



Technical Appendix

Drummarnock Wind Farm

Technical Appendix 11-3: Details of Cumulative
Wind Farms

Drummarnock Wind Farm Limited

July 2024



Contents

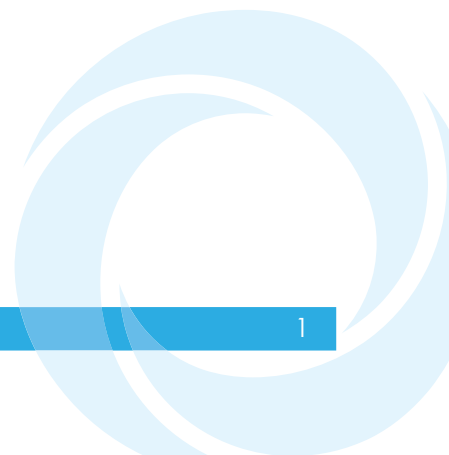
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1 Introduction

This appendix sets out the turbine sound power level data assumed for other wind farms that have been included in the cumulative operational noise assessment detailed in the noise chapter.



2 Sound Power Levels

The sound power levels assumed for each site included in the cumulative predictions are set out below. Each includes the relevant uncertainty (usually 2 dB) in line with the recommendations of the IOA GPG.

The wind farms included in the cumulative assessment, along with the installed or proposed turbine model, are set out in Table A3-1 below.

Table A3-1: Cumulative Wind Farm Turbines

Wind Farm	Turbine Make and Model	Hub Height, m	Number of Turbines
Craigannet	EWT DW54	74	1
Craigengelt	Nordex N90	80	8
Earlsburn	Nordex N80	70	15
Earlsburn Extension*	Nordex N163 5.7 MW STE	98.5	11
Kingsburn	Nordex N90	65	1
		70	8
Shelloch	Vestas V150	105	2
	Vestas V136	81.5	3

*Earlsburn Extension has been submitted for determination but is not yet consented or built. The details provided are those proposed, however different turbines may be installed than those listed.

The sound power levels for each turbine are shown in Table A3-2 to Table A3-9 by octave band frequency (63 Hz to 8000 Hz) against wind speed standardised to 10 m height (3 m/s to 12 m/s).

Table A3-2: EWT DW54 74 m hub Turbine Octave Band Sound Power Level (dB LWA)

Standardised 10 m height wind speed, m/s	Octave band centre frequency (Hz)								Broadband
	63	125	250	500	1000	2000	4000	8000	
3	80.5	86.5	90.5	94.5	92.5	89.5	87.5	81.5	99.0
4	80.5	86.5	90.5	94.5	92.5	89.5	87.5	81.5	99.0
5	80.5	86.5	90.5	94.5	92.5	89.5	87.5	81.5	99.0
6	81.5	87.5	91.5	95.5	93.5	90.5	88.5	82.5	100.0
7	82.5	88.5	92.5	96.5	94.5	91.5	89.5	83.5	101.0
8	83.5	89.5	93.5	97.5	95.5	92.5	90.5	84.5	102.0
9	84.0	90.0	94.0	98.0	96.0	93.0	91.0	85.0	102.5
10	84.0	90.0	94.0	98.0	96.0	93.0	91.0	85.0	102.5
11	84.0	90.0	94.0	98.0	96.0	93.0	91.0	85.0	102.5
12	84.0	90.0	94.0	98.0	96.0	93.0	91.0	85.0	102.5

Sound power levels for the EWT DW54 are taken from the Appendix A9.1 of the Environmental Appraisal for Craigannet.



Table A3-3: Nordex N90 80 m hub Turbine Octave Band Sound Power Level (dB L_{WA})

Standardised 10 m height wind speed, m/s	Octave band centre frequency (Hz)								Broadband
	63	125	250	500	1000	2000	4000	8000	
3	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
4	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
5	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
6	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
7	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
8	90.3	94.1	100.3	102.3	102.2	99.7	96.8	86.9	108.0
9	91.1	94.9	101.1	103.1	103.0	100.5	97.6	87.7	108.8
10	91.3	95.1	101.3	103.3	103.2	100.7	97.8	87.9	109.0
11	91.1	94.9	101.1	103.1	103.0	100.5	97.6	87.7	108.8
12	91.1	94.9	101.1	103.1	103.0	100.5	97.6	87.7	108.8

Sound power levels for the Nordex N90 are taken from the Craigengelt Environmental Statement Chapter 7 and Appendix 7.1.

