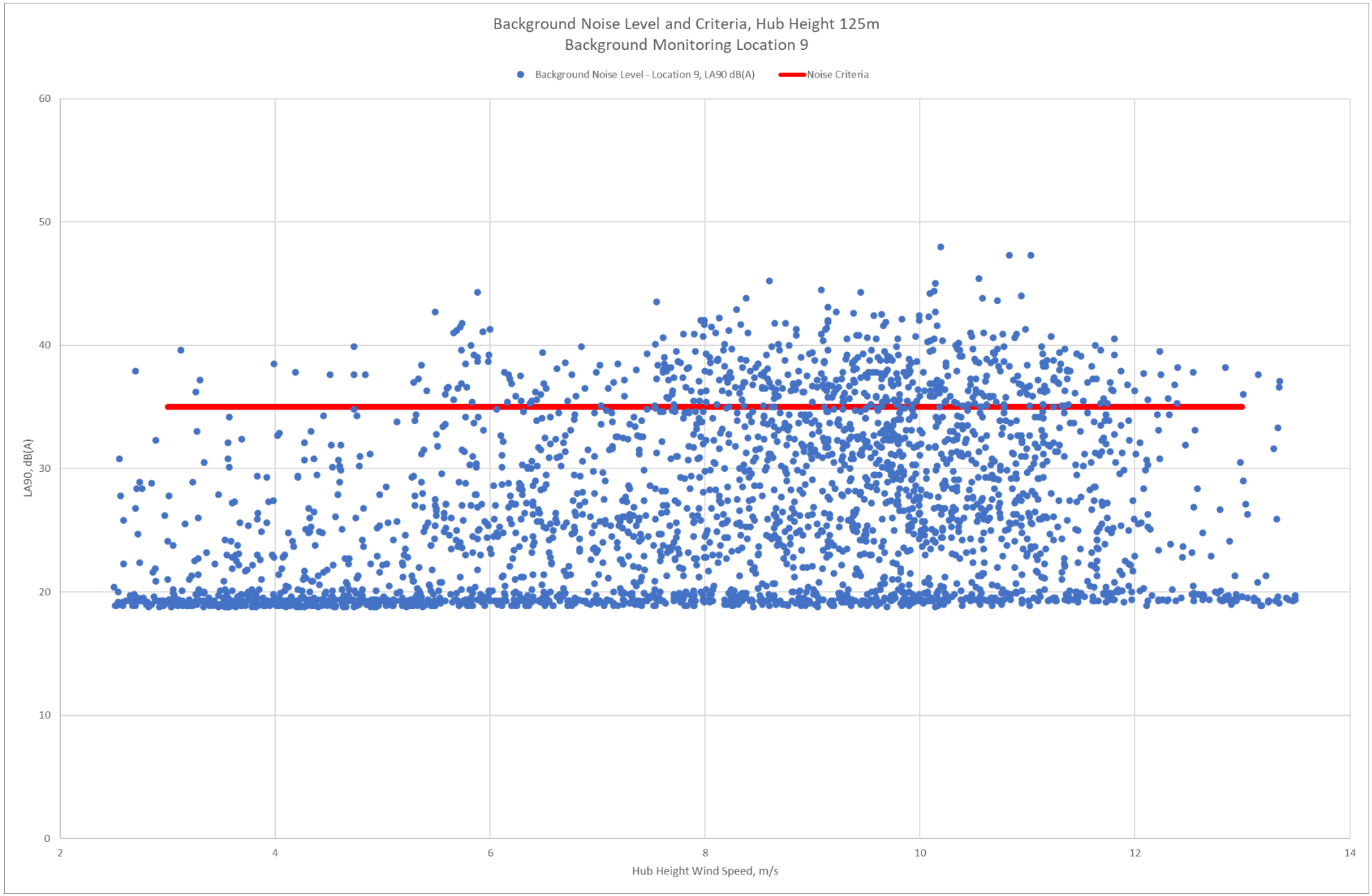
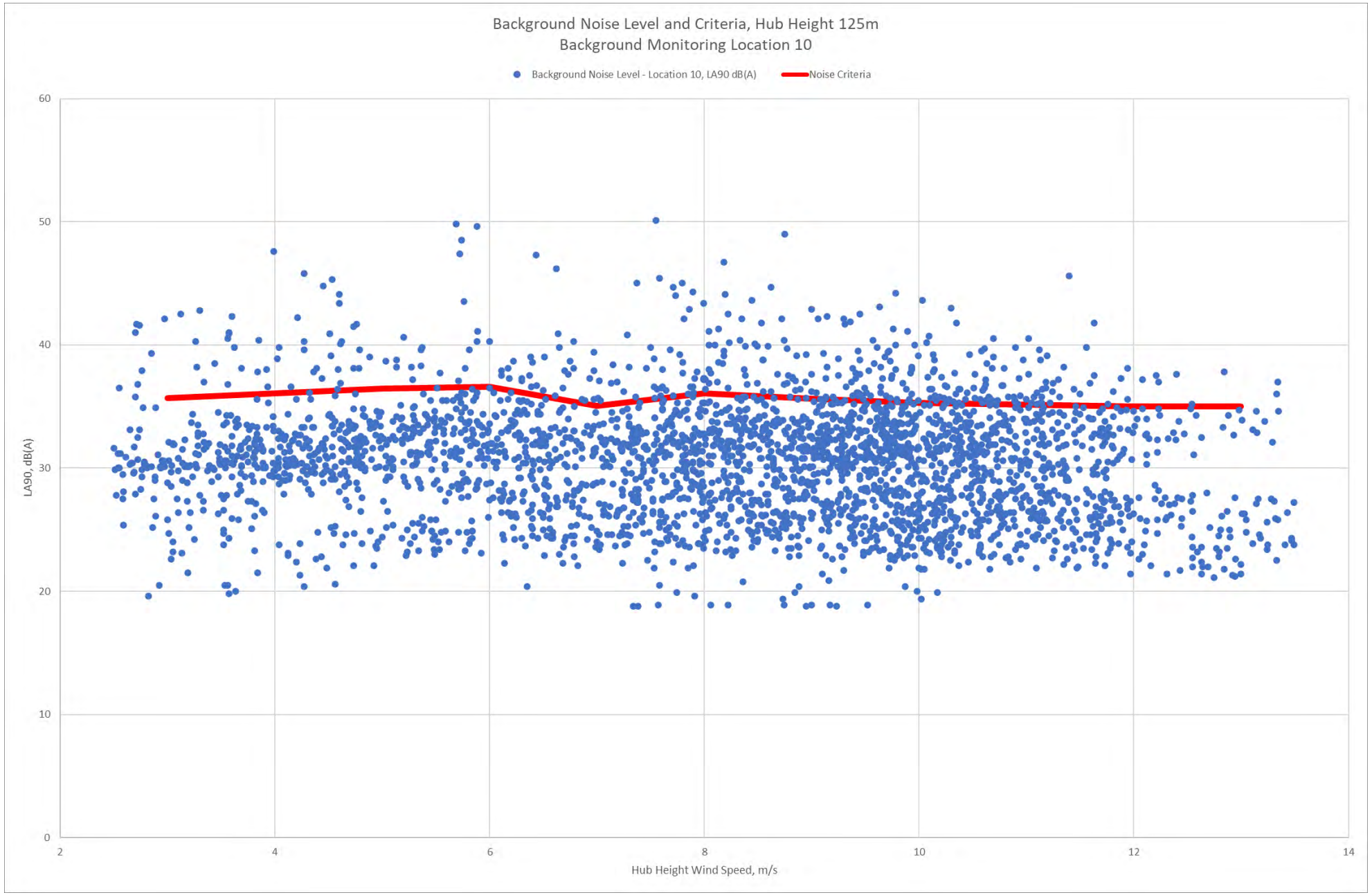
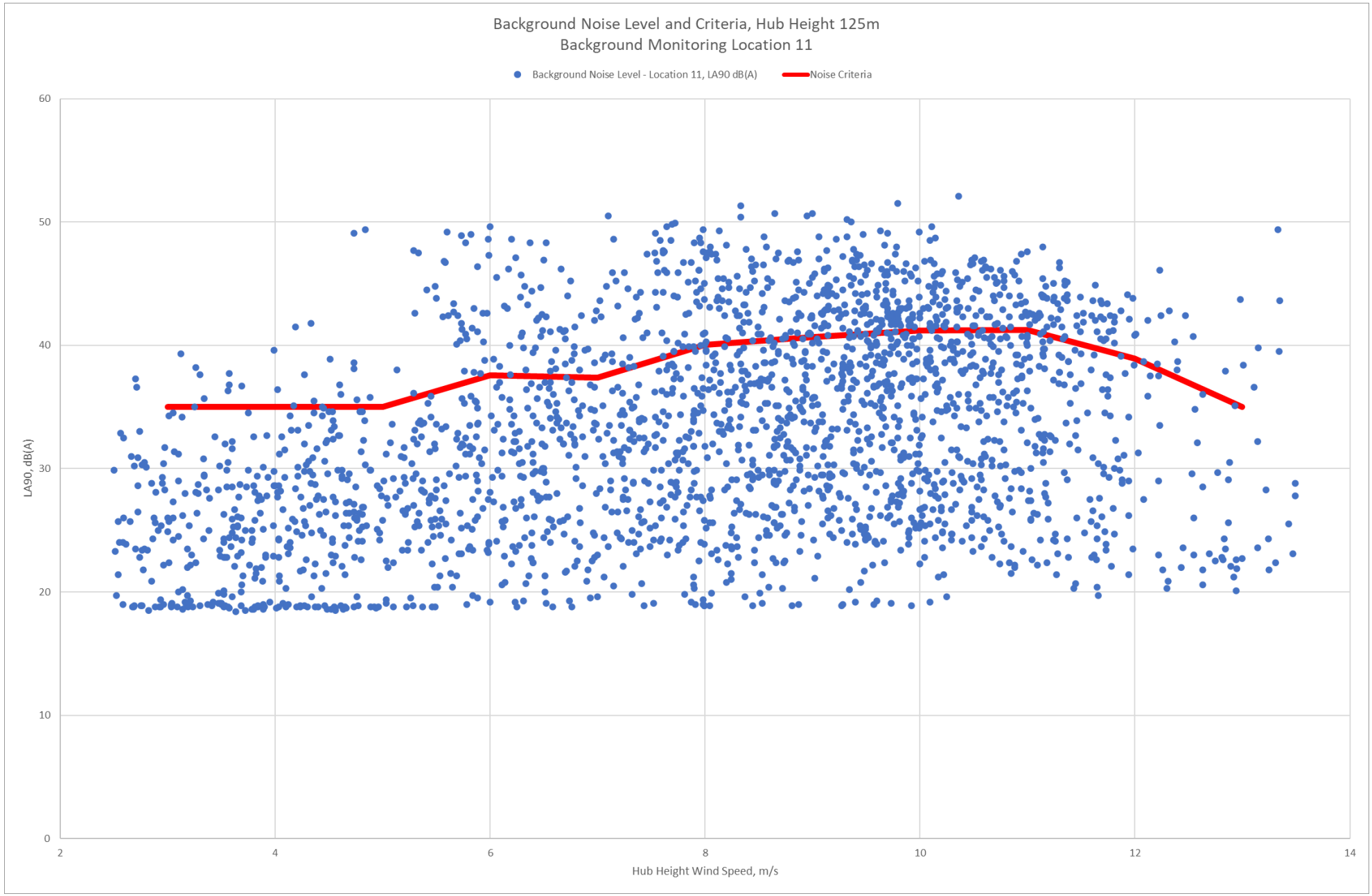
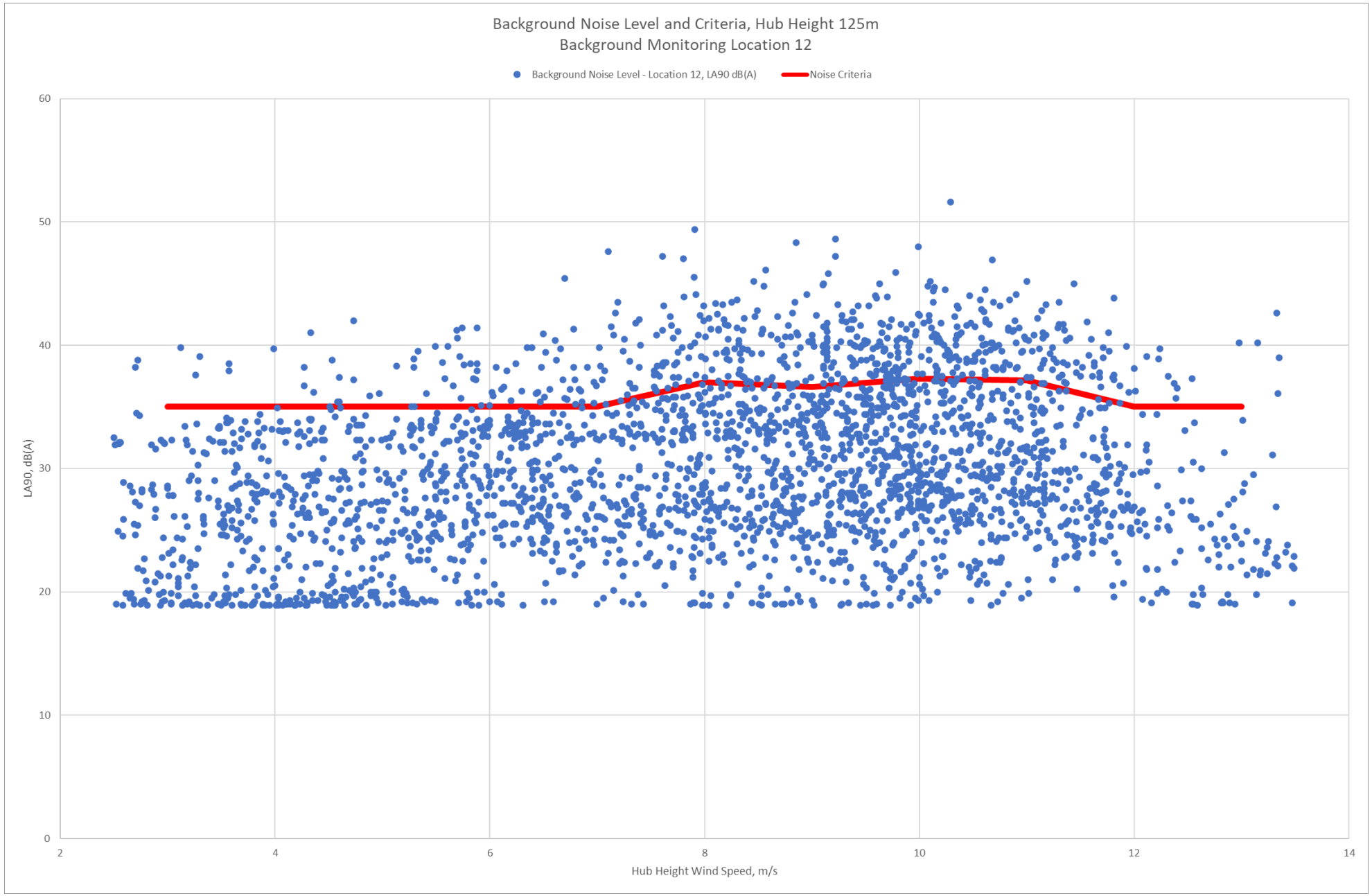
20
30
40
50
60
2
4
6
8
10
12
14


Background Noise Level and Criteria, Hub Height 125m
Background Monitoring Location 8
Background Noise Level - Location 8, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
0
10
20
30
40
50
60
2
4
6
8
10
12
14


Background Noise Level and Criteria, Hub Height 125m
Background Monitoring Location 9
Background Noise Level - Location 9, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
0
10
20
30
40
50
60
2
4
6
8
10
12
14

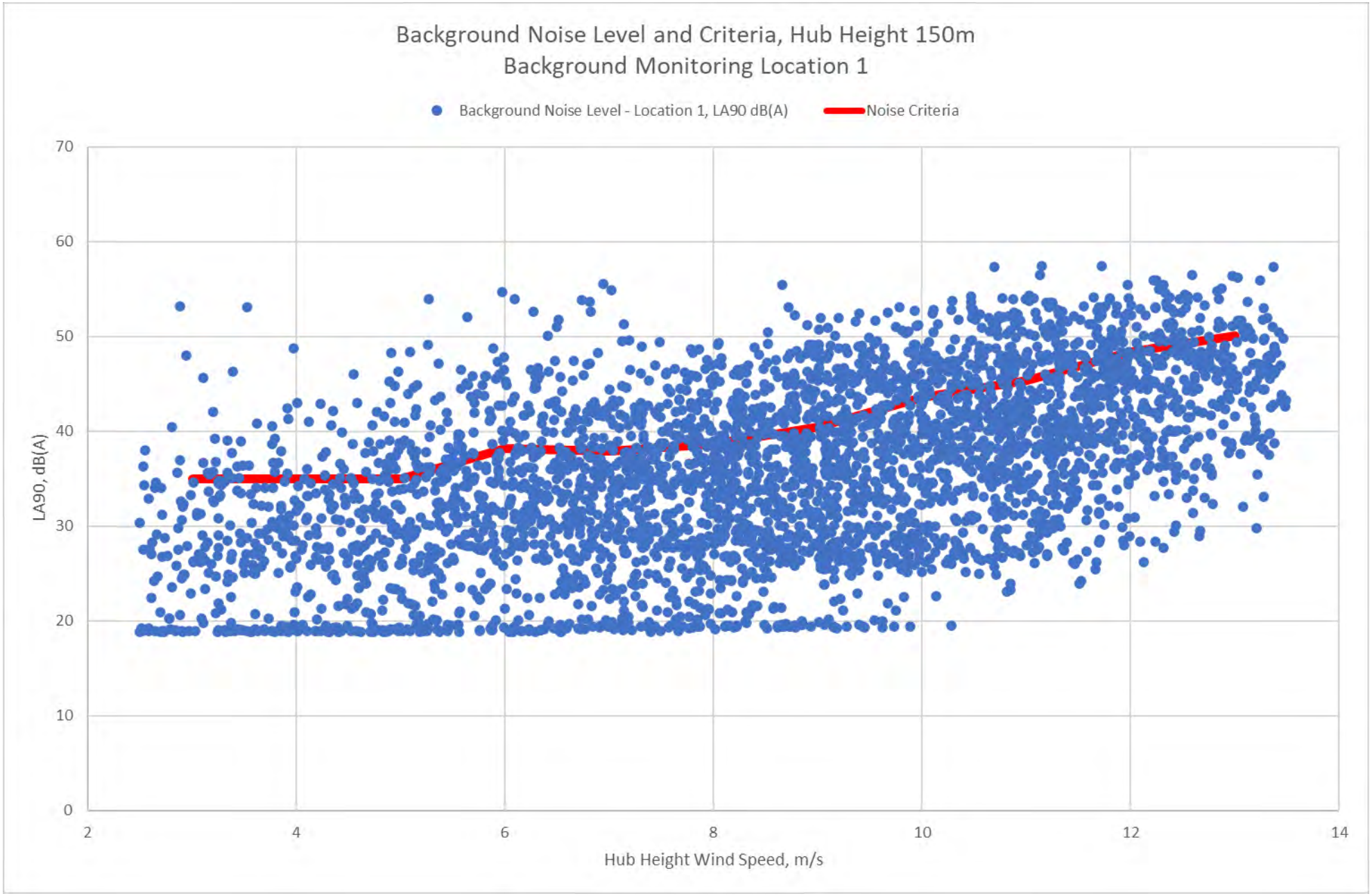

Background Noise Level and Criteria, Hub Height 125m
Background Monitoring Location 10
Background Noise Level - Location 10, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
0
10
20
30
40
50
60
2
4
6
8
10
12
14

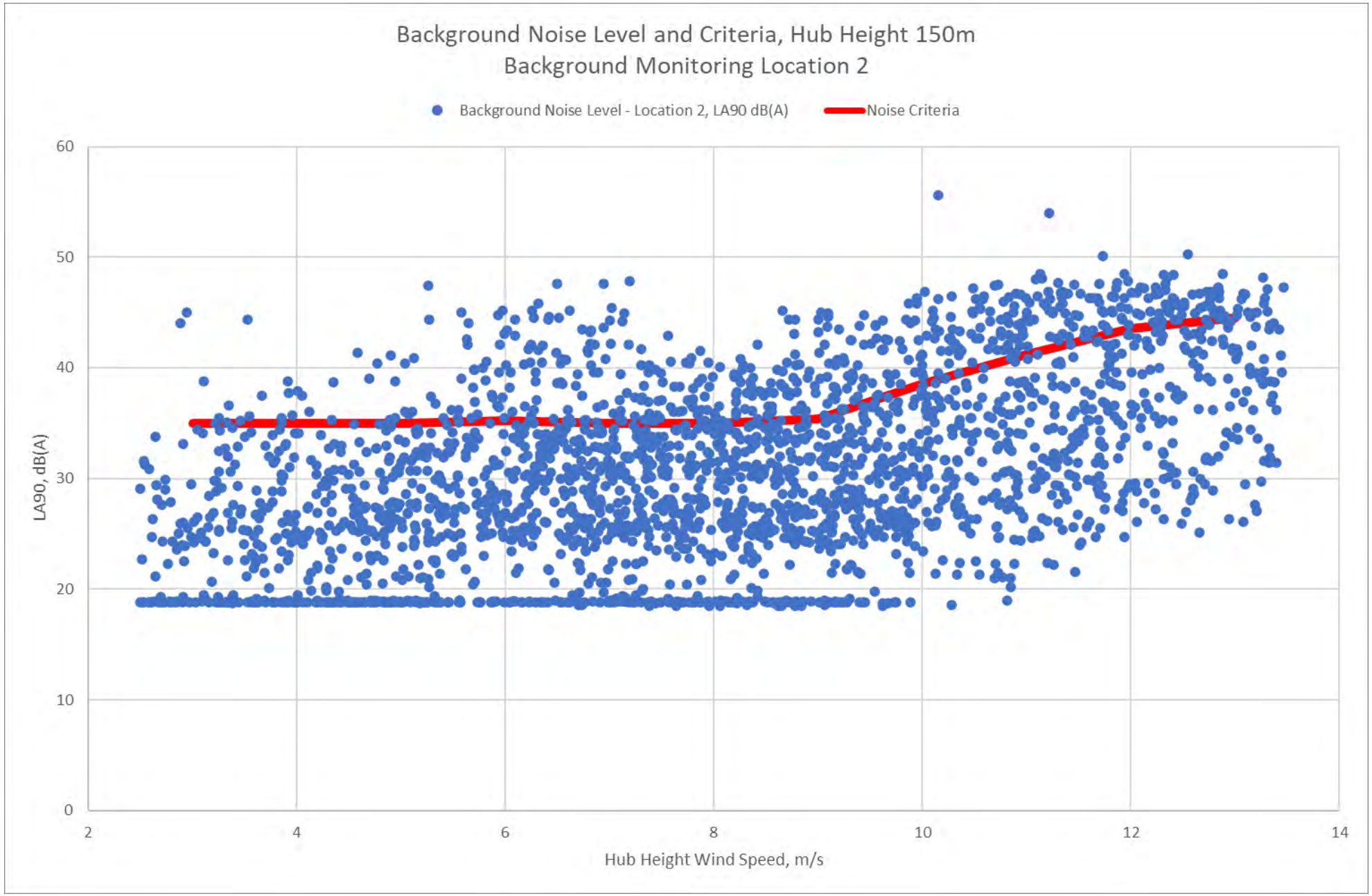

Background Noise Level and Criteria, Hub Height 125m
Background Monitoring Location 11
Background Noise Level - Location 11, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
0
10
20
30
40
50
60
2
4
6
8
10
12
14

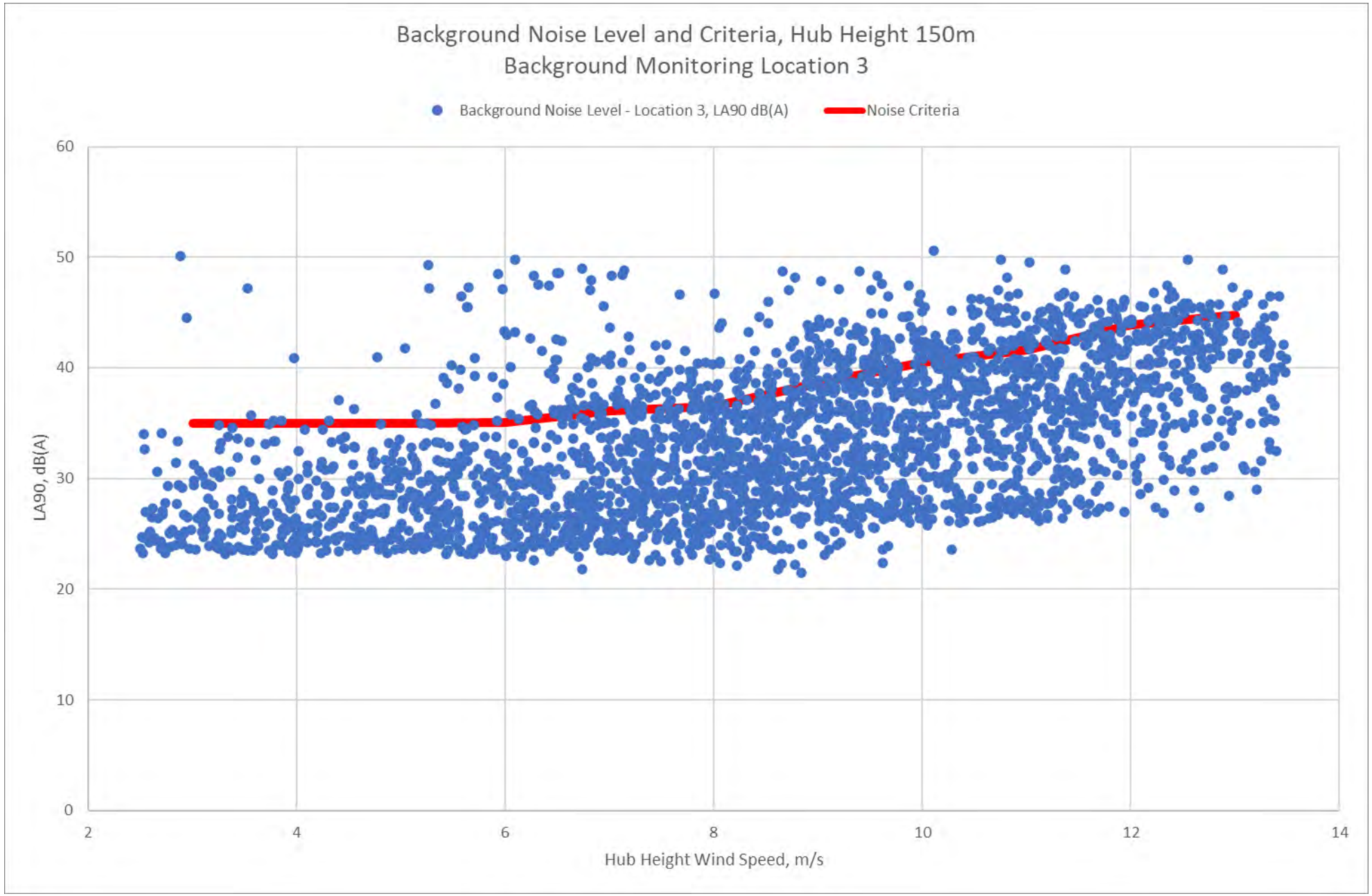

Background Noise Level and Criteria, Hub Height 125m
Background Monitoring Location 12
Background Noise Level - Location 12, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
0
10
20
30
40
50
60
2
4
6
8
10
12
14

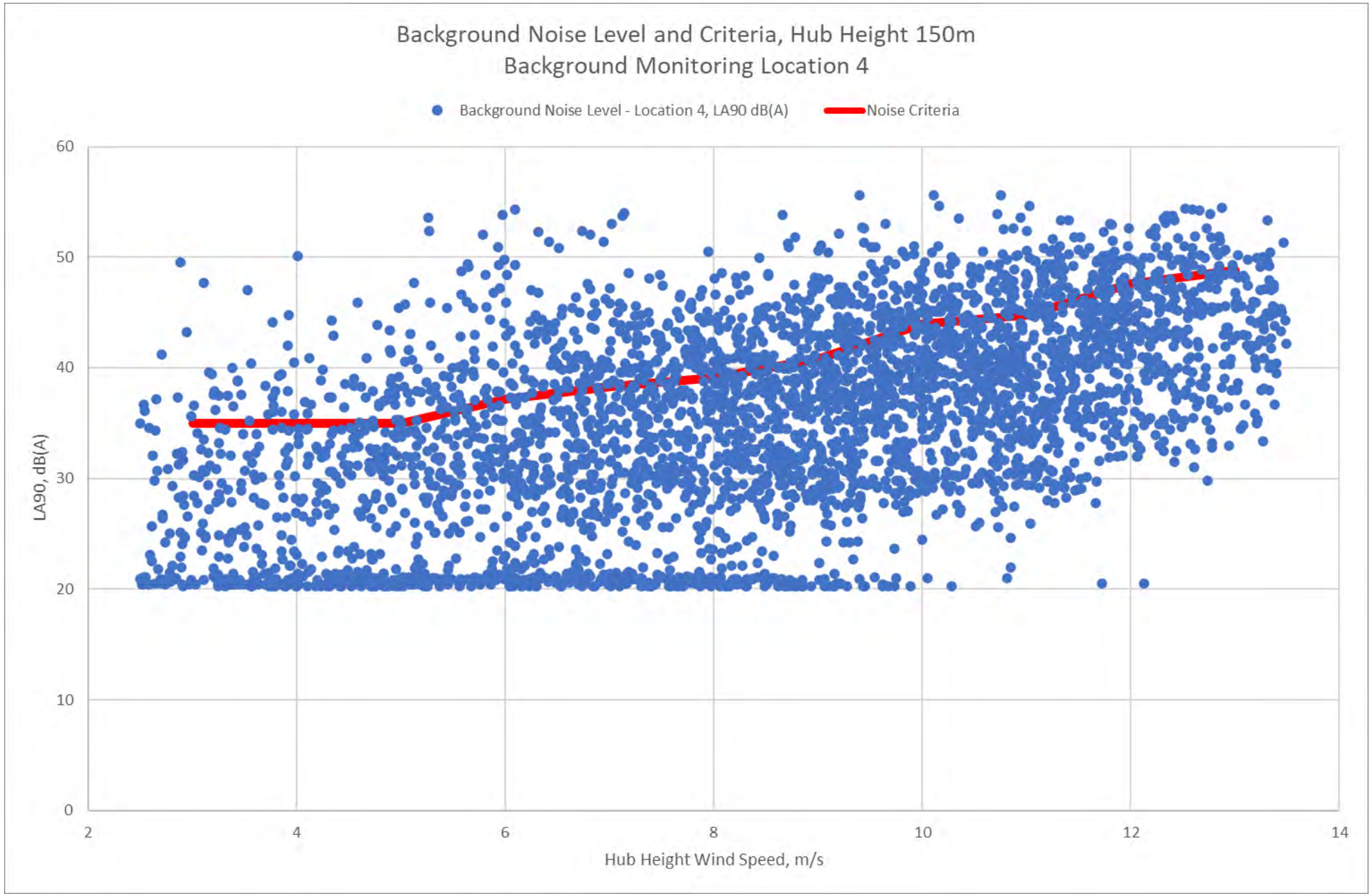
APPENDIX D

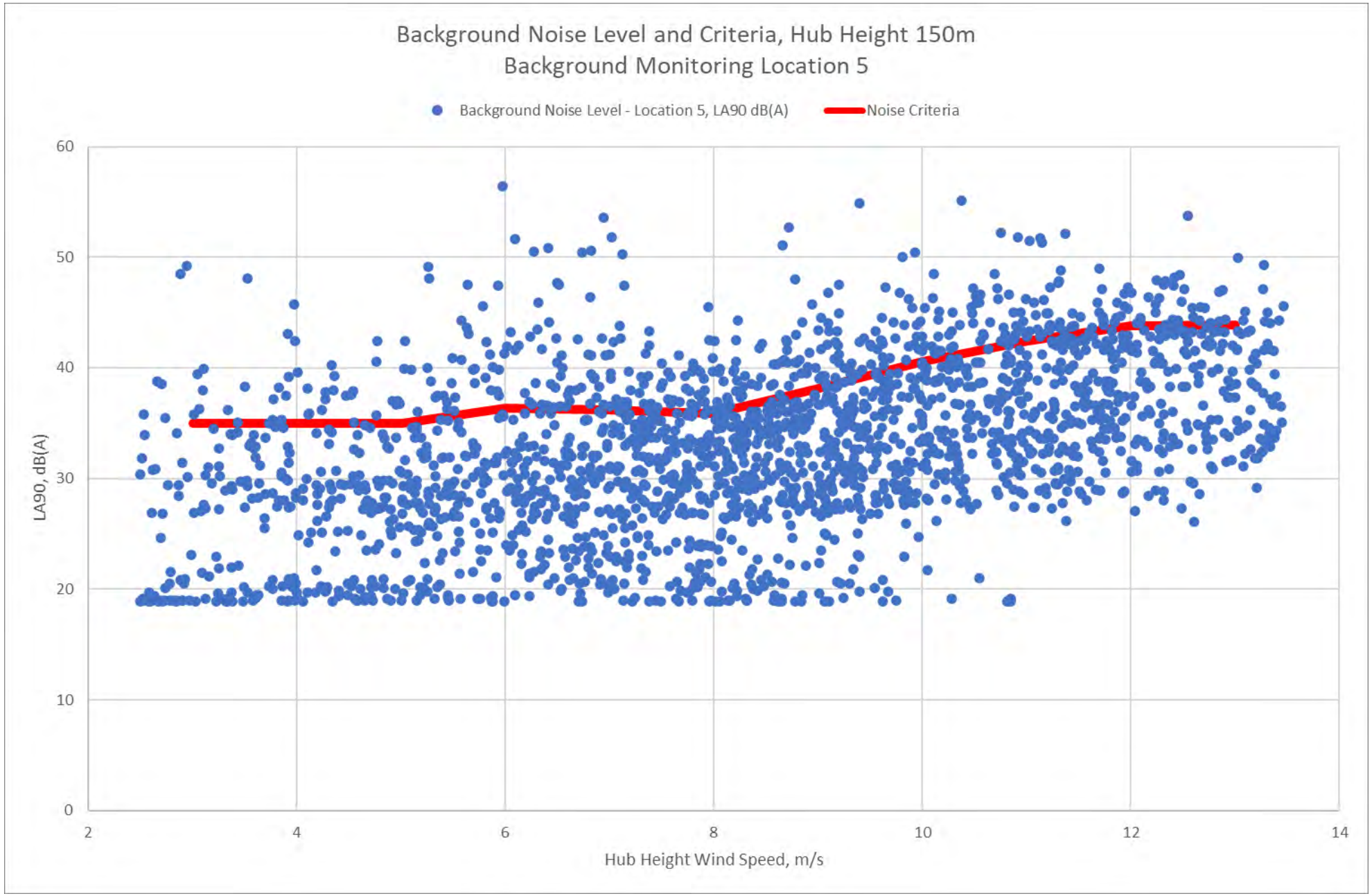
BACKGROUND NOISE LEVELS vs WIND SPEED PLOTS
150m AGL

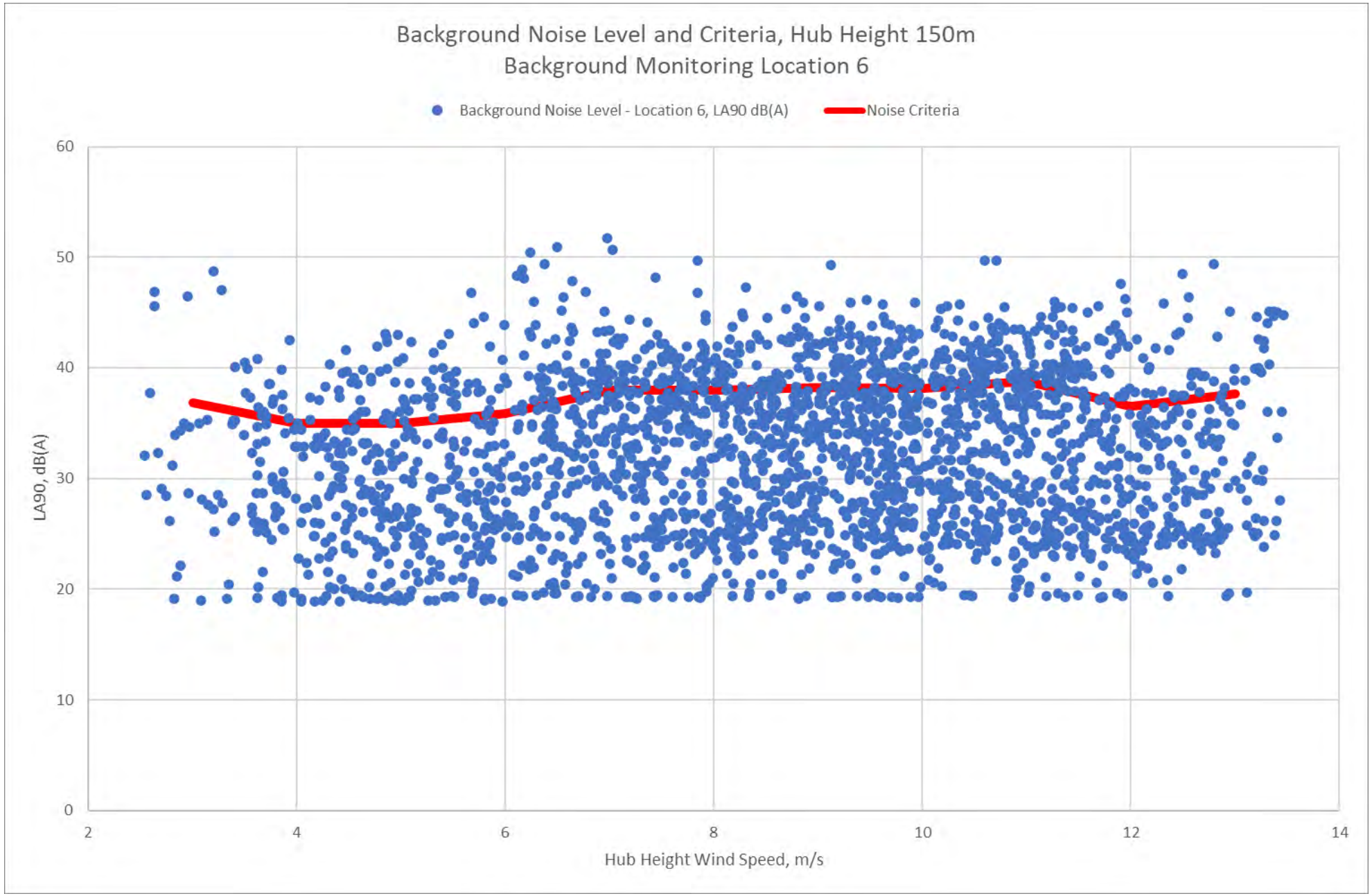

Background Noise Level and Criteria, Hub Height 150m
Background Monitoring Location 1
Background Noise Level - Location 1, LA90 dB(A)
Noise Criteria
LA90, dB(A)
70
60
50
40
30
20
10
0
2
4
6
8
10
12
14
Hub Height Wind Speed, m/s

