

Environmental Impact Assessment Report

Beinneun 2 Wind Farm

Volume 3

Technical Appendix A9.1: Sound Power Levels and Cumulative Noise Levels

Document prepared by Envams Ltd for Beinneun 2 Wind Farm Ltd

September 2025



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A9.1 SOUND POWER LEVELS AND CUMULATIVE NOISE LEVELS

The following sections present the noise emission data for each assessed cumulative development, including the adjustments made in accordance with the methodology described in Section 9.4.4 of Chapter 9, Noise, of the EIA Report.

The following cumulative developments were identified for assessment:

- Beinneun – operational;
- Beinneun Extension – operational;
- Bunnloin – consented;
- Millennium (including extension) – operational
- Millennium East – in planning; and
- Tomchrasky – in planning.

A9.1.1 BEINNEUN WIND FARM

Table A9.1.1: Senvion 3.4M 104, 80 m Hub Height

	Standardised 10 m Wind Speed, ms ⁻¹								
	4	5	6	7	8	9	10	11	12
	Sound Power Level, dB L _{WA}								
Sound Power Level, inc. 2 dB allowance for uncertainty	98.4	101.8	105.6	107.3	107.6	107.1	107.1	107.1	107.1
Adjusted Sound Power Level, dB L _{WA} , for cumulative assessment	100.4	103.8	107.6	109.3	109.6	109.1	109.1	109.1	109.1

Table A9.1.2: Senvion 3.4M 104 Octave Band Spectrum

	Octave Band Centre Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
	Sound Power Level, dB L _{WA}							
Maximum Sound Power Level, dB, L _{WA}	95.0	99.0	101.6	103.8	104.6	100.1	93.9	86.2

A9.1.2 BEINNEUN EXTENSION WIND FARM

Table A9.1.3: Senvion 3.4M 114, 84 m Hub Height

	Standardised 10 m Wind Speed, ms ⁻¹								
	4	5	6	7	8	9	10	11	12
	Sound Power Level, dB L _{WA}								
Sound Power Level, inc. 2 dB allowance for uncertainty	99.3	103.2	105.9	106.2	106.2	106.2	106.2	106.2	106.2
Adjusted Sound Power Level, dB L _{WA} , for cumulative assessment	101.3	105.2	107.9	108.2	108.2	108.2	108.2	108.2	108.2

Table A9.1.4: Senvion 3.4M 114 Octave Band Spectrum

	Octave Band Centre Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
	Sound Power Level, dB L _{WA}							
Maximum Sound Power Level, dB, L _{WA}	93.6	97.6	100.2	102.4	103.2	98.7	92.5	84.8

A9.1.3 BUNLOINN WIND FARM

Table A9.1.5: Siemens Gamesa SG 6.6-170

	Standardised 10 m Wind Speed, ms ⁻¹								
	4	5	6	7	8	9	10	11	12
	Sound Power Level, dB L _{WA}								
119 m Hub Height									
Sound Power Level, inc. 2 dB allowance for uncertainty	99.9	104.8	107.7	108.0	108.0	108.0	108.0	108.0	108.0
Adjusted Sound Power Level, dB L _{WA} , for cumulative assessment	101.9	106.6	109.7	110.0	110.0	110.0	110.0	110.0	110.0
145 m Hub Height									
Sound Power Level, inc. 2 dB allowance for uncertainty	100.5	105.3	108.0	108.0	108.0	108.0	108.0	108.0	108.0
Adjusted Sound Power Level, dB L _{WA} , for cumulative assessment	102.5	107.3	110.0	110.0	110.0	110.0	110.0	110.0	110.0

Table A9.1.6: Senvion 3.4M 104 Octave Band Spectrum

	Octave Band Centre Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
	Sound Power Level, dB L _{WA}							
Maximum Sound Power Level, dB, L _{WA}	91.4	98.2	100.4	101.4	104.6	104.3	99.8	91.4

A9.1.4 MILLENNIUM WIND FARM (INCLUDING EXTENSIONS)

Table A9.1.7: Nordex N90/2500 70 m and 80 m Hub Height

	Standardised 10 m Wind Speed, ms ⁻¹								
	4	5	6	7	8	9	10	11	12
	Sound Power Level, dB L _{WA}								
Sound Power Level, inc. 2 dB allowance for uncertainty	99.5	103.0	106.0	107.0	107.5	107.5	107.5	107.5	107.5
Adjusted Sound Power Level, dB L _{WA} , for cumulative assessment	101.5	105.0	108.0	109.0	109.5	109.5	109.5	109.5	109.5

Table A9.1.8: Nordex N90/2500 Octave Band Spectrum

	Octave Band Centre Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
	Sound Power Level, dB L _{WA}							
Maximum Sound Power Level, dB, L _{WA}	94.7	98.8	103.2	103.6	102.1	101.0	97.0	89.4

A9.1.5 MILLENNIUM EAST WIND FARM

Table A9.1.9: Siemens Gamesa SG 155 102.5 m and 122.5 m Hub Height

	Standardised 10 m Wind Speed, ms ⁻¹								
	4	5	6	7	8	9	10	11	12
	Sound Power Level, dB L _{WA}								
102.5 m hub height									
Sound Power Level, inc. 2 dB allowance for uncertainty	99.8	104.7	107.0	107.0	107.0	107.0	107.0	107.0	107.0
Adjusted Sound Power Level, dB L _{WA} , for cumulative assessment	101.8	106.7	109.0	109.0	109.0	109.0	109.0	109.0	109.0
122.5 m hub height									
Sound Power Level, inc. 2 dB allowance for uncertainty	100.4	105.2	107.0	107.0	107.0	107.0	107.0	107.0	107.0
Adjusted Sound Power Level, dB L _{WA} , for cumulative assessment	102.4	107.2	109.0	109.0	109.0	109.0	109.0	109.0	109.0