Table A3-4: Nordex N80 70 m hub Turbine Octave Band Sound Power Level (dB L_{WA})

Standardised 10 m height wind speed, m/s	Octave band centre frequency (Hz)								Broadband
	63	125	250	500	1000	2000	4000	8000	
3	81.0	87.6	88.4	86.2	85.9	85.0	81.4	73.5	94.3
4	84.9	91.5	92.3	90.1	89.8	88.9	85.3	77.4	98.2
5	87.5	94.1	94.9	92.7	92.4	91.5	87.9	80.0	100.8
6	89.5	96.1	96.9	94.7	94.4	93.5	89.9	82.0	102.8
7	90.3	96.9	97.7	95.5	95.2	94.3	90.7	82.8	103.6
8	90.9	97.5	98.3	96.1	95.8	94.9	91.3	83.4	104.1
9	91.3	97.9	98.7	96.5	96.2	95.3	91.7	83.8	104.6
10	91.7	98.3	99.1	96.9	96.6	95.7	92.1	84.2	104.9
11	91.7	98.3	99.1	96.9	96.6	95.7	92.1	84.2	105.0
12	91.7	98.3	99.1	96.9	96.6	95.7	92.1	84.2	105.0

Sound power levels for the Nordex N80 are based on manufacturer specification data for this turbine model.

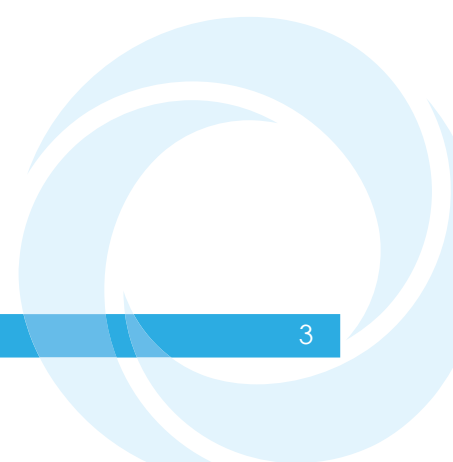


Table A3-5: Nordex N163 5.7 MW STE 98.5m hub Turbine Octave Band Sound Power Level (dB LWA)

Standardised 10 m height wind speed, m/s	Octave band centre frequency (Hz)								Broadband
	63	125	250	500	1000	2000	4000	8000	
3	80.4	86.1	88.4	89.2	91.0	91.5	89.2	78.6	97.5
4	82.9	88.6	90.9	91.7	93.5	94.0	91.7	81.1	100.0
5	87.7	93.4	95.7	96.5	98.3	98.8	96.5	85.9	104.8
6	91.8	97.5	99.8	100.6	102.4	102.9	100.6	90.0	108.9
7	92.1	97.8	100.1	100.9	102.7	103.2	100.9	90.3	109.2
8	92.1	97.8	100.1	100.9	102.7	103.2	100.9	90.3	109.2
9	92.1	97.8	100.1	100.9	102.7	103.2	100.9	90.3	109.2
10	92.1	97.8	100.1	100.9	102.7	103.2	100.9	90.3	109.2
11	92.1	97.8	100.1	100.9	102.7	103.2	100.9	90.3	109.2
12	92.1	97.8	100.1	100.9	102.7	103.2	100.9	90.3	109.2

Sound power levels for the 98.5 m hub height Nordex N163 5.7 MW STE are taken from the Earlsburn Extension Environmental Statement Chapter 12 and Appendix 12.1.

Table A3-6: Nordex N90 65 m hub Turbine Octave Band Sound Power Level (dB LWA)

Standardised 10 m height wind speed, m/s	Octave band centre frequency (Hz)								Broadband
	63	125	250	500	1000	2000	4000	8000	
3	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
4	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
5	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
6	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
7	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
8	89.9	93.7	99.9	101.9	101.8	99.3	96.4	86.5	107.6
9	90.9	94.7	100.9	102.9	102.8	100.3	97.4	87.5	108.6
10	91.3	95.1	101.3	103.3	103.2	100.7	97.8	87.9	108.9
11	91.2	95.0	101.2	103.2	103.1	100.6	97.7	87.8	108.9
12	91.1	94.9	101.1	103.1	103.0	100.5	97.6	87.7	108.8

Sound power levels for the 65 m hub height Nordex N90 are assumed to be the same as the 80 m hub height sound power data obtained from the Craigenfelt Environmental Statement Chapter 7 and Appendix 7.1.