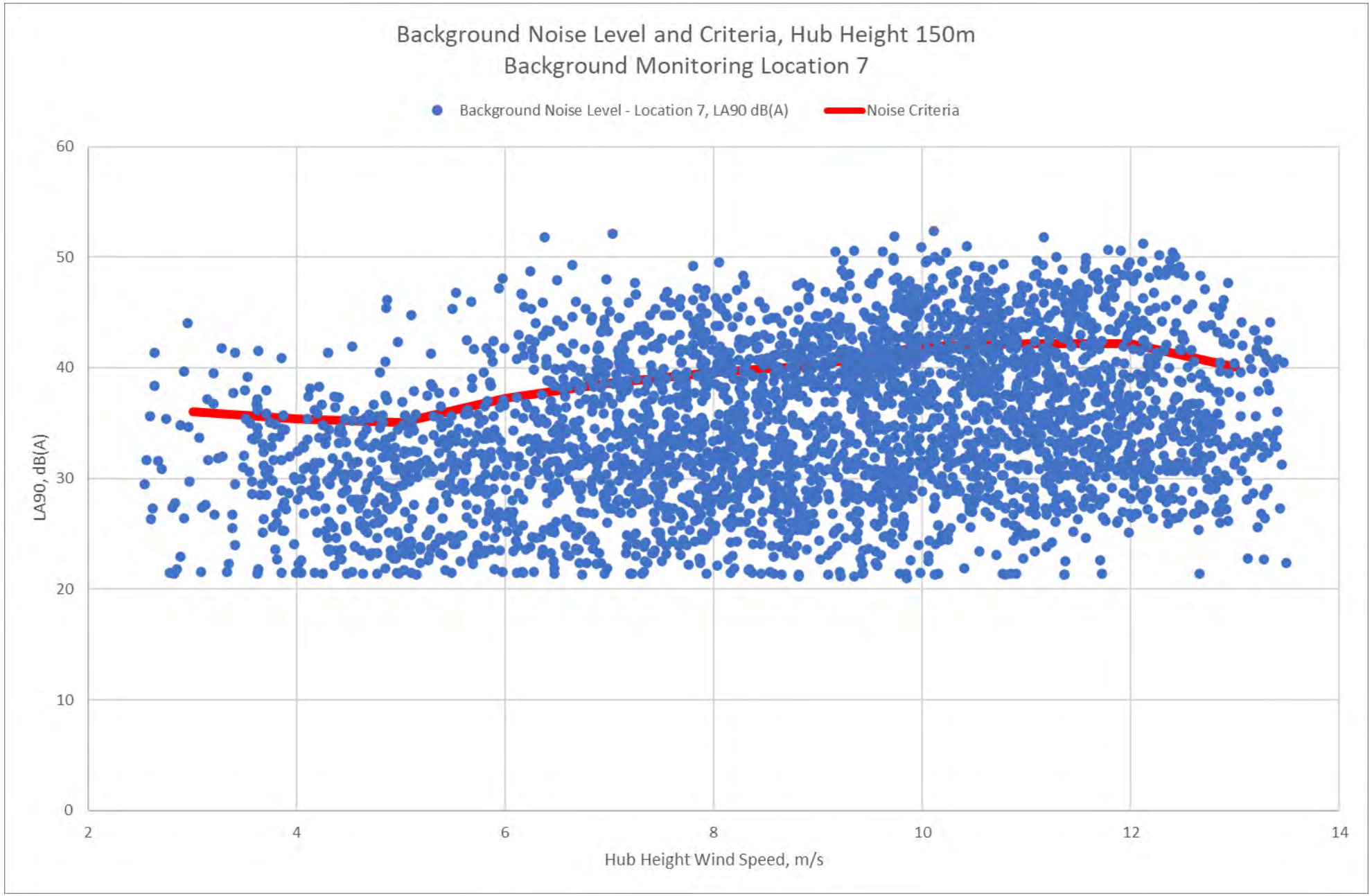

Background Noise Level and Criteria, Hub Height 150m
Background Monitoring Location 2
Background Noise Level - Location 2, LA90 dB(A)
Noise Criteria
LA90, dB(A)
Hub Height Wind Speed, m/s
0
10
20
30
40
50
60
2
4
6
8
10
12
14

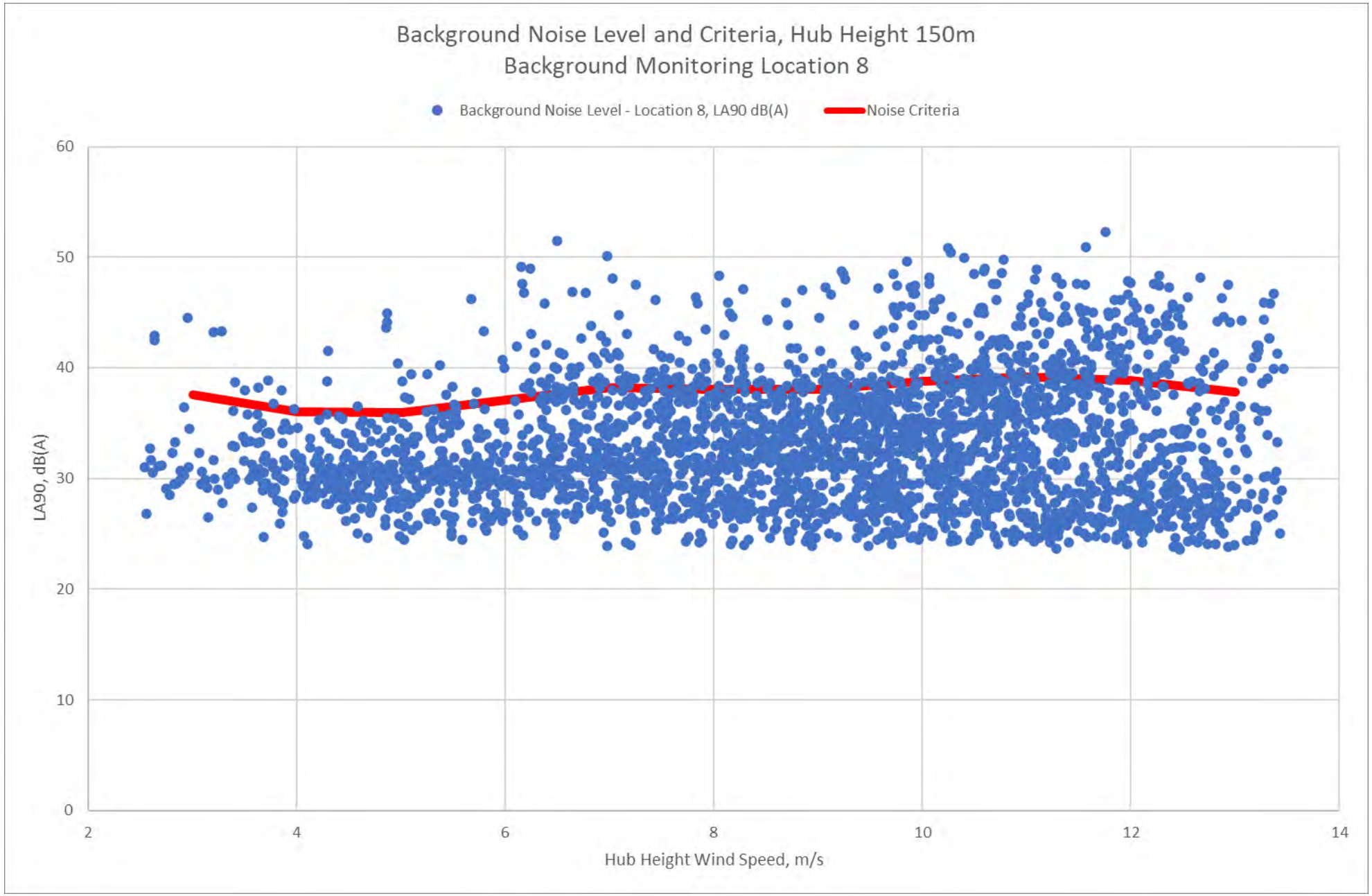

Background Noise Level and Criteria, Hub Height 150m
Background Monitoring Location 3
Background Noise Level - Location 3, LA90 dB(A)
Noise Criteria
LA90, dB(A)
60
50
40
30
20
10
0
2
4
6
8
10
12
14
Hub Height Wind Speed, m/s

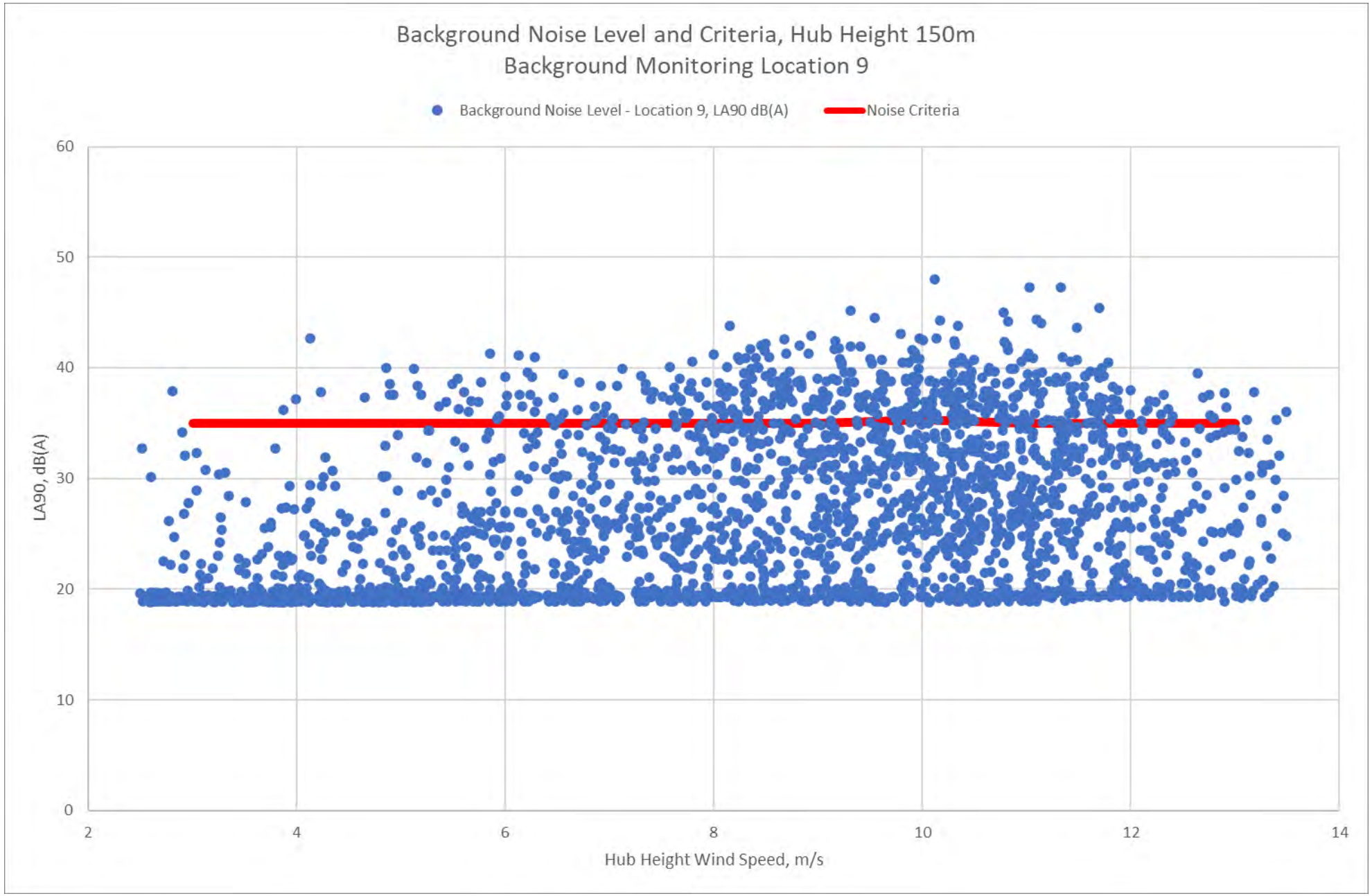

Background Noise Level and Criteria, Hub Height 150m
Background Monitoring Location 4
Background Noise Level - Location 4, LA90 dB(A)
Noise Criteria
LA90, dB(A)
60
50
40
30
20
10
0
2
4
6
8
10
12
14
Hub Height Wind Speed, m/s

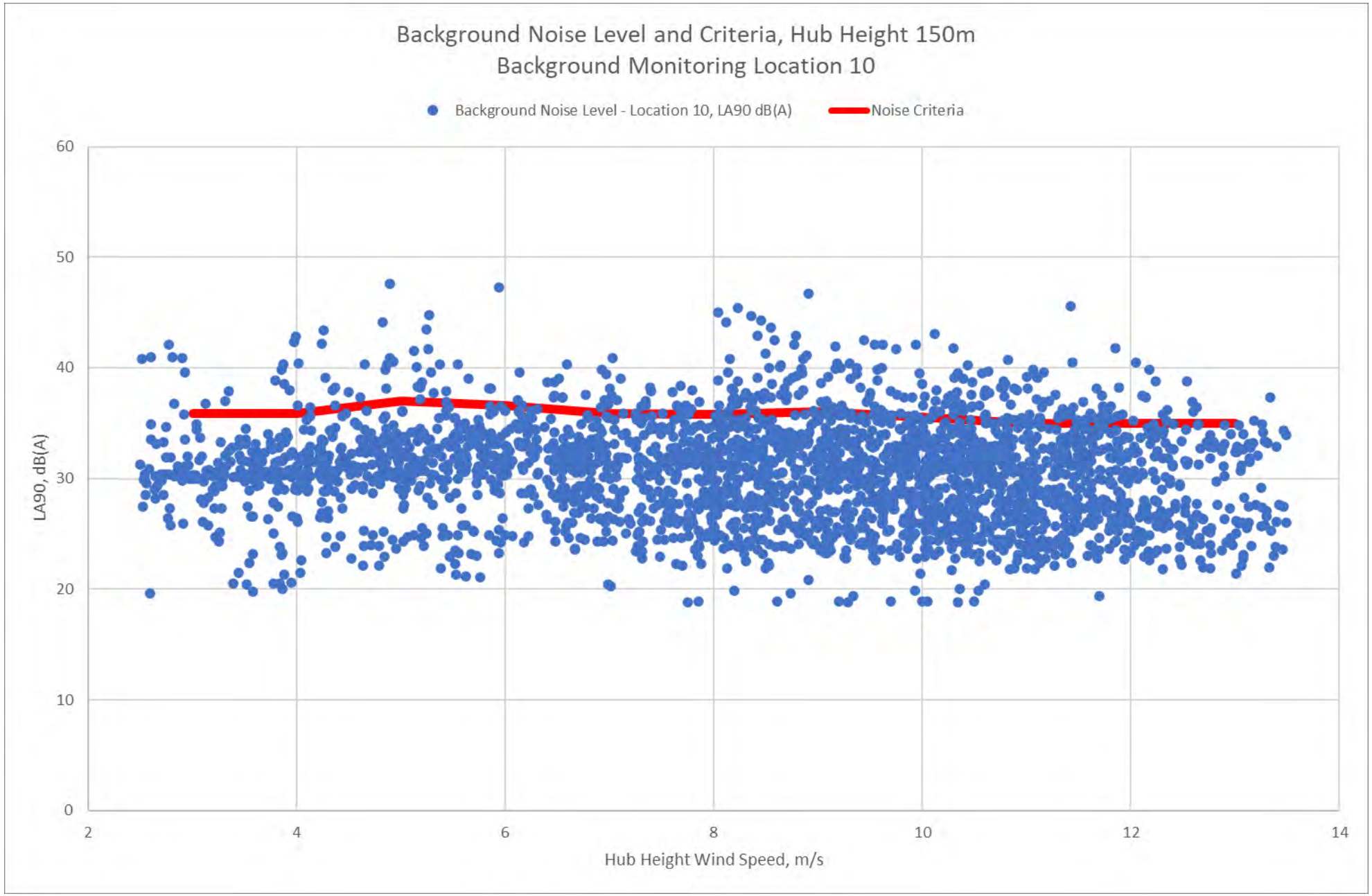

Background Noise Level and Criteria, Hub Height 150m
Background Monitoring Location 5
Background Noise Level - Location 5, LA90 dB(A)
Noise Criteria
LA90, dB(A)
60
50
40
30
20
10
0
2
4
6
8
10
12
14
Hub Height Wind Speed, m/s

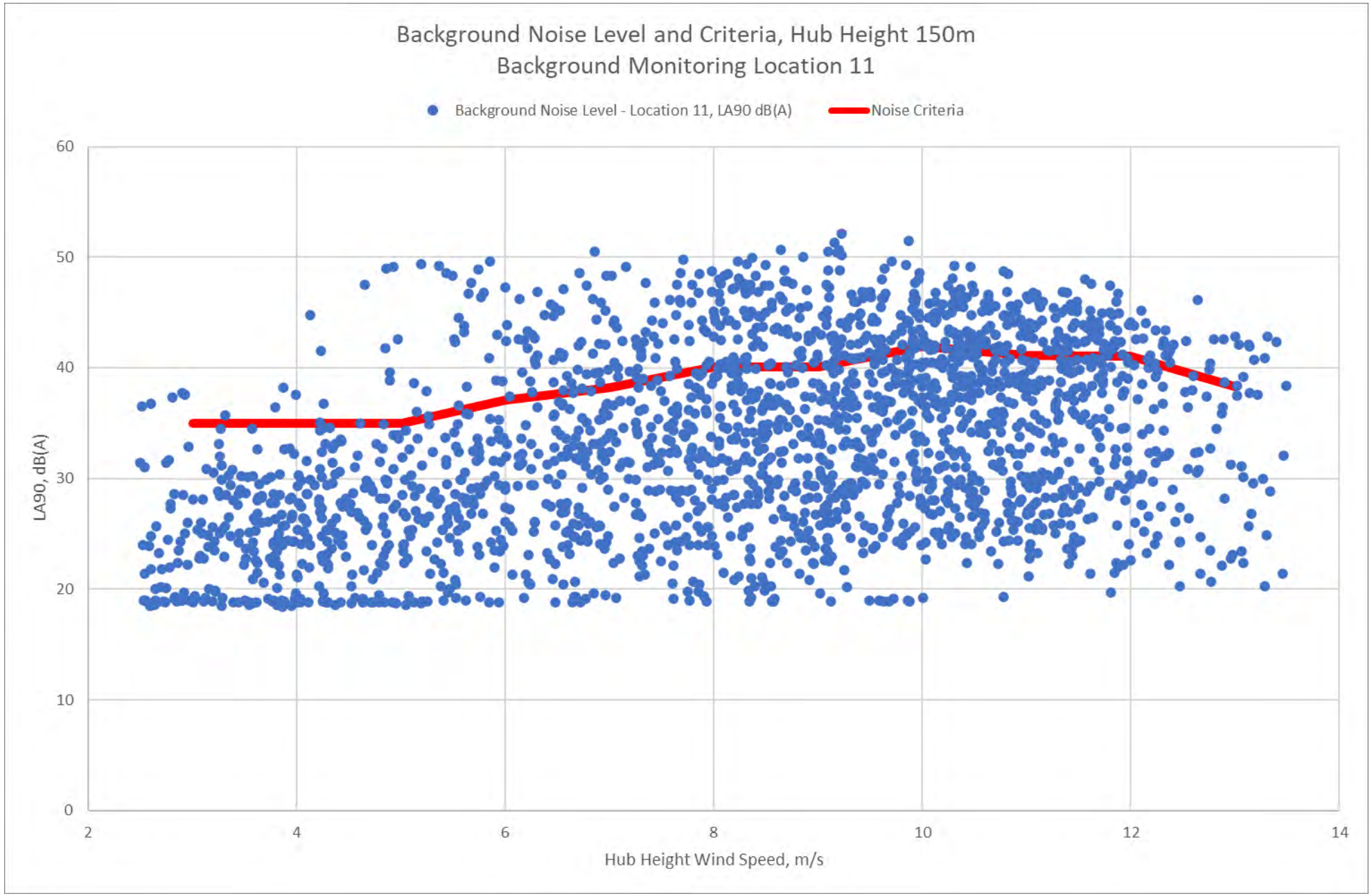

Background Noise Level and Criteria, Hub Height 150m
Background Monitoring Location 6
Background Noise Level - Location 6, LA90 dB(A)
Noise Criteria
LA90, dB(A)
60
50
40
30
20
10
0
2
4
6
8
10
12
14
Hub Height Wind Speed, m/s

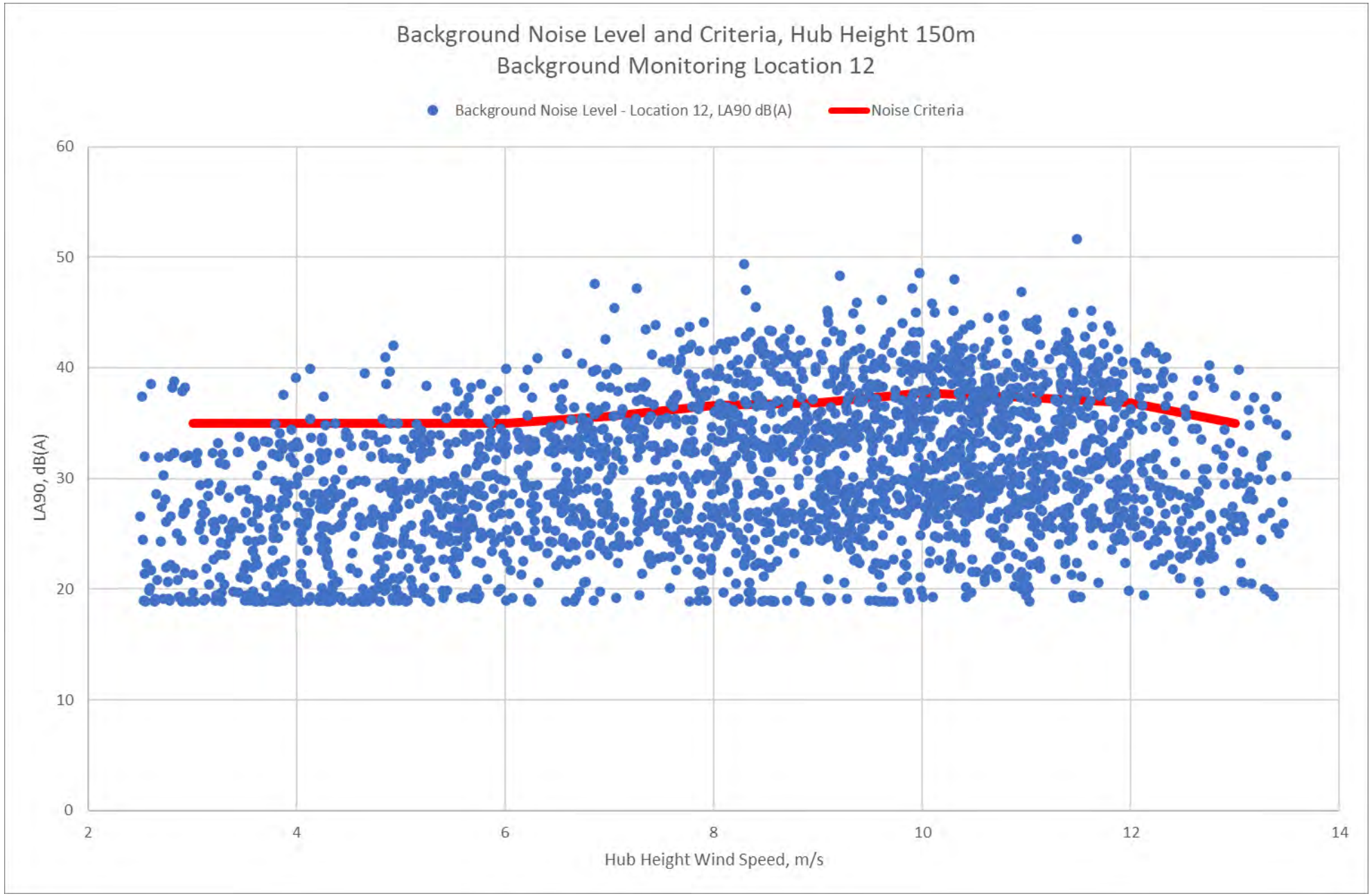

Background Noise Level and Criteria, Hub Height 150m
Background Monitoring Location 7
Background Noise Level - Location 7, LA90 dB(A)
Noise Criteria
LA90, dB(A)
60
50
40
30
20
10
0
2
4
6
8
10
12
14
Hub Height Wind Speed, m/s


Background Noise Level and Criteria, Hub Height 150m
Background Monitoring Location 8
Background Noise Level - Location 8, LA90 dB(A)
Noise Criteria
LA90, dB(A)
60
50
40
30
20
10
0
2
4
6
8
10
12
14
Hub Height Wind Speed, m/s


Background Noise Level and Criteria, Hub Height 150m
Background Monitoring Location 9
Background Noise Level - Location 9, LA90 dB(A)
Noise Criteria
LA90, dB(A)
60
50
40
30
20
10
0
2
4
6
8
10
12
14
Hub Height Wind Speed, m/s

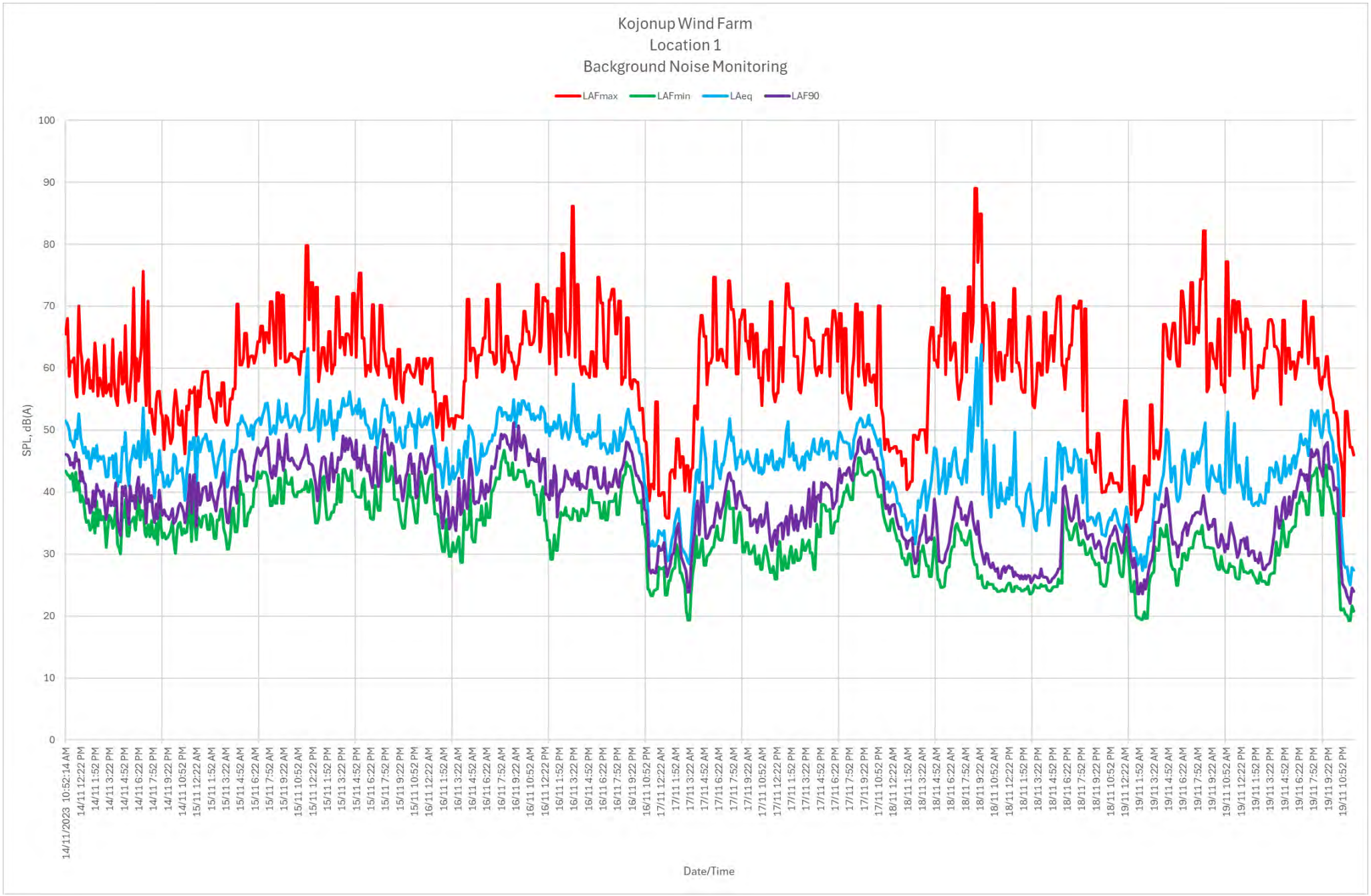

Background Noise Level and Criteria, Hub Height 150m
Background Monitoring Location 10
Background Noise Level - Location 10, LA90 dB(A)
Noise Criteria
LA90, dB(A)
60
50
40
30
20
10
0
2
4
6
8
10
12
14
Hub Height Wind Speed, m/s

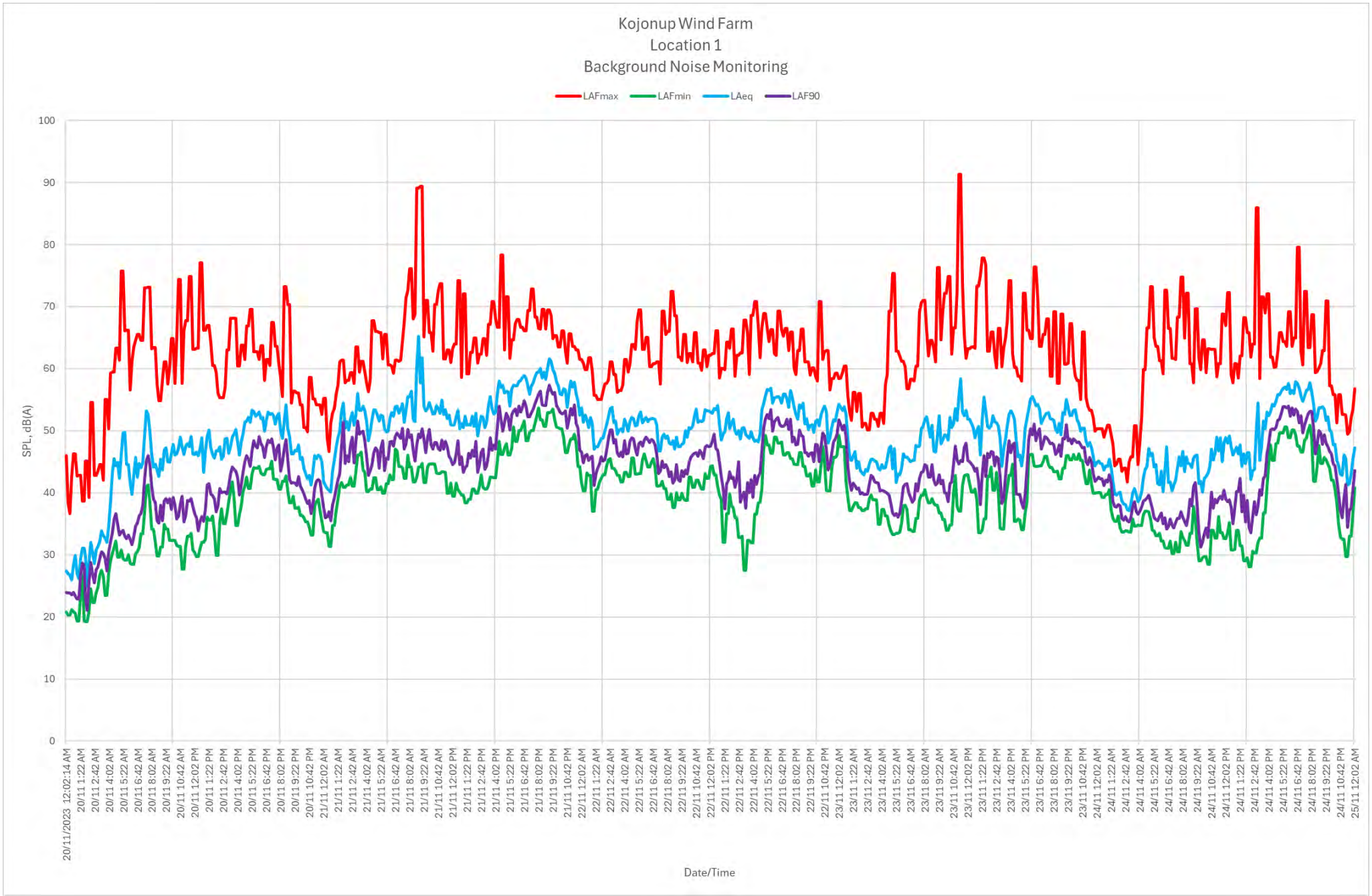

Background Noise Level and Criteria, Hub Height 150m
Background Monitoring Location 11
Background Noise Level - Location 11, LA90 dB(A)
Noise Criteria
LA90, dB(A)
60
50
40
30
20
10
0
2
4
6
8
10
12
14
Hub Height Wind Speed, m/s

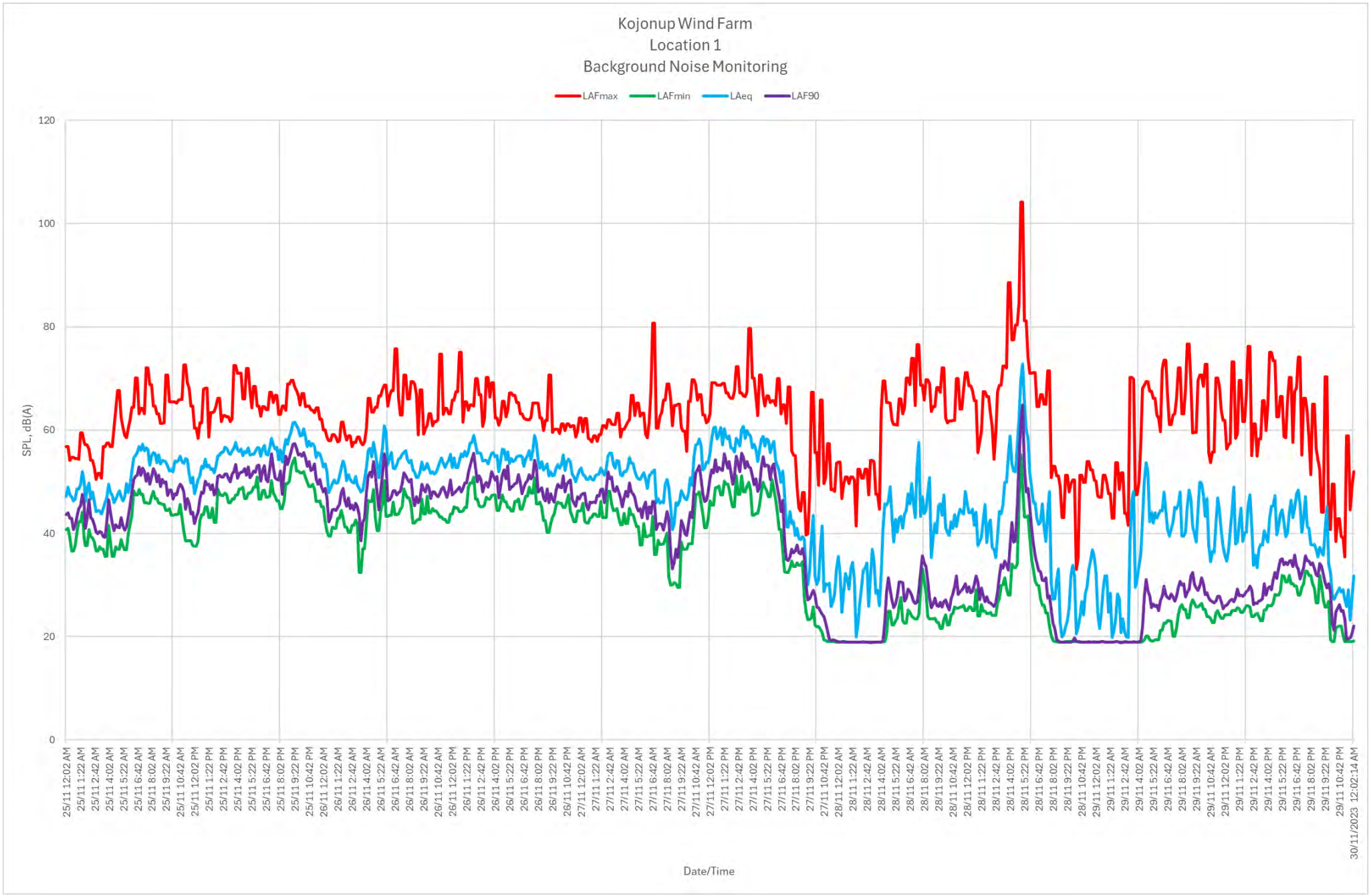

Background Noise Level and Criteria, Hub Height 150m
Background Monitoring Location 12
Background Noise Level - Location 12, LA90 dB(A)
Noise Criteria
LA90, dB(A)
60
50
40
30
20
10
0
2
4
6
8
10
12
14
Hub Height Wind Speed, m/s