Table A9.1.10: Siemens Gamesa SG 155 Octave Band Spectrum

	Octave Band Centre Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
	Sound Power Level, dB L _{WA}							
Maximum Sound Power Level, dB, L _{WA}	86.6	94.0	98.6	100.9	100.7	101.0	94.4	79.4

A9.1.6 TOMCHRASKY WIND FARM

Table A9.1.11: Vestas V150 6.0, 110 m Hub Height

	Standardised 10 m Wind Speed, ms ⁻¹								
	4	5	6	7	8	9	10	11	12
	Sound Power Level, dB L _{WA}								
Sound Power Level, inc. 2 dB allowance for uncertainty	101.1	105.7	108.5	109.7	109.7	109.7	109.7	109.7	109.7
Adjusted Sound Power Level, dB L _{WA} , for cumulative assessment	103.1	107.7	110.5	111.7	111.7	111.7	111.7	111.7	111.7

Table A9.1.12: Vestas V150 6.0 Octave Band Spectrum

	Octave Band Centre Frequency, Hz							
	63	125	250	500	1k	2k	4k	8k
	Sound Power Level, dB L _{WA}							
Maximum Sound Power Level, dB, L _{WA}	90.1	98.8	104.4	106.8	106.2	102.4	95.6	85.5

A9.1.7 CUMULATIVE NOISE LEVEL BREAKDOWN

Table A9.1.13 presents a breakdown of the predicted noise levels for each cumulative development specified above, at each assessed receptor.

Table A9.13: Predicted Noise Levels from Cumulative Developments

NSR / Wind Farm	Standardised 10 m Wind Speed, m/s								
	4	5	6	7	8	9	10	11	12
	Predicted Noise Level, dB, LA90,10min								
1 Achadh-luachraich									
Beinneun	25.5	28.9	32.7	34.4	34.7	34.2	34.2	34.2	34.2
Beinneun Extension	22.4	26.3	29.0	29.3	29.3	29.3	29.3	29.3	29.3
Bunnloin	7.0	11.9	14.7	14.8	14.8	14.8	14.8	14.8	14.8
Millennium (including extensions)	26.1	29.6	33.0	34.5	34.8	34.5	34.5	34.5	34.5
Millennium East	10.8	15.6	17.8	17.8	17.8	17.8	17.8	17.8	17.8
Tomchrasky	7.0	11.6	14.4	15.6	15.6	15.6	15.6	15.6	15.6
2 Achadh-luachraich									
Beinneun	25.5	28.9	32.7	34.4	34.7	34.2	34.2	34.2	34.2
Beinneun Extension	22.3	26.2	28.9	29.2	29.2	29.2	29.2	29.2	29.2
Bunnloin	6.9	11.8	14.6	14.7	14.7	14.7	14.7	14.7	14.7
Millennium (including extensions)	26.4	29.8	33.2	34.7	35.0	34.7	34.7	34.7	34.7
Millennium East	10.8	15.6	17.8	17.8	17.8	17.8	17.8	17.8	17.8
Tomchrasky	7.0	11.6	14.4	15.6	15.6	15.6	15.6	15.6	15.6
Ardochy House									
Beinneun	22.8	26.2	30.0	31.7	32.0	31.5	31.5	31.5	31.5
Beinneun Extension	18.3	22.2	24.9	25.2	25.2	25.2	25.2	25.2	25.2
Bunnloin	13.6	18.5	21.3	21.4	21.4	21.4	21.4	21.4	21.4
Millennium (including extensions)	21.9	25.3	28.9	30.5	30.8	30.4	30.4	30.4	30.4
Millennium East	4.4	9.3	11.4	11.4	11.4	11.4	11.4	11.4	11.4
Tomchrasky	5.7	10.3	13.1	14.3	14.3	14.3	14.3	14.3	14.3
Caledonian Cabin									
Beinneun	24.1	27.5	31.3	33.0	33.3	32.8	32.8	32.8	32.8
Beinneun Extension	21.0	24.9	27.6	27.9	27.9	27.9	27.9	27.9	27.9
Bunnloin	9.8	14.7	17.5	17.6	17.6	17.6	17.6	17.6	17.6
Millennium (including extensions)	24.0	27.5	31.0	32.5	32.8	32.5	32.5	32.5	32.5
Millennium East	8.5	13.4	15.5	15.5	15.5	15.5	15.5	15.5	15.5
Tomchrasky	6.5	11.1	13.9	15.1	15.1	15.1	15.1	15.1	15.1
Daingean									
Beinneun	23.5	26.9	30.7	32.4	32.7	32.2	32.2	32.2	32.2
Beinneun Extension	20.1	24.0	26.7	27.0	27.0	27.0	27.0	27.0	27.0
Bunnloin	10.1	15.0	17.7	17.9	17.9	17.9	17.9	17.9	17.9

Millennium (including extensions)	23.6	27.1	30.6	32.1	32.4	32.1	32.1	32.1	32.1
Millennium East	8.1	13	15.1	15.1	15.1	15.1	15.1	15.1	15.1
Tomchrasky	6.4	11.0	13.8	15.0	15.0	15.0	15.0	15.0	15.0