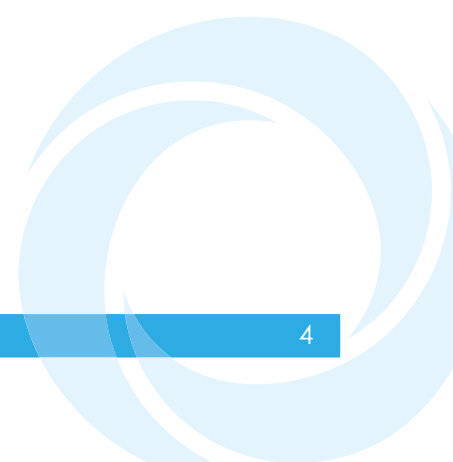


Table A3-7: Nordex N90 70 m hub Turbine Octave Band Sound Power Level (dB L_{WA})

Standardised 10 m height wind speed, m/s	Octave band centre frequency (Hz)								Broadband
	63	125	250	500	1000	2000	4000	8000	
3	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
4	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
5	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
6	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
7	88.5	92.3	98.5	100.5	100.4	97.9	95.0	85.1	106.2
8	90.1	93.9	100.1	102.1	102.0	99.5	96.6	86.7	107.7
9	91.0	94.8	101.0	103.0	102.9	100.4	97.5	87.6	108.7
10	91.3	95.1	101.3	103.3	103.2	100.7	97.8	87.9	109.0
11	91.2	95.0	101.2	103.2	103.1	100.6	97.7	87.8	108.8
12	91.1	94.9	101.1	103.1	103.0	100.5	97.6	87.7	108.8

Sound power levels for the 70 m hub height Nordex N90 are assumed to be the same as the 80 m hub height sound power data obtained from the Craigengelt Environmental Statement Chapter 7 and Appendix 7.1.

Table A3-8: Vestas V150 105 m hub Turbine Octave Band Sound Power Level (dB L_{WA})

Standardised 10 m height wind speed, m/s	Octave band centre frequency (Hz)								Broadband
	63	125	250	500	1000	2000	4000	8000	
3	87.1	94.5	99.7	102.7	103.5	102.2	98.7	93.0	109.0
4	87.1	94.5	99.7	102.7	103.5	102.2	98.7	93.0	109.0
5	87.1	94.5	99.7	102.7	103.5	102.2	98.7	93.0	109.0
6	87.1	94.5	99.7	102.7	103.5	102.2	98.7	93.0	109.0
7	87.1	94.5	99.7	102.7	103.5	102.2	98.7	93.0	109.0
8	87.1	94.5	99.7	102.7	103.5	102.2	98.7	93.0	109.0
9	87.1	94.5	99.7	102.7	103.5	102.2	98.7	93.0	109.0
10	87.1	94.5	99.7	102.7	103.5	102.2	98.7	93.0	109.0
11	87.1	94.5	99.7	102.7	103.5	102.2	98.7	93.0	109.0
12	87.1	94.5	99.7	102.7	103.5	102.2	98.7	93.0	109.0

Sound power levels for the 105 m hub height Vestas V150 are obtained from the Shelloch EIA Statement Appendix 11.2 and normalised to 109 dB as allowed by the development planning condition.

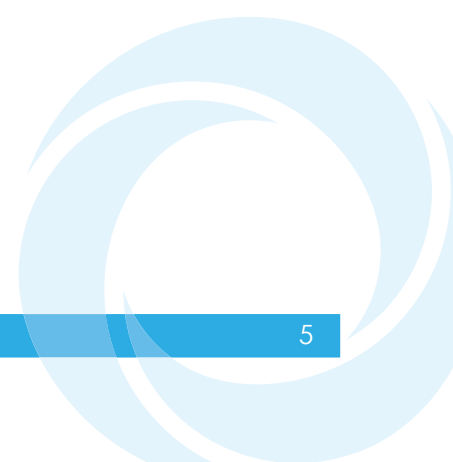
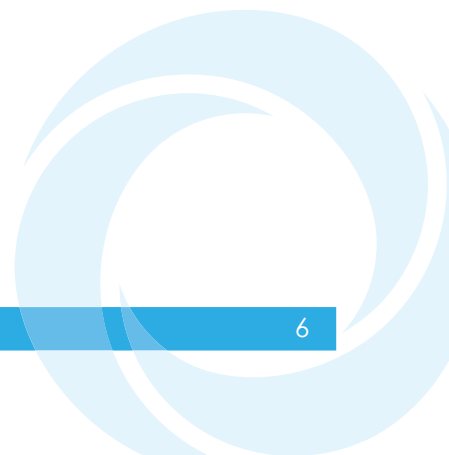


Table A3-9: Vestas V136 81.5 m hub Turbine Octave Band Sound Power Level (dB L_{WA})