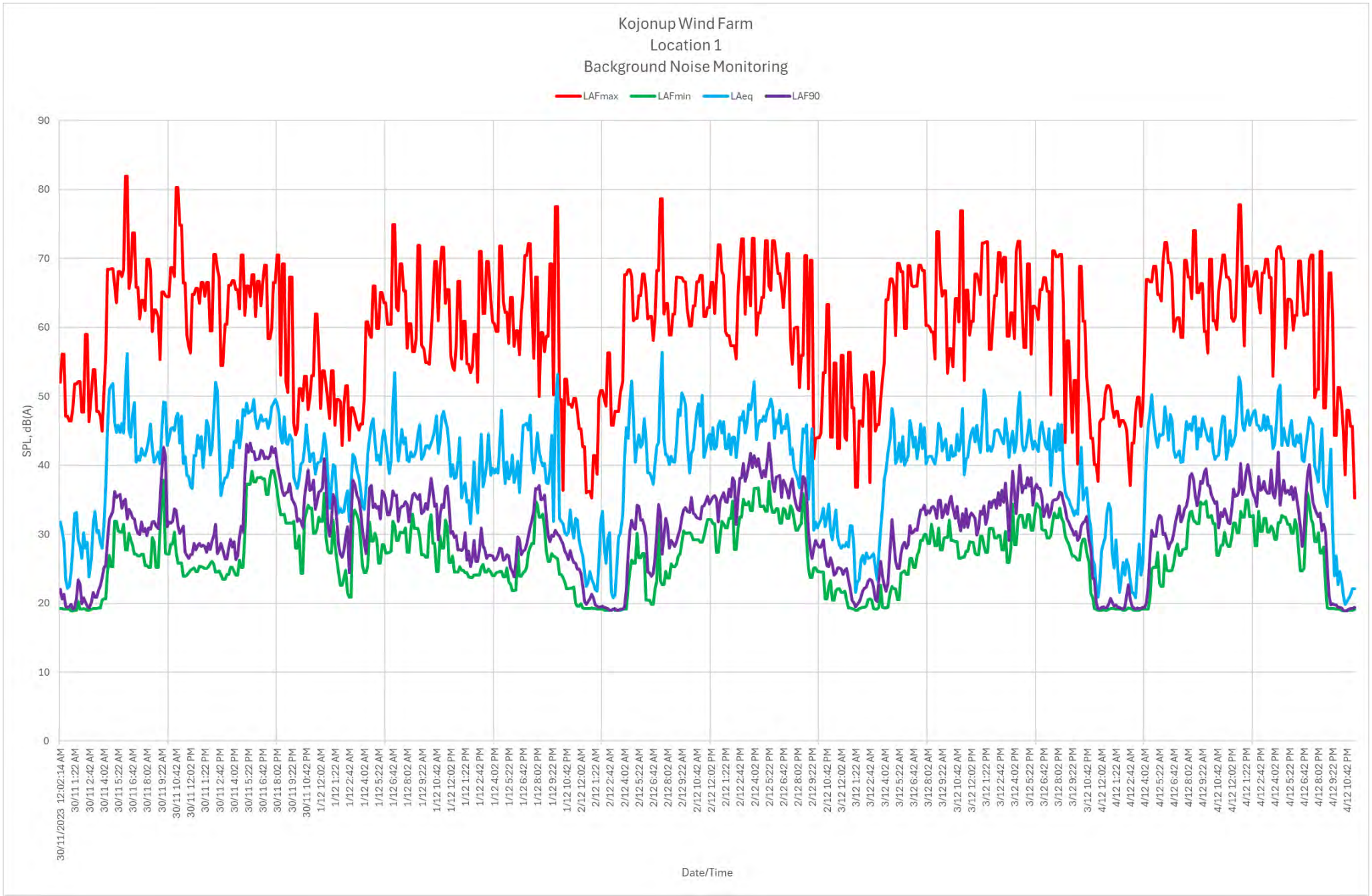
APPENDIX E

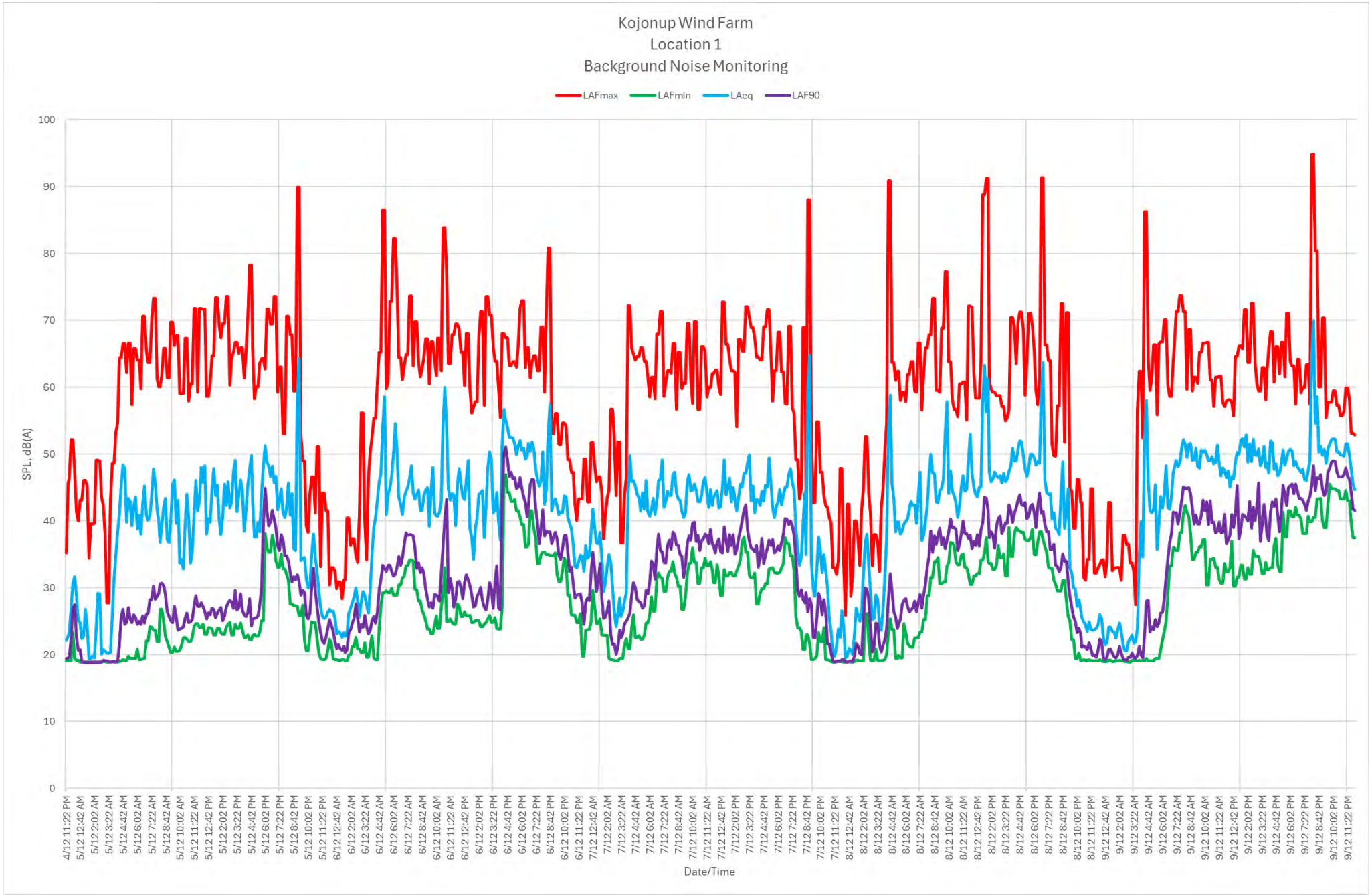
BACKGROUND NOISE LEVELS TIME HISTORY PLOTS

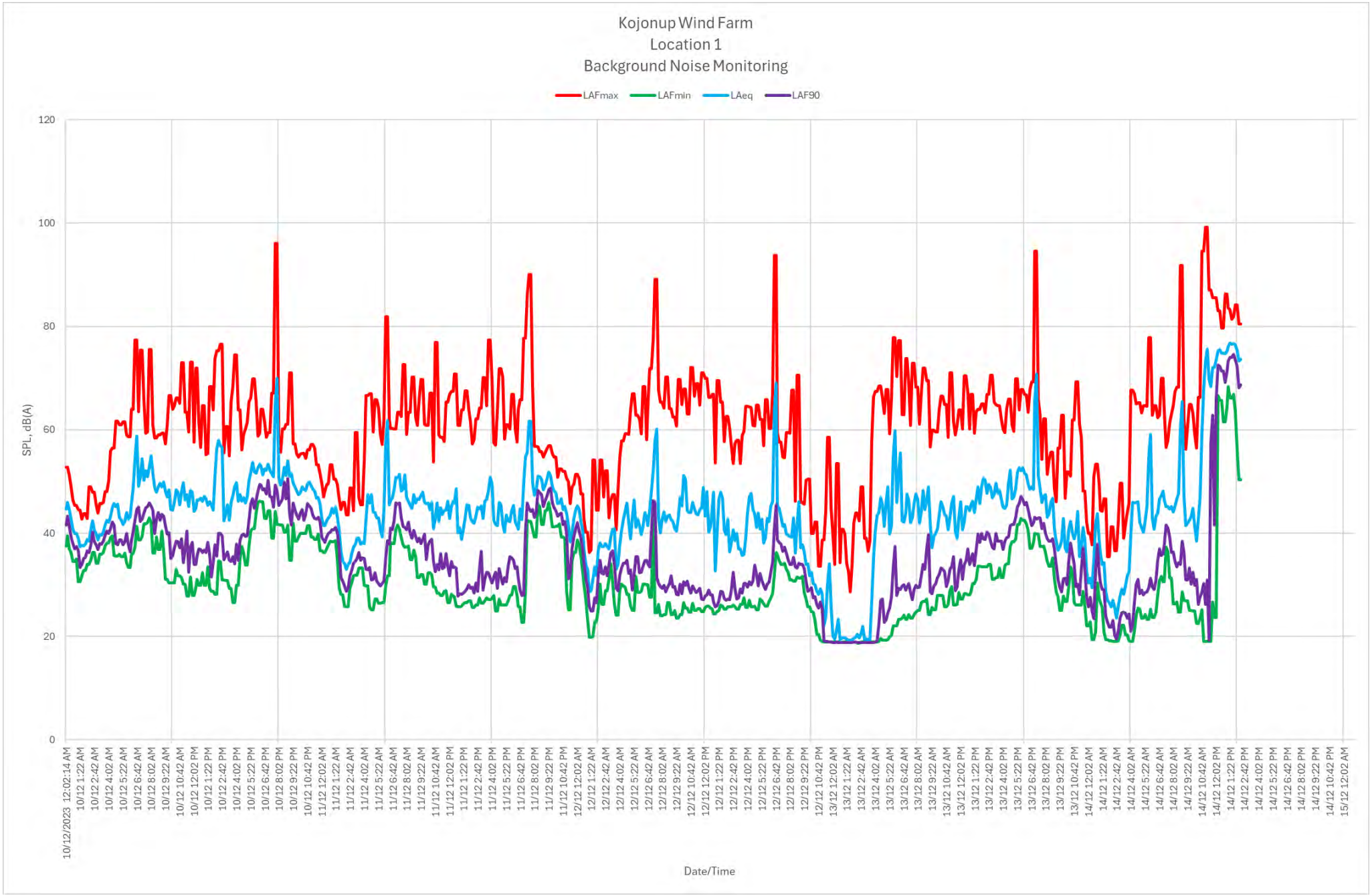

Kojonup Wind Farm
Location 1
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 1
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 1
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
120
100
80
60
40
20
0
Date/Time
25/11 12:02 AM
30/11/2023 12:02:14 AM


Kojonup Wind Farm
Location 1
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 1
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 1
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
120
100
80
60
40
20
0
Date/Time
10/12/2023 12:02:14 AM
10/12 1:22 AM
10/12 2:42 AM
10/12 4:02 AM
10/12 5:22 AM
10/12 6:42 AM
10/12 8:02 AM
10/12 9:22 AM
10/12 10:42 AM
10/12 12:02 PM
10/12 1:22 PM
10/12 2:42 PM
10/12 4:02 PM
10/12 5:22 PM
10/12 6:42 PM
10/12 8:02 PM
10/12 9:22 PM
10/12 10:42 PM
11/12 12:02 AM
11/12 1:22 AM
11/12 2:42 AM
11/12 4:02 AM
11/12 5:22 AM
11/12 6:42 AM
11/12 8:02 AM
11/12 9:22 AM
11/12 10:42 AM
11/12 12:02 PM
11/12 1:22 PM
11/12 2:42 PM
11/12 4:02 PM
11/12 5:22 PM
11/12 6:42 PM
11/12 8:02 PM
11/12 9:22 PM
11/12 10:42 PM
12/12 12:02 AM
12/12 1:22 AM
12/12 2:42 AM
12/12 4:02 AM
12/12 5:22 AM
12/12 6:42 AM
12/12 8:02 AM
12/12 9:22 AM
12/12 10:42 AM
12/12 12:02 PM
12/12 1:22 PM
12/12 2:42 PM
12/12 4:02 PM
12/12 5:22 PM
12/12 6:42 PM
12/12 8:02 PM
12/12 9:22 PM
12/12 10:42 PM
13/12 12:02 AM
13/12 1:22 AM
13/12 2:42 AM
13/12 4:02 AM
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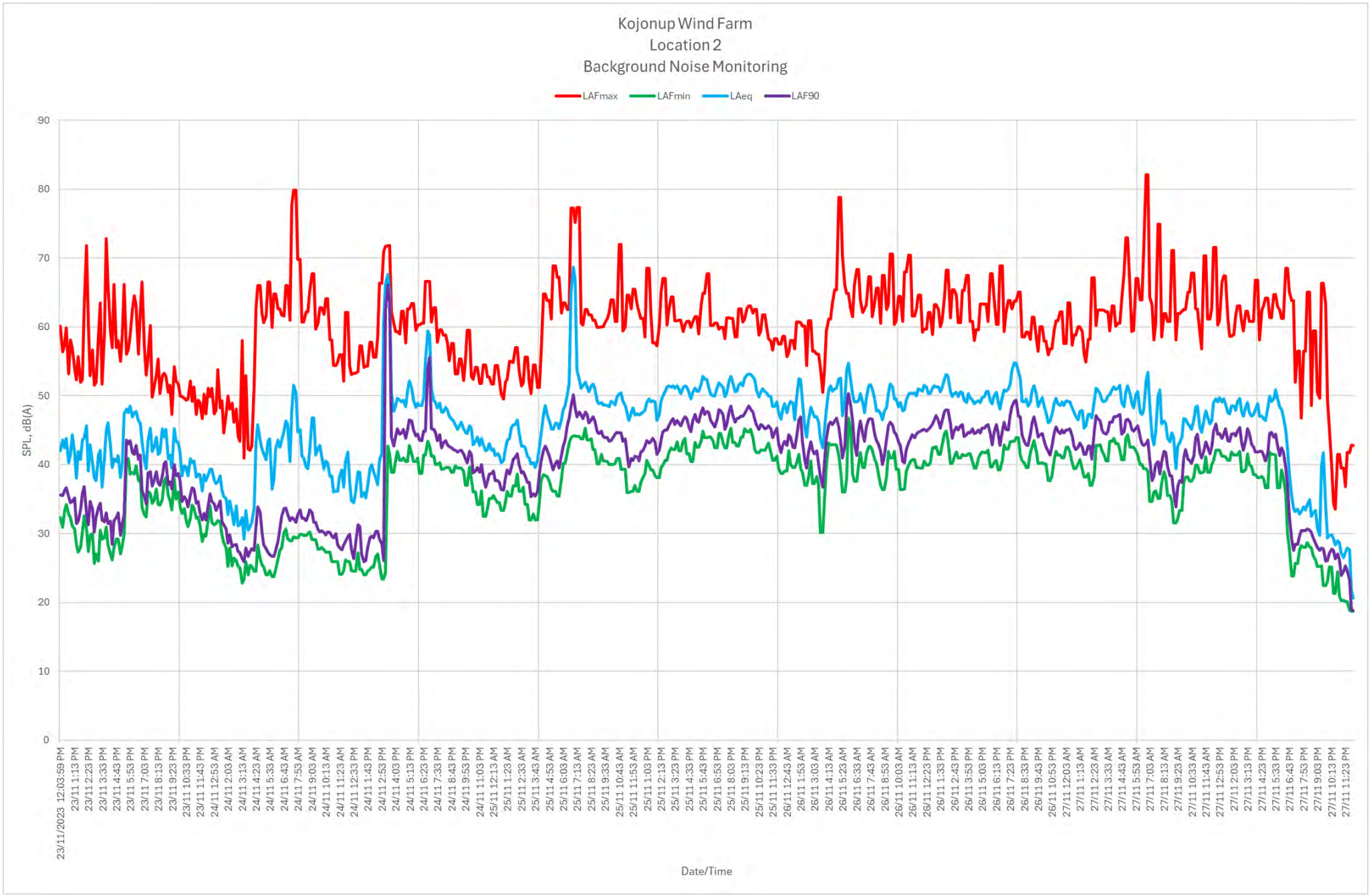
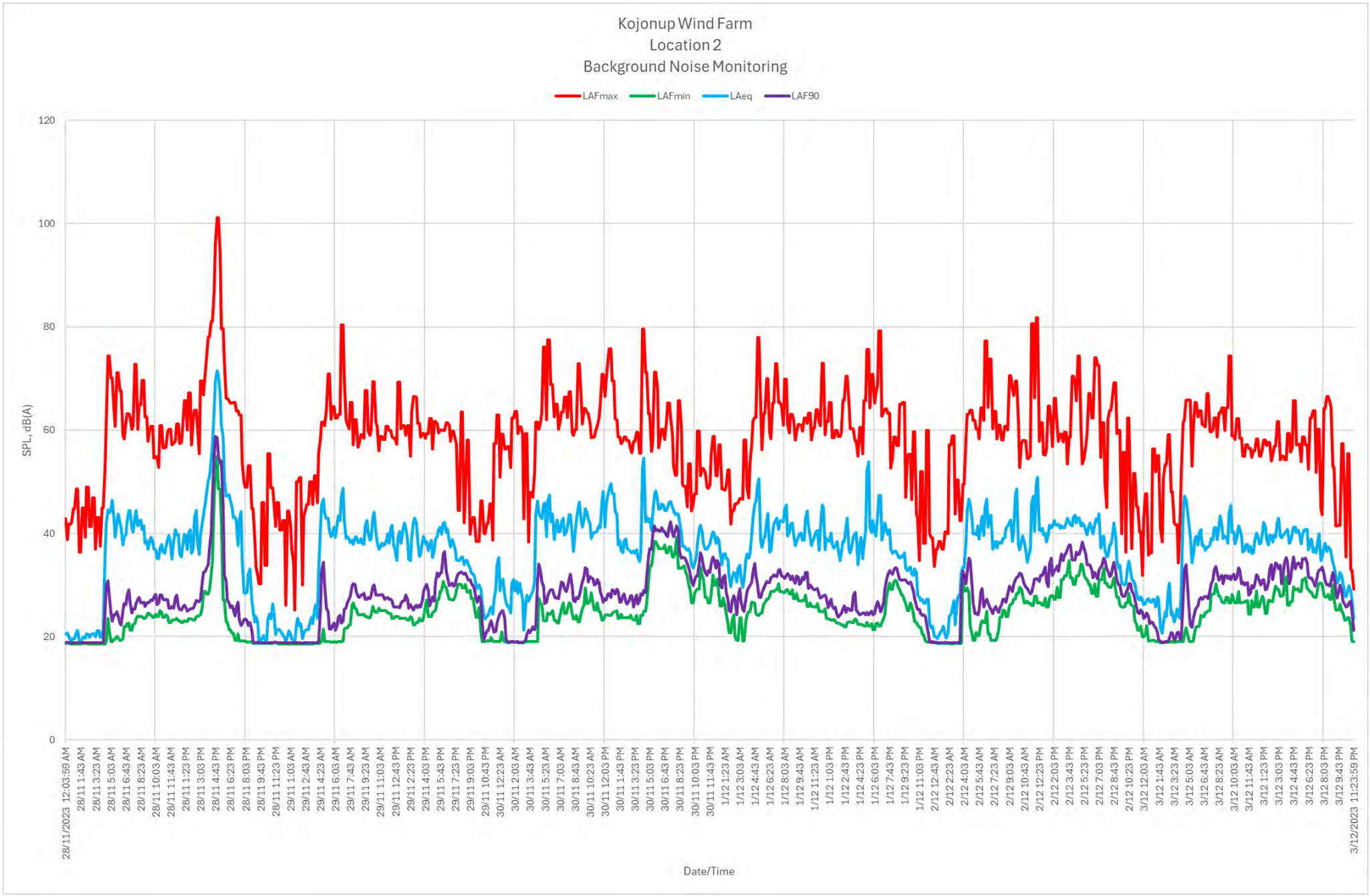
14/12 5:22 AM
14/12 6:42 AM
14/12 8:02 AM
14/12 9:22 AM
14/12 10:42 AM
14/12 12:02 PM
14/12 1:22 PM
14/12 2:42 PM
14/12 4:02 PM
14/12 5:22 PM
14/12 6:42 PM
14/12 8:02 PM
14/12 9:22 PM
14/12 10:42 PM
15/12 12:02 AM


Kojonup Wind Farm
Location 2
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 2
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
120
100
80
60
40
20
0
28/11/2023 12:03:59 AM
28/11 1:43 AM
28/11 3:23 AM
28/11 5:03 AM
28/11 6:43 AM
28/11 8:23 AM
28/11 10:03 AM
28/11 11:43 AM
28/11 1:23 PM
28/11 3:03 PM
28/11 4:43 PM
28/11 6:23 PM
28/11 8:03 PM
28/11 9:43 PM
28/11 11:23 PM
29/11 1:03 AM
29/11 2:43 AM
29/11 4:23 AM
29/11 6:03 AM
29/11 7:43 AM
29/11 9:23 AM
29/11 11:03 AM
29/11 12:43 PM
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29/11 10:43 PM
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30/11 8:43 AM
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1/12 1:23 AM
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2/12 2:03 PM
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2/12 8:43 PM
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3/12 3:23 AM
3/12 5:03 AM
3/12 6:43 AM
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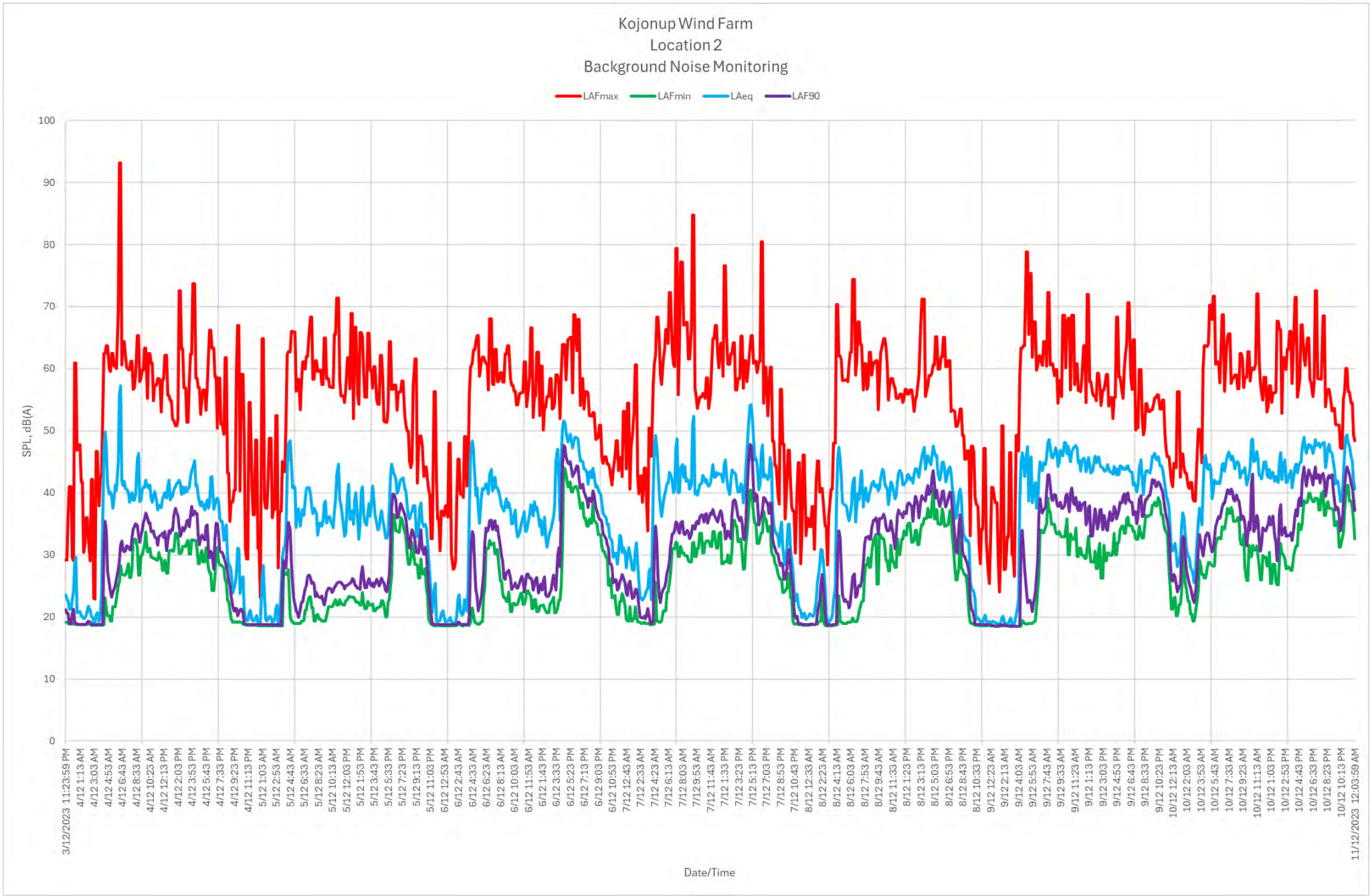
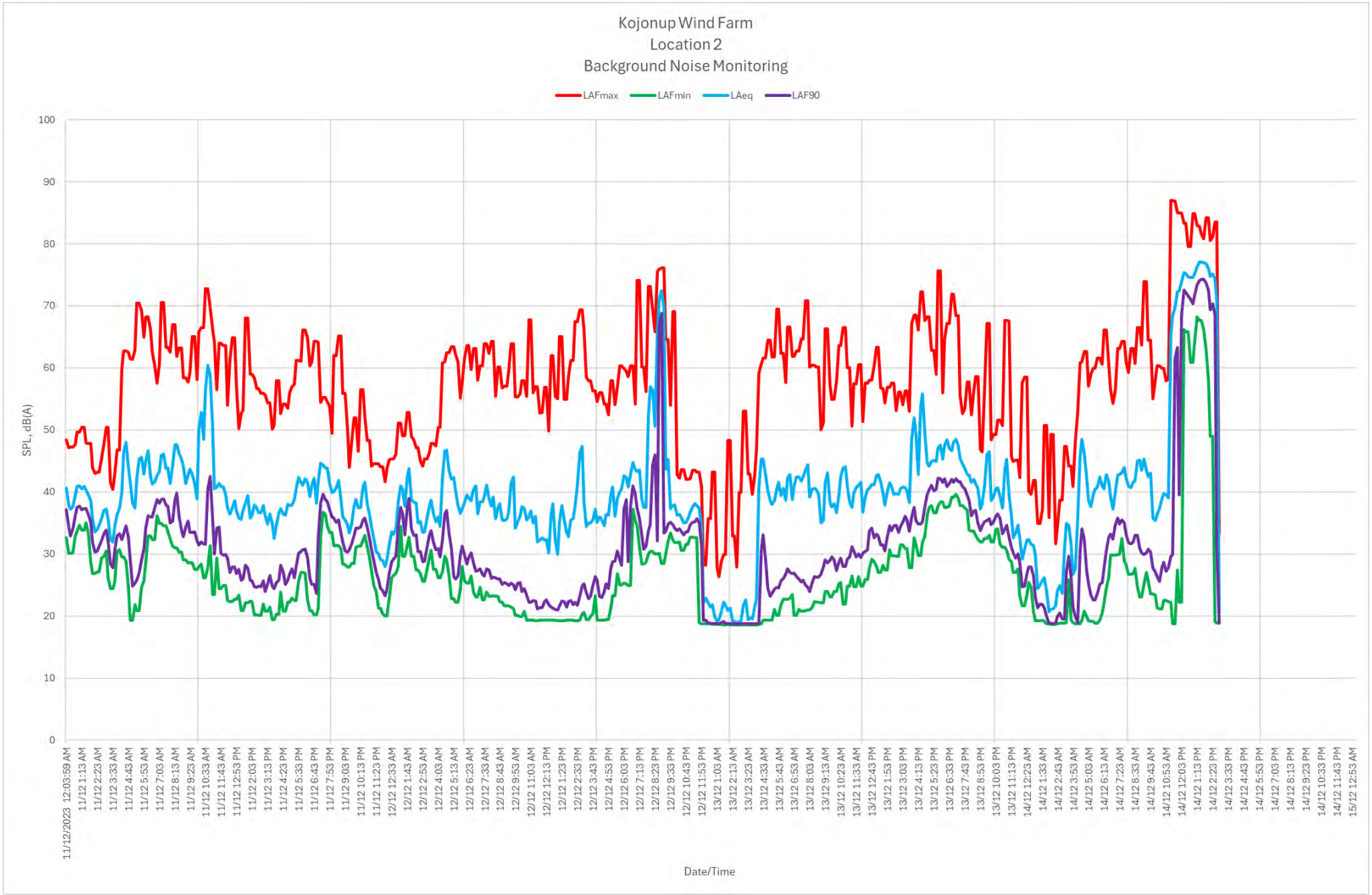
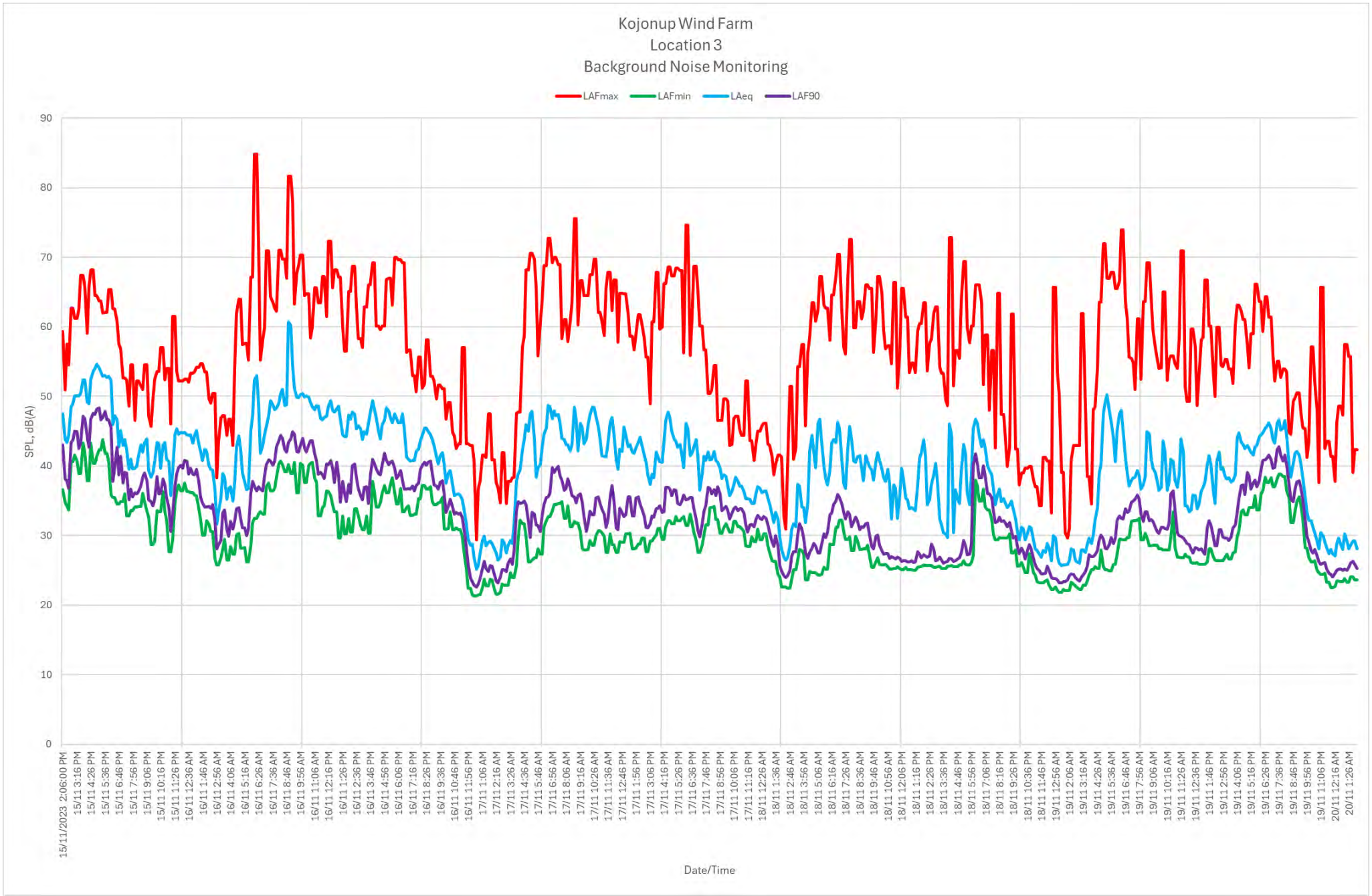
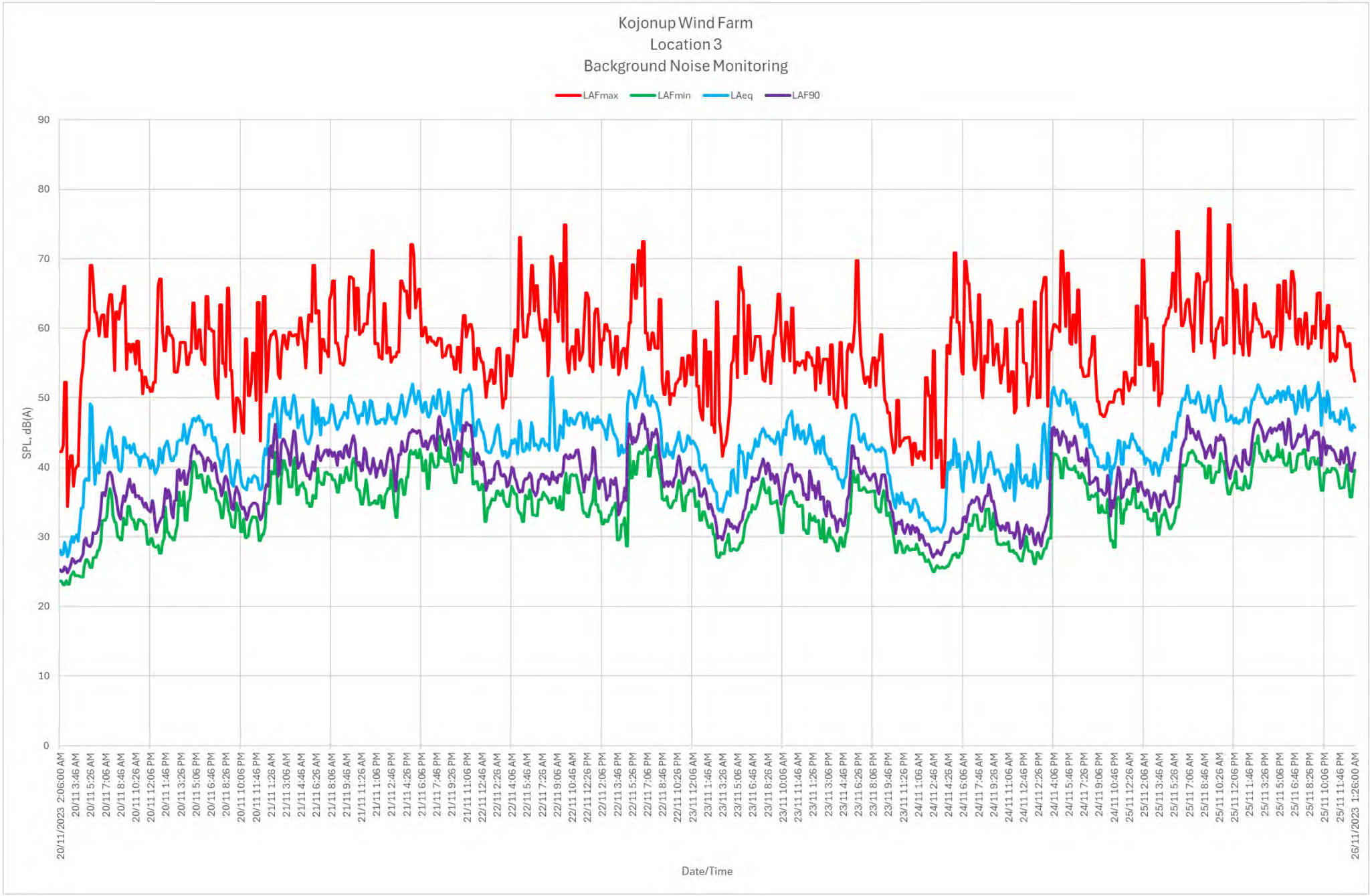
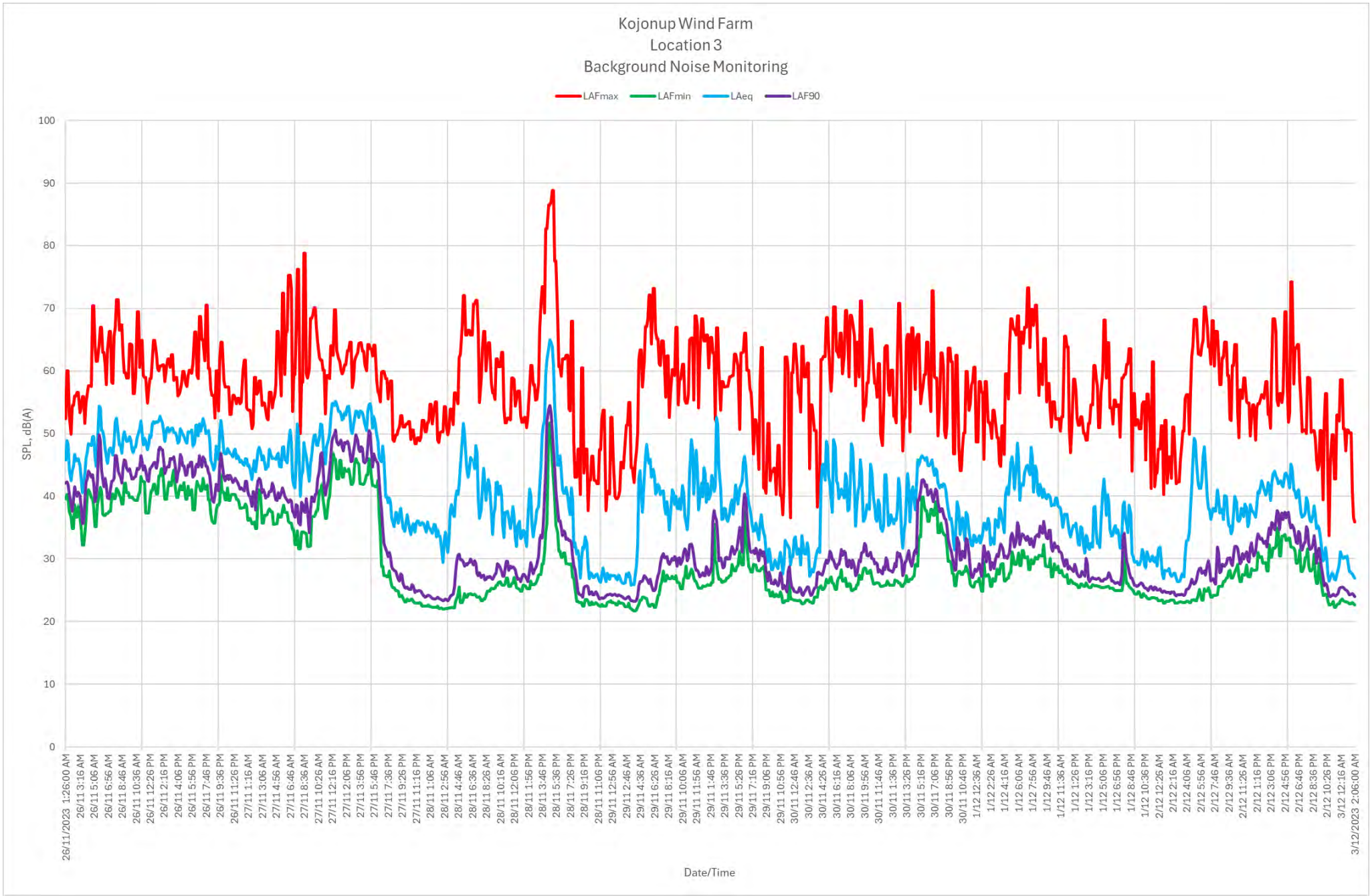
3/12 1:23 PM
3/12 3:03 PM
3/12 4:43 PM
3/12 6:23 PM
3/12 8:03 PM
3/12 9:43 PM
3/12/2023 11:23:59 PM
Date/Time


Kojonup Wind Farm
Location 2
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 2
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 3
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 3
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
90
80
70
60
50
40
30
20
10
0
Date/Time
20/11/2023 2:06:00 AM
26/11/2023 1:26:00 AM


Kojonup Wind Farm
Location 3
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
100
90
80
70
60
50
40
30
20
10
0
Date/Time
26/11/2023 1:26:00 AM
26/11 3:16 AM
26/11 5:06 AM
26/11 6:56 AM
26/11 8:46 AM
26/11 10:36 AM
26/11 12:26 PM
26/11 2:16 PM
26/11 4:06 PM
26/11 5:56 PM
26/11 7:46 PM
26/11 9:36 PM
26/11 11:26 PM
27/11 1:16 AM
27/11 3:06 AM
27/11 4:56 AM
27/11 6:46 AM
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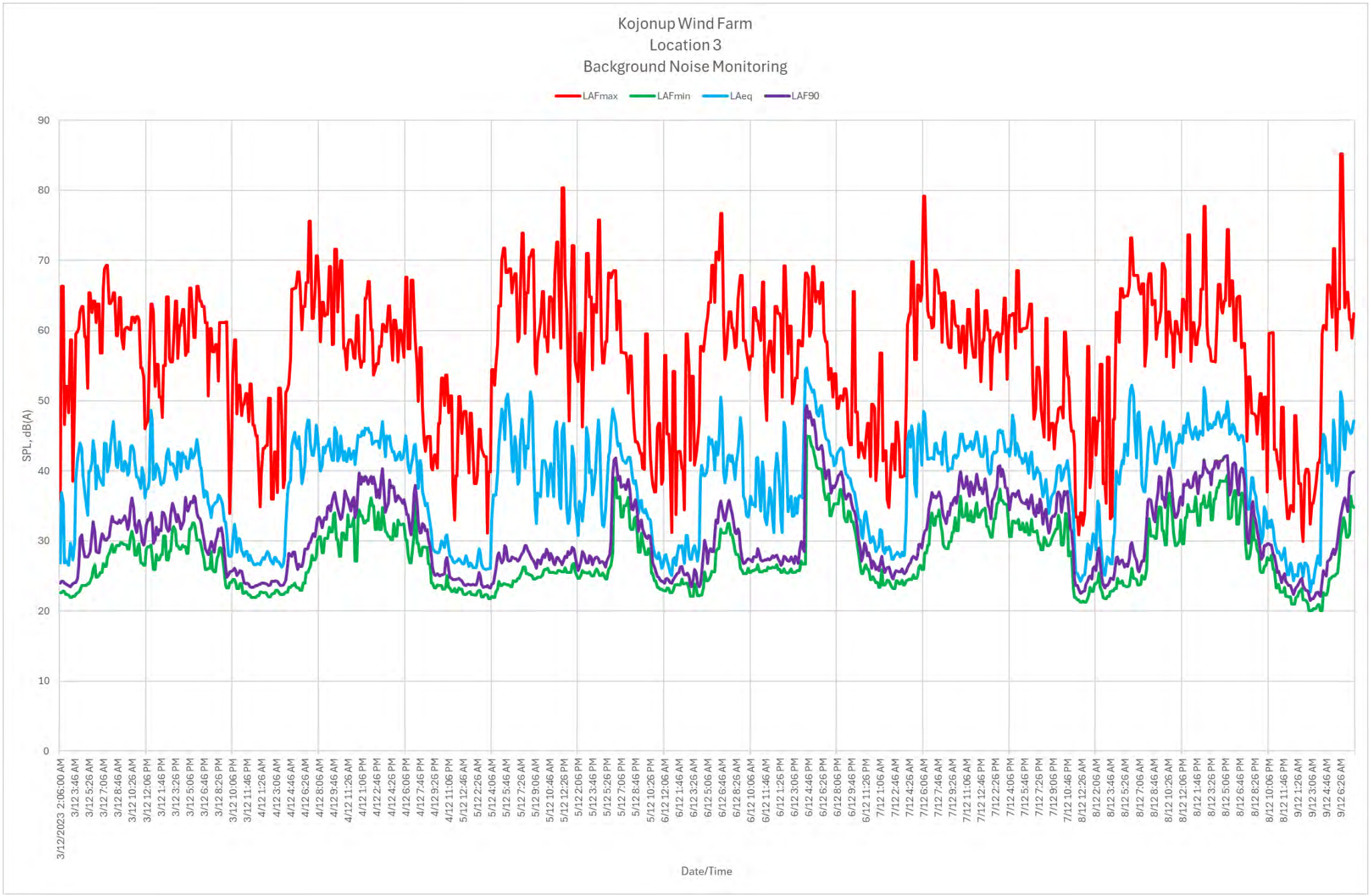
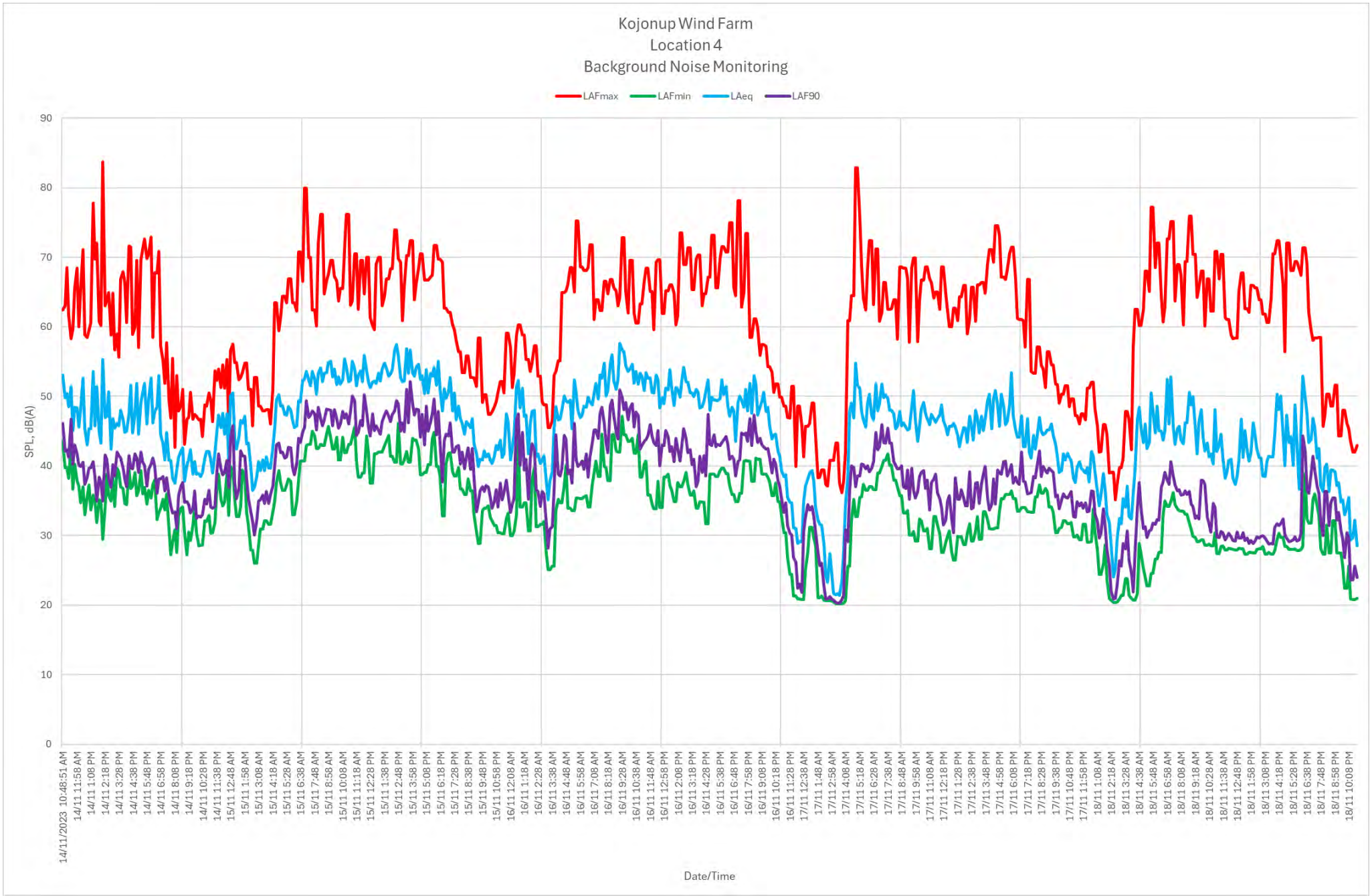
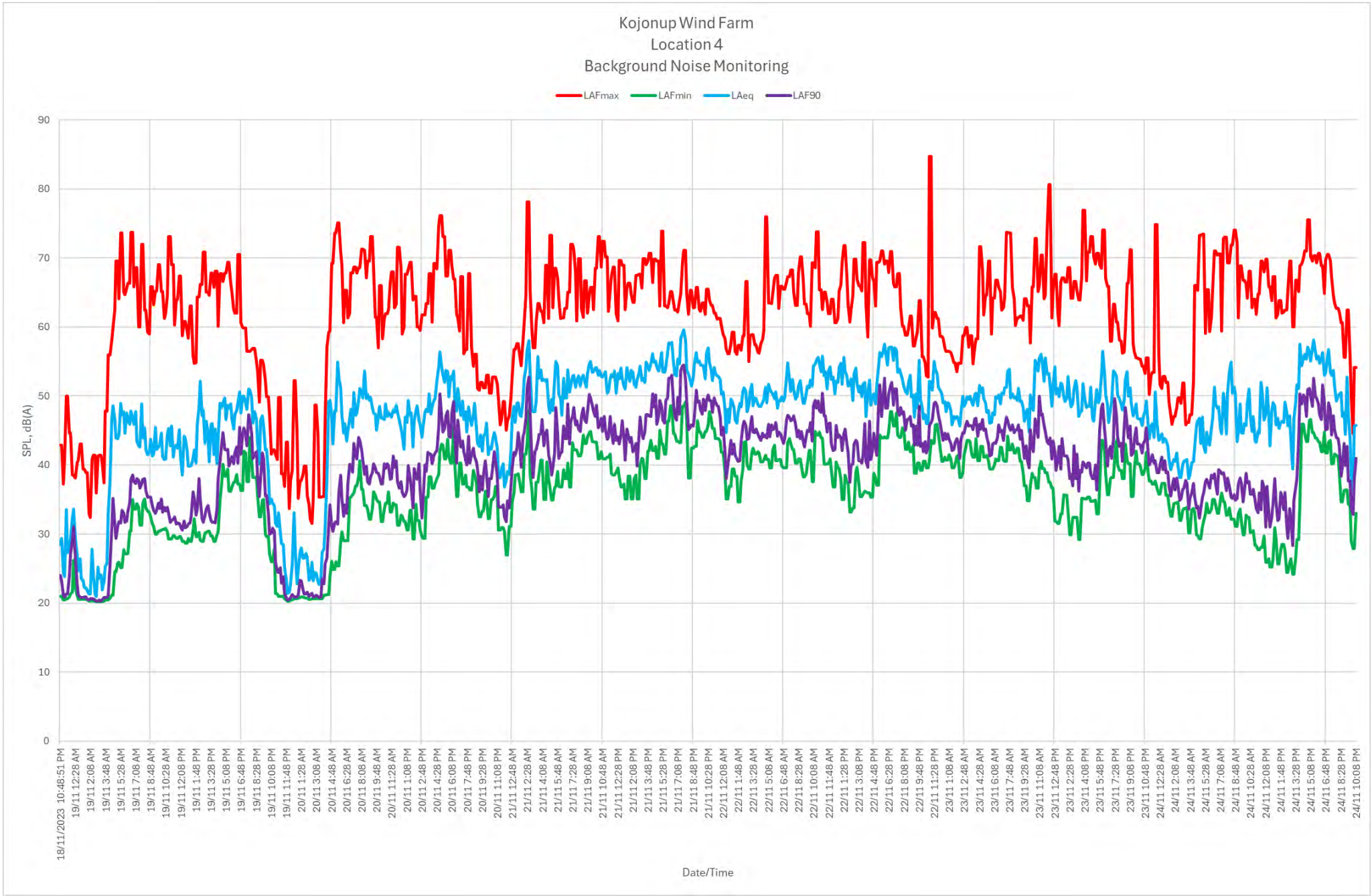
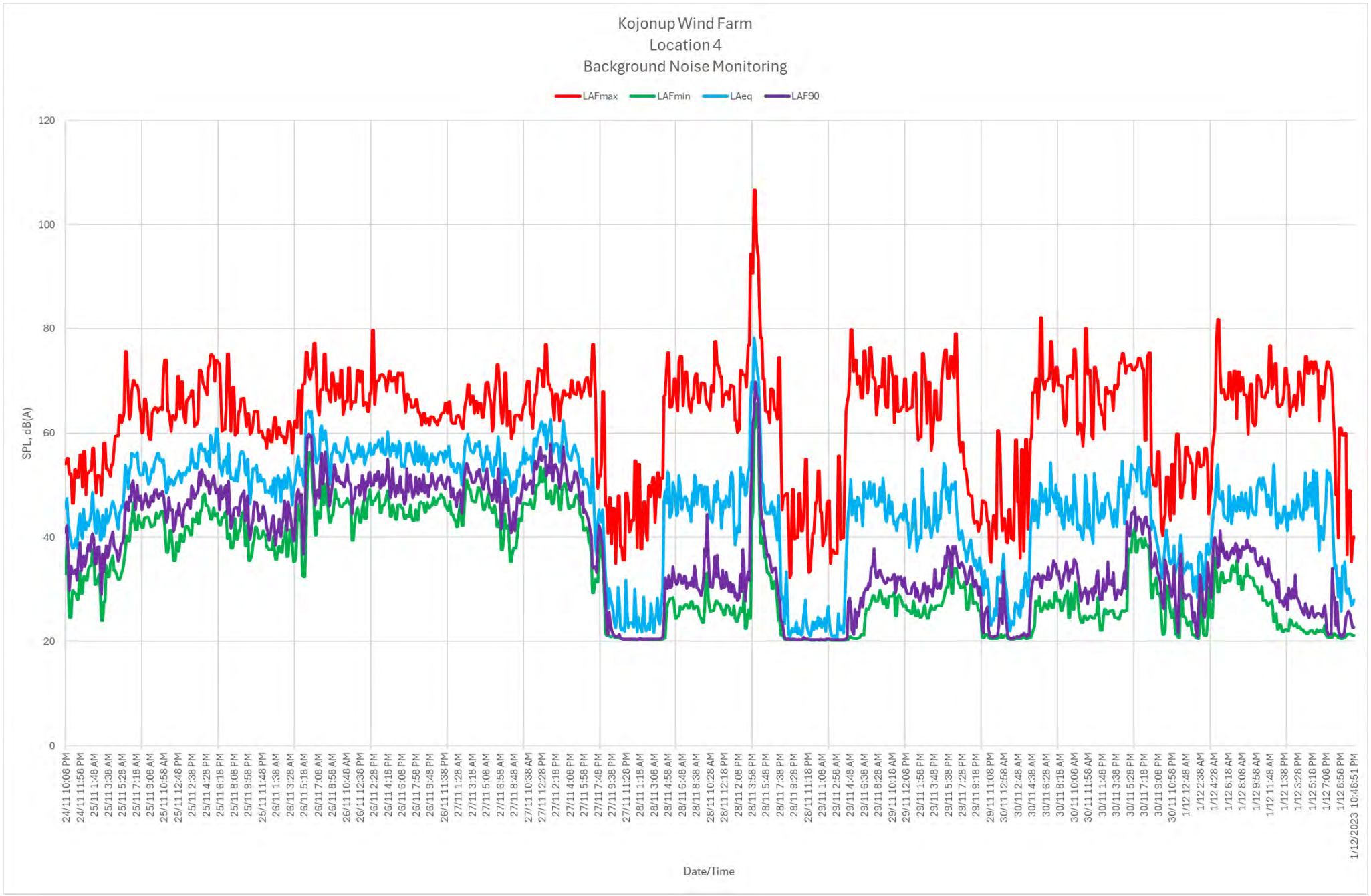
28/11 10:16 AM
28/11 12:06 PM
28/11 1:56 PM
28/11 3:46 PM
28/11 5:36 PM
28/11 7:26 PM
28/11 9:16 PM
28/11 11:06 PM
29/11 12:56 AM
29/11 2:46 AM
29/11 4:36 AM
29/11 6:26 AM
29/11 8:16 AM
29/11 10:06 AM
29/11 11:56 AM
29/11 1:46 PM
29/11 3:36 PM
29/11 5:26 PM
29/11 7:16 PM
29/11 9:06 PM
29/11 10:56 PM
30/11 12:46 AM
30/11 2:36 AM
30/11 4:26 AM
30/11 6:16 AM
30/11 8:06 AM
30/11 9:56 AM
30/11 11:46 AM
30/11 1:36 PM
30/11 3:26 PM
30/11 5:16 PM
30/11 7:06 PM
30/11 8:56 PM
30/11 10:46 PM
1/12 12:36 AM
1/12 2:26 AM
1/12 4:16 AM
1/12 6:06 AM
1/12 7:56 AM
1/12 9:46 AM
1/12 11:36 AM
1/12 1:26 PM
1/12 3:16 PM
1/12 5:06 PM
1/12 6:56 PM
1/12 8:46 PM
1/12 10:36 PM
2/12 12:26 AM
2/12 2:16 AM
2/12 4:06 AM
2/12 5:56 AM
2/12 7:46 AM
2/12 9:36 AM
2/12 11:26 AM
2/12 1:16 PM
2/12 3:06 PM
2/12 4:56 PM
2/12 6:46 PM
2/12 8:36 PM
2/12 10:26 PM
3/12 12:16 AM
3/12/2023 2:06:00 AM


Kojonup Wind Farm
Location 3
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 4
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 4
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 4
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
120
100
80
60
40
20
0
Date/Time
24/11 10:08 PM
24/11 11:58 PM
25/11 1:48 AM
25/11 3:38 AM
25/11 5:28 AM
25/11 7:18 AM
25/11 9:08 AM
25/11 10:58 AM
25/11 12:48 PM
25/11 2:38 PM
25/11 4:28 PM
25/11 6:18 PM
25/11 8:08 PM
25/11 9:58 PM
25/11 11:48 PM
26/11 1:38 AM
26/11 3:28 AM
26/11 5:18 AM
26/11 7:08 AM
26/11 8:58 AM
26/11 10:48 AM
26/11 12:38 PM
26/11 2:28 PM
26/11 4:18 PM
26/11 6:08 PM
26/11 7:58 PM
26/11 9:48 PM
26/11 11:38 PM
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27/11 3:18 AM
27/11 5:08 AM
27/11 6:58 AM
27/11 8:48 AM
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1/12 9:58 AM
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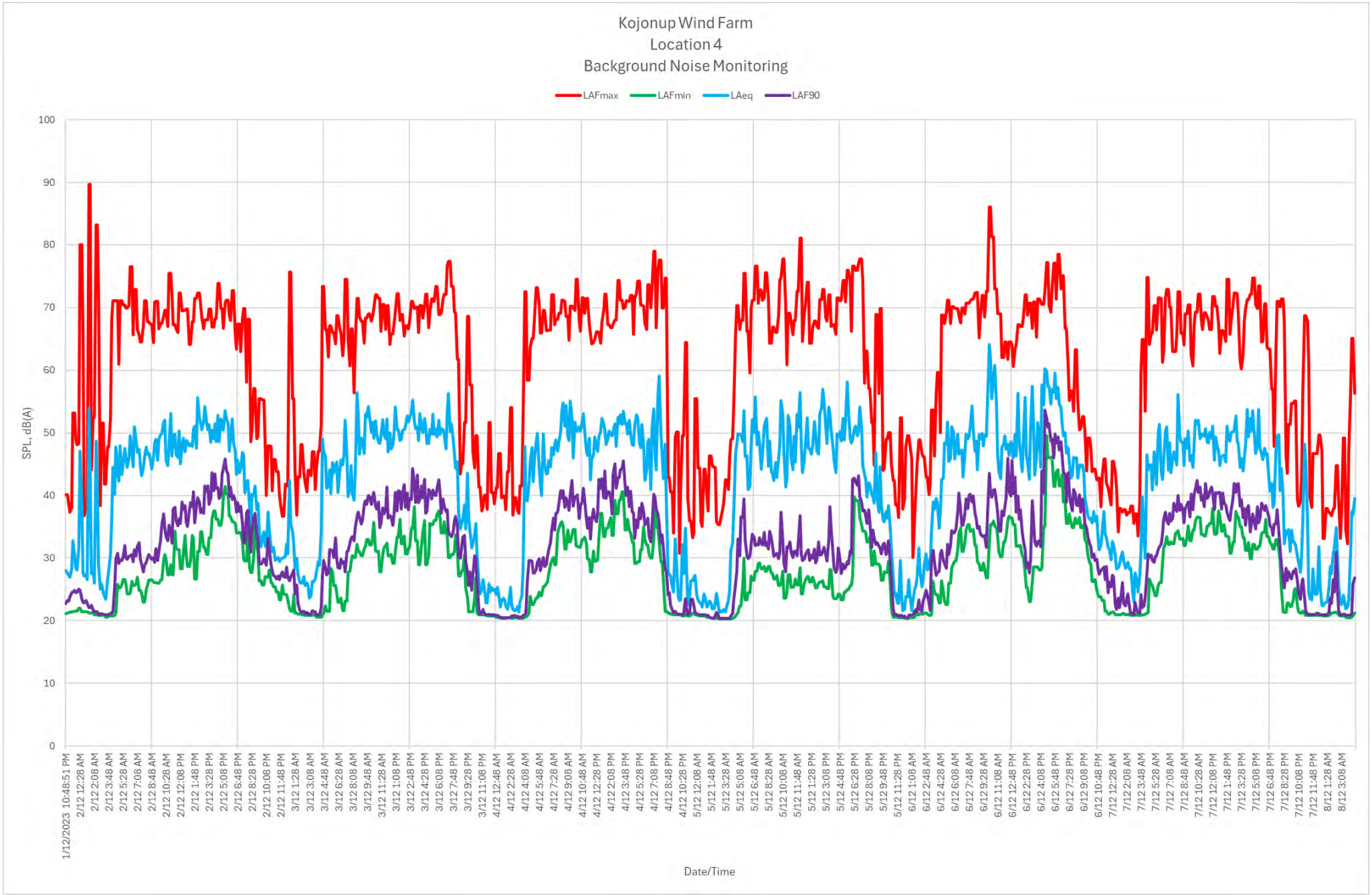
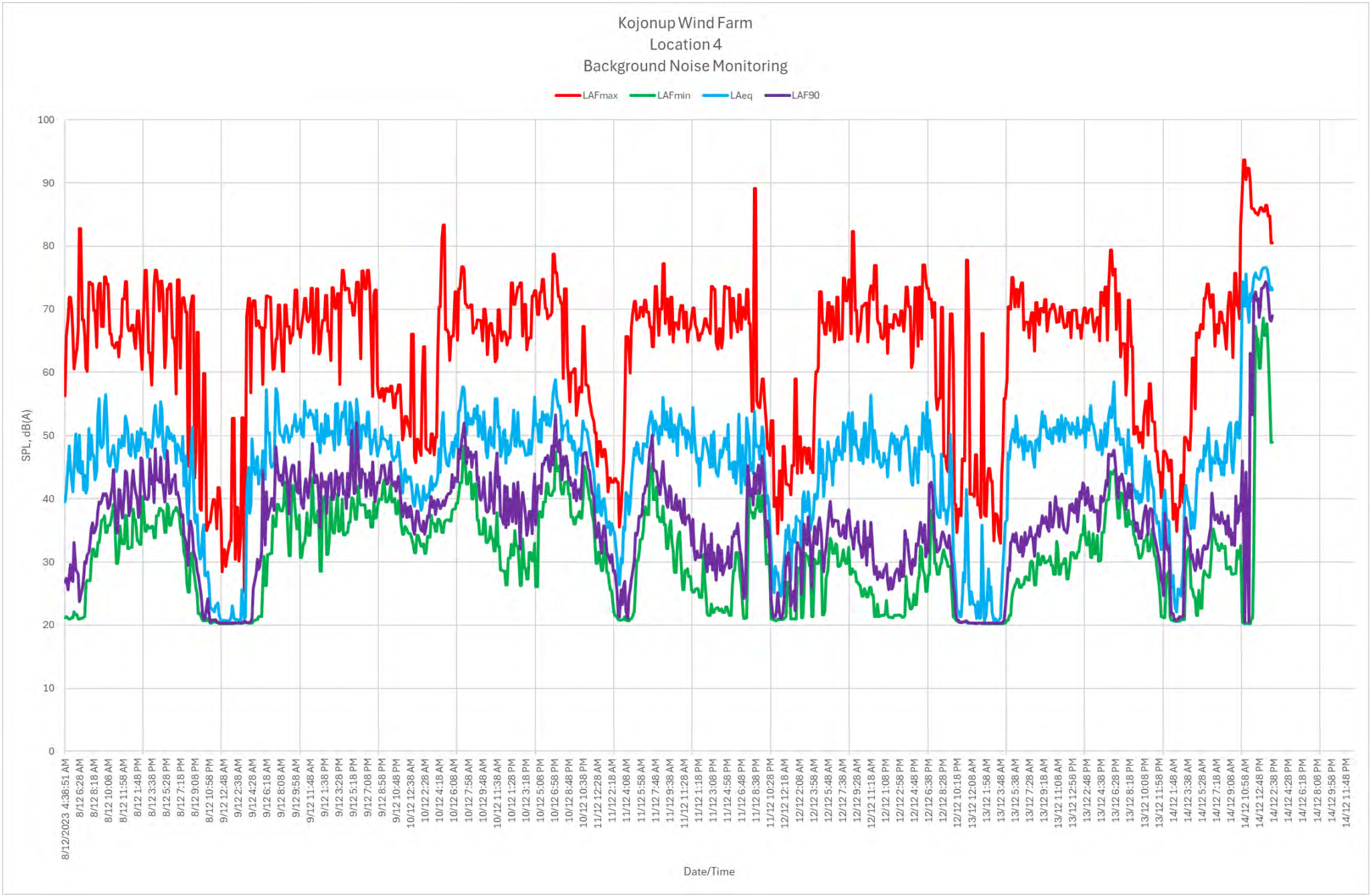
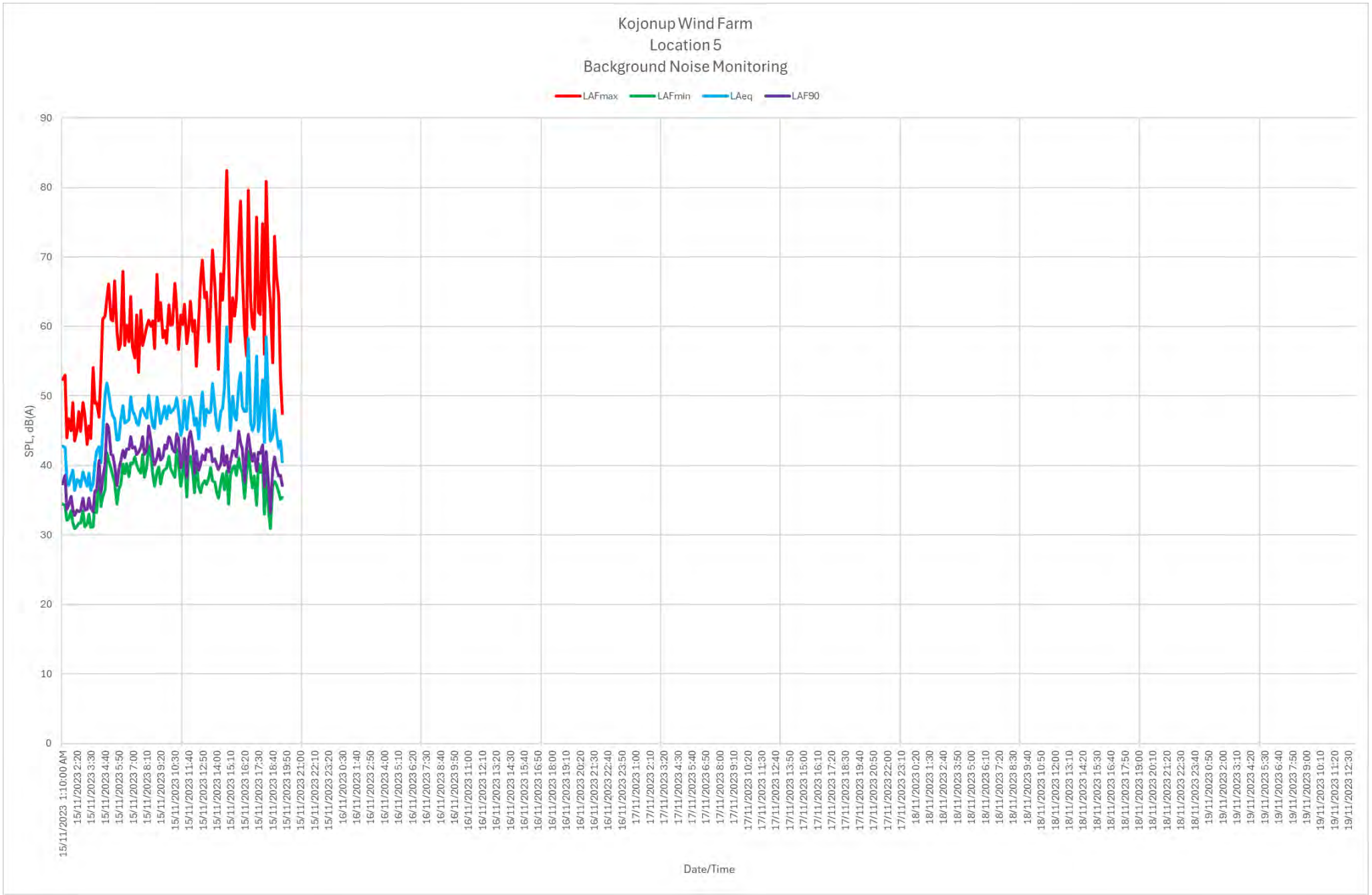
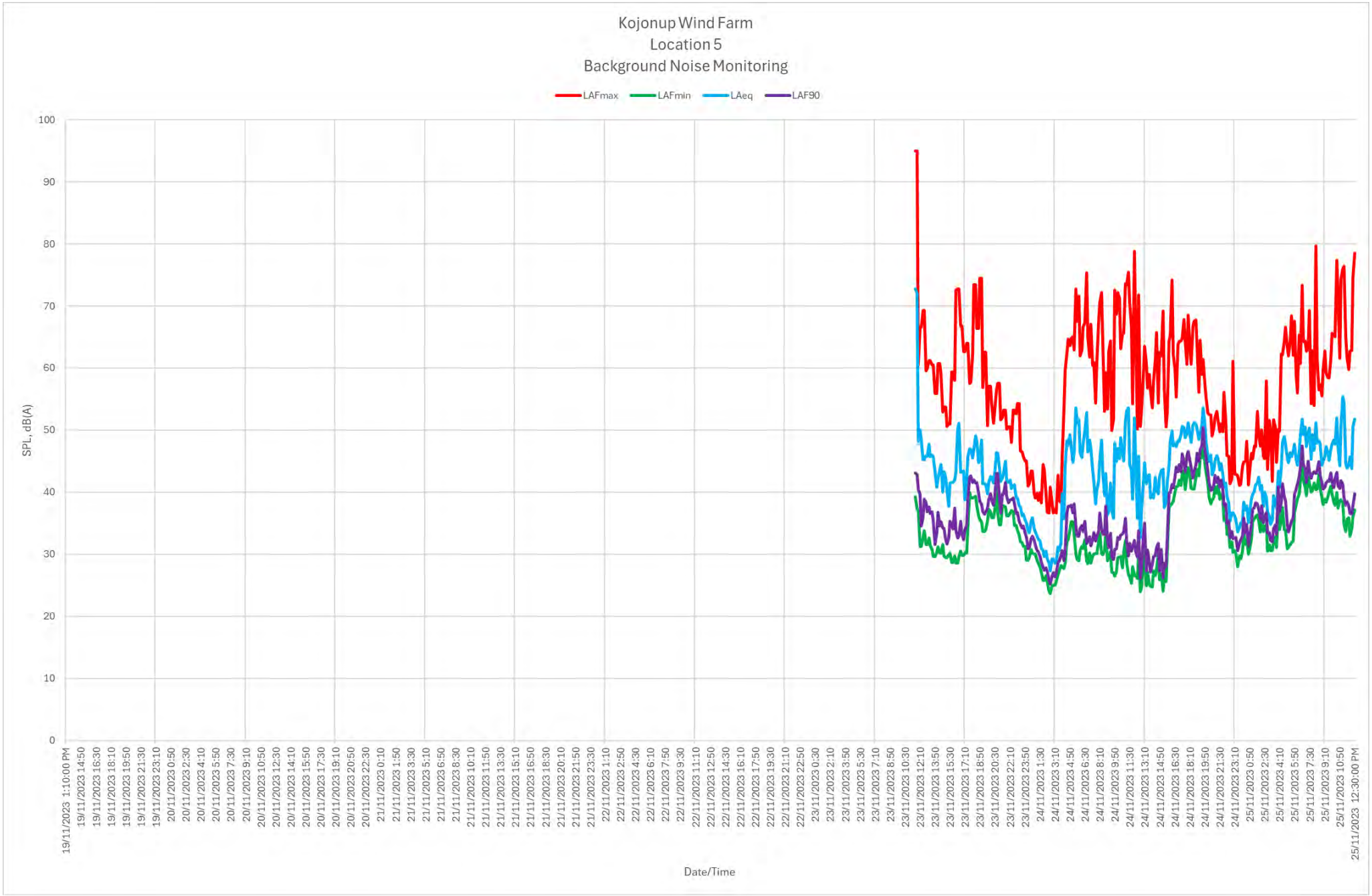
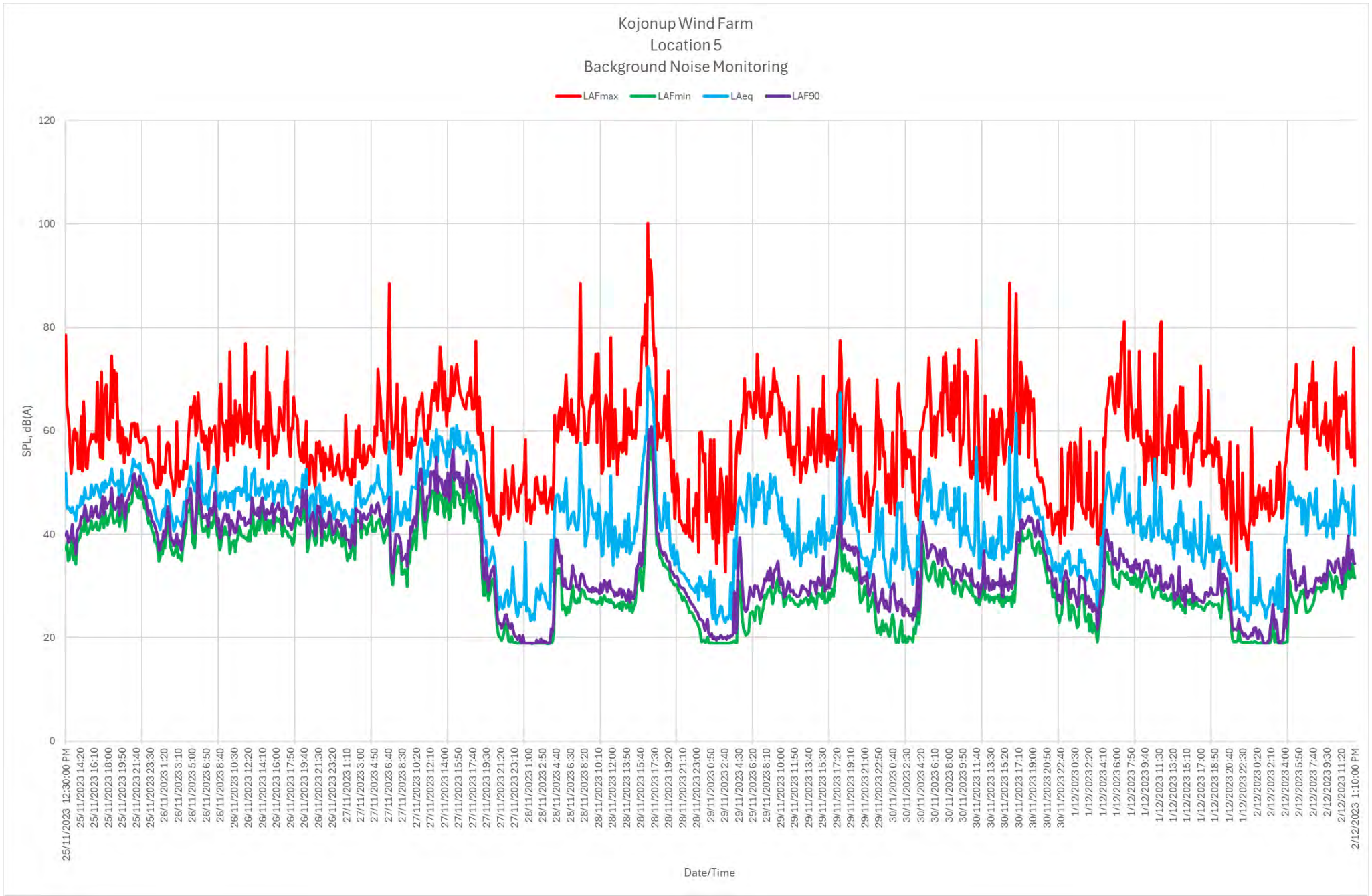
1/12 8:58 PM
1/12/2023 10:48:51 PM