Standardised 10 m height wind speed, m/s	Octave band centre frequency (Hz)								Broadband
	63	125	250	500	1000	2000	4000	8000	
3	87.6	95.0	100.2	103.0	103.5	101.8	97.7	91.4	109.0
4	87.6	95.0	100.2	103.0	103.5	101.8	97.7	91.4	109.0
5	87.6	95.0	100.2	103.0	103.5	101.8	97.7	91.4	109.0
6	87.6	95.0	100.2	103.0	103.5	101.8	97.7	91.4	109.0
7	87.6	95.0	100.2	103.0	103.5	101.8	97.7	91.4	109.0
8	87.6	95.0	100.2	103.0	103.5	101.8	97.7	91.4	109.0
9	87.6	95.0	100.2	103.0	103.5	101.8	97.7	91.4	109.0
10	87.6	95.0	100.2	103.0	103.5	101.8	97.7	91.4	109.0
11	87.6	95.0	100.2	103.0	103.5	101.8	97.7	91.4	109.0
12	87.6	95.0	100.2	103.0	103.5	101.8	97.7	91.4	109.0

Sound power levels for the 81.5 m hub height Vestas V136 are obtained from the Shelloch EIA Statement Appendix 11.2 and normalised to 109 dB as allowed by the development planning condition.



3 Turbine Co-ordinates

The coordinates and hub heights of the turbines for each of the wind farms included in the cumulative assessment are set out in Table A3-10 to Table A3-15 below.

Table A3-10: Craigengelt Turbine Coordinates

Craigengelt			
Turbine ID	Easting	Northing	Hub height (m)
G1	271252	685550	74

Table A3-11: Craigengelt Turbine Coordinates

Craigengelt			
Turbine ID	Easting	Northing	Hub height (m)
C1	272582	686532	80
C2	272405	686717	80
C3	271897	686758	80
C4	271953	686529	80
C5	272111	686291	80
C6	272248	686057	80
C7	272581	685919	80
C8	272780	686301	80

Table A3-12: Earlsburn Turbine Coordinates

Earlsburn			
Turbine ID	Easting	Northing	Hub height (m)
E1	269013	690311	70
E2	269228	689982	70
E3	269400	689682	70
E4	269014	689306	70
E5	269249	689096	70
E6	269807	689104	70
E7	269530	688614	70
E8	269615	688377	70
E9	269669	688171	70
E10	269762	687828	70
E11	269643	687463	70
E12	268354	688658	70
E13	268421	688395	70
E14	268434	688126	70
E15	269078	687408	70

Table A3-13: Earlsburn Extension Turbine Coordinates

Earlsburn Extension			
Turbine ID	Easting	Northing	Hub height (m)
EE1	269402	691015	98.5
EE2	270145	691345	98.5

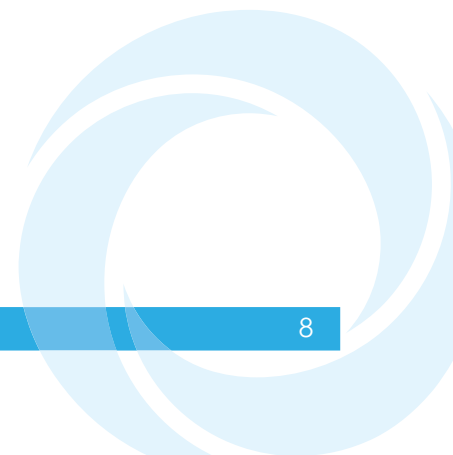
Earlsburn Extension			
Turbine ID	Easting	Northing	Hub height (m)
EE3	270964	691417	98.5
EE4	269997	690816	98.5
EE5	269775	690296	98.5
EE6	270500	690561	98.5
EE7	271085	691008	98.5
EE8	270284	690053	98.5
EE9	271242	690603	98.5
EE10	270807	689819	98.5
EE11	271468	690203	98.5

Table A3-14: Kingsburn Turbine Coordinates

Kingsburn			
Turbine ID	Easting	Northing	Hub height (m)
K1	267545	688908	70
K2	267419	689218	70
K3	267288	689517	70
K4	267267	689824	70
K5	266680	690129	70
K6	267098	690125	70
K7	266786	689845	70
K8	269329	690637	65
K9	268706	690581	70

Table A3-15: Shelloch Turbine Coordinates

Shelloch			
Turbine ID	Easting	Northing	Hub height (m)
S1	266150	688934	105
S2	266703	688563	105
S3	265993	688419	81.5
S4	266296	688198	81.5
S5	266740	687910	81.5



4 References

Institute of Acoustics (May 2013). A Good Practice Guide to the Application of ETSU-R-97 for the Assessment and Rating of Wind Turbine Noise. IOA.