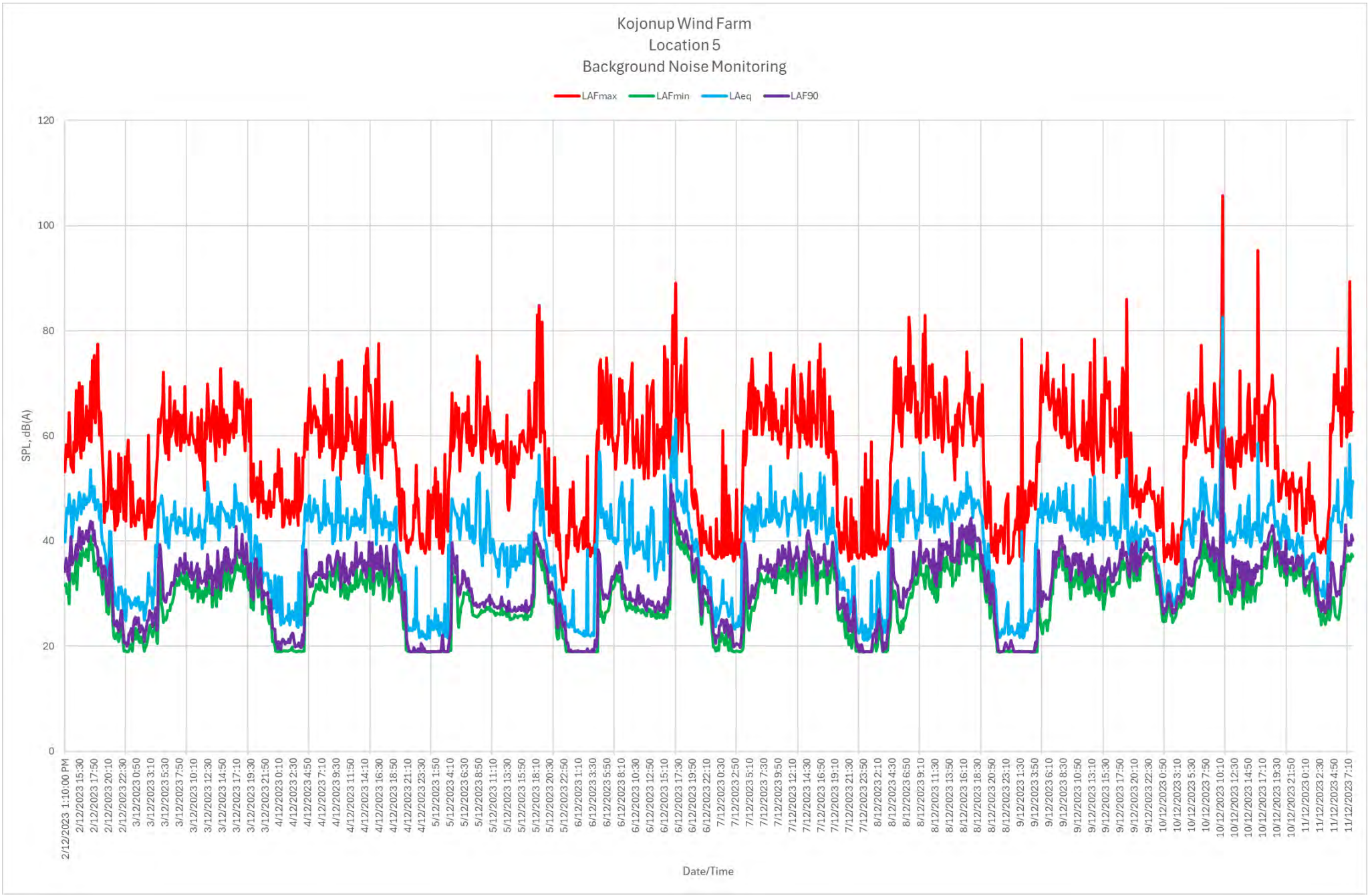

Kojonup Wind Farm
Location 4
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 4
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 5
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 5
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 5
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
120
100
80
60
40
20
0
Date/Time
25/11/2023 12:30:00 PM
2/12/2023 1:10:00 PM


Kojonup Wind Farm
Location 5
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
120
100
80
60
40
20
0
Date/Time
2/12/2023 1:10:00 PM
2/12/2023 15:30
2/12/2023 17:50
2/12/2023 20:10
2/12/2023 22:30
3/12/2023 0:50
3/12/2023 3:10
3/12/2023 5:30
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3/12/2023 12:30
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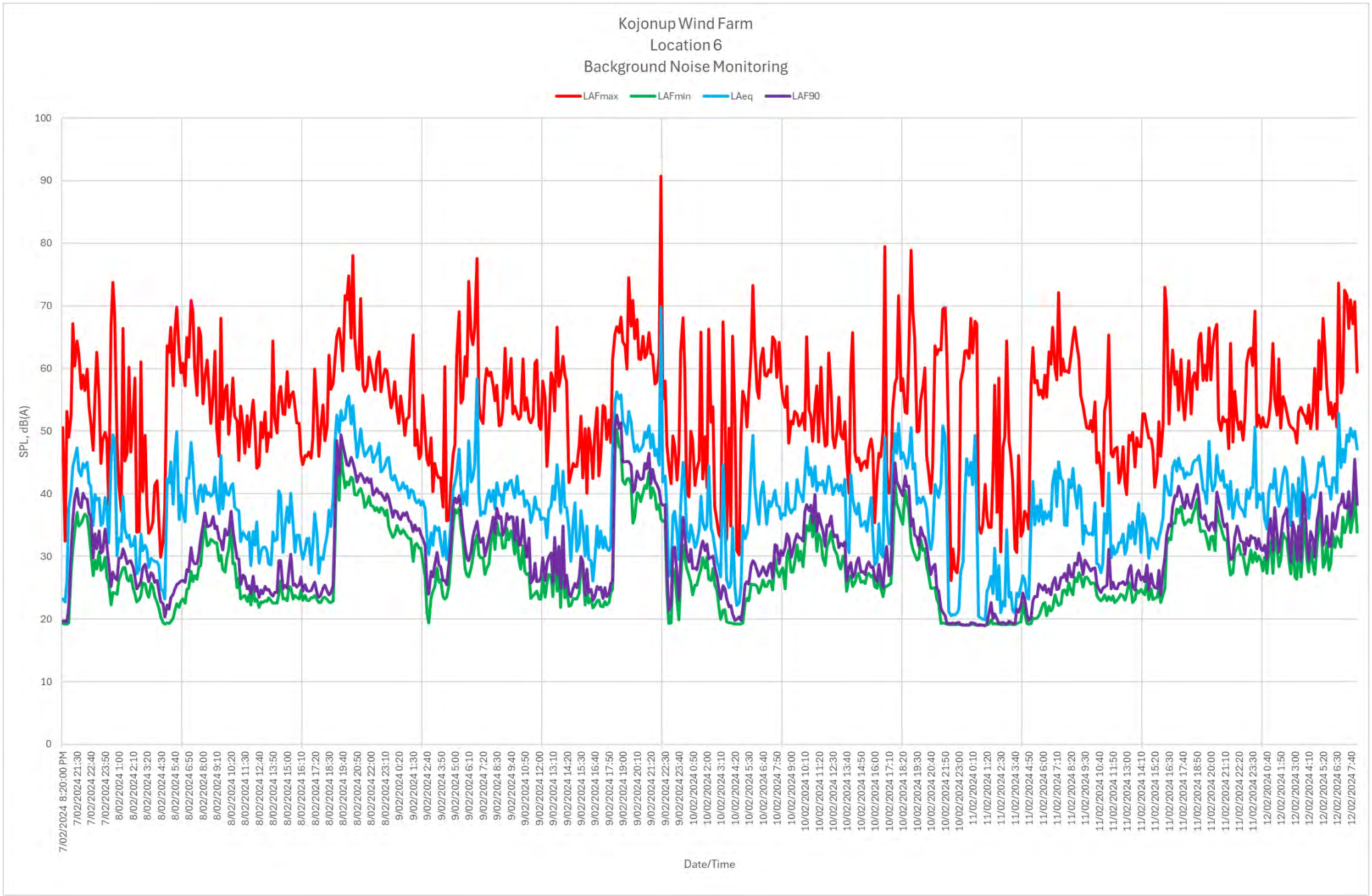
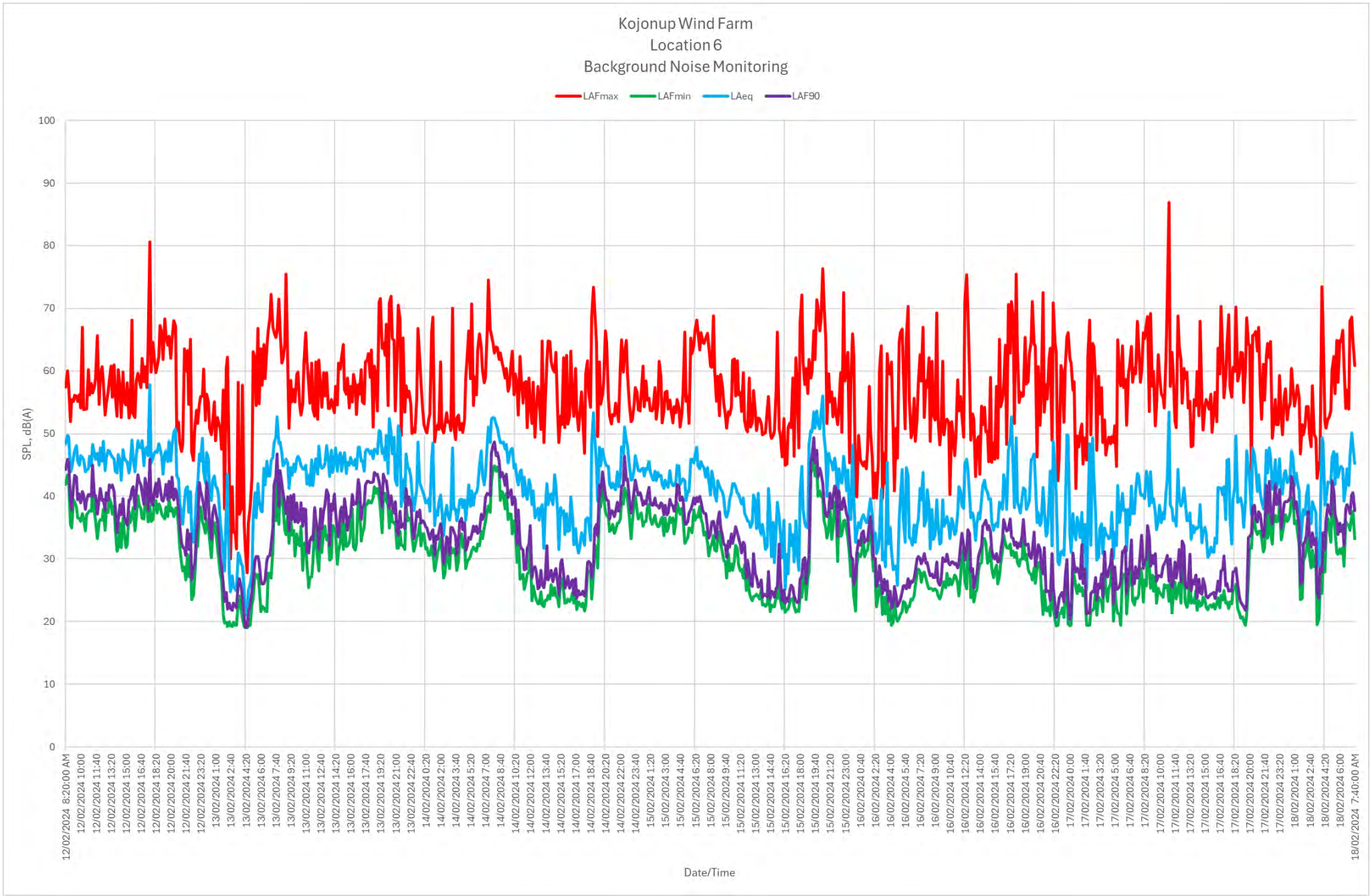
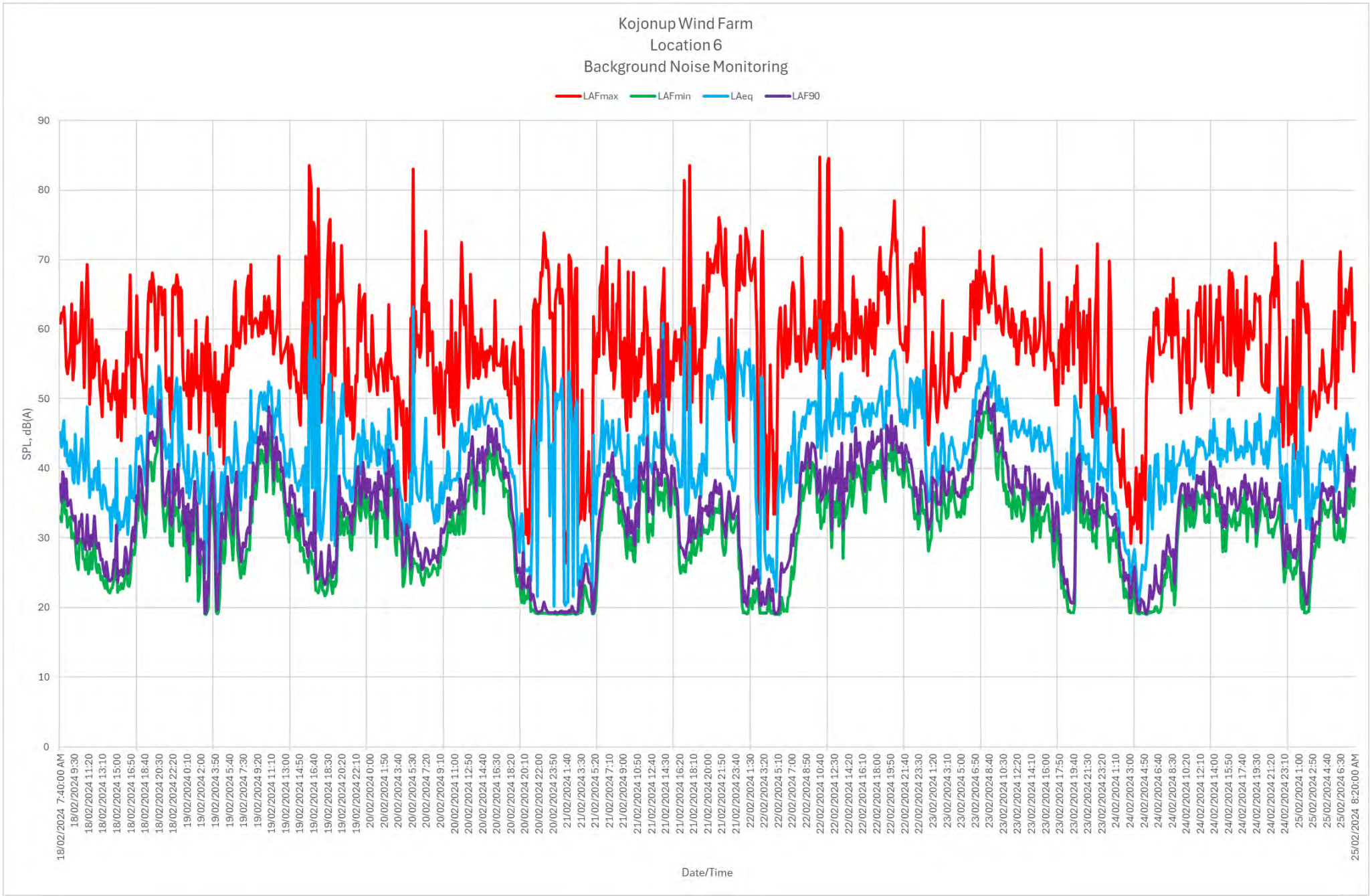
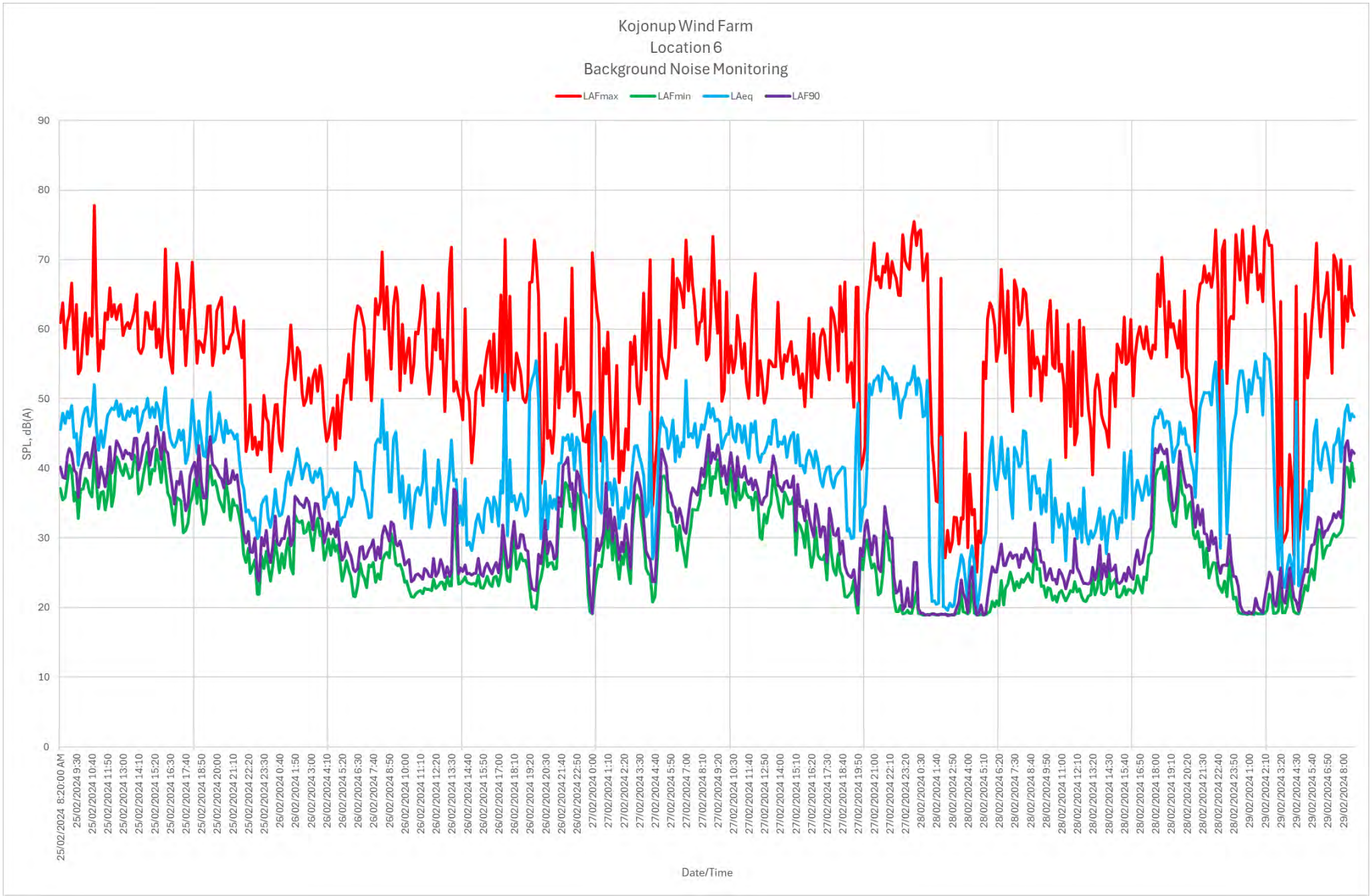
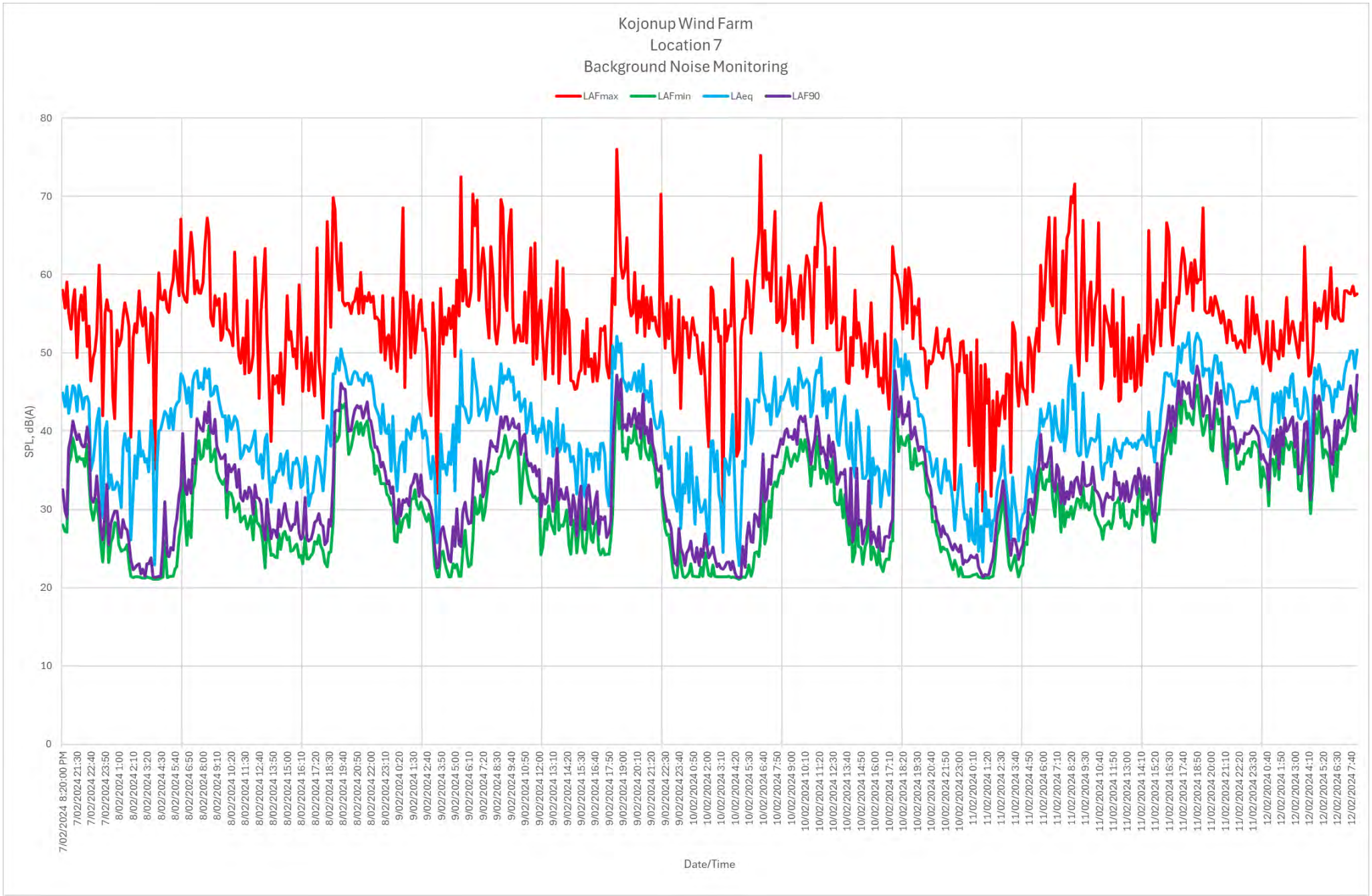
11/12/2023 4:50
11/12/2023 7:10

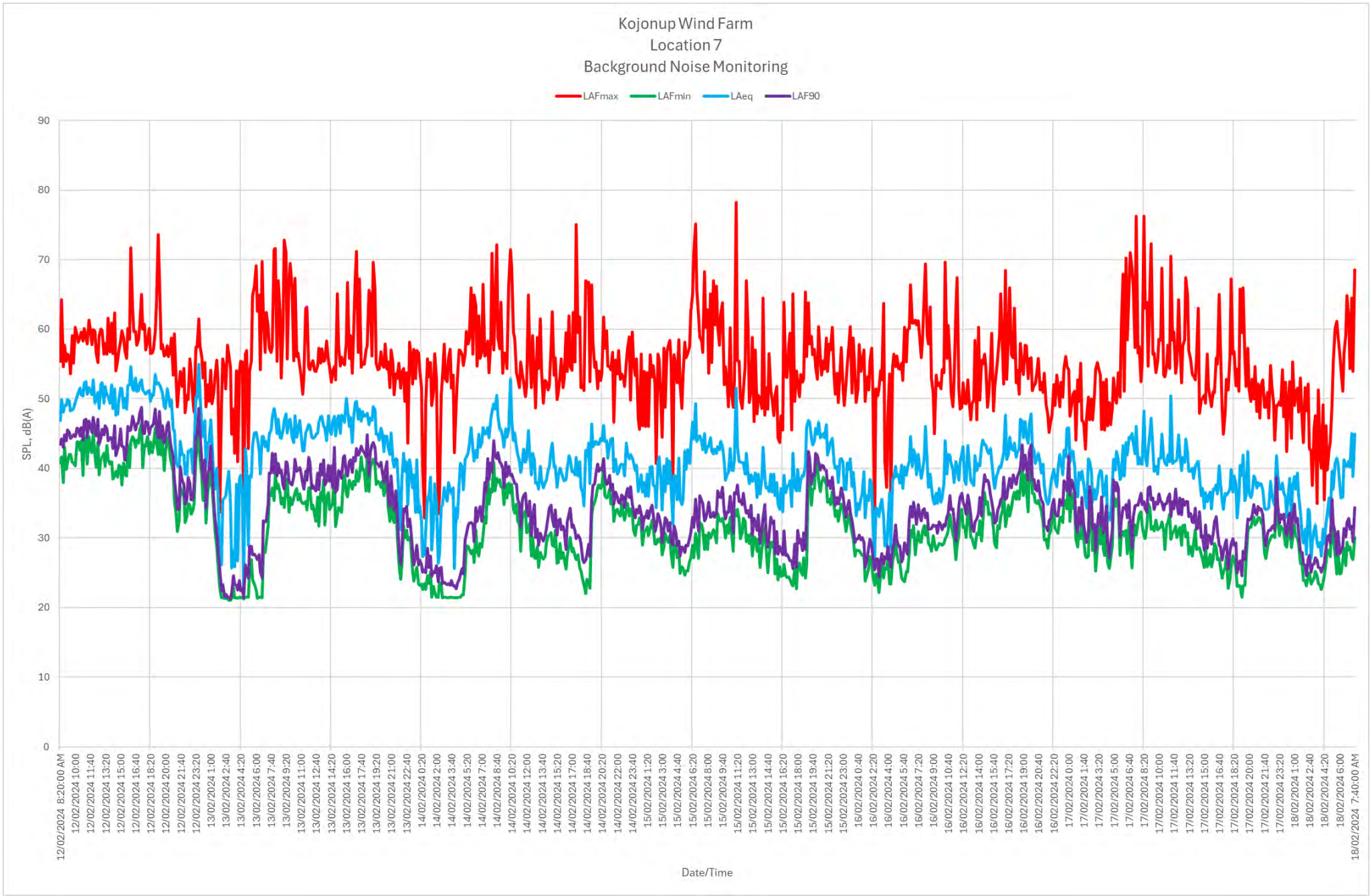

Kojonup Wind Farm
Location 6
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time

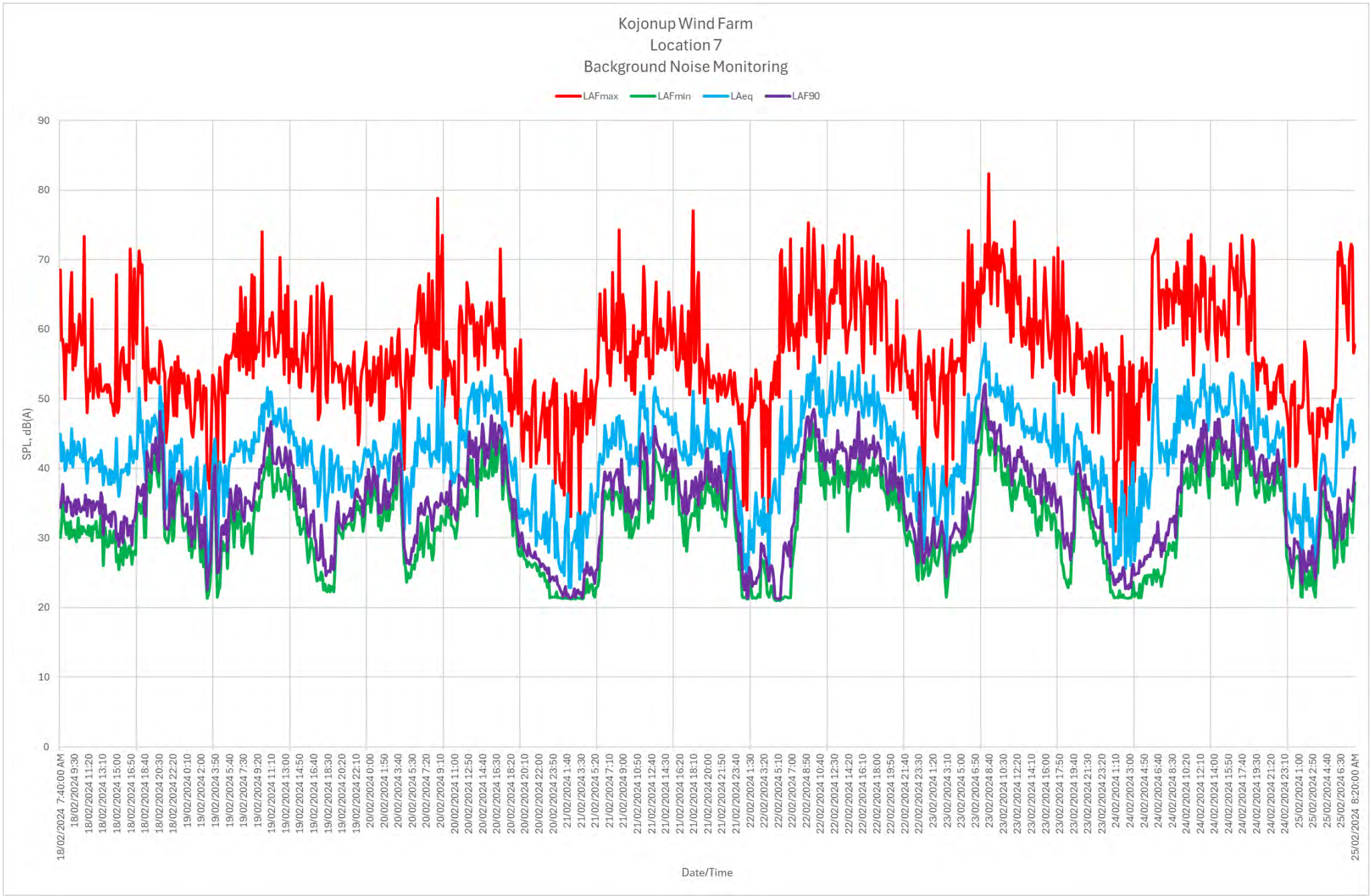

Kojonup Wind Farm
Location 6
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time

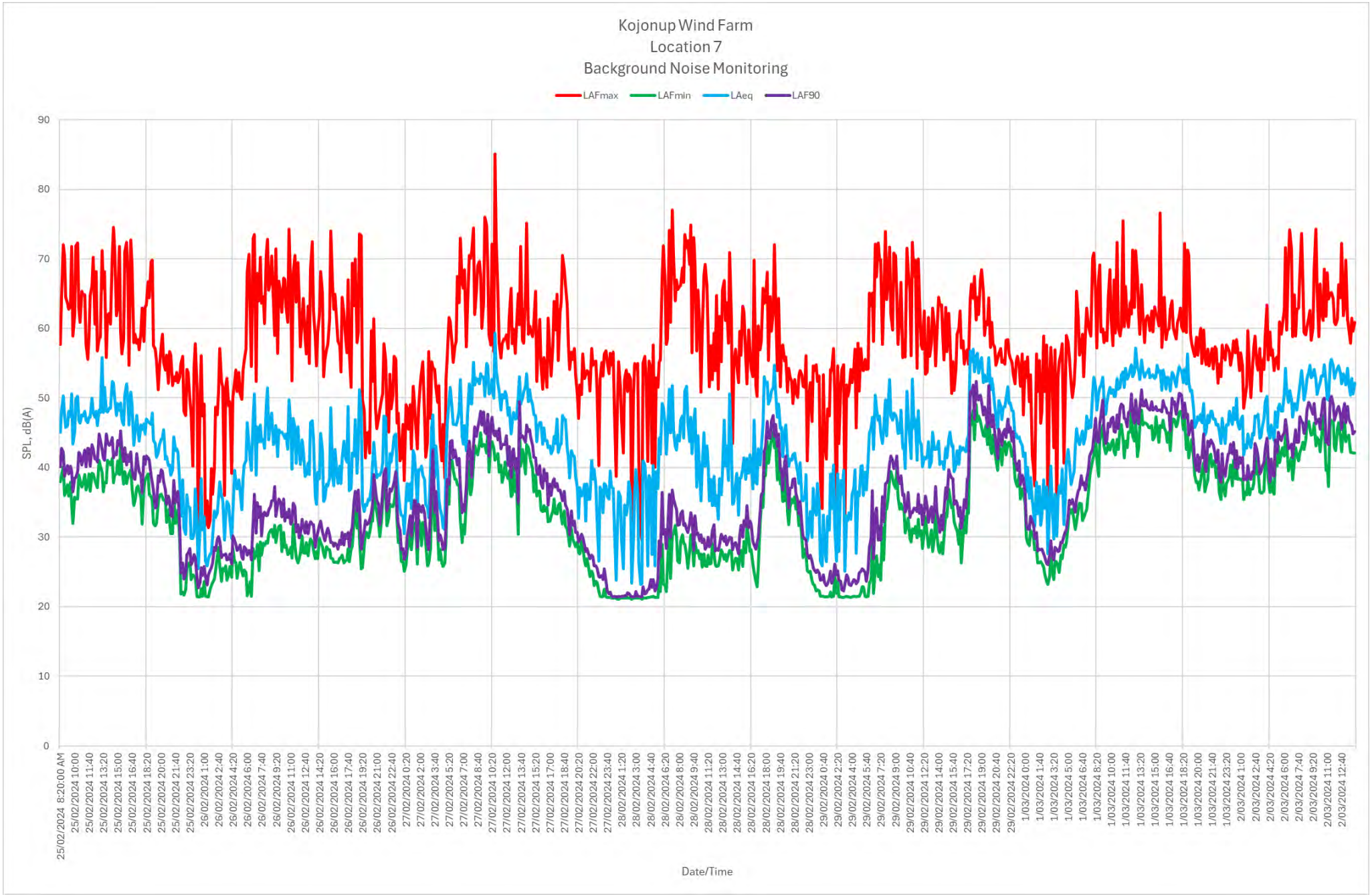

Kojonup Wind Farm
Location 6
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 6
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
90
80
70
60
50
40
30
20
10
0
25/02/2024 8:20:00 AM
Date/Time


Kojonup Wind Farm
Location 7
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 7
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
90
80
70
60
50
40
30
20
10
0
Date/Time
12/02/2024 8:20:00 AM
18/02/2024 7:40:00 AM


Kojonup Wind Farm
Location 7
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 7
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
90
80
70
60
50
40
30
20
10
0
Date/Time
25/02/2024 8:20:00 AM
25/02/2024 10:00
25/02/2024 11:40
25/02/2024 13:20
25/02/2024 15:00
25/02/2024 16:40
25/02/2024 18:20
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2/03/2024 2:40
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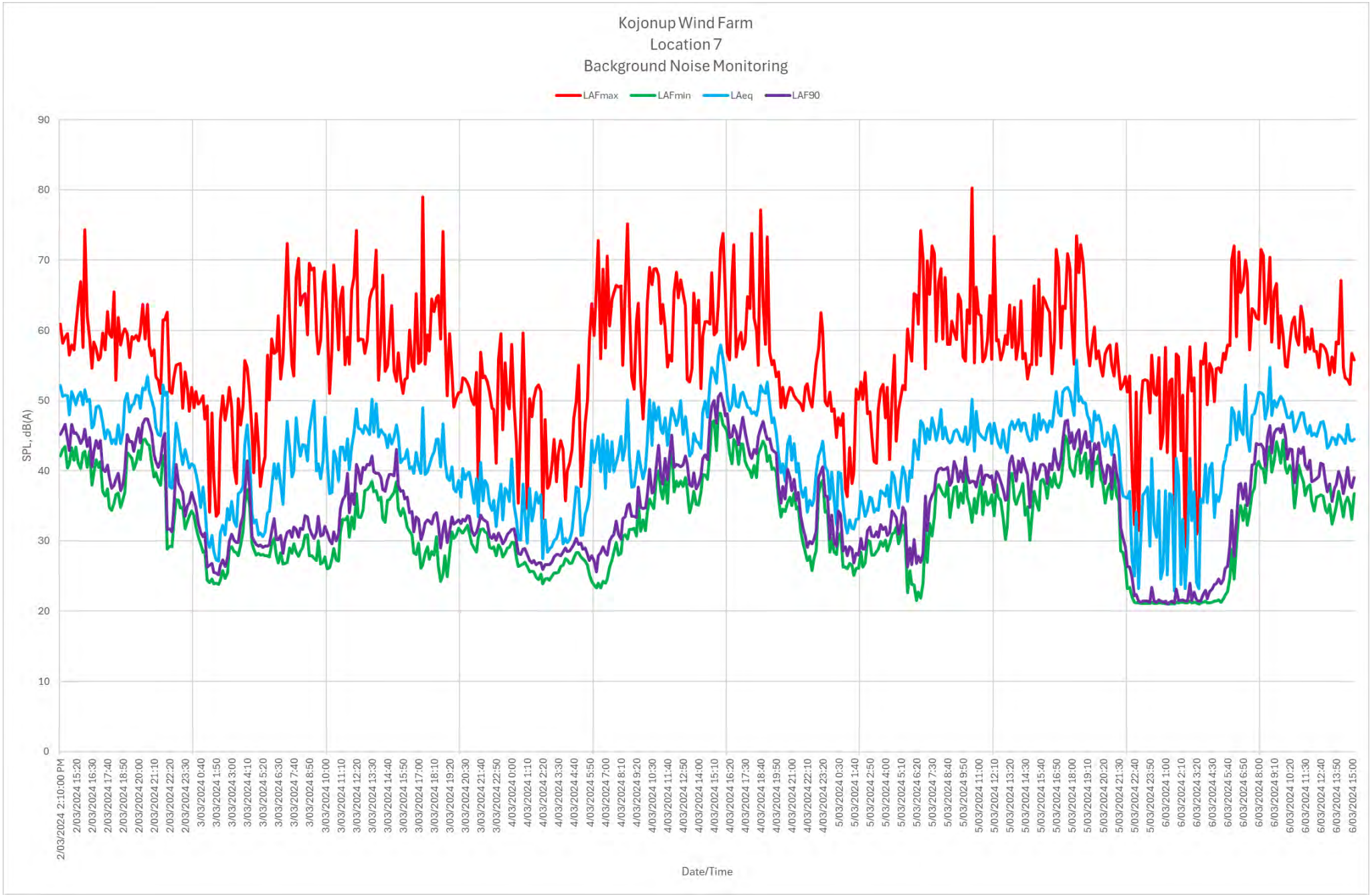
2/03/2024 12:40


Kojonup Wind Farm
Location 7
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
90
80
70
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40
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20
10
0
2/03/2024 2:10:00 PM
2/03/2024 15:20
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3/03/2024 18:10
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4/03/2024 0:00
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4/03/2024 2:20
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4/03/2024 4:40
4/03/2024 5:50
4/03/2024 7:00
4/03/2024 8:10
4/03/2024 9:20
4/03/2024 10:30
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4/03/2024 18:40
4/03/2024 19:50
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4/03/2024 22:10
4/03/2024 23:20
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5/03/2024 2:50
5/03/2024 4:00
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5/03/2024 8:40
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6/03/2024 2:10
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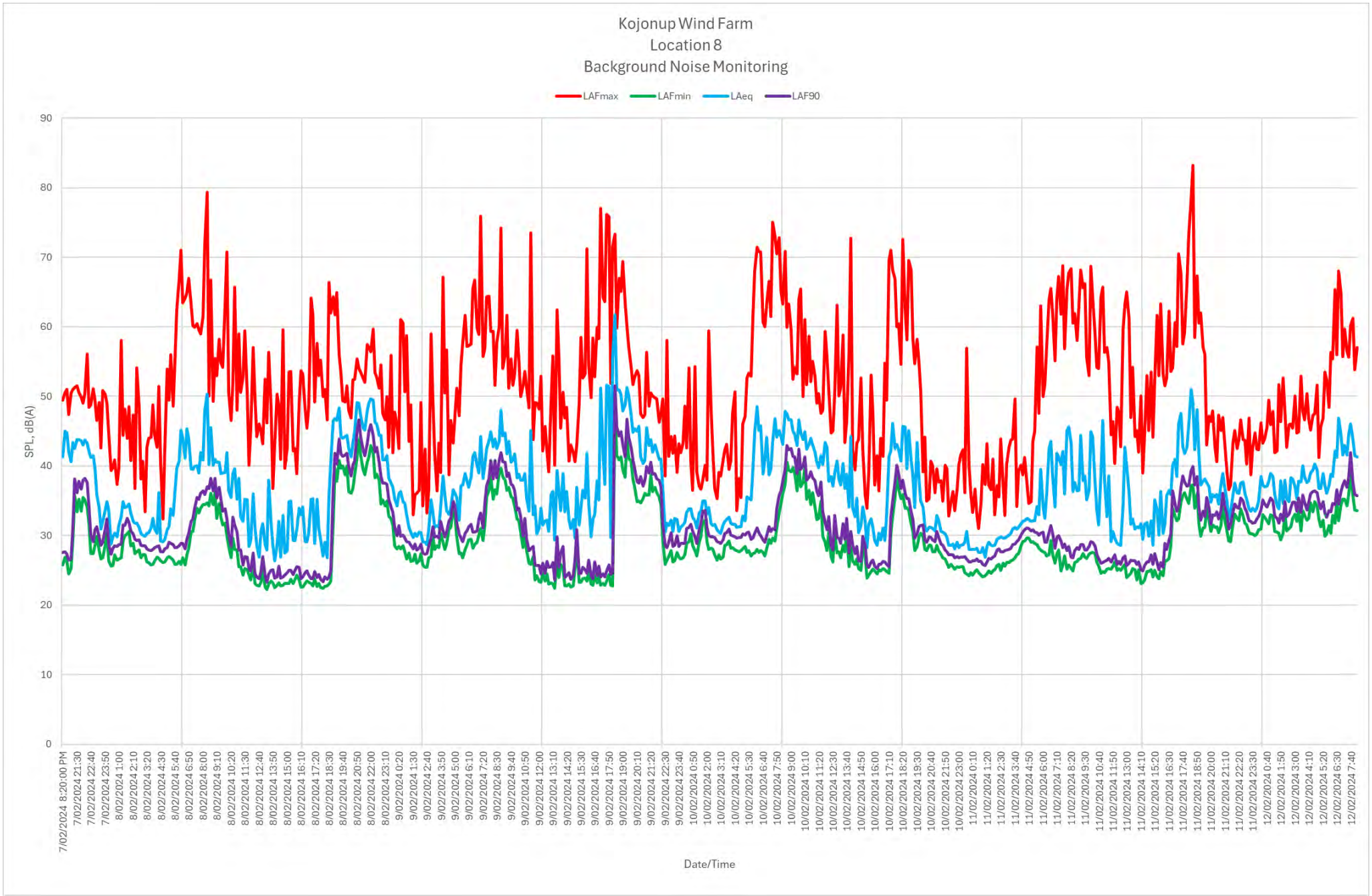
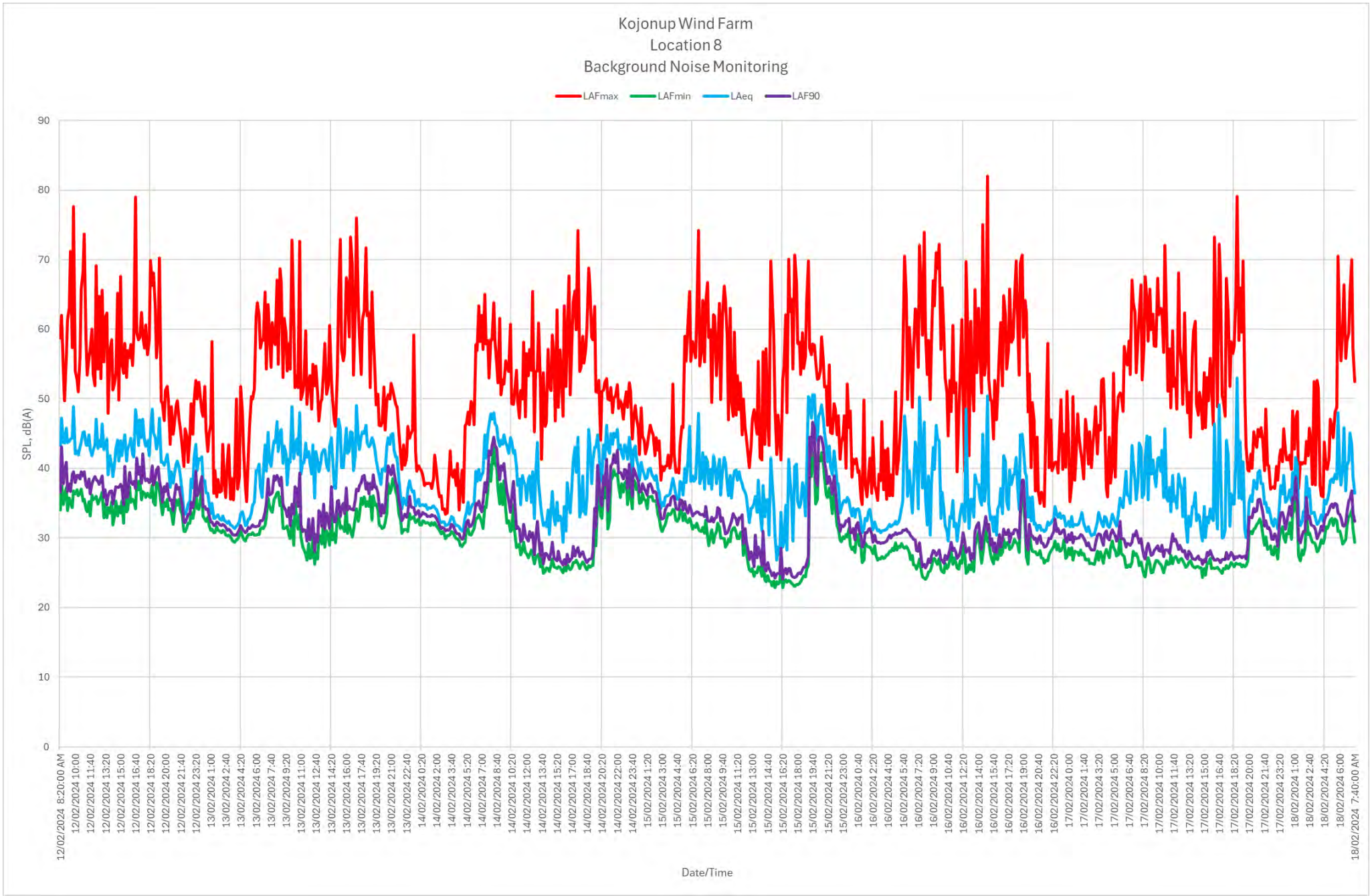
6/03/2024 15:00
Date/Time


Kojonup Wind Farm
Location 8
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 8
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
90
80
70
60
50
40
30
20
10
0
12/02/2024 8:20:00 AM
12/02/2024 10:00
12/02/2024 11:40
12/02/2024 13:20
12/02/2024 15:00
12/02/2024 16:40
12/02/2024 18:20
12/02/2024 20:00
12/02/2024 21:40
12/02/2024 23:20
13/02/2024 1:00
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13/02/2024 4:20
13/02/2024 6:00
13/02/2024 7:40
13/02/2024 9:20
13/02/2024 11:00
13/02/2024 12:40
13/02/2024 14:20
13/02/2024 16:00
13/02/2024 17:40
13/02/2024 19:20
13/02/2024 21:00
13/02/2024 22:40
14/02/2024 0:20
14/02/2024 2:00
14/02/2024 3:40
14/02/2024 5:20
14/02/2024 7:00
14/02/2024 8:40
14/02/2024 10:20
14/02/2024 12:00
14/02/2024 13:40
14/02/2024 15:20
14/02/2024 17:00
14/02/2024 18:40
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14/02/2024 22:00
14/02/2024 23:40
15/02/2024 1:20
15/02/2024 3:00
15/02/2024 4:40
15/02/2024 6:20
15/02/2024 8:00
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15/02/2024 11:20
15/02/2024 13:00
15/02/2024 14:40
15/02/2024 16:20
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15/02/2024 23:00
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16/02/2024 4:00
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16/02/2024 9:00
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17/02/2024 18:20
17/02/2024 20:00
17/02/2024 21:40
17/02/2024 23:20
18/02/2024 1:00
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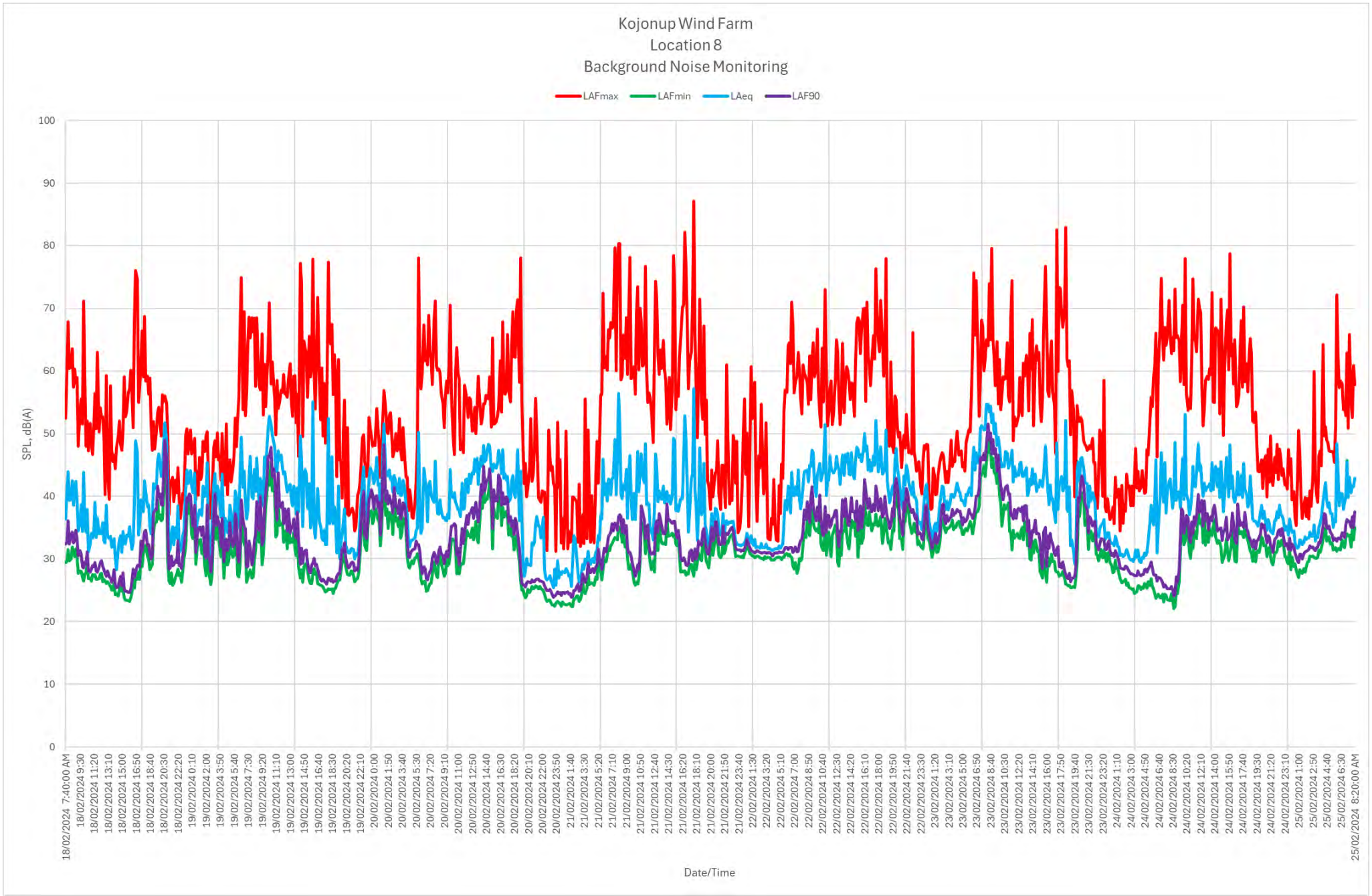
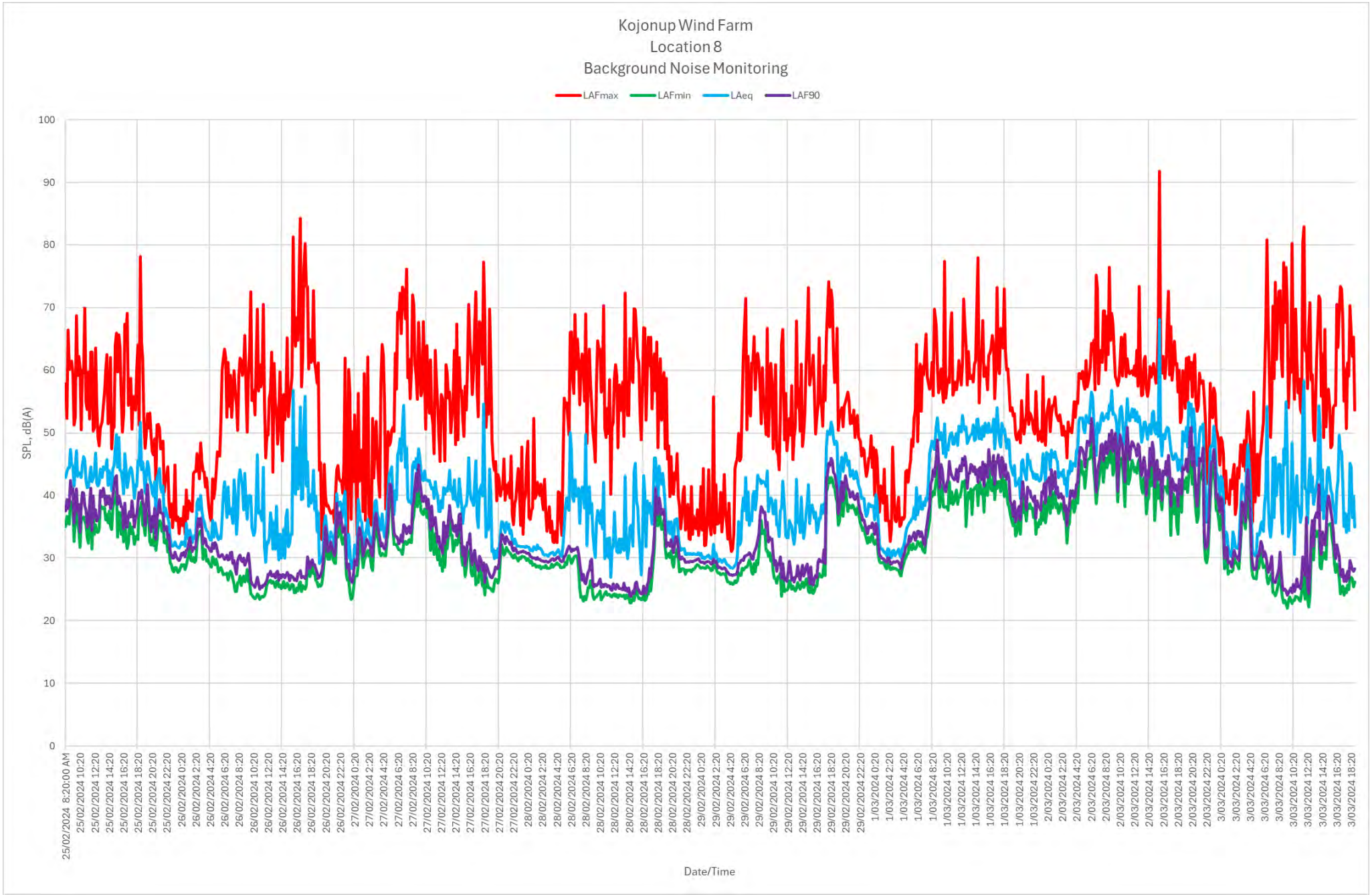
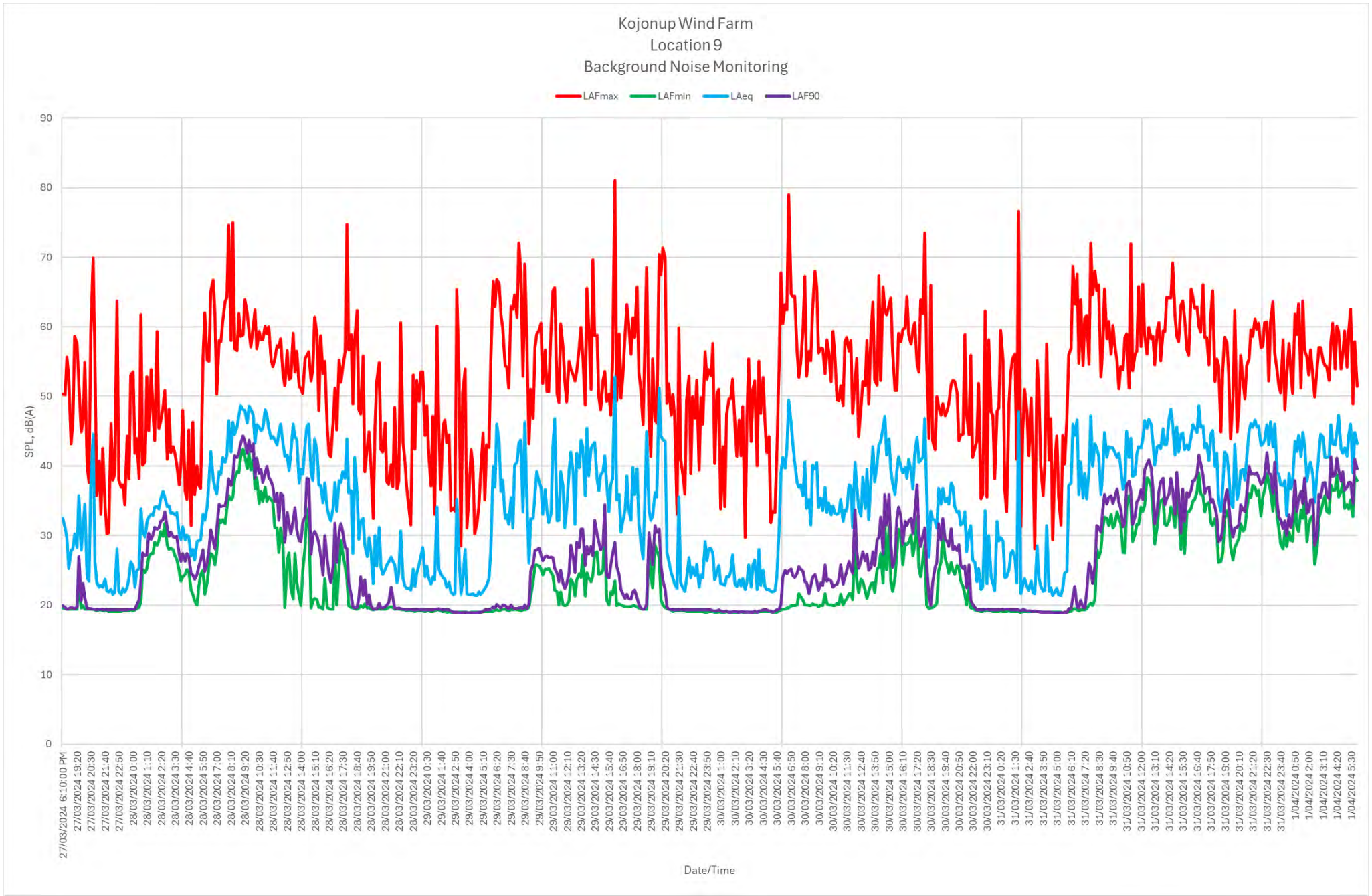
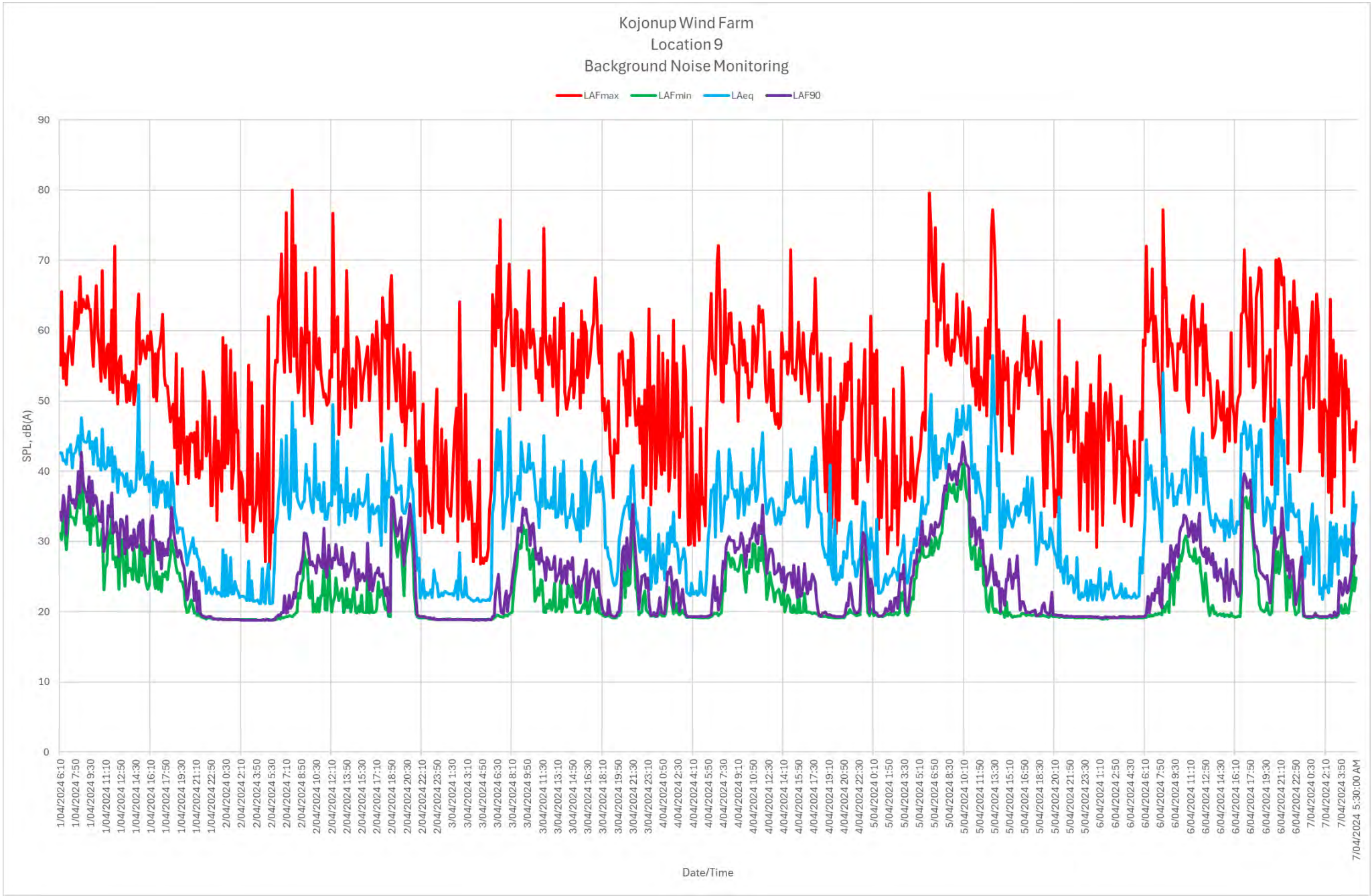
18/02/2024 4:20
18/02/2024 6:00
18/02/2024 7:40:00 AM
Date/Time


Kojonup Wind Farm
Location 8
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 8
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 9
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 9
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
90
80
70
60
50
40
30
20
10
0
Date/Time
1/04/2024 6:10
1/04/2024 7:50
1/04/2024 9:30
1/04/2024 11:10
1/04/2024 12:50
1/04/2024 14:30
1/04/2024 16:10
1/04/2024 17:50
1/04/2024 19:30
1/04/2024 21:10
1/04/2024 22:50
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2/04/2024 2:10
2/04/2024 3:50
2/04/2024 5:30
2/04/2024 7:10
2/04/2024 8:50
2/04/2024 10:30
2/04/2024 12:10
2/04/2024 13:50
2/04/2024 15:30
2/04/2024 17:10
2/04/2024 18:50
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2/04/2024 22:10
2/04/2024 23:50
3/04/2024 1:30
3/04/2024 3:10
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3/04/2024 6:30
3/04/2024 8:10
3/04/2024 9:50
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3/04/2024 18:10
3/04/2024 19:50
3/04/2024 21:30
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4/04/2024 2:30
4/04/2024 4:10
4/04/2024 5:50
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4/04/2024 10:50
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4/04/2024 15:50
4/04/2024 17:30
4/04/2024 19:10
4/04/2024 20:50
4/04/2024 22:30
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6/04/2024 7:50
6/04/2024 9:30
6/04/2024 11:10
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6/04/2024 16:10
6/04/2024 17:50
6/04/2024 19:30
6/04/2024 21:10
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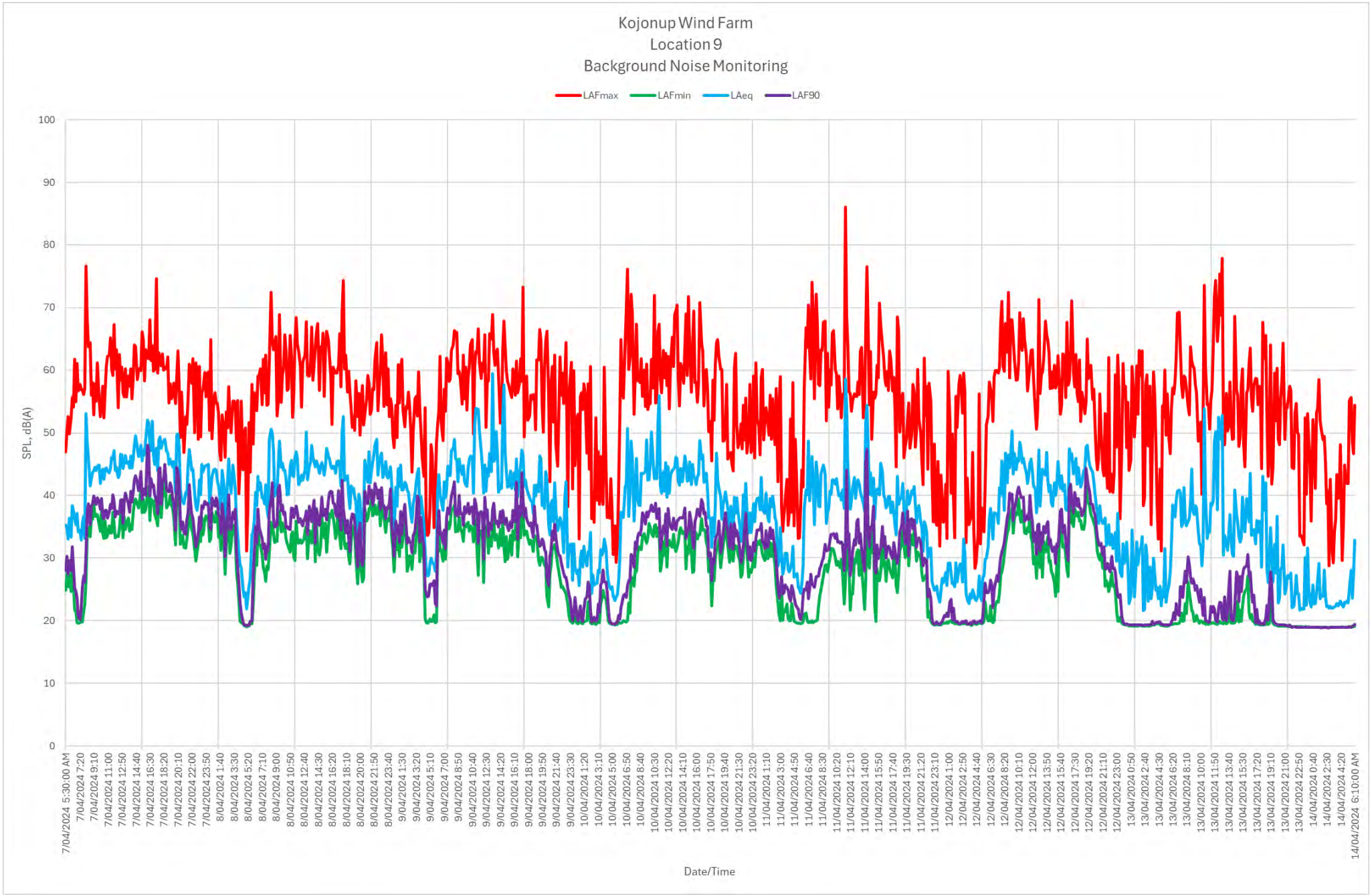
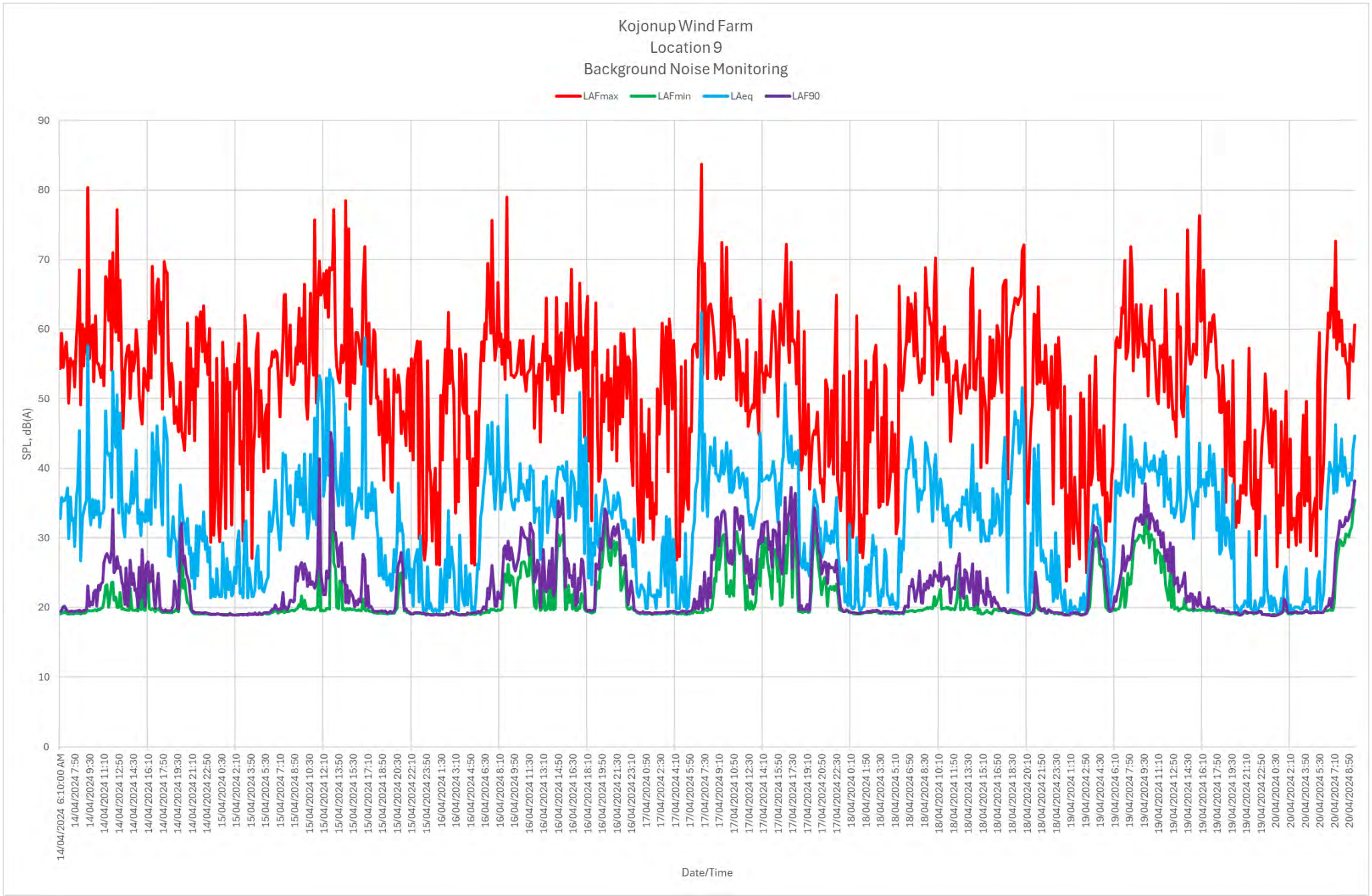
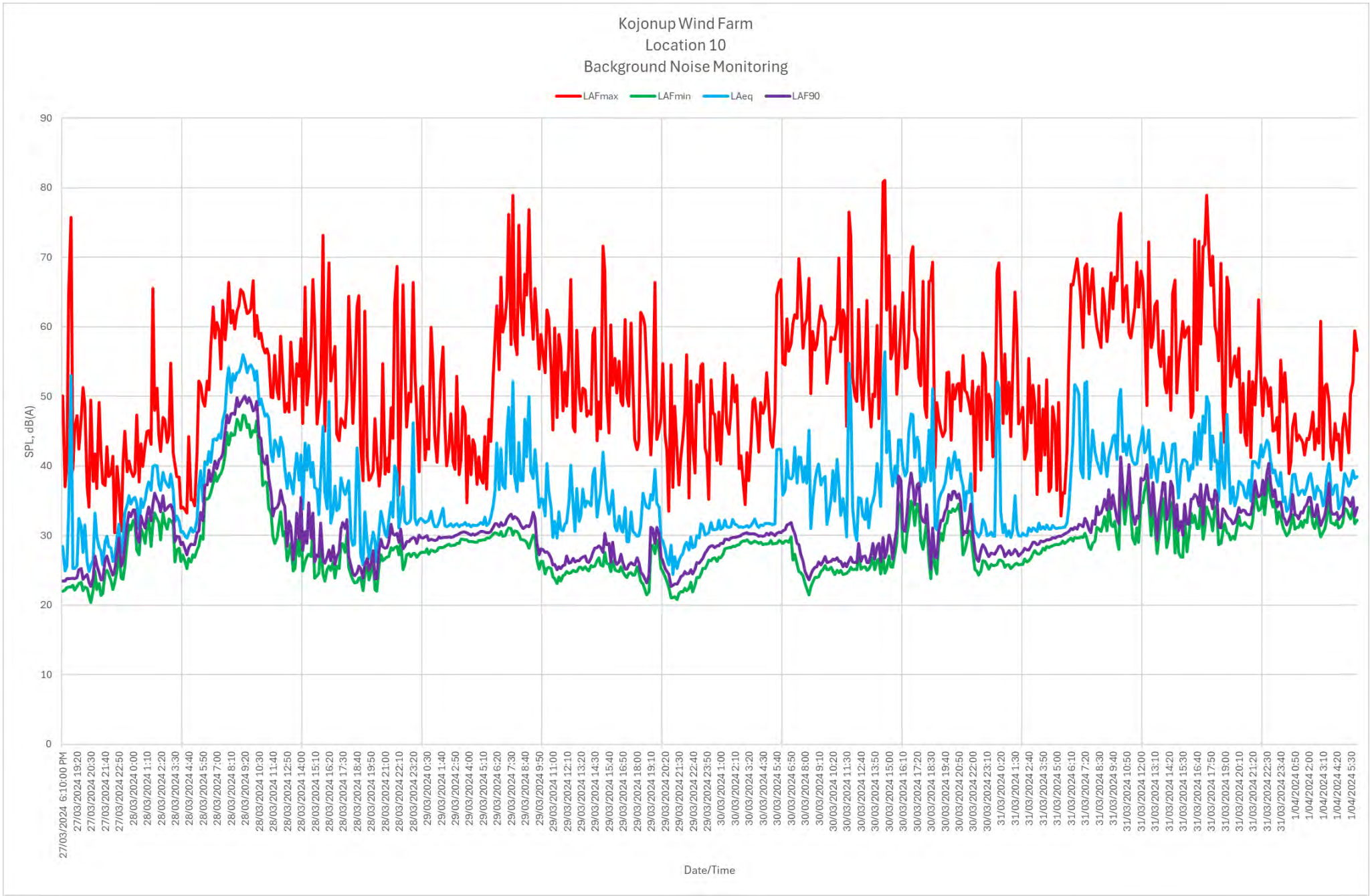
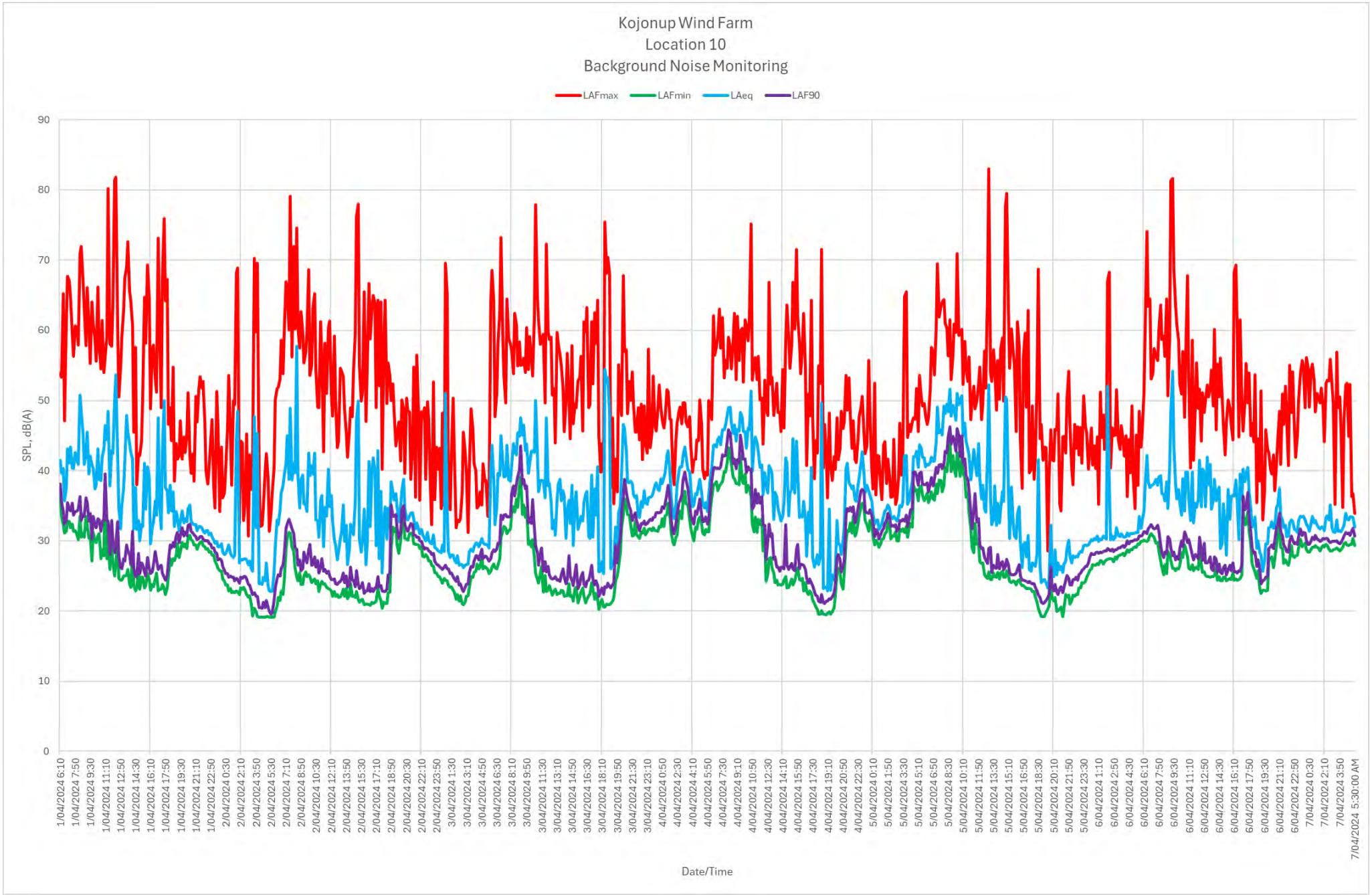
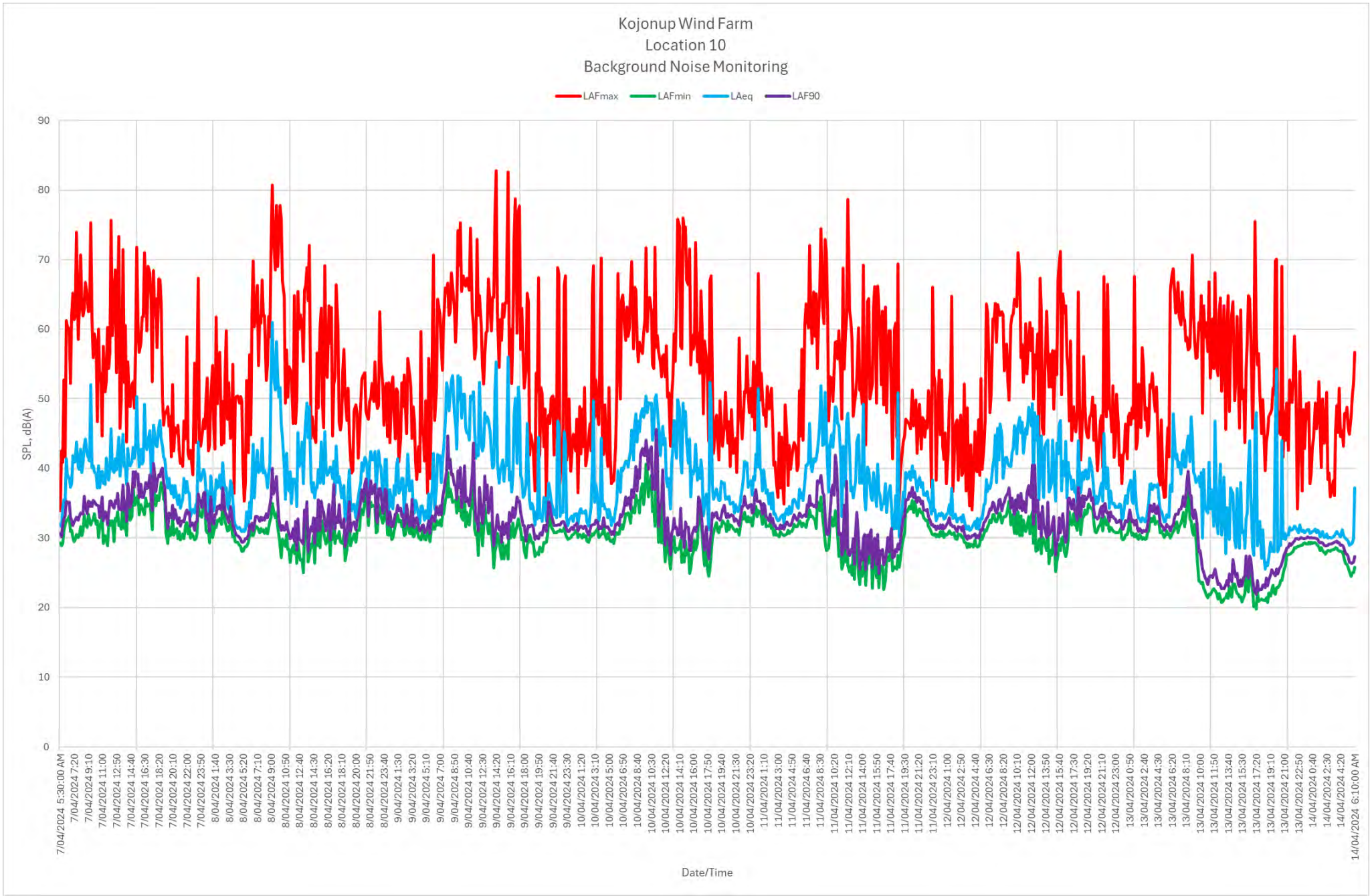
7/04/2024 2:10
7/04/2024 3:50
7/04/2024 5:30:00 AM


Kojonup Wind Farm
Location 9
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
100
90
80
70
60
50
40
30
20
10
0
Date/Time
7/04/2024 5:30:00 AM
14/04/2024 6:10:00 AM


Kojonup Wind Farm
Location 9
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 10
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 10
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 10
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
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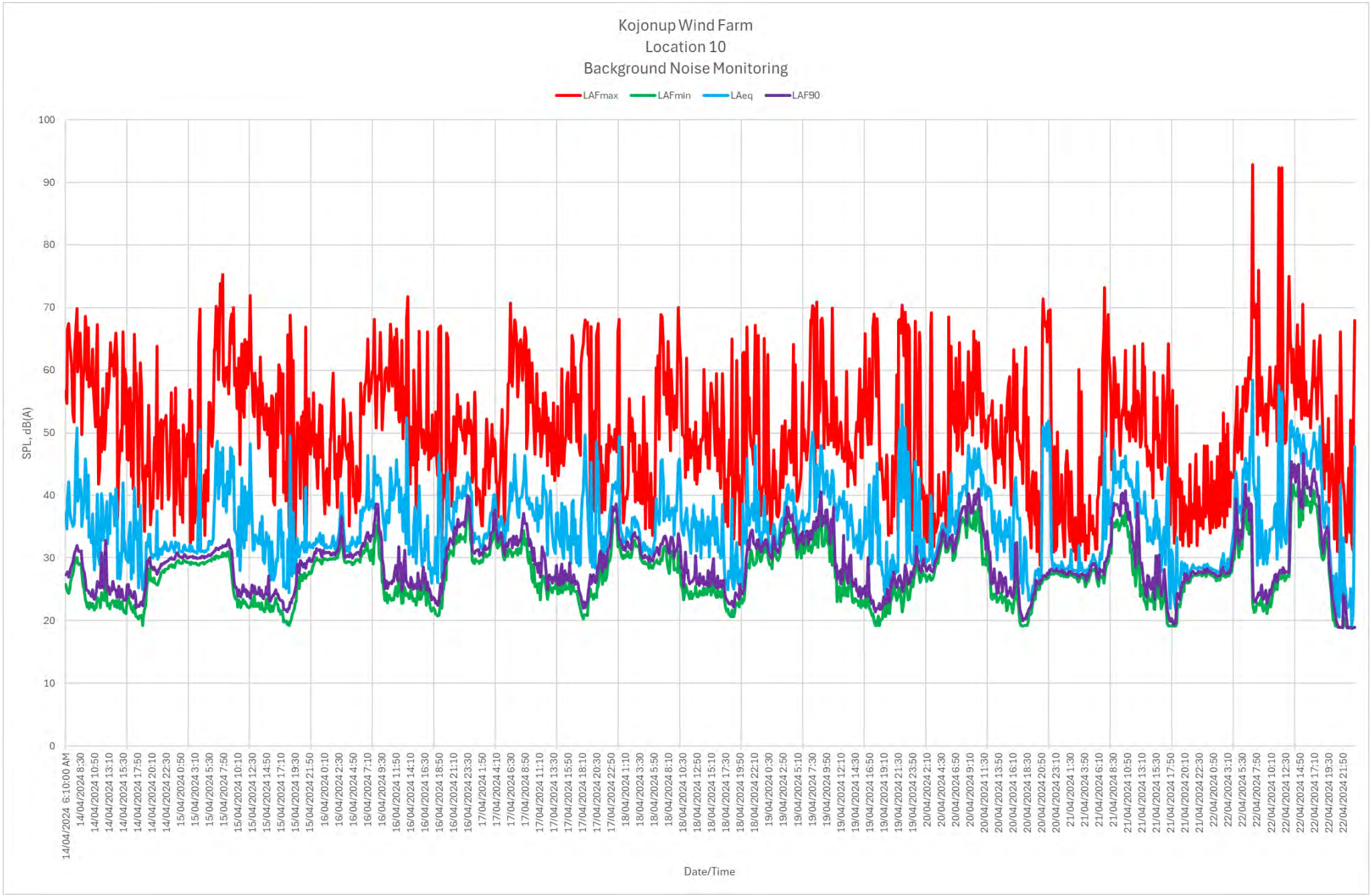
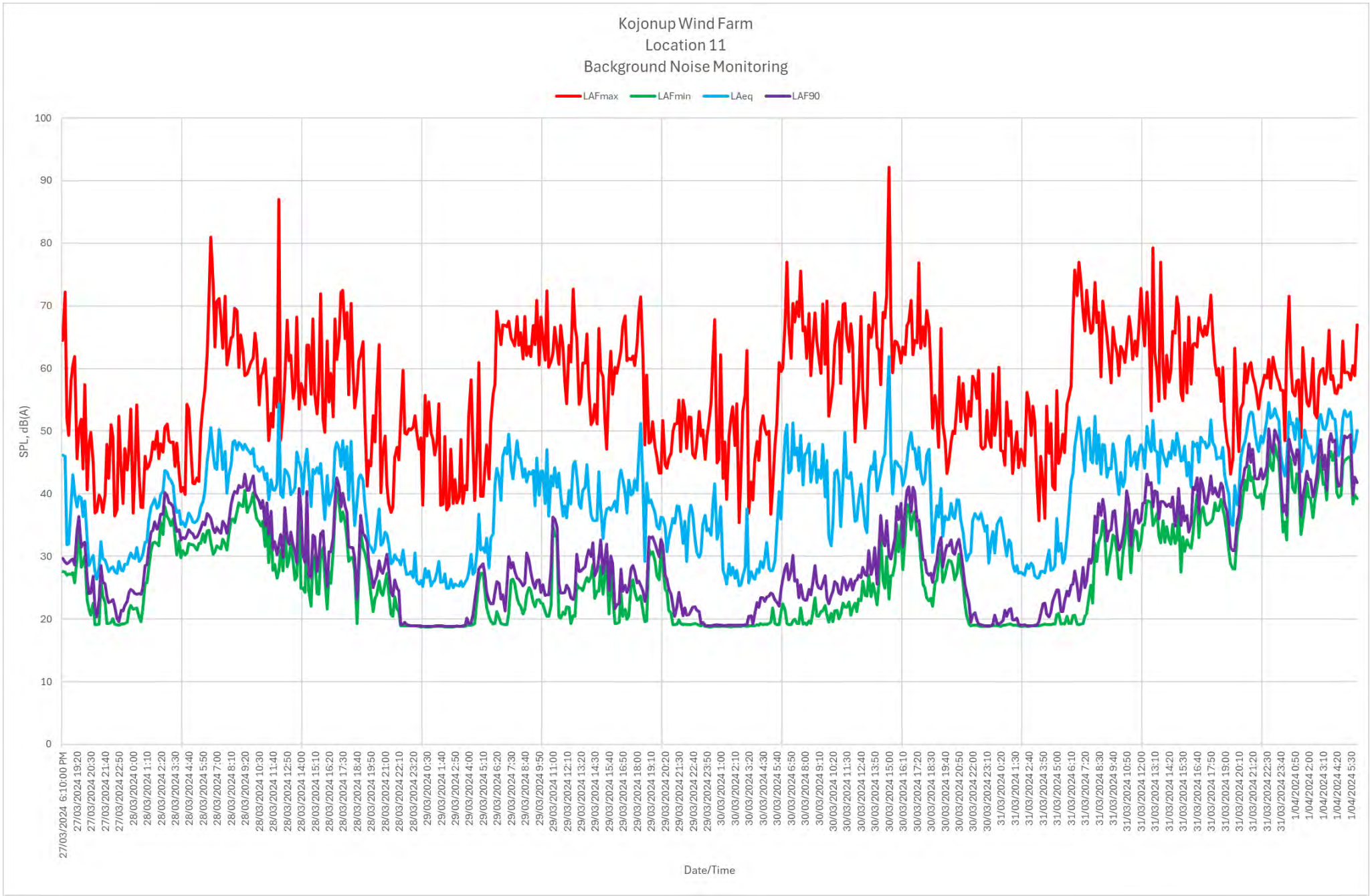
Date/Time
7/04/2024 5:30:00 AM
14/04/2024 6:10:00 AM


Kojonup Wind Farm
Location 10
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 11
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
100
90
80
70
60
50
40
30
20
10
0
Date/Time
27/03/2024 6:10:00 PM
27/03/2024 19:20
27/03/2024 20:30
27/03/2024 21:40
27/03/2024 22:50
28/03/2024 0:00
28/03/2024 1:10
28/03/2024 2:20
28/03/2024 3:30
28/03/2024 4:40
28/03/2024 5:50
28/03/2024 7:00
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28/03/2024 9:20
28/03/2024 10:30
28/03/2024 11:40
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28/03/2024 18:40
28/03/2024 19:50
28/03/2024 21:00
28/03/2024 22:10
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29/03/2024 0:30
29/03/2024 1:40
29/03/2024 2:50
29/03/2024 4:00
29/03/2024 5:10
29/03/2024 6:20
29/03/2024 7:30
29/03/2024 8:40
29/03/2024 9:50
29/03/2024 11:00
29/03/2024 12:10
29/03/2024 13:20
29/03/2024 14:30
29/03/2024 15:40
29/03/2024 16:50
29/03/2024 18:00
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29/03/2024 20:20
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29/03/2024 22:40
29/03/2024 23:50
30/03/2024 1:00
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30/03/2024 5:40
30/03/2024 6:50
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30/03/2024 10:20
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30/03/2024 12:40
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30/03/2024 17:20
30/03/2024 18:30
30/03/2024 19:40
30/03/2024 20:50
30/03/2024 22:00
30/03/2024 23:10
31/03/2024 0:20
31/03/2024 1:30
31/03/2024 2:40
31/03/2024 3:50
31/03/2024 5:00
31/03/2024 6:10
31/03/2024 7:20
31/03/2024 8:30
31/03/2024 9:40
31/03/2024 10:50
31/03/2024 12:00
31/03/2024 13:10
31/03/2024 14:20
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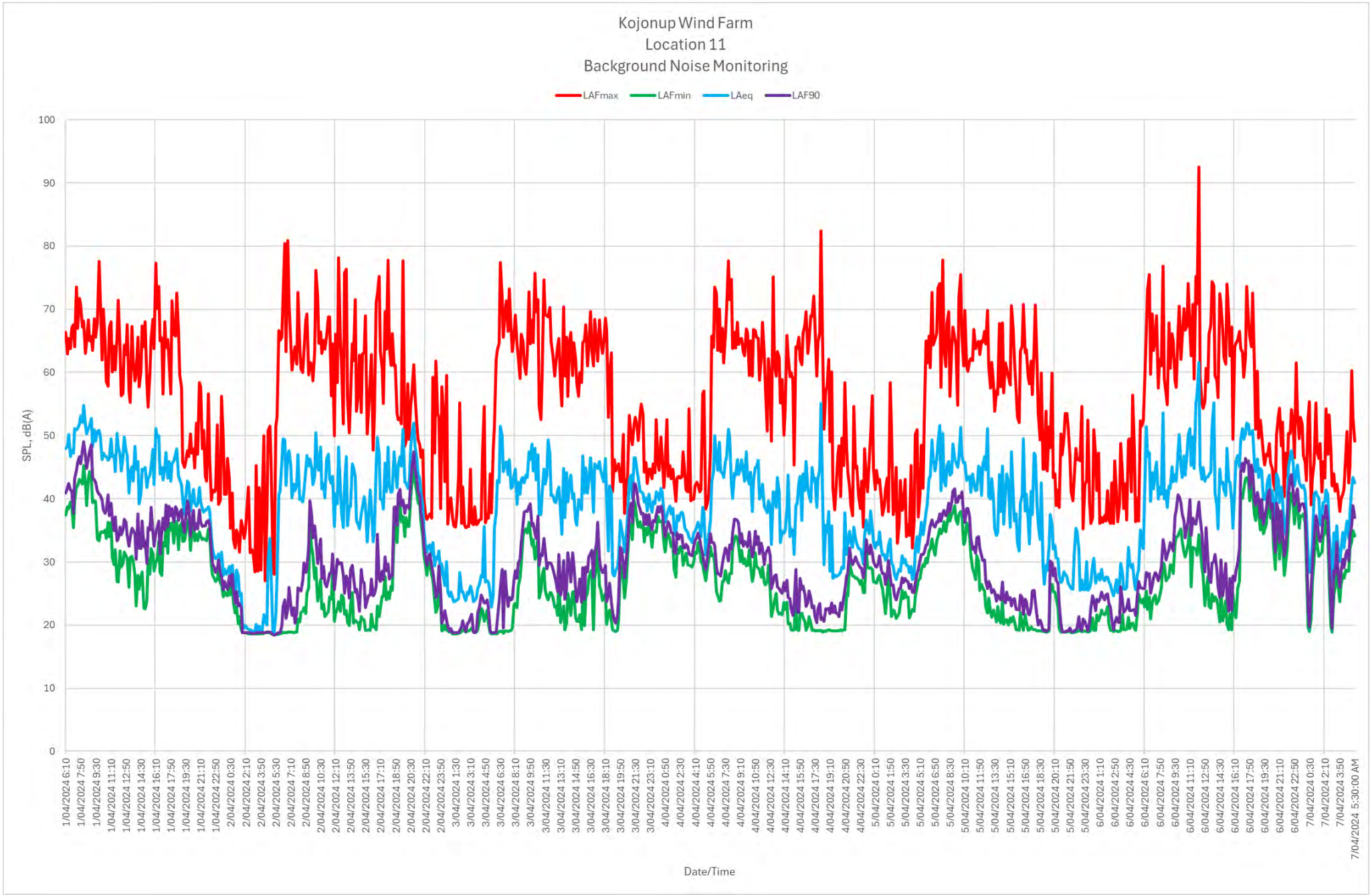
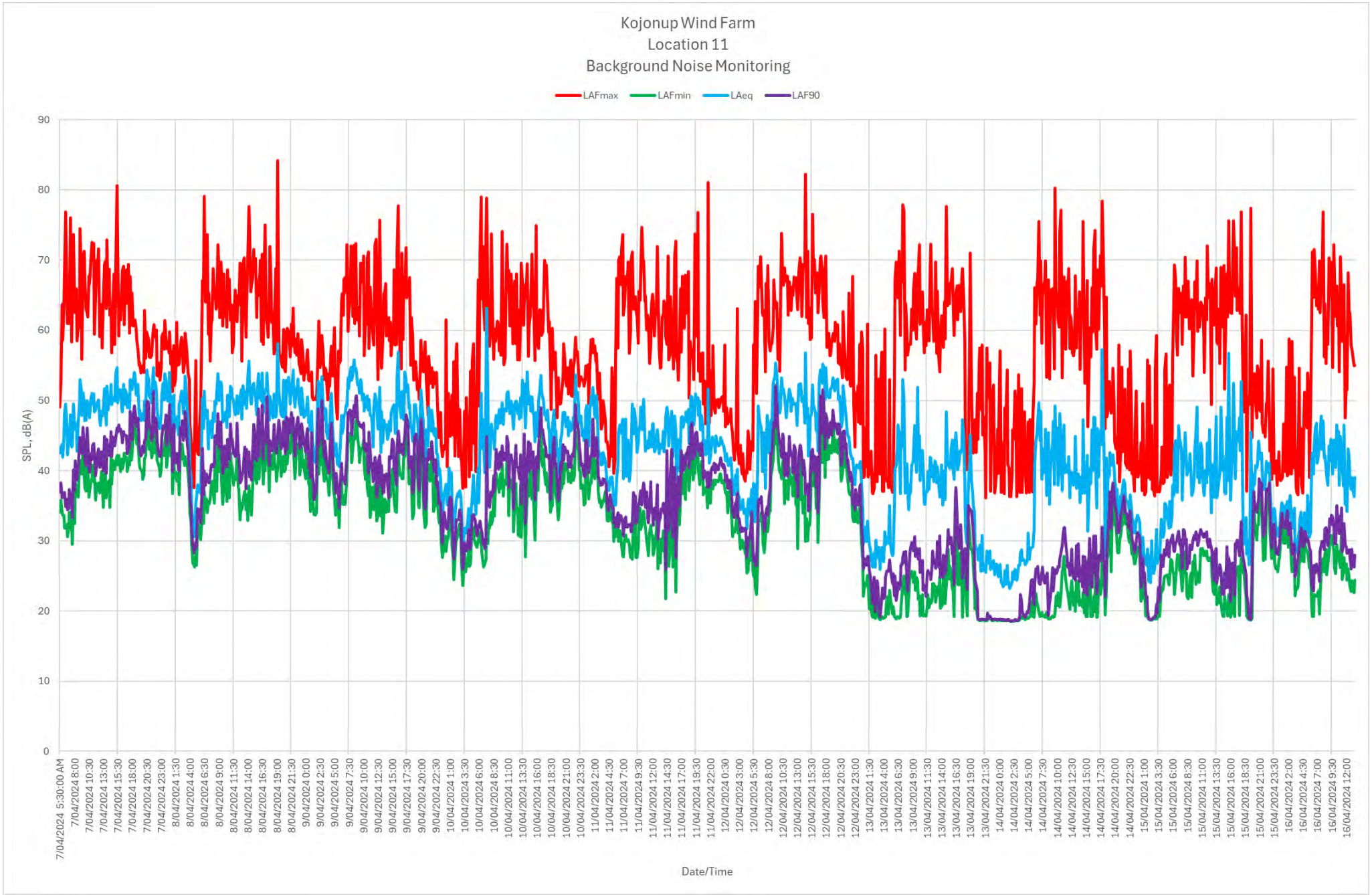
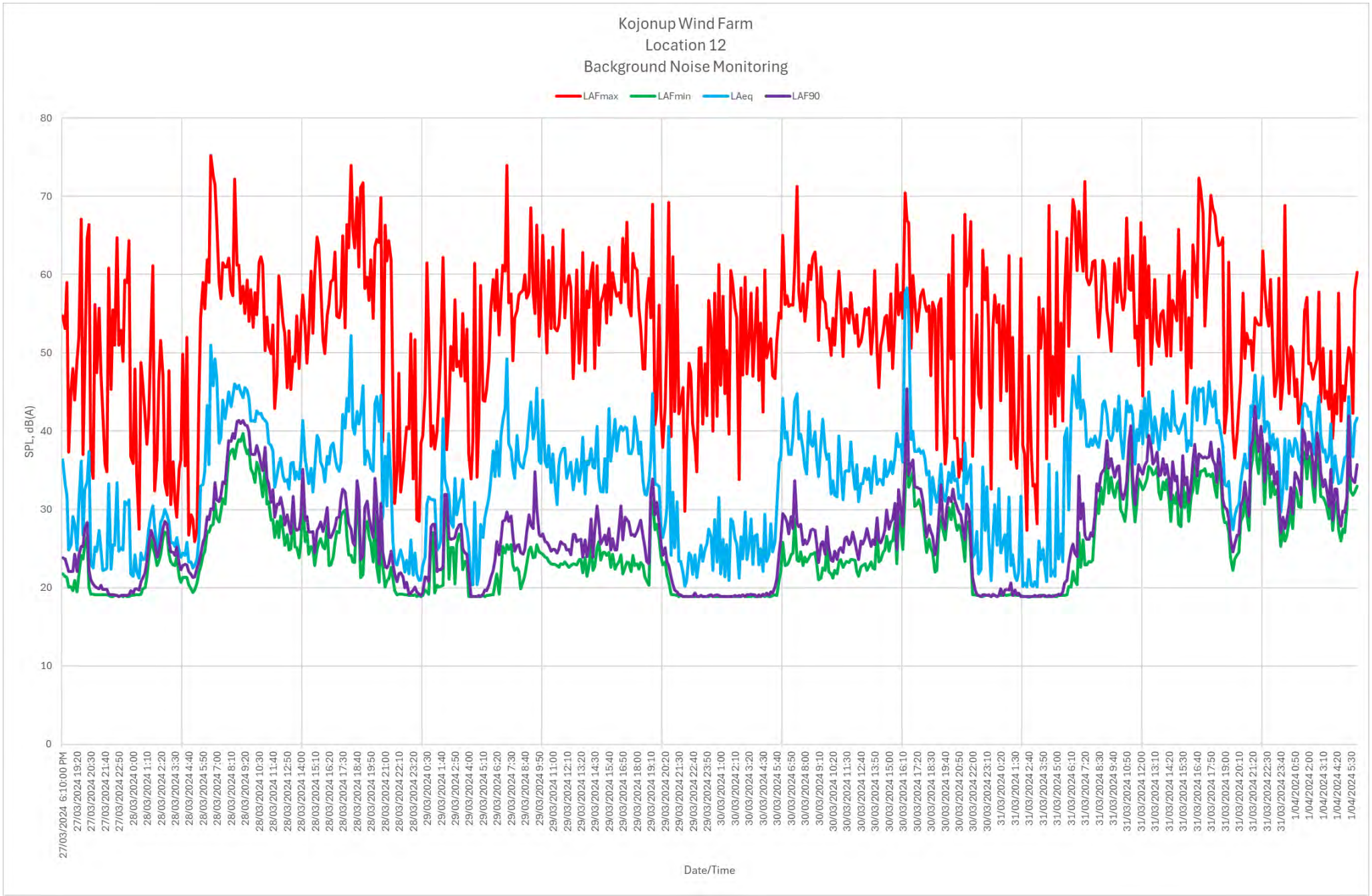
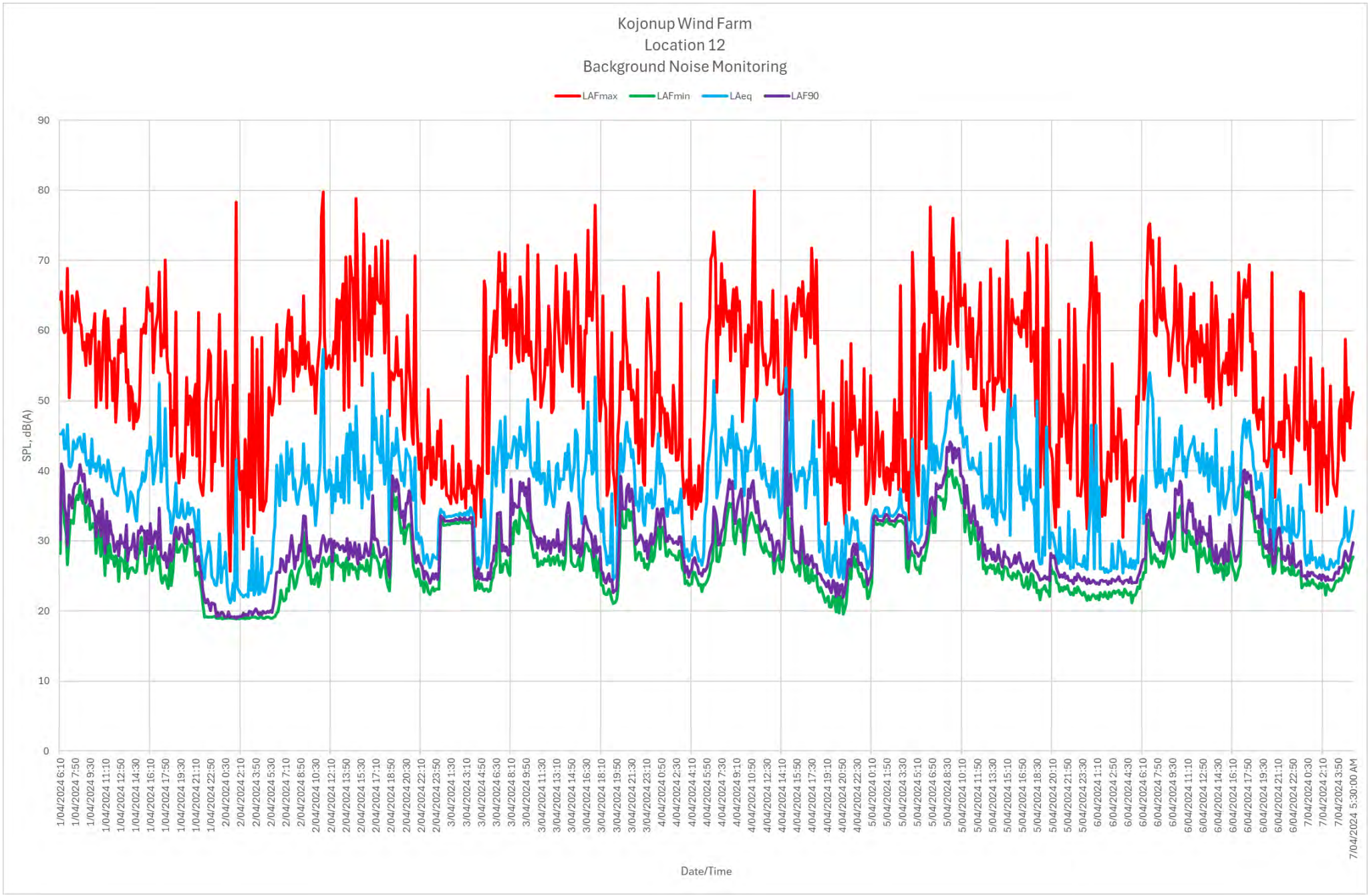
31/03/2024 16:40
31/03/2024 17:50
31/03/2024 19:00
31/03/2024 20:10
31/03/2024 21:20
31/03/2024 22:30
31/03/2024 23:40
1/04/2024 0:50
1/04/2024 2:00
1/04/2024 3:10
1/04/2024 4:20
1/04/2024 5:30


Kojonup Wind Farm
Location 11
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 11
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 12
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 12
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
90
80
70
60
50
40
30
20
10
0
Date/Time
1/04/2024 6:10
1/04/2024 7:50
1/04/2024 9:30
1/04/2024 11:10
1/04/2024 12:50
1/04/2024 14:30
1/04/2024 16:10
1/04/2024 17:50
1/04/2024 19:30
1/04/2024 21:10
1/04/2024 22:50
2/04/2024 0:30
2/04/2024 2:10
2/04/2024 3:50
2/04/2024 5:30
2/04/2024 7:10
2/04/2024 8:50
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2/04/2024 18:50
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3/04/2024 9:50
3/04/2024 11:30
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3/04/2024 14:50
3/04/2024 16:30
3/04/2024 18:10
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4/04/2024 10:50
4/04/2024 12:30
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4/04/2024 17:30
4/04/2024 19:10
4/04/2024 20:50
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5/04/2024 6:50
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6/04/2024 7:50
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6/04/2024 17:50
6/04/2024 19:30
6/04/2024 21:10
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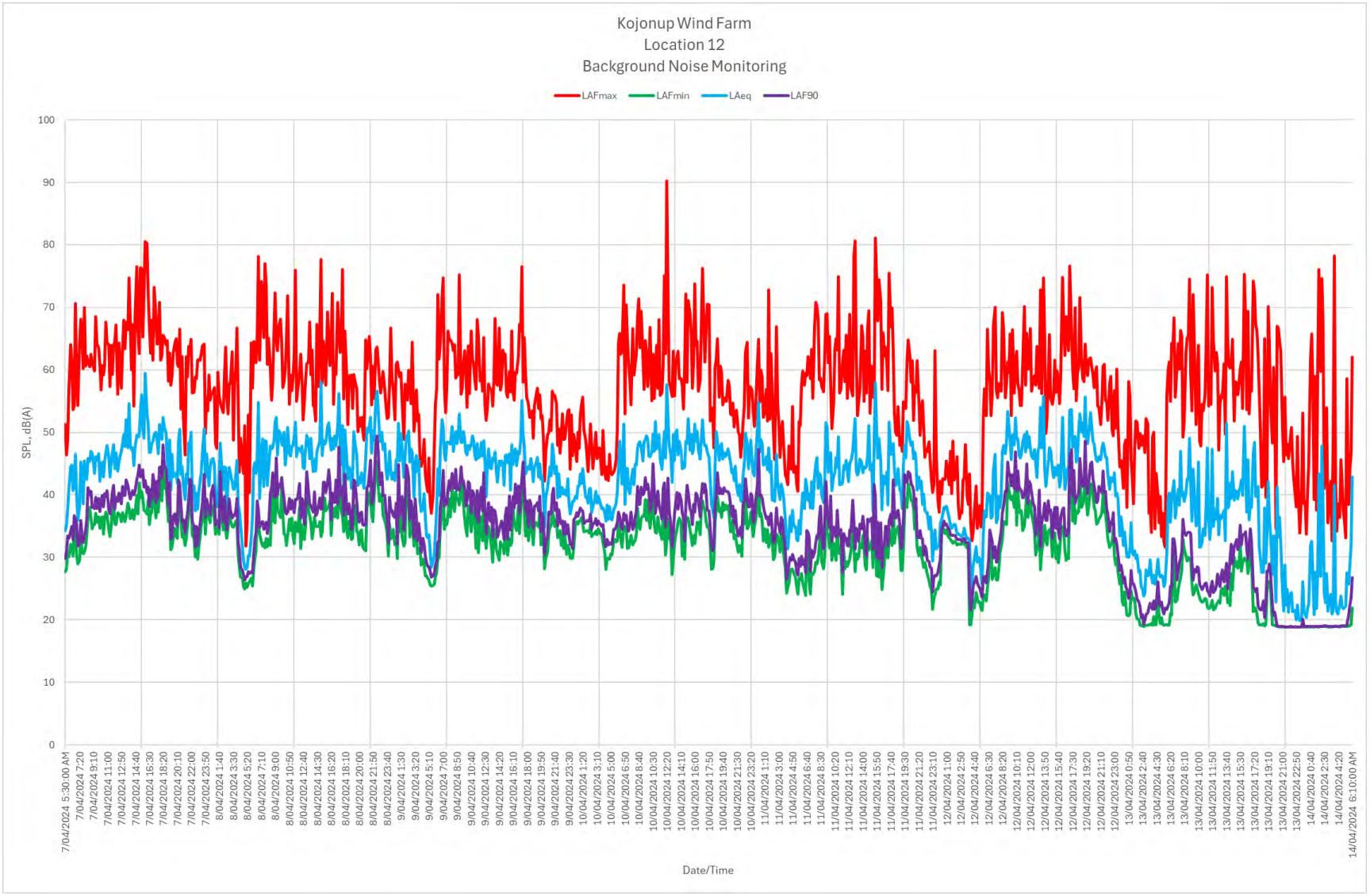
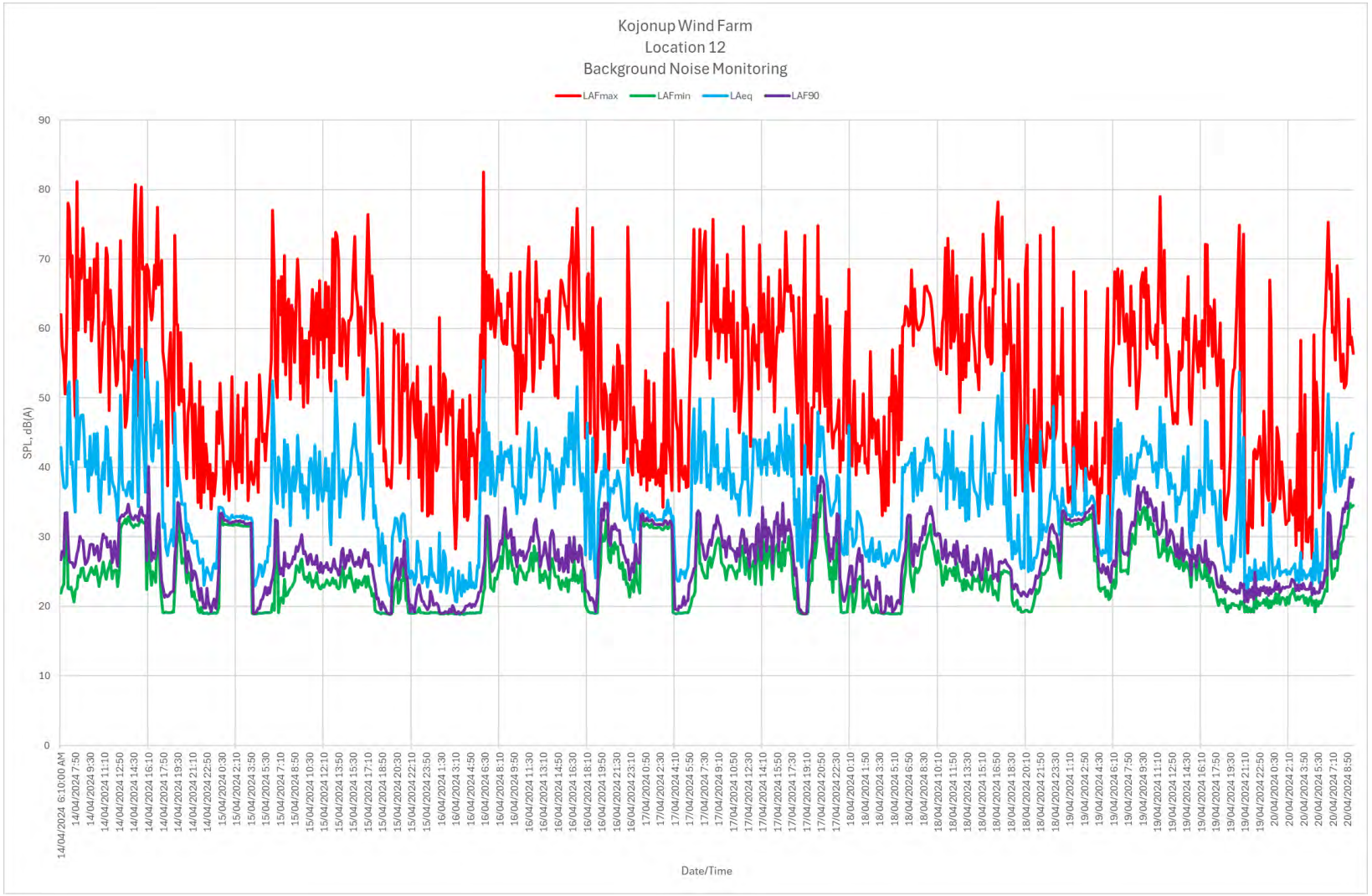
7/04/2024 5:30:00 AM


Kojonup Wind Farm
Location 12
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time


Kojonup Wind Farm
Location 12
Background Noise Monitoring
LAFmax
LAFmin
LAeq
LAF90
SPL, dB(A)
Date/Time

APPENDIX F

CALIBRATION CERTIFICATES

5. INTERNAL NOISE LEVEL (electrical - compensated)

LEVEL METER function; Calibration factor: 0dB

Characteristic	Z	A	C
Level [dB]	≤32	≤19	≤23

6. INTERNAL NOISE LEVEL (acoustical - compensated)

LEVEL METER function; Characteristic: A;

Indication [dB]	≤23

Noise measured in special chamber, with reference microphone G.R.A.S type 40AN No. 73421

ENVIRONMENTAL CONDITIONS

Temperature	Relative humidity	Ambient pressure
26 °C	49%	999 hPa

TEST EQUIPMENT

Item	Manufacturer	Model	Serial no.	Description
1.	SVANTEK	SVAN 401	127	Signal generator
2.	SVANTEK	SV979	21041	Sound &Vibration Analyser
3.	RIGOL	DM3068	DM30155100773	Digital multimeter
4.	SVANTEK	SV33B	109989	Acoustic calibrator
5.	G.R.A.S.	51AB	200368	Sound Intensity Calibrator
6.	BRUEL&KJAER	BK4192	3340648	Reference Pressure Microphone
7.	G.R.A.S.	40AN	73421	Reference Free Field Microphone
8.	SVANTEK	SL3071	-	Microphone equivalent electrical impedance

CONFORMITY & TEST DECLARATION

1. Herewith Svantek company declares that this instrument has been calibrated and tested in compliance with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them.

2. The acoustic calibration was performed using the Sound Calibrator and is traceable to the GUM (Central Office of Measures) reference standard - sound level calibrator type 4231 No 2292773.

3. The information appearing on this sheet has been compiled specifically for this instrument. This form is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.

4. This calibration sheet shall not be reproduced except in full, without written permission of the SVANTEK Ltd.

Calibration specialist: Maria Sawicka ..... Test date: 2023-09-21

SVANTEK

ISO9001 certified

FACTORY CALIBRATION DATA OF THE *SV 307A No. 131855*

with microphone SVANTEK type ST30A_v3 No. 141281

IMEI: 356531110614454

1. CALIBRATION (acoustical)

LEVEL METER function; Reference frequency: 1000Hz; Sound Pressure Level: **114.07** dB.

Characteristic	Correct value [dB]	Indication [dB]	Error [dB]
Z	113.91	113.88	-0.03
A	113.91	113.88	-0.03
C	113.91	113.88	-0.03

Calibration measured with the microphone SVANTEK type ST30A_v3 No. 141281. Calibration factor: 0.00 dB.

2. LINEARITY TEST (electrical)

LEVEL METER function; Characteristic: A; f_{sin}= 31.5 Hz

Nominal result LEQ [dB]	30.0	31.0	32.0	40.0	75.0	85.0
Error [dB]	0.1	0.1	0.1	-0.0	-0.0	0.0

LEVEL METER function; Characteristic: A; f_{sin}= 1000 Hz

Nominal result LEQ [dB]	30.0	31.0	32.0	40.0	115.0	125.0
Error [dB]	0.2	0.1	0.1	0.0	-0.0	0.0

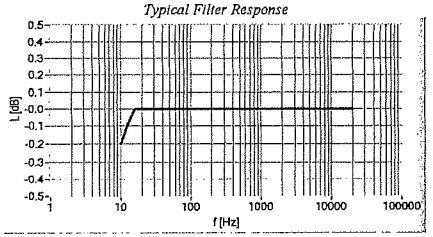
LEVEL METER function; Characteristic: A; f_{sin}= 8000 Hz

Nominal result LEQ [dB]	30.0	31.0	32.0	40.0	114.0	124.0
Error [dB]	0.1	0.1	0.0	-0.0	-0.0	0.0

3. FREQUENCY RESPONSE (electrical)

LEVEL METER function; Characteristic: Z; Input signal =122 dB;

Typical Filter Response



Measured Filter Response
(f-frequency, L-level)

f [Hz]	L [dB]	f [Hz]	L [dB]	f [Hz]	L [dB]
10	-3.3	63	-0.1	4000	0.0
12.5	-2.5	125	-0.0	8000	0.0
16	-1.8	250	0.0	16000	0.0
20	-1.3	500	0.0	20000	-0.0
25	-0.8	1000	0.0		
31.5	-0.6	2000	0.0		

All frequencies are nominal center values for the 1/3 octave bands

4. FREQUENCY RESPONSE (acoustical)

LEVEL METER function; Characteristic: Z; Input: 90 dB;

Frequency [Hz]	20	31.5	63	125	250	500	800	1000	2000
Pressure Response [dB]	0.8	0.6	0.2	0.1	0.1	0.0	-0.1	-0.2	-0.6
Free Field Response [dB]	0.8	0.6	0.2	0.1	0.0	0.0	-0.0	0.0	-0.1

Frequency [Hz]	3150	4000	5000	6300	8000	10000	12500	16000
Pressure Response [dB]	-1.4	-2.0	-2.8	-3.8	-4.8	-6.0	-7.6	-10.0
Free Field Response [dB]	-0.2	-0.3	-0.4	-0.6	-0.9	-1.6	-3.0	-5.2

5. INTERNAL NOISE LEVEL (electrical - compensated)

LEVEL METER function: Calibration factor: 0dB

Characteristic	Z	A	C
Level [dB]	≤32	≤19	≤23

6. INTERNAL NOISE LEVEL (acoustical - compensated)

LEVEL METER function: Characteristic: A:

Indication [dB]	≤23

Noise measured in special chamber, with reference microphone G.R.A.S type 40AN No. 73421

ENVIRONMENTAL CONDITIONS

Temperature	Relative humidity	Ambient pressure
26 °C	49%	999 hPa

TEST EQUIPMENT

Item	Manufacturer	Model	Serial no.	Description
1.	SVANTEK	SVAN 401	127	Signal generator
2.	SVANTEK	SV979	21041	Sound &Vibration Analyser
3.	RIGOL	DM3068	DM30155100773	Digital multimeter
4.	SVANTEK	SV33B	109989	Acoustic calibrator
5.	G.R.A.S.	51AB	200368	Sound Intensity Calibrator
6.	BRUEL&KJAER	BK4192	3340648	Reference Pressure Microphone
7.	G.R.A.S.	40AN	73421	Reference Free Field Microphone
8.	SVANTEK	SL3071	-	Microphone equivalent electrical impedance

CONFORMITY & TEST DECLARATION

1. Herewith Svantek company declares that this instrument has been calibrated and tested in compliance with the internal ISO9001 procedures and meets all specification given in the Manual(s) or respectively surpass them.
2. The acoustic calibration was performed using the Sound Calibrator and is traceable to the GUM (Central Office of Measures) reference standard - sound level calibrator type 4231 No 2292773.
3. The information appearing on this sheet has been compiled specifically for this instrument. This form is produced with advanced equipment & procedures which permit comprehensive quality assurance verification of all data supplied herein.
4. This calibration sheet shall not be reproduced except in full, without written permission of the SVANTEK Ltd.

Calibration specialist: Maria Sawicka ..... Test date: 2023-09-20

SVANTEK

ISO9001 certified

FACTORY CALIBRATION DATA OF THE *SV 307A No. 131848*

with microphone SVANTEK type ST30A_v3 No. 141297

IMEI: 356531110616491

1. CALIBRATION (acoustical)

LEVEL METER function; Reference frequency: 1000Hz; Sound Pressure Level: **114.07** dB.

Characteristic	Correct value [dB]	Indication [dB]	Error [dB]
Z	113.91	113.89	-0.02
A	113.91	113.89	-0.02
C	113.91	113.89	-0.02

Calibration measured with the microphone SVANTEK type ST30A_v3 No. 141297. Calibration factor: 0.00 dB.

2. LINEARITY TEST (electrical)

LEVEL METER function; Characteristic: A; f_{sin}= 31.5 Hz

Nominal result LEQ [dB]	30.0	31.0	32.0	40.0	75.0	85.0
Error [dB]	0.1	0.1	0.0	0.0	-0.0	0.0

LEVEL METER function; Characteristic: A; f_{sin}= 1000 Hz

Nominal result LEQ [dB]	30.0	31.0	32.0	40.0	115.0	125.0
Error [dB]	0.1	0.1	0.1	0.0	-0.0	0.0

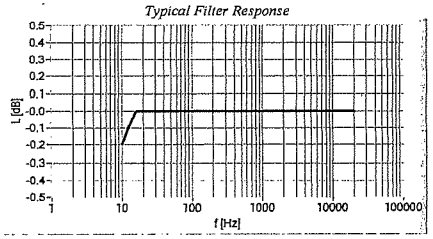
LEVEL METER function; Characteristic: A; f_{sin}= 8000 Hz

Nominal result LEQ [dB]	30.0	31.0	32.0	40.0	114.0	124.0
Error [dB]	0.0	-0.0	0.0	-0.0	-0.0	0.0

3. FREQUENCY RESPONSE (electrical)

LEVEL METER function; Characteristic: Z; Input signal =122 dB;

Typical Filter Response



Measured Filter Response
(f-frequency, L-level)

f [Hz]	L [dB]	f [Hz]	L [dB]	f [Hz]	L [dB]
10	-3.3	63	-0.1	4000	0.0
12.5	-2.5	125	-0.0	8000	0.0
16	-1.8	250	0.0	16000	0.0
20	-1.3	500	0.0	20000	-0.0
25	-0.8	1000	0.0		
31.5	-0.6	2000	0.0		

All frequencies are nominal center values for the 1/3 octave bands

4. FREQUENCY RESPONSE (acoustical)

LEVEL METER function; Characteristic: Z; Input: 90 dB;

Frequency [Hz]	20	31.5	63	125	250	500	800	1000	2000
Pressure Response [dB]	0.1	0.1	0.0	0.1	0.1	0.0	-0.0	-0.2	-0.7
Free Field Response [dB]	0.1	0.1	0.0	0.1	0.1	0.0	0.0	0.0	-0.2

Frequency [Hz]	3150	4000	5000	6300	8000	10000	12500	16000
Pressure Response [dB]	-1.5	-2.2	-3.1	-4.0	-5.1	-6.3	-7.6	-9.4
Free Field Response [dB]	-0.4	-0.6	-0.7	-0.9	-1.1	-1.9	-2.9	-4.7

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM37462

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	Svantek		
Type No:	SV307A	**Serial No:**	131847
Mic. Type:	ST30A_V3	**Serial No:**	143473
Pre-Amp. Type:	Internal	**Serial No:**	N/A

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

Tests Performed: IEC 61672-3:2013

Comments: All Tests passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1002	hPa ±1 hPa	**Date of Receipt :**	21/09/2023
Temperature	23	°C ±1° C	**Date of Calibration :**	21/09/2023
Relative Humidity	36	% ±5%	**Date of Issue :**	21/09/2023

Acu-Vib Test Procedure: AVP10 (SLM) based on IEC 61672-3.

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Hein Soe

Accredited for compliance with ISO/IEC 17025 - Calibration
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Head Office & Calibration Laboratory
Unit 14, 22 Hudson Ave. Castle Hill NSW 2154
(02) 9680 8133
www.acu-vib.com.au

The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self-Generated Noise	11.1	Observed
Electrical Noise	11.2	Observed
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Not Available
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM37660

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	Svantek		
Type No:	SV307A	**Serial No:**	131859
Mic. Type:	ST30A_V3	**Serial No:**	143466
Pre-Amp. Type:	N/A	**Serial No:**	N/A
Filter Type:	1/3 Octave	**Test No:**	F037661

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

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1012	hPa ±1 hPa	**Date of Receipt :**	31/08/2023
Temperature	21	°C ±1° C	**Date of Calibration :**	17/10/2023
Relative Humidity	35	% ±5%	**Date of Issue :**	17/10/2023

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

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Hein Soe

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The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self-Generated Noise	11.1	Observed
Electrical Noise	11.2	Observed
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Not Applicable
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	*Clause*	*Result*
Test of relative attenuation at filter midband frequency	10	Pass
Linear operating range including range control if fitted	11	N/A
Test of lower limit of linear operating range	12	Pass
Measurement of relative attenuation (filter shape)	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM34201

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	Svantek		
Type No:	SV-307A	**Serial No:**	131816
Mic. Type:	ST30A	**Serial No:**	132672
Pre-Amp. Type:	N/A	**Serial No:**	N/A
Filter Type:	1/3 Octave	**Test No:**	F034203

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

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1009	hPa ±1 hPa	**Date of Receipt :**	07/11/2022
Temperature	22	°C ±1° C	**Date of Calibration :**	07/11/2022
Relative Humidity	48	% ±5%	**Date of Issue :**	07/11/2022

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

CHECKED BY: ..... **AUTHORISED SIGNATURE:** .....

Hein Soe

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mance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self-Generated Noise	11.1	Observed
Electrical Noise	11.2	Observed
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Not Applicable
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

f Compliance: The sound level meter submitted for testing has successfully e class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions the tests were performed. As public evidence was available, from an independent responsible for approving the results of pattern evaluation tests performed in vith IEC 61672-2:2013, to demonstrate that the model of sound level meter fully o the requirements in IEC 61672-1:2013, the sound level meter submitted for rms to the class 1 requirements of IEC61672-1:2013.

ound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	*Clause*	*Result*
ive attenuation at filter midband frequency	10	Pass
ating range including range control if fitted	11	N/A
Test of lower limit of linear operating range	12	Pass
rement of relative attenuation (filter shape)	13	Pass

mitted for testing successfully completed the tests listed above for the

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM38374

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	Svantek		
Type No:	SV307A	**Serial No:**	131846
Mic. Type:	ST30A_V3	**Serial No:**	143377
Pre-Amp. Type:	-	**Serial No:**	-
Filter Type:	1/3 Octave	**Test No:**	F038375

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

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	998	hPa ±1 hPa	**Date of Receipt :**	07/12/2023
Temperature	25	°C ±1° C	**Date of Calibration :**	22/01/2024
Relative Humidity	37	% ±5%	**Date of Issue :**	22/01/2024

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

CHECKED BY: .....

AUTHORISED SIGNATURE: .....
Hein Soe

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The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self-Generated Noise	11.1	Observed
Electrical Noise	11.2	Observed
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Not Applicable
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	*Clause*	*Result*
Test of relative attenuation at filter midband frequency	10	Pass
Linear operating range including range control if fitted	11	N/A
Test of lower limit of linear operating range	12	Pass
Measurement of relative attenuation (filter shape)	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

CERTIFICATE OF CALIBRATION

CERTIFICATE NO: SLM38037

EQUIPMENT TESTED: Sound Level Meter

Manufacturer:	Svantek		
Type No:	SV 307A	**Serial No:**	131815
Mic. Type:	ST30A	**Serial No:**	143310
Pre-Amp. Type:	N/A	**Serial No:**	N/A
Filter Type:	1/3 Octave	**Test No:**	F038038

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

Tests Performed: IEC 61672-3:2013 & IEC 61260-3:2016

Comments: All Test passed for Class 1. (See overleaf for details)

CONDITIONS OF TEST:

Ambient Pressure	1007	hPa ±1 hPa	**Date of Receipt :**	06/10/2023
Temperature	25	°C ±1° C	**Date of Calibration :**	22/11/2023
Relative Humidity	50	% ±5%	**Date of Issue :**	22/11/2023

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

CHECKED BY: .....

AUTHORISED SIGNATURE: .....

Hein Soe

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The performance characteristics listed below were tested. The tests are based on the relevant clauses of IEC 61672-3:2013

Tests Performed:	*Clause*	*Result*
Absolute Calibration	10	Pass
Acoustical Frequency Weighting	12	Pass
Self-Generated Noise	11.1	Observed
Electrical Noise	11.2	Observed
Long Term Stability	15	Pass
Electrical Frequency Weightings	13	Pass
Frequency and Time Weightings	14	Pass
Reference Level Linearity	16	Pass
Range Level Linearity	17	Not Applicable
Toneburst	18	Pass
Peak C Sound Level	19	Pass
Overload Indicator	20	Pass
High Level Stability	21	Pass

Statement of Compliance: The sound level meter submitted for testing has successfully completed the class 1 periodic tests of IEC 61672-3:2013, for the environmental conditions under which the tests were performed. As public evidence was available, from an independent organization responsible for approving the results of pattern evaluation tests performed in accordance with IEC 61672-2:2013, to demonstrate that the model of sound level meter fully conformed to the requirements in IEC 61672-1:2013, the sound level meter submitted for testing conforms to the class 1 requirements of IEC61672-1:2013.

This Sound Level Meter included an Octave Filter Set. Tests were based on IEC 61260-3:2016 and were conducted to test the following performance characteristics:

Tests performed	*Clause*	*Result*
Test of relative attenuation at filter midband frequency	10	Pass
Linear operating range including range control if fitted	11	N/A
Test of lower limit of linear operating range	12	Pass
Measurement of relative attenuation (filter shape)	13	Pass

The filter submitted for testing successfully completed the tests listed above for the environmental conditions under which the tests were performed. If the filter type has successfully completed the pattern-evaluation tests of IEC 61260-2 then it can be stated that the filter set continues to conform to the specifications of IEC 61260-1.

A full technical report is available on request.

APPENDIX D

TURBINE SPECIFICATIONS

Restricted
Document no: 0105-5200 V02
2024-11-20

1/3 Octave noise emission

EnVentus™ V162-6.2MW

Abstract

This document serves as a paper behind the variant specific performance specification.

The document describes the third octave spectra for noise levels according to the variant specific performance and sound specification.

The document is a living document and may be updated regularly.

When new measurements exist, the document might be updated.

Table of Contents

1. Introduction

The purpose of this document is to present the 1/3 octave noise spectra for the EnVentus V162-6.2MW turbine.

2. Method

2.1 Procedure

During measurements, a very large number of correlated values for noise emission spectra and turbine operating parameters are identified.

From these a relation between noise emission within each 1/3 octave band, wind speed and operational conditions are extracted. By combination of these extracted values and the actual turbine operation and rotor size, an estimate of the actual 1/3 octave performance is obtained.

The frequency content is limited to the frequency range 6.3 Hz to 10 kHz to secure that measurement system limitations are not influencing the findings. The stated spectral values are thus representative for the expected noise emission from the turbine at each wind speed.

The method is verified as giving results corresponding to direct measured values.

The reported wind speed range cover hub height wind speeds from 3 to 20 m/s. Extrapolations outside this wind speed range is not possible due to limitations in the measured input data.

The stated values do not in any way enable issuing guarantees.

2.2 Physical environment

The results are valid for the downwind reference position as defined according to IEC 61400-11 Ed.3.

Applicable environmental conditions are thus corresponding to the standardized requirements as described directly and indirectly in IEC 61400-11.

These can be interpreted as air density 1.225 kg/m^3, yaw errors below +/- 15 deg. and vertical inflow angles below +/- 10 deg. Blade condition is clean and undamaged.

3. 1/3 Octave Values for Power Optimised Modes

3.1 1/3 Octave Values for Power Optimised Mode PO6200

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
10 Hz	54.9	55.5	39.5	38.4	43.2	47.6	48.9	49.4	49.6	50.0	49.0	50.2	49.6
12.5 Hz	57.4	58.0	44.0	43.2	47.6	52.1	53.4	53.9	54.1	54.4	53.4	54.5	54.0
16 Hz	59.9	60.5	48.4	47.9	52.1	56.5	57.9	58.4	58.6	58.8	57.8	58.9	58.4
20 Hz	62.4	63.0	52.9	52.6	56.5	61.0	62.4	62.9	63.1	63.1	62.2	63.2	62.7
25 Hz	64.2	64.8	55.4	55.9	61.0	66.1	67.6	68.1	68.3	68.4	67.4	68.1	67.8
31.5 Hz	66.7	67.3	59.9	60.6	65.4	70.6	72.2	72.6	72.8	72.7	71.9	72.5	72.2
40 Hz	70.3	70.9	67.0	67.4	69.8	73.9	75.6	76.0	76.2	75.8	75.0	75.9	75.5
50 Hz	75.4	76.0	78.8	78.3	75.4	77.8	79.5	79.7	80.0	78.9	78.1	79.8	79.0
63 Hz	79.0	79.6	86.0	85.0	79.8	81.2	82.9	83.1	83.3	81.9	81.2	83.3	82.3
80 Hz	80.3	80.9	86.2	85.5	82.2	83.4	85.3	85.8	85.9	84.4	84.0	85.8	84.9
100 Hz	81.4	82.0	85.4	85.0	85.2	86.0	88.4	89.5	89.4	87.9	87.8	89.1	88.4
125 Hz	82.6	83.2	85.6	85.5	87.6	88.2	90.7	92.1	92.0	90.5	90.6	91.5	91.1
160 Hz	83.3	83.9	84.8	85.4	88.3	89.2	91.3	92.5	92.3	91.1	91.2	92.1	91.6
200 Hz	84.1	84.7	83.5	85.2	88.9	90.4	91.6	92.3	92.1	91.3	91.2	92.3	91.8
250 Hz	84.8	85.4	82.7	85.1	89.6	91.4	92.2	92.6	92.5	91.9	91.8	92.8	92.3
315 Hz	84.4	85.0	82.7	85.1	89.2	91.1	92.2	92.6	92.5	92.3	92.2	92.8	92.5
400 Hz	83.7	84.3	82.9	85.1	88.2	90.1	91.9	92.3	92.2	92.6	92.6	92.5	92.6
500 Hz	83.3	83.9	82.8	85.0	87.8	89.9	91.9	92.3	92.3	92.9	93.0	92.5	92.8
630 Hz	83.1	83.7	82.8	85.0	88.0	90.2	92.3	92.7	92.7	93.3	93.4	92.9	93.1
800 Hz	83.1	83.7	82.7	84.9	88.5	91.0	93.0	93.4	93.5	93.9	93.9	93.6	93.8
1 kHz	82.8	83.4	82.7	84.9	88.6	91.4	93.4	93.7	93.9	94.3	94.3	94.0	94.2
1.25 kHz	81.7	82.3	82.6	84.7	88.3	91.3	93.2	93.6	93.7	94.0	94.0	93.7	93.9
1.6 kHz	80.2	80.8	83.3	85.1	88.4	91.7	93.4	93.8	93.7	94.0	94.0	93.7	93.9
2 kHz	79.0	79.6	83.2	85.0	88.1	91.6	93.3	93.6	93.4	93.7	93.7	93.4	93.6
2.5 kHz	77.7	78.3	80.7	82.7	85.7	89.4	91.3	91.6	91.6	91.9	91.8	91.3	91.6
3.15 kHz	76.8	77.4	77.3	79.8	82.6	86.6	88.7	88.9	89.1	89.5	89.4	88.6	89.0
4 kHz	75.5	76.1	74.8	77.5	80.2	84.4	86.6	86.9	87.2	87.6	87.6	86.5	87.0
5 kHz	72.4	73.0	70.8	73.4	76.1	80.4	83.0	83.4	84.6	84.7	85.0	83.4	84.2
6.3 kHz	68.2	68.8	65.8	68.0	70.9	75.4	78.6	79.2	81.7	81.4	82.0	79.8	80.9
8 kHz	65.1	65.7	61.8	63.9	66.8	71.4	75.0	75.8	79.1	78.6	79.4	76.8	78.1
10 kHz	61.9	62.5	57.7	59.7	62.7	67.5	71.4	72.3	76.5	75.8	76.8	73.7	75.3
A-wgt	95.0	95.6	96.3	97.5	100.2	102.5	104.3	104.8	104.8	104.8	104.8	104.8	104.8

Blades with Serrated Trailing Edges

3.2 1/3 Octave Values for Power Optimised Mode PO6200-0S

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
10 Hz	54.8	55.5	39.0	41.7	43.3	47.6	48.9	49.3	49.5	50.0	49.8	50.2	53.2
12.5 Hz	57.3	58.0	43.5	46.8	48.3	52.1	53.4	53.8	54.0	54.4	54.5	54.5	57.8
16 Hz	59.8	60.4	48.3	52.0	53.3	56.5	57.9	58.3	58.5	58.8	59.3	59.0	62.3
20 Hz	62.3	62.9	53.8	57.1	58.3	61.0	62.4	62.8	63.0	63.1	64.1	63.9	66.9
25 Hz	64.2	64.8	60.2	63.3	64.1	66.1	67.6	68.0	68.2	68.4	69.5	69.7	71.7
31.5 Hz	66.6	67.3	65.7	68.5	69.1	70.8	72.2	72.5	72.7	72.7	74.2	74.7	76.3
40 Hz	70.3	70.9	69.7	72.0	72.9	74.8	75.6	75.9	76.1	76.2	78.0	78.4	80.4
50 Hz	75.3	75.9	78.4	78.1	77.4	79.8	81.0	80.2	80.3	81.4	82.9	83.0	86.2
63 Hz	78.9	79.5	85.5	84.8	81.2	83.8	85.2	84.3	84.3	85.4	86.7	86.7	90.3
80 Hz	80.2	80.8	85.7	85.3	83.5	85.9	87.2	86.4	86.3	87.2	88.4	88.5	91.4
100 Hz	81.3	81.9	84.9	84.8	86.1	87.9	89.0	89.4	89.4	88.6	89.9	90.3	92.3
125 Hz	82.6	83.7	85.1	85.6	88.3	89.9	90.9	92.1	91.9	90.5	91.5	92.1	93.3
160 Hz	83.8	85.3	85.3	86.7	89.6	91.3	92.3	92.4	92.2	91.8	92.7	93.3	93.2
200 Hz	85.4	87.0	87.6	88.2	91.2	93.1	94.0	93.8	93.5	93.6	94.0	94.6	92.4
250 Hz	87.0	88.6	89.1	89.4	92.5	94.5	95.4	95.3	95.0	95.0	95.2	95.8	92.3
315 Hz	86.6	87.9	88.6	89.3	92.5	94.6	95.8	95.9	95.6	95.5	95.5	95.9	93.1
400 Hz	86.2	87.3	87.1	88.7	92.0	94.3	96.0	96.3	95.9	95.7	95.5	95.5	94.2
500 Hz	85.8	86.7	86.5	88.6	92.0	94.4	96.5	96.9	96.5	96.2	95.9	95.6	95.0
630 Hz	86.2	86.7	86.6	88.8	92.1	94.5	96.8	97.3	97.1	96.9	96.6	96.4	96.2
800 Hz	86.6	86.7	87.1	89.6	92.7	95.2	97.5	98.2	98.3	98.3	98.1	97.9	98.4
1 kHz	87.0	86.7	87.1	89.9	92.8	95.4	97.8	98.6	98.8	99.0	98.8	98.6	99.6
1.25 kHz	86.2	85.7	86.3	88.7	91.5	94.1	96.4	97.3	97.6	97.8	97.7	97.5	98.1
1.6 kHz	85.4	84.6	85.2	87.1	89.8	92.5	94.7	95.5	96.0	96.2	96.0	95.9	95.8
2 kHz	84.5	83.5	84.4	85.9	88.5	91.2	93.3	94.2	94.8	95.0	94.9	94.8	94.4
2.5 kHz	83.7	83.3	83.6	84.2	86.5	89.0	90.8	91.5	92.0	92.4	92.4	92.2	92.2
3.15 kHz	82.8	83.2	83.3	82.5	84.3	86.5	87.9	88.3	88.8	89.4	89.6	89.1	89.5
4 kHz	82.0	83.0	82.5	80.8	82.3	84.3	85.4	85.6	86.1	86.8	87.1	86.6	87.3
5 kHz	78.6	79.6	79.3	78.5	79.4	80.9	81.5	81.1	81.6	82.2	83.0	82.2	85.8
6.3 kHz	75.3	76.2	74.8	75.9	76.1	76.7	76.7	75.5	76.1	76.4	77.8	76.7	84.6
8 kHz	72.0	72.8	71.6	73.6	73.3	73.3	72.7	71.1	71.6	71.9	73.6	72.3	83.1
10 kHz	68.6	69.3	68.3	71.4	70.4	69.9	68.8	66.6	67.2	67.3	69.5	67.9	81.6
A-wgt	97.8	98.4	99.1	100.3	103.0	105.3	107.1	107.6	107.6	107.6	107.6	107.6	107.6

Blades without Serrated Trailing Edges

4. 1/3 Octave Values for Sound Optimised Modes

4.1 1/3 Octave Values for Sound Optimised Mode SO3

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
10 Hz	54.9	55.5	39.5	38.4	41.4	43.4	45.1	45.5	44.7	45.1	46.5	46.4	46.8
12.5 Hz	57.4	58.0	44.0	43.2	46.0	47.9	49.8	50.2	49.2	49.5	50.7	50.5	50.8
16 Hz	59.9	60.5	48.4	47.9	50.5	52.4	54.5	54.9	53.6	53.8	54.8	54.5	54.9
20 Hz	62.4	63.0	52.9	52.6	55.1	56.9	59.3	59.6	58.1	58.1	58.9	58.5	58.9
25 Hz	64.2	64.8	55.4	55.9	59.4	61.5	64.2	64.5	62.5	62.0	62.6	62.1	62.5
31.5 Hz	66.7	67.3	59.9	60.6	63.9	66.0	68.9	69.2	66.9	66.3	66.8	66.1	66.6
40 Hz	70.3	70.9	67.0	67.4	69.1	70.5	73.3	73.5	71.7	71.3	71.6	70.9	71.1
50 Hz	75.4	76.0	78.8	78.3	76.5	76.0	79.2	79.3	78.0	78.1	78.4	77.9	77.7
63 Hz	79.0	79.6	86.0	85.0	81.7	80.5	83.6	83.6	82.7	83.0	83.2	82.7	82.2
80 Hz	80.3	80.9	86.2	85.5	83.2	83.4	85.6	85.4	84.8	84.9	84.7	84.0	83.6
100 Hz	81.4	82.0	85.4	85.0	84.6	87.6	88.2	87.6	87.3	87.2	86.0	85.1	84.5
125 Hz	82.6	83.2	85.6	85.5	86.1	90.5	90.2	89.4	89.4	89.1	87.5	86.5	85.8
160 Hz	83.3	83.9	84.8	85.4	86.4	89.9	90.0	89.5	89.6	89.4	88.0	87.0	86.7
200 Hz	84.1	84.7	83.5	85.2	86.6	88.4	89.3	89.3	89.8	89.4	88.7	87.8	87.8
250 Hz	84.8	85.4	82.7	85.1	86.9	87.9	89.1	89.4	90.1	89.7	89.2	88.3	88.6
315 Hz	84.4	85.0	82.7	85.1	86.7	87.4	88.6	88.8	89.3	88.9	88.4	87.9	88.3
400 Hz	83.7	84.3	82.9	85.1	86.1	86.6	87.4	87.6	87.7	87.4	86.5	86.6	87.2
500 Hz	83.3	83.9	82.8	85.0	85.9	86.1	86.9	87.0	86.9	86.6	85.7	86.1	86.9
630 Hz	83.1	83.7	82.8	85.0	86.5	86.8	87.6	87.7	87.5	87.4	86.7	87.0	87.7
800 Hz	83.1	83.7	82.7	84.9	87.6	88.2	89.0	89.1	88.8	88.9	88.8	88.7	89.1
1 kHz	82.8	83.4	82.7	84.9	88.2	88.9	89.7	89.8	89.4	89.7	89.8	89.6	89.8
1.25 kHz	81.7	82.3	82.6	84.7	87.6	88.5	89.3	89.4	89.1	89.4	89.8	89.8	89.8
1.6 kHz	80.2	80.8	83.3	85.1	87.1	88.2	89.0	89.1	88.9	89.3	89.6	90.1	89.8
2 kHz	79.0	79.6	83.2	85.0	86.6	87.8	88.6	88.8	88.6	89.1	89.6	90.3	89.8
2.5 kHz	77.7	78.3	80.7	82.7	84.5	85.8	86.7	87.1	87.1	87.5	88.7	89.5	89.1
3.15 kHz	76.8	77.4	77.3	79.8	81.9	83.2	84.6	85.1	85.2	85.7	88.0	88.8	88.6
4 kHz	75.5	76.1	74.8	77.5	79.7	81.2	82.7	83.4	83.6	84.1	87.2	88.0	88.0
5 kHz	72.4	73.0	70.8	73.4	76.0	77.6	79.2	79.9	80.7	80.9	84.3	85.1	85.1
6.3 kHz	68.2	68.8	65.8	68.0	71.4	73.1	74.8	75.5	77.1	76.7	80.5	81.0	81.2
8 kHz	65.1	65.7	61.8	63.9	67.7	69.6	71.3	72.0	74.3	73.5	77.7	78.1	78.4
10 kHz	61.9	62.5	57.7	59.7	64.0	66.0	67.9	68.6	71.4	70.3	74.9	75.2	75.6
A-wgt	95.0	95.6	96.3	97.5	98.8	100.2	101.0	101.0	101.0	101.0	101.0	101.0	101.0

Blades with Serrated Trailing Edges

4.2 1/3 Octave Values for Sound Optimised Mode SO5

Frequency	Hub height wind speeds [m/s]												
	3 m/s	4 m/s	5 m/s	6 m/s	7 m/s	8 m/s	9 m/s	10 m/s	11 m/s	12 m/s	13 m/s	14 m/s	15 m/s
10 Hz	54.9	55.5	39.5	38.4	45.4	45.1	42.1	41.3	41.0	43.0	43.7	44.1	43.7
12.5 Hz	57.4	58.0	44.0	43.2	49.3	49.3	46.7	45.9	45.7	47.4	48.0	48.5	48.3
16 Hz	59.9	60.5	48.4	47.9	53.2	53.5	51.3	50.5	50.4	51.9	52.4	52.8	52.9
20 Hz	62.4	63.0	52.9	52.6	57.1	57.7	55.8	55.1	55.1	56.3	56.8	57.1	57.6
25 Hz	64.2	64.8	55.4	55.9	60.8	61.7	59.9	59.0	59.3	60.1	60.8	60.9	61.9
31.5 Hz	66.7	67.3	59.9	60.6	64.7	65.9	64.4	63.6	64.0	64.5	65.1	65.2	66.5
40 Hz	70.3	70.9	67.0	67.4	68.8	70.3	69.8	69.1	69.4	69.8	70.2	70.3	71.5
50 Hz	75.4	76.0	78.8	78.3	74.2	76.2	77.2	76.8	76.8	77.2	77.0	77.4	78.7
63 Hz	79.0	79.6	86.0	85.0	78.4	80.7	82.5	82.3	82.3	82.4	82.0	82.5	83.7
80 Hz	80.3	80.9	86.2	85.5	80.4	82.6	84.7	84.7	84.6	84.5	84.2	84.4	85.2
100 Hz	81.4	82.0	85.4	85.0	82.8	84.9	87.5	87.8	87.7	87.1	87.0	86.7	86.7
125 Hz	82.6	83.2	85.6	85.5	84.9	86.9	89.7	90.1	90.0	89.1	89.1	88.7	88.2
160 Hz	83.3	83.9	84.8	85.4	85.4	87.1	89.1	89.5	89.5	88.8	88.9	88.5	87.9
200 Hz	84.1	84.7	83.5	85.2	85.6	86.8	87.7	88.0	88.0	87.9	87.8	87.8	87.0
250 Hz	84.8	85.4	82.7	85.1	86.1	87.0	87.2	87.4	87.4	87.6	87.5	87.7	86.7
315 Hz	84.4	85.0	82.7	85.1	86.4	87.1	86.9	87.0	87.1	87.2	87.3	87.5	86.6
400 Hz	83.7	84.3	82.9	85.1	86.8	87.2	86.5	86.4	86.5	86.7	86.9	87.1	86.6
500 Hz	83.3	83.9	82.8	85.0	87.1	87.4	86.3	86.0	86.2	86.4	86.7	86.8	86.6
630 Hz	83.1	83.7	82.8	85.0	87.3	87.5	86.6	86.3	86.4	86.7	86.9	86.9	86.9
800 Hz	83.1	83.7	82.7	84.9	87.7	87.9	87.4	87.0	87.0	87.4	87.3	87.2	87.6
1 kHz	82.8	83.4	82.7	84.9	87.9	88.0	87.7	87.3	87.2	87.7	87.5	87.3	87.9
1.25 kHz	81.7	82.3	82.6	84.7	87.2	87.3	87.3	86.9	86.9	87.3	87.2	87.1	87.7
1.6 kHz	80.2	80.8	83.3	85.1	86.5	86.9	87.1	86.8	86.9	87.2	87.2	87.3	87.9
2 kHz	79.0	79.6	83.2	85.0	85.8	86.2	86.7	86.4	86.5	86.9	86.8	87.1	87.7
2.5 kHz	77.7	78.3	80.7	82.7	83.3	83.7	84.2	83.9	84.1	84.5	84.5	84.9	85.5
3.15 kHz	76.8	77.4	77.3	79.8	80.1	80.5	81.0	80.7	81.0	81.4	81.6	82.1	82.7
4 kHz	75.5	76.1	74.8	77.5	77.5	78.1	78.5	78.2	78.5	79.0	79.3	79.9	80.4
5 kHz	72.4	73.0	70.8	73.4	73.8	74.4	73.9	73.4	73.8	74.3	74.7	75.3	75.4
6.3 kHz	68.2	68.8	65.8	68.0	69.4	70.0	68.1	67.1	67.7	68.2	68.6	69.2	68.5
8 kHz	65.1	65.7	61.8	63.9	65.6	66.3	63.6	62.3	63.0	63.5	64.0	64.6	63.5
10 kHz	61.9	62.5	57.7	59.7	61.9	62.7	59.0	57.5	58.3	58.9	59.4	60.0	58.4
A-wgt	95.0	95.6	96.3	97.5	98.3	99.0	99.5	99.5	99.5	99.5	99.5	99.5	99.5

Blades with Serrated Trailing Edges

5. Limitations

The values as stated in the present document are to be regarded as “best estimates” for the octave band performance for the turbine. The values are to be regarded as informative and cannot in any way be used as guaranteed for any projects.

6. Recalculation to 10 m wind speeds

In case 10 m height wind speed references are required, recalculation of the stated values can be made using the following procedure:

1. The stated hub height wind speeds are recalculated to 10 m reference height.
2. Integer 10 m height wind speed related sound power levels are calculated using linear interpolation between the nearest non-integer values.

Recalculation is made using procedures as defined in IEC 61400-11 ed.3. Appendix D